SENSE-MAKING AND SELF-MAKING IN INTERDISCIPLINARITY

AN ANALYSIS OF DILEMMATIC DISCOURSES OF EXPERTISE

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Abstract

This thesis explores the discursive environment in which the 'interdisciplinary self' is constructed. Interdisciplinarity is part of research policy agendas across the globe; however, there are competing and contrasting discourses about its value. On the one hand, interdisciplinarity is meant to foster innovation and to address contemporary world problems; on the other hand, it represents an intellectual and a professional risk for those who engage in it. Interdisciplinarity has become a research topic in itself, but scholars have not engaged with contemporary literature on 'the self' and on expertise. This limits our understanding of the individuals who engage in interdisciplinary research and how they deal with their intellectual and professional challenges.

This thesis aims to fill this gap by reviewing literature on expertise and analysing 27 semi-structured interviews with researchers and administrators from a large research-oriented British university. The analysis draws on an approach that focuses on how 'the self' is constructed in discourse and biographical narrative, taking up but also resisting widely established meanings (e.g. what is an expert, what is worthwhile professionally, etc.).

The analysis identifies in particular four 'ideological dilemmas' that the interviewees struggle with in their arguments about their background, their skills, and the value of their careers; namely the dilemmas of 'openness and rigour', 'individualism and collectivism', 'disciplinary tolerance and expert prejudice', and 'effort and reward'. These dilemmas suggest that the 'interdisciplinary self' is performatively and discursively constructed in a rhetorical context in which no position can remain untroubled. Therefore associating interdisciplinary individuals with idealised traits, personalities and 'virtues' is not so adequate. It is suggested that 'interdisciplinary expertise' consists of the skills of managing these dilemmas, which may be partially but not permanently solved.

List of publications

Cuevas-Garcia, Carlos Adrian. 2015. "'I Have Never Cared for Particular Disciplines' – Negotiating an Interdisciplinary Self in Biographical Narrative." *Contemporary Social Science* 10(1):86–98.

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scholarship, no great supervisors, and no thesis. I've been very fortunate to have grown up in such an eclectic milieu surrounded by lenses and wood and fungi and books and even a bit of jam. And this is where one struggles between trying to be as thankful as possible without disclosing much private information.

This thesis is dedicated to the women that make us flourish, especially to my mum Lourdes, who has done so much for this world, and to my grandma Gloria, who is now looking after everything, yet from another world.

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Chapter 1. Introduction

Much still needs to be learned about the personal lived experiences of interdisciplinarians, including meanings and feelings that affect the work itself. Yet there is little in the published literature that discloses the realities of the complex social process of interdisciplinary work and even less focusing on the experiences of faculty in academe (Vincenti 2005:83).

I do not only have the formal credentials that prove that I am a qualified economist. It is not only what I do, but who I am. I am a representative of my discipline, and I expect to be recognized as such. These are expectations that I also have to myself. Thus, crossing disciplinary boundaries will challenge expectations that others have of me, as well as those of my own. It raises questions concerning my identity, my own values, and I risk breaking norms within my discipline. I also risk my colleagues' condemnation (Buanes and Jentoft 2009:450).

In their book about the history of scientific 'objectivity', Daston and Galison (2007) state that 'the pursuit of knowledge is also a way of life' (p. 232), and therefore, they argue, such history is also a history of the scientific *self*. This thesis is about individuals making sense of a way of life, hence of 'the self', associated with a particular way of producing knowledge, namely interdisciplinary research. Interdisciplinarity is understood here[1] as

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[1] Chapter 2 includes a broad description of different typologies of interdisciplinarity, and how scholars distinguish it from multidisciplinarity and transdisciplinarity.

'communication and collaboration across academic disciplines' (Jacobs and Frickel 2009:44) which 'imply a variety of [disciplinary] boundary transgressions' (Barry and Born 2013:1). Interdisciplinarity has been described as 'one of the most popular catchwords used in present-day knowledge politics' (Schmidt 2007:313), but, as Vincenti suggests in the quote above, not much is known about the individuals who engage in this type of research. It is often argued, however, that individuals engaged in interdisciplinary research confront a number of challenges (Buanes and Jentoft 2009; Pfirman and Martin 2010), because academic disciplines can be seen as different cultures (Knorr-Cetina 1999), and they have different expectations of their disciples, as the quote of Buanes and Jentoft suggests.

Scholars from science and technology studies (STS) and history and philosophy of science, but also from other disciplines have taken interdisciplinarity as a topic of research, in order to understand it, to critique it, to facilitate it, or to improve it. This body of scholarship can be referred to as 'interdisciplinarity studies', and this thesis aims to contribute to this field by focusing on the discursive construction of the 'interdisciplinary self'. Thus, following Daston and Galison (2007), this thesis also contributes to the study of the scientific self, and more broadly to the field of STS.

This introductory chapter illustrates the social and political context in which the topic of the thesis is situated, describing research policies across the globe that emphasise the need for interdisciplinarity, as well as concerns of researchers engaged in this type of work, as expressed in high profile blogs and newspapers. Since the thesis is focused on 'the self', this concept is also

clarified in this introduction. Once such background information is provided, the chapter presents the research questions and the structure of the thesis.

A research policy matter

As noted above, interdisciplinarity is currently a popular word in knowledge politics, and governments and research funding bodies in different regions of the world support and promote interdisciplinary research. The largest research and innovation framework programme of the European Union, Horizon 2020, for instance, states that collaboration across sciences, social sciences, arts and humanities, is the source of 'radical breakthroughs with a transformative impact' (European Commission 2011:35). The website of the European Research Council (ERC) states that the Council 'encourages in particular proposals that cross disciplinary boundaries' (ERC 2015). Research that transgresses disciplinary boundaries is highly regarded by the ERC, since it is associated with high expectations invested in 'frontier research'[2]:

> The term 'frontier research' reflects a new understanding of basic research. On the one hand it denotes that basic research in science and technology is of critical importance to economic and social welfare. And on the other that research at and beyond the frontiers of understanding is an intrinsically risky venture, progressing in new and the most exciting research areas and is characterised by the absence of disciplinary boundaries (ERC, 2015).

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[2] The trope 'frontier' to refer to scientific knowledge was also used by US president Franklin D. Roosevelt in a letter addressed to Vannevar Bush, director of the Office of Scientific Research and Development, in 1944. One year later Bush directed a report called 'Science – The endless frontier'. The report started with a quote from president Roosevelt taken from his initial letter: 'New frontiers of the mind are before us, and if they are pioneered with the same vision, boldness, and drive with which we have waged this war we can create a fuller and more fruitful employment and a fuller and more fruitful life' (Bush 1945:1)

In the United Kingdom, public money is invested in scientific and academic research through seven research councils, including the Arts and Humanities Research Council (AHRC), the Economic and Social Research Council (ESRC), the Biotechnology and Biological Sciences Research Council (BBSRC), the Engineering and Physical Sciences Research Council (EPSRC), the Medical Research Council (MRC), the Natural Environment Research Council (NERC), and the Science and Technology Facilities Council (STFC). All of these fund research in single disciplines but also research that combines different disciplines. In the section on Funding and Guidance, the ESRC website emphasises 'Impact, innovation and interdisciplinary expectations', and notes that innovation 'involve[s] multiple or unusual disciplinary combinations both within and beyond the social sciences' (ESRC 2015). The site also states that they 'recognise that many of the most pressing research challenges are interdisciplinary in nature, both within the social sciences and between the social sciences and other areas of research'. The 2015 strategic plan of the EPSRC also acknowledges that 'the challenges we must tackle do not respect geographical, political or scientific boundaries' (EPSRC 2015:7), and states that in order to increase the impact of research, the boundaries between the seven research councils 'must be porous' (p. 9).

Besides the seven research councils, Research Councils UK (RCUK) is a strategic partnership formed by the chief executives of each council, which aims to coordinate joint actions between the individual councils. This organisation is also oriented towards improving the delivery of funding and the evaluation of projects in areas between the ones covered by individual councils. This 'umbrella' organisation and its Cross-Council Funding

Agreements represent the government's efforts to support interdisciplinary research. The RCUK website emphasises that interdisciplinary approaches are required to address 'grand challenges' such as 'Living with Environmental Change, Global Uncertainties, Energy, Lifelong Health and Wellbeing, Digital Economy and Global Food Security' (RCUK 2015). In the UK there are also charities that support interdisciplinary research, such as the Wellcome Trust and the Leverhulme Trust, among others. In Germany, the Deutsche Forschungsgemeinschaft (DFG), the largest funding organisation in Europe, states in its institutional mission that they address challenges such as supporting young researchers and 'the interdisciplinarisation of the sciences and humanities', and it also states that the DFG 'especially promotes interdisciplinary cooperation among researchers' (DFG 2015).

National research funding organisations from countries outside the European continent also include interdisciplinarity in their agenda. In the US, the National Science Foundation (NSF) Strategic Plan 2014-2018 states that the first strategic goal is 'to promote the progress of science in order to expand and explore the frontiers of human knowledge, to enhance the ability of the Nation to meet the challenges it faces', and therefore they support 'fundamental, interdisciplinary, high-risk, and potentially transformative research in science and engineering' (NSF 2014).

Besides world-leading countries in scientific and academic research, research that crosses disciplinary boundaries has also been taken up as a strategic goal for emerging economies. In Mexico, part of a key strategy of the National Special Programme on Science, Technology and Innovation 2014-2018 is to promote and strengthen inter- and multi-disciplinary groups in National

priority areas. Moreover, the Mexican National Council for Science and Technology (CONACYT 2014) has had an evaluation panel for multidisciplinary projects since 2009 (Bocco et al. 2014).

While these and many other countries include interdisciplinarity and other forms of cross-disciplinary research in their research and innovation strategies, prestigious universities and research centres follow the same path, making interdisciplinarity part of their institutional image. The website of a research institute in Israel, for instance, states that:

> To be able to shape a better future, the Institute is continuously developing, changing and reinventing itself. On the research front, boundaries between the different disciplines are being torn down and formerly impossible collaborations and combinations are being formed (Weizmann Institute of Science 2015).

A Danish university website claims that:

> Interdisciplinary research is one of the focus areas which must drive the university forward, as many important breakthroughs in research will be made in the crossfields between the traditional subjects (Aarhus University 2015).

University efforts to support and to understand interdisciplinarity better also take other forms. To name a high profile example, on 19 May 2015 the University of Warwick held a lecture with Brian Cox and Michael Scott as guest speakers (Warwick Arts Centre 2015). Brian Cox is a well-known particle physicist and broadcaster, while Michael Scott is a historian and documentary maker. The focus was to discuss the future of interdisciplinarity and the future of collaboration between arts and science.

Alongside large national and university initiatives to promote and support interdisciplinary research, academic organisations have intended to develop understanding about this practice. In the UK, on 12 May 2015 the British Academy for the humanities and social sciences launched a call for evidence aiming to investigate:

> how interdisciplinary research is carried out within universities, the relevance of interdisciplinarity to innovation in the wider economy, and the issue of how academics can forge a career path in interdisciplinary research – both within universities and beyond (British Academy 2015).

Similar to the British Academy, in Mexico, a civil organisation known as 'Foro Consultivo Científico y Tecnológico' was asked by CONACYT to investigate mechanisms implemented by its evaluation panel on multidisciplinary research from 2009 to 2012, and a report was published in March, 2014 (Bocco et al. 2014).

All this evidence underlines the relevance of interdisciplinarity at high and medium institutional levels, and it emphasises that interdisciplinarity is ripe for academic study and reflection. However, texts about interdisciplinarity are not only reproduced in official institutional documentation and within research journals. Interdisciplinarity is also a personal matter of concern, as the following section suggests.

A personal and professional matter

Researchers from different countries and from different levels of the academic ladder have expressed their views on interdisciplinarity in newspapers and on blogs. Although the main concern of this thesis is not with blogs and

newspaper articles, a few of these are presented here to emphasise that, besides large funding bodies, interdisciplinarity is also a matter of concern for individual researchers. Drawing on Huang et al. (2007), Gil de Zúñiga et al. (2011) suggest that people generally blog 'to seek information, to provide commentary, to participate in community forums, to document daily life, and to express oneself' (p. 588). Personal opinions about interdisciplinarity are interesting because these are not limited to expectations about pushing the frontiers of knowledge, increasing the social and economic impact of research, or making nations and institutions more competitive, which tend to be the dominant themes in institutional narratives. Personal opinions about interdisciplinarity highlight – at least – two issues of analytic interest: the first is that there are contrasting views about the technical, institutional and professional risks interdisciplinarity involves; and the second is the presentation and construction of the self.

A brief review of blogs and newspaper articles also illustrates recent concerns in the more local context about interdisciplinarity. In the UK blogging and newspaper writing about interdisciplinarity highlights concerns of academic researchers about the potential damage of the Research Excellence Framework (REF) to interdisciplinarity. This is because, although research councils and other funding bodies encourage interdisciplinary research, the REF – academics argue – discourages it. The REF is the 'system for assessing the quality of research in the UK higher education institutions' (REF, 2015) and it is carried out every six years by the Higher Education Council for England (HEFCE). Institutions have to submit to the REF the 'best quality' publications of their tenured staff. The issue is that academics suspect 'quality' is defined

by the reputation of journals, which are often strongly based in single disciplines (Rafols 2012). Claire Shaw, a higher education journalist from a British central-left newspaper, *The Guardian*, gathered contrasting opinions of researchers and university administrators about the issue. A professor of history from Lancaster argued 'I am now being asked effectively to abandon my interdisciplinary commitments for research that meets with the approval of REF' (Shaw 2013). On the same side of the argument,

> a professor in economics at the University of Warwick said "The government's policy is to promote interdisciplinary research, REF itself says it makes allowances for interdisciplinary research, but universities don't seem to be doing it and regard it as a risk" (Shaw 2013).

However, a spokesperson from the same university stated:

> If anyone has failed to notice that the university [of Warwick] not only values interdisciplinary research, but has in fact actually built its research strategy around it, then they have not been being paying much attention (Shaw 2013).

More than a year later, a couple of weeks before the results of the REF were published, Tim Hall, a social science professor from the University of Winchester wrote an article in *The Guardian* entitled 'Why working across subject areas may benefit you in the REF'. He argued that many researchers suspect interdisciplinary research 'fairs *(sic.)* less well' in the REF, and that

> Dissenting voices from this narrative are rare. However, as someone whose work has ranged across geography, sociology and criminology as well as pedagogic and higher education research, these concerns do not fully accord with my own experiences (Hall 2014).

Interestingly, he then added that 'interdisciplinary researchers frequently speak of being more interested, engaged and stimulated by their work'. More recently, once the results of the REF are out, there have been claims about interdisciplinarity having actually scored high in terms of impact case studies (Hill 2015; Northam 2015). Regardless of what the actual situation is regarding the REF and interdisciplinarity it is interesting to observe that accounts of personal experience, personal characteristics, and (lack of) awareness are part of discussions about the value and risks of interdisciplinarity. At times, expectations of interdisciplinarity are associated with particular characteristics of researchers. Mallory Ladd, a doctoral student at the University of Tennessee, posted in a blog entitled 'Interdisciplinarity – More than a Buzzword':

> Young scientists […] are crossing academic boundaries, while simultaneously focusing on the fundamentals in their respective fields, more than ever before. Instead of "sacrificing depth for breadth" as some of the gray-beards *(sic.)* will still undoubtedly try to argue, there is a new breed of scientist that is effectively communicating between fields and between cultures to find new applications of pure science with deep and measurable impacts (Ladd 2015).

In this quote, expectations surrounding interdisciplinarity as found on funding bodies' websites and strategies are presented as if these were embodied by 'a new breed of scientists'. However, identifying oneself as an interdisciplinary researcher is not always expressed so positively. In an article published in *The Guardian*, Sarah Byrne, doctoral student at Imperial College London, describes that when she is asked about the topic of her PhD 'there's usually a bit of an awkward silence while I try to come up with a short and not-too-

confusing response' (Byrne 2014). And she adds, 'there's a risk of ending up being an expert in nothing' and 'it can also mean an uncertain future'. In the same light, influential physicist Athene Donald, from the University of Cambridge, posted on her blog recently,

> Spreading one's wings into (mixed metaphor) pastures new has to be good for all kinds of reasons beyond simply the CV and the next job application. But, go too far and it is of course possible that glib superficiality will set in (Donald 2015).

These examples illustrate the diversity of opinions about interdisciplinary research. This thesis focuses on accounts about the selves implicated in and shaped by engaging in interdisciplinarity, who are meant to bring to reality the expectations of this form of knowledge production, at the same time as they deal with all its intellectual and professional risks. Moreover, the self of the interdisciplinary researcher is a matter for science and technology studies (STS) because this is a self that often has to deal with the question of what it takes to be an expert, and whose expertise is often subject to challenge. As the self is at the core of this thesis, it is crucial to describe how this concept has been understood in the social sciences.

An overview of 'the self' in social science

The self is referred to as 'all those qualities, attributes, beliefs, desires, goals, intentions, preferences, motivations, emotions, feelings, and moral sentiments that a person assumes to be his or her own' (Tsekeris 2015:1). The self, or the answer to the question 'who am I?' has been at the centre of Western social and philosophical thought since Hellenist and Roman culture, and for even

longer in the Buddhist tradition (Immergut and Kaufman 2014; Loy 2003). It is impossible to summarise here a history of intellectual thought about the self and to do justice to all the social theorists who have written about it. It is, however, worth highlighting what is understood by 'the self' within the thesis and where these understandings come from.

In broad terms it is possible to distinguish between two forms of understanding the self. One conception of the self is the Christian view connected to the spirit or the soul, which refers to the self as an indivisible and metaphysical *essence*, separable from the body. This view, though encompassing a variety of perspectives, is associated with Saint Augustin, Descartes, Rousseau and Kant (Burkitt 2009). The second view, by contrast, emphasises the social nature of the self. According to Burkitt (2009), Adam Smith laid the ground for influential philosophers, sociologists and social psychologists of the self of the 20th Century. Smith suggested in his *Theory of Moral Sentiments* (1759) that there are two fundamental human motives: one is self-interest, which moves individuals to increase their wealth; and the other are the sentiments and sympathies we have for others, and it is 'in this mutual interaction and identification with others that a view of our own self is possible, because we judge our own conduct by viewing it as through the eyes of other people' (Burkitt 2009:10). Burkitt suggests that Smith was so interested in the free market because it 'encourages interaction with a wider range of people from all different societies and walks of life, thus broadening the view we have of the world and ourselves' (2009:11). These views of Smith are not too different to those of pragmatists and symbolic interactionists such as James, Dewey, Cooley, Mead and Goffman. One should also not forget that other precursors

of sociology made their contributions to the notion of the social self. For example, Marx and Durkheim understood that the social division of labour produced different self-identities; and Durkheim's notion of *social facts* underlines the social nature of the self, since social facts are coercive forces external to individuals that shape their ways of thinking, acting and feeling (Burkitt 2009; Cahill 1998; Durkheim 1982).

While Cooley drew strongly on Smith's view that we conduct ourselves according to how others perceive us, Mead (1934) developed such an idea further to suggest that the self is structured in the same way as the social structure inhabited by the individual. Individuals behave, adopting the roles and attitudes they see in others, and they modify these behaviours according to responses of others. The potential attitudes of others can be anticipated by the individual because he or she is familiar with the roles others adopt. These roles and attitudes are not invented by individuals but are part of the social structure. Since individuals can adopt different roles and shift between them according to the actual or anticipated responses of others, Mead suggested, the self is *reflexive*. An individual experiences himself or herself being the reflexive subject ('I') and object which is reflected upon ('me'), only according to the roles available in the social structure (e.g. teacher, mother, kid, scientist) (Carreira da Silva 2007; Holstein and Gubrium 2000). After Mead, Goffman (1959) suggested that in an interactional situation, an individual *performs* a self which he or she 'effectively attempts to induce others to hold in regard to him [or her]' (p.87). Thus, an individual's self is constructed in interaction and in discourse, and achieving a specific self is the purpose of the individual. As Burkitt (2009) argues 'to become an individual self with its own unique

identity, we must first participate in a world of others that is formed by history and culture' (p. 4). In this process language, talk and conversations with others play an important role.

In contemporary social science the self is considered 'reflexively open, socially embedded and interactively created' (Tsekeris 2015:1). Constructing the self also involves a power dimension, since 'who we are, or can become, is often a political issue involving rights and duties fought over within society. Becoming who we want to be, if that is possible, often involves a political struggle' (Burkitt 2009:4). However, as society transforms over time, the ways in which the self can be constructed also change. Daston and Galison (2007) note that the scientific personas and their skills have transformed since the 19th century; and Latour (2013) argues that as science has been involved in public controversies, scientists cannot appeal to scientific certainty in public, as they could some decades ago.

As influential sociologists of the so-called 'late modernity', such as Bauman (1998, 2000) and Giddens (1991), argued two decades ago, the more traditional institutions and cultural habits weaken, 'the more individuals are forced to negotiate lifestyle choices' (Giddens 1991:5), and 'the self has to be explored and constructed as part of a reflexive process of connecting personal and social change' (p. 33). These authors suggest that the range of possibilities to construct the self is almost infinite. As a consequence, Giddens states, individuals face anxiety because they no longer have the sense of security offered by traditional identities and ways of living. However, such an emphasis on individuals' freedom to construct self and identity has been criticised because of the lack of attention paid to the 'structural constraints' still faced by

individuals (Rose 1998; Taylor and Littleton 2008). As Burkitt argues, defining who we are is also a political issue. Thus, there is flexibility, but also uncertainties and constraints, in the construction of the self.

More recently, social psychologists drawing on discourse analysis have suggested an approach that takes into account the almost infinite flexibility to construct the self, but also prevailing structural constraints (Reynolds, Wetherell, and Taylor 2007; Taylor and Littleton 2006, 2008, 2012; Taylor 2015). Detailed analysis of discourse in use allows researchers to explore how individuals construct the self in infinitude of ways, while they also struggle with structural constraints, cultural conventions, dilemmas and other meanings established in the social and cultural environment. This thesis has adopted this approach, known as discursive psychology, and specifically the narrative-discursive approach, to carry out the study described in the following section.

Research questions and design

The research project for this thesis started from an interest in the 'interdisciplinary self' and developed by drawing on studies of interdisciplinarity, STS and other approaches focused on experts and expertise, and discourse studies focused on the construction of self and identity. This thesis draws on discursive psychology and the synthetic narrative-discursive approach to address the following research questions.

- *What discursive resources do individuals draw on to make sense of interdisciplinarity?*

- *How are interdisciplinary selves constructed in and through discourse[3]?*

- *How do interviewees negotiate the issue of expertise in interdisciplinary research?*

- *How are interdisciplinary careers constructed and negotiated as worthwhile?*

The project was carried out at a large, research-oriented British university, including interdisciplinarity in its official research strategy. Qualitative semi-structured interviews were conducted with 27 researchers from the faculties of arts, social sciences, sciences, engineering and health sciences, as well as university administrators. Some of the fields of study of the interviewees include medical humanities, regenerative medicine or tissue engineering, mathematical neuroscience, systems biology, bioinformatics, zoo-archaeology, film and television studies, and STS. At times details of these fields of study are replaced by others to preserve anonymity.

Structure of the thesis

The thesis is organised as follows. Chapters 2 and 3 are dedicated to the review of different literatures. Chapter 2 presents a general literature review of academic work focused on interdisciplinarity. The chapter emphasises the challenges of interdisciplinarity as a practice and also the challenges of studying interdisciplinarity conceptually and empirically. Scholars who have published about interdisciplinarity come from different academic fields and also have different aims and objectives. Some authors criticise disciplines and

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[3] *This question involves how an individual presents oneself as interdisciplinary, how staff and administrators talk about interdisciplinary researchers, how peer researchers talk about interdisciplinary researchers?*

take interdisciplinarity to be the way forward, others see the two as complementary, and yet others are critical of efforts to promote interdisciplinarity. This diversity of views also produces different perspectives on the history of disciplinarity and interdisciplinarity. The roles of public and private organisations as well as the role of influential academics in the promotion of interdisciplinarity are also described. The aim of the chapter is to show that there are multiple and contradictory ways in which individuals can make sense of disciplinarity and interdisciplinarity.

Chapter 3 explores the literature that has a greater focus on the individuals who engage in interdisciplinarity. This includes accounts of their reputation, career trajectories, traits, and skills. Drawing on this review of the literature, two observations can be made. First, that there has not been much engagement with contemporary perspectives on the self, and therefore the literature presupposes an essentialist view of the self. Second, scholars focused on interdisciplinarity have had a minimum engagement with studies of expertise, either from STS or from other academic fields. The exception to this is Collins and Evans' (2002, 2007) approach, which, paradoxically, has received much criticism. For that reason the chapter is complemented by a literature review of studies of experts and expertise. Finally, the chapter suggests discursive psychology as a suitable approach to explore the self of interdisciplinary researchers and their claims of expertise.

Chapter 4 describes the research approach and design. The chapter then provides a detailed review of discursive psychology, with particular foci on argumentative rhetoric (Billig 1996; Billig et al. 1988) and the construction of self and identity in biographical talk (Taylor and Littleton 2006). The chapter

also makes the case for a narrative-discourse analysis of interdisciplinary selves and expertise and this specific approach is contrasted with other discursive analyses of interdisciplinarity. This is followed by a detailed description of the research process including sampling, access to participants, and how the data were analysed. The chapter also presents a reflection on ethical issues, and on the philosophical assumptions and the limitations of the study. In the last section of the chapter I reflect on the dilemma of doing an interdisciplinary study of interdisciplinarity.

The analysis is presented in chapters 5 to 8. Chapter 5 introduces 'interpretative repertoires' (Potter and Wetherell 1987) that were often used by my interviewees to construct accounts about interdisciplinarity. Rather than showing the specific function of these repertoires in the interactional context of the interview, the aim of the chapter is to show that these repertoires represent common ways of talking about interdisciplinarity, and that these are related to each other, often in conflicting ways. Most of these interpretative repertoires can also be found in the literature. Since some interpretative repertoires are in conflict with others, individuals' accounts can be seen as situated in a rhetorical and argumentative context, in which one side of a previously existing argument is supported and the other is undermined[4] (Billig 1996, 2009).

Chapter 6 is the first of three chapters that explore the biographical narratives of my interviewees. It is shown that they draw on, but also resist, the interpretative repertoires introduced in chapter 5. Thus, biographical narrative

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[4] Discursive psychologists use the term 'undermine' in the sense that 'descriptions are built to counter actual or potential alternatives, and they are organised in ways that manage actual or possible attempts to undermine them' (Potter 2012a:123).

is the meeting-point between life events and widely established meanings and understandings. The chapter focuses on interviewees' accounts of their background and on accounts of becoming interested in interdisciplinarity research. The interpretative repertoires introduced in chapter 5 make available a number of 'subject positions' that interviewees can adopt but also challenge. The chapter demonstrates that 'subject positions' (Wetherell 1998) is a better unit of analysis than fixed categories, such as 'narrow-minded specialist' or 'natural interdisciplinarian'. The chapter also introduces a discursive resource that I call the 'canonical narrative of the single discipline specialist', and the first of four 'ideological dilemmas' (Billig et al, 1988) I identified, the 'openness and rigour' dilemma.

Chapter 7 shifts the focus from interviewees' accounts of early life and academic background to claims of the skills for interdisciplinary research they possess. The focus is not only on the skills being claimed but on the discursive strategies interviewees use to present their possession of those skills as factual. The chapter looks back at the literature on interdisciplinarity and on expertise that stresses the different dimensions of interdisciplinary research, and thus on the different skill sets individuals could account for. The chapter introduces two further ideological dilemmas I identified in the accounts of my interviewees. These are the dilemma of 'disciplinary tolerance and expert prejudice', and the dilemma of 'individualism and collectivism'.

Chapter 8 focuses on interviewees' accounts of the value of interdisciplinary careers. Since interdisciplinarity can be described as a personal and a professional risk, the value of an interdisciplinary career has to be negotiated. While some interviewees may associate interdisciplinarity with professional

success, others stress the importance of strategies to minimise professional risks. To explore these tensions and in order to inform the analysis, the chapter draws on concepts from occupational psychology and on Rose's (1999) critique of 'new psycho-technologies of work'. Drawing on this work, I identify the fourth and last ideological dilemma, namely the 'effort and reward' dilemma. This ideological dilemma brings the interviewees into different 'troubled subject positions' (Edley 2001; Wetherell 1998) where they have to provide 'projects of repair' (Taylor and Littleton 2012), which consist of rationalising the challenges and embracing the uncertainties of an interdisciplinary career.

Finally, chapter 9 presents the conclusions to the thesis, bringing together the findings and suggesting a way in which interdisciplinary expertise can be conceived, drawing on theories of expertise that consider it as performative (Lynch 2004), argumentative, multidimensional (Majdik and Keith 2011a, 2011b), and dilemmatic (Billig et al. 1988). This concluding chapter also presents limitations of the empirical analysis, different from limitations of the research design presented in chapter 4. In this chapter I also discuss what the findings contribute to the literature on interdisciplinarity and STS, and it ends by presenting possible avenues for future research and practice.

Chapter 2. Histories and studies of (inter)disciplinarity

2.1 Introduction

The introductory chapter demonstrated how salient interdisciplinarity is in current research policies, at national and international levels. It also showed that interdisciplinarity is a matter of concern at every stage of researchers' careers. This chapter provides an introduction to the existing literature on interdisciplinarity and it highlights commonly explored issues. Part of the literature included in this chapter takes a historical approach and it is both about disciplinarity and about interdisciplinarity, since these have a common history. It should be noted, however, that whilst individual disciplines may have similar histories they also have their particularities. These historical accounts highlight the multiple discourses and understandings around disciplinarity and interdisciplinarity.

The chapter is divided into three main sections. Section 2.2 presents the first of two versions of the history of how disciplines have formed. This 'functionalist' version (Schaffer 2013) claims that disciplines were formed and isolated from each other as a consequence of increasing specialisation. The role of different actors who have championed such views of disciplines is also described here. Section 2.3 presents a second version, critical of assumptions about both the rigidity of disciplinary boundaries and the superiority of interdisciplinarity. This section also integrates concept of 'boundary work'

(Gieryn 1983) in the context of disciplinarity and interdisciplinarity. These histories are followed by section 2.4 which describes challenges associated with the promotion, practice and research of interdisciplinarity. This section also describes different types of research across disciplines. Section 2.5 provides conclusions to the chapter.

2.2 A history of disciplinary unity

According to the Oxford English Dictionary (2015), 'interdisciplinary' appeared for the first time in the *Journal of Educational Sociology* in 1937, and 'interdisciplinarity' appeared in *Nature* in 1970. Although relatively modern terms, concerns about the overspecialisation and fragmentation of knowledge on the one hand, and about unity and synthesis on the other, have existed for much longer (since the early stages of Western civilisation according to Klein, 1990). A number of authors suggest that in order to locate a time when interdisciplinarity first became an issue for debate and practice, one has to look at the history of disciplines. This section describes a number of events that are meant to have given origin to modern disciplines and also a number of functions attributed to these disciplines. The section also presents a version of the origins of interdisciplinarity that follows from such a history of disciplines.

2.2.1 The "functionalist" history of disciplinary development

Klein (1990) traces concerns about unity and fragmentation of knowledge back to Plato and Aristotle. She argues that Plato idealised a unified science, but Aristotle divided modes of inquiry into politics, poetics and metaphysics. Their different points of view have shaped debates about the organisation of

knowledge throughout the development of Western culture. The model of universities that evolved from medieval cathedral schools divided the content in '*trivium* (grammar, logic, and rhetoric) and *quadrivium* (music, geometry, arithmetic, and astronomy)'. In this environment, it was intended that students would specialise in a subject, but that this specialisation 'would occur in a community of general studies' (Klein 1990:20). Frodeman and Mitcham (2007) note that students were meant to have competence in the breadth of fields and that the study of one at the expense of another was considered 'a deformation of the mind' (p. 508). In turn, Klein (1990) argues that these ideals of medieval education were far from reality, highlighting that in the late Middle Ages demands for specialisation external to the university system stimulated division of faculties into law, medicine, and theology and arts.

Weingart (2010) reasons that disciplines need to be relatively stable so that societies can accumulate, classify, and discard knowledge as part of the evolving bodies of work. He suggests that one of the first models of classification within the sciences was suggested by Francis Bacon in the 17th century, a classification endorsed by French encyclopaedists at the end of the 18th century. Bacon distinguished amongst sciences by referencing the method of gaining knowledge, highlighting particular foci on theology, on nature and on man *(sic.)*. No distinction was made between history, philosophy and mathematics. Weingart (2010) notes that by the end of the eighteenth century disciplines started to gain importance and to shape the structure of universities. From the second half of the seventeenth century, Weingart (2010) argues, science started having as its primary activities the 'collecting and ordering all available knowledge, the delineating and systematic arranging of topics, and

the ever more intense interaction between participants in scientific communities' (p. 5). This occasioned a dramatic growth of information. Weingart explains that the increasing amount of data collected, instruments used, and methods and theories developed necessitated sorting and classification, and disciplines resulted as a solution to these needs. He goes on to suggest that disciplines began differentiating from one another because theories, methods and questions were becoming more abstract.

As abstraction increased, disciplines coalesced around specific questions rather than concrete objects. Weingart (2010) observes that as abstraction and disciplinary languages became more specialised, publications that had been addressed to a general public started to be addressed only to the relevant specialist communities. Not only did this increase the gap between scientific experts and lay people, but judgements about the relevance of research questions and problems came to be decided only by disciplinary specialists. In turn, with disciplinary divisions and specialisation individual researchers came to focus on increasingly narrow areas of knowledge. One of the consequences of this, argues Weingart (2010), was that rather than publishing textbooks and compendia (common for eighteenth century scientists), the priority became 'originality, the discovery of new phenomena and explanations' (p. 7).

As specialisation increased, scientific research moved from scientific societies, such as the Royal Society in England and the Prussian Academy in Berlin, to university departments. Klein (1990) points to a modern model of the university emerging between the eighteenth and nineteenth centuries in Germany, France, Great Britain and the US. This model brought together traditional knowledge as taught in the medieval universities, and natural

sciences as conducted in scientific societies. Klein describes modern disciplines as being established as a response to 'the evolution of the modern natural sciences, the general "scientification" of knowledge, the industrial revolution, technological advancement, and the agrarian agitation' (1990:21). At the same time, industry was demanding specialists and disciplines were recruiting students. Thus, disciplines are the result of both internal and external pressures, and have functions related to the production and classification of knowledge, but also about the control of the academic job market, as will be noted below.

Having considered how disciplines came into being, the next is to ask what function they fulfil. In establishing rules of membership, content of teaching, how careers progress, and how reputation is attributed, disciplines establish and maintain their own social structure (Weingart 2010). Disciplines define what their problems, theories, concepts and methods are, and they also define what counts as quality though peer review. A critical academic process, peer review is said to 'constitute the borderline between experts and laymen' (Weingart 2010:8). Aldrich (2014) describes peer review as the basis for many of the decisions made in academia, including 'hiring, promotion, tenure, and reaching judgements of quality generally' (p. 11), and therefore disciplines operationalize peer review into well-established systems of recognition. A counterpoint that arises – noted later in this chapter – is that interdisciplinarity is challenged by a lack of commensurate established systems of evaluation and reward. Further disciplinary functions include coordinating communication, organising conferences and managing journals (Weingart 2010). Outside the university, disciplinary associations advocate for the discipline's interests with

political decision-makers such as funding bodies and research policy organisations. Weingart (2010) notes that regardless of their apparent stability, disciplines are subject to change, shaped by both internal and external pressures. Specialisation is therefore not only the outcome of internal dynamics but also of 'external motivations and opportunities, changes in contexts of application, economic developments, competition between disciplines, demand for expertise, etc.' (Weingart 2010:11).

Whilst Klein (1990) and Weingart (2010) argue that modern disciplines started taking shape and relevance more than two centuries ago, in paying close attention to the emergence of disciplinary departments in American universities Abbott (2001) observes that these appeared only in the twentieth century in a model that then spread across Europe. Moreover, while Klein and Weingart reach for rather remote origins of disciplines and the causes of disciplinary division, Abbott focuses on how disciplinary structures keep reproducing in a self-sustaining way. He suggests that the American disciplinary system is powerful because of its multiple functions. Besides Weingart's summary of the influences that gave birth to disciplines, Abbott argues that disciplines control the job market because disciplinary departments exchange positions between them and also supply the candidates for those jobs. Abbott (2001) goes as far as to surmise that faculties across universities have similar departments in order to be able to participate in the dynamics of this job market with ease; if one university had a different structure it could endanger the future employability of their PhD graduates. Taking a similar position, Turner (2000) argues that sustenance of the employment market is the key characteristic of disciplines, rather than their formal epistemic practices.

According to Turner the knowledge contents of a discipline can be challenged and transformed, but this does not affect the way the job market is organised. To Abbott (2001), while there are 'organised means of reproduction and exchange' (p. 130) of disciplinary scholars, the case is not the same for non-disciplinary scholars, and he argues that the American university system can secure positions only to a small number of them.

Alongside these 'social structural' functions Abbott (2001) draws out 'cultural' functions that disciplines perform, such as preventing knowledge from becoming too overwhelming or too abstract, and providing an identity to intellectuals. Turner (2000) argues that besides providing intellectuals with an identity 'disciplines establish a clear career track from an undergraduate major to professorial appointment and thus produce the kind of self-perpetuating generational cycles that allow for a disciplinary history and so forth' (Turner 2000:60). Breaking out of this cycle in terms of embarking on an interdisciplinary career or setting up interdisciplinary doctoral training centres for example, poses particular challenges and risks to identity, career progression and the supply of suitably qualified academic staff. Building on this synthesis of the origins and functions of disciplines, the next subsection moves on to look at interdisciplinarity more carefully, described through historical perspectives that consider disciplines as rigid and well differentiated.

2.2.2 Discourses of disciplinary limitations and the need of interdisciplinarity

The literature indicates that the discourse of interdisciplinarity is symbiotic with criticisms of disciplines, criticisms that commonly focus on disciplinary limitations (Klein 1990; Schaffer 2013; Weingart 2000). Disciplines are said to

be isolated silos, narrow, unable to address world problems (Jacobs 2013), rigid (Weingart 2000), old-fashioned (Moran 2006) and it is argued that researchers' interests may lie beyond the conventional questions of their disciplines (Aldrich 2014); in contrast, interdisciplinarity is seen as advantageous in a variety of ways. Nissani (1997) summarises ten positive arguments about interdisciplinarity: 1) interdisciplinarity fosters creativity, 2) there are relevant and unexplored research topics at the interstices of disciplines, 3) practical problems are not limited to disciplines and require interdisciplinary approaches, 4) interdisciplinarity is a reminder of the unity of knowledge; 5) scholars who move to a different field are able to make original contributions to it; 6) interdisciplinary researchers can identify the mistakes of a discipline, 7) they enjoy greater flexibility than disciplinary researchers, 8) they can 'travel to new lands' more often than disciplinary researchers, 9) they help to improve the communication between disciplines; and 10) by increasing the connections between disciplines they help to defend academic freedom. To this, Buller (2008) adds that interdisciplinarity is unique in its 'ability to make connections and relativise objects and knowledge systems' (p. 402). Yet, it is worth noticing that interdisciplinarity is not what everybody wants to do and not part of everybody's aspirations.

Expectations of interdisciplinarity coupled with criticisms of disciplines are reflected in both academic literature and in official institutional documents; and as will be pointed out below, there has been alignment between the two literatures. This subsection describes three historical events that have promoted and reproduced expectations about interdisciplinarity at different times through the twentieth century. It starts with the role of private foundations in the US,

before moving onto the influence of the Organisation for Economic Co-operation and Development (OECD) and finally the publication of Gibbons and collaborators' influential book *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies*. It is not to say that these events have been the most influential in shaping the discourse of interdisciplinarity, but these are often recognised in the literature as such. Moreover, conditions in which interdisciplinarity might flourish differ between regions of the world and may depend on contextual characteristics.

The role of private foundations

Interdisciplinary research has been supported from sectors outside academia. Focusing on social and political sciences, Aldrich (2014) describes how concerns about the narrowness of disciplinary activities have motivated private foundations in the US to promote interdisciplinarity since the 1920s. These have included the Russell Sage Foundation, the Laura Spellman Rockefeller Memorial Fund, Recent Social Trends, and the Ford Foundation – all organisations that fund research that could contribute to the solution of different social problems. The Nuffield Foundation, established in 1943, has demonstrated a similar pattern in the UK (Nuffield Foundation 2015). What these foundations have in common is their focus on problems of interest that are intended to directly contribute to the nation's improvement, and their focus on an interdisciplinary approach in achieving that. However, researchers have also had an important role in selecting which problems to address and how to address them, making such research priorities a complementary mix of national and intellectual projects (as Aldrich labels them). According to Aldrich some of the projects supported by the foundations had a long term orientation, with

some traceable through to established interdisciplinary fields such as women's studies, public policy studies and security studies, amongst others. Federal organisations such as the National Science Foundation and the National Institutes of Health in the US quickly followed suit, by the 1950s developing their own initiatives to expand the interdisciplinary content of their research agenda (Aldrich 2014).

Outside the US, the involvement of private foundations in supporting interdisciplinarity can be identified in Germany. The Volkswagen Foundation, the largest private funder of academic research in that country, has since the 1960s been interested in the development of interdisciplinary areas and in bringing different types of expertise together. Krull (2000) recounts how the Volkswagen Foundation was interested in the development of molecular biology, biophysics and biochemistry in German universities. In the 1970s this support expanded not only to collaborations between sciences and engineering but to the less common combination of scientific techniques and archaeology in order to increase the connections between the humanities and the sciences. Since 1992 the Volkswagen Foundation has funded research on intercultural communications.

The role of the OECD

Having looked at the role of national foundations in building interdisciplinary capacity, here the focus turns to the international stage. Martimianakis (2011) describes the process through which the Organisation for Economic Co-operation and Development (OECD) adopted the concept of interdisciplinarity and made it a key topic for academic research and higher education. After a survey was conducted in country members, a book presenting the results but

also promoting interdisciplinary research and education was published (OECD 1972), and its influence was assessed thirteen years later (Levin and Lind 1985). Results showed that it had had little impact (Weingart 2000).

However, based on a careful analysis of academic literature and OECD publications, Martimianakis (2011) shows that the OECD definition, classification, and valuation of interdisciplinarity were taken up by scholars doing research on the topic. She notes that the OECD classification attributed a higher value to interdisciplinary activity whose main impact is outside academia (exogenous interdisciplinarity) and addressing real community problems, than to interdisciplinarity within academia (endogenous interdisciplinarity). In this context, exogenous interdisciplinarity is meant to 'critique the disciplines on the basis of the artificial demarcations they apply to social issues' (Martimianakis 2011:57). Thus, the OECD promoted the idea that disciplines are limited in their impacts on real-world problems and that interdisciplinarity is to be given more weight. However, Martimianakis notes that some scholars such as Salter and Hearn (1996) rejected the hierarchy between disciplinarity and interdisciplinarity proposed by the OECD, because it 'fail[ed] to problemati[s]e why intellectual divisions are created and sustained in the first place' (Martimianakis 2011:62). As noted in the previous section, disciplines and intellectual divisions are attributed different functions such as facilitating communication in their communities, defining quality and relevance, and controlling the academic job market, among others (Abbott 2001; Turner 2000; Weingart 2010).

The role of academics

The previous sections focused on the role of organisations external to academia in promoting interdisciplinarity. Within academia Gibbons and collaborators' (1994) *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies* has been particularly influential. The book has received large uptake and thousands of citations; and one of the co-authors, Helga Nowotny, was President of the European Research Council between 2010 and 2013 (Nowotny 2015). The central idea put forward by Gibbons et al. (1994) is that there is an emerging form of knowledge production that differs from disciplinary research as carried out in universities, in which knowledge is produced in the context of application and involves non-academic stakeholders. This new model of knowledge production shares similar characteristics and expectations with interdisciplinarity. Gibbons et al. (1994) avoid using dichotomies such as basic and applied science to distinguish between the traditional and the new way of knowledge production by naming them Mode 1 and Mode 2. They suggest that Mode 2 differs from applied research, in which knowledge is produced with an application in mind and then applied, and they argue that in Mode 2 knowledge is rather produced within the context of application.

According to Gibbons et al. (1994) Mode 2 has as its main characteristics that it is 'transdisciplinary' rather than disciplinary, it is 'non-hierarchical and heterogeneously organised', it is 'not institutionalised primarily within university structures', it is 'more socially accountable' and 'more reflexive' (p. vii). By socially accountable they mean that different users and stakeholders are involved in definition of problems, research priorities and interpretation of

results. They argue that Mode 2 production of knowledge is inherently more reflexive because the problems it addresses – related to environment, health, communications, procreation and other complex topics – 'cannot be answered in scientific and technical terms alone' (Gibbons et al. 1994:7). They note that while in Mode 1 quality is defined by peer review in Mode 2 other additional criteria are required, because the context of application involves diverse intellectual, social, economic and political interests. However, they acknowledge that knowledge produced in Mode 2 is generally seen as being of lower quality than Mode 1 knowledge, an accusation they reject.

Although characteristics of Mode 2 are clearly defined, Gibbons et al. (1994) argue that it is not always easy to distinguish between this and Mode 1. It is curious that while they argue against making value judgements of one over the other at the same time they argue that 'the emergence of Mode 2, we believe, is profound and calls into question the adequacy of familiar knowledge producing institutions' (Gibbons et al. 1994:1). Moreover, 'Mode 2 is a response to the needs of both science and society. It is irreversible. The problem is how to understand and manage it' (p. 11). They then add that 'Mode 2 is not supplanting but rather supplementing Mode 1' (Gibbons et al. 1994:14). These contrasting assessments make it difficult to discern Gibbons et al.'s position about disciplinary knowledge because they seem to call into question its adequacy but also express that Mode 1 and Mode 2 interact with one another. Although Mode 2 seems valuable, Gibbons et al. (1994) also note that this mode of knowledge production is often questioned because disciplinary structures are 'pattern[s] of cognitive and social control' that traditionally 'tended to treat harshly those who tried to circumvent its controls'

(p. 10). Furthermore they note that traditional scientists who get involved in Mode 2 research are perceived as weakening their disciplinary loyalty. As will be shown later, interdisciplinary research attracts similar criticisms.

Mode 2 is also said to produce challenges to governments and international organisations, and Gibbons et al. indicate that these need to develop more effective policies to make more competitive innovation systems. Part of these expectations associated with both Mode 2 and interdisciplinarity research seem to resonate in the Horizon 2020 scheme of the European Commission, which indicates that:

> Radical breakthroughs with a transformative impact increasingly rely on intense collaboration across disciplines in science and technology (for instance, information and communication, biology, chemistry, earth system sciences, material sciences, neuro- and cognitive sciences, social sciences or economics) and with the arts and humanities (European Commission, 2011: 35).

Given the complexities and inconsistencies previously discussed, it is difficult to assess either the novelty or the actual presence of clearly identifiable Mode 2 production of knowledge. As Weingart (2010) argues, theoretical and empirical evidence for it have to date proved inadequate, and claims of a new form of knowledge production 'ha[ve] been based on impressionistic evidence only' (p. 12). A second book was published some years later in order to address some of the criticisms aimed at *The New Production of Knowledge* (Nowotny, Scott, and Gibbons 2001), and further discussion is presented in a special issue of *Minerva* edited by the same authors (Nowotny, Scott, and Gibbons 2003). However, this body of scholarship has focused primarily on

the ideas of social accountability and reflexivity rather than on concerns about disciplinarity, interdisciplinarity or transdisciplinarity.

This section has presented one version of the history of disciplinarity and interdisciplinarity, and the relationship between the two concepts. Disciplines and specialisation were described as a way to organise a constantly growing volume of information, and it was noted that disciplines are able to maintain stability and reproduce themselves because of their institutional functions. From this perspective, interdisciplinarity is meant to overcome the limitations of disciplines. However, there is an alternative view of the relation between disciplines and interdisciplinarity, which also questions the history of disciplines provided in this section. The following section explores this alternative view.

2.3 Questioning the historical boundary between disciplinarity and interdisciplinarity

Research on interdisciplinarity frequently puts this concept into direct contrast with that of disciplinarity, usually with the former posited as the answer to presumed deficiencies of the latter. Interdisciplinarity is sometimes portrayed as an improved version of disciplines, promising a route through which to overcome the weaknesses of disciplines. Interdisciplinarity is meant to foster creativity, to address real world problems which traditional disciplines alone cannot solve, and to offer different incentives to researchers who engage in it, such as greater flexibility and enhanced opportunity to 'travel to new lands'. However, some authors question why, if interdisciplinarity is expected to produce so many positive outcomes, disciplines have not been replaced, and

why they still maintain a central position in the academic system (Jacobs 2013; Weingart 2000, 2010). This section takes this dichotomy as its focal question, synthesising literature that observes the relationship between disciplines and interdisciplinarity from a more critical angle. This does not mean that arguments presented above are misleading, but only that the boundary between disciplinarity and interdisciplinarity is not as clear as it may seem, and that the relationship between the two is rather more complex.

In contrast to the version of the history of disciplinarity and interdisciplinarity presented above, Schaffer (2013) argues that disciplines tell stories about themselves and that these stories are performative in the sense that they make disciplines look like 'well-institutionalised homogeneous systems of formal behaviour' (p. 58). He suggests that disciplines are hybrid rather than homogeneous and that 'any story of primordial disciplinary unity and hegemony is entirely misleading' (Schaffer 2013:65). To Shaffer, whilst functionalist accounts suggest that disciplines emerged in the 19th Century as the outcome of 'a utilitarian division of intellectual labour' (p. 59), they have failed to locate the precise moment at which this disciplinary homogeneity emerged. Instead, Schaffer posits that functionalist accounts forget or ignore disciplines' *interdisciplinary* history, suggesting that 'the stereotypes of disciplinary homogeneity and interdisciplinary critique need examination through attention to the ways hybrid systems are made and make up their subjects' (Schaffer 2013:74). As Farred (2011) would suggest, we need to 'radically unlearn' how interdisciplinarity has 'traditionally' been seen and talked about.

The remainder of this section introduces a number of texts which perceive a more dynamic relation between the boundaries of disciplines and unsettle the neat boundary between disciplinarity and interdisciplinarity. Before unsettling these boundaries, one can interrogate the rigidity and limitations of disciplines. In an attempt to defend the value of disciplines, Jacobs (2013) reviews a number of arguments made against them in favour of interdisciplinarity, and offers analyses that contribute to form a more positive view of disciplines. This does not mean to say that Jacobs is antagonistic towards interdisciplinarity; his concern comes at the spaces where reforms promote interdisciplinarity at the expense of disciplinary structures. He also scrutinises a number of criticisms commonly found in the literature which suggest that disciplines are as 'isolated silos'. As isolated silos, disciplines supposedly 'inhibit communication, stifle innovation, thwart the search for integrated solutions to social problems, inhibit the economic contributions of universities, and provide a fragmented education for undergraduates' (Jacobs 2013:13).

To counter such accusations, Jacobs provides evidence of existing connections between different disciplines, including 'maps of science' produced using the Web of Knowledge database and other survey results. He also emphasises disciplines' breadth and the arbitrariness of their boundaries, which give vitality to disciplines. Similarly, Osborne (2013) argues that disciplines are 'porous' and 'promiscuous', and that cross-fertilisation among disciplines is a sign of disciplinarity rather than, or as much as, of interdisciplinarity. Moreover, he argues that one has to 'do a very disciplinary job precisely in order to be interdisciplinary' (Osborne 2013:92). If a scientist wants to work with an artist, he or she goes with his or her scientist mind-set, expecting to

find an artist thinking as an artist, not as a scientist. Osborne stresses that no doubt interdisciplinarity is a good idea, but it is already an aspect of disciplinarity itself, and that the surprising thing is not *that* it happens but *where* it happens. He argues that the interaction between some disciplines is more surprising than others, for example between art and science, rather than between human geography and sociology. In defence of the work between a human geographer and a sociologist, Callard and Fitzgerald (2015) suggest a very original approach to the phenomenon of mind-wandering, collaborating also with humanities' scholars and neuroscientists[5].

Returning to Jacobs' (2013) defence, he argues that specialisation within and competition between disciplines fosters innovation and promotes creativity. In contrast, he argues that if there was a reform and universities were to be organised around interdisciplinary units, disciplinary autonomy would decline, staff power would decrease, and decision making in universities would be more centralised. He suggests that interdisciplinary departments would require more frequent modifications and long-term planning would be more difficult to manage, which would also make tenure less meaningful. Finally, he argues that although interdisciplinarity is effective in producing knowledge and solving problems it should not be seen as contrary to disciplinarity.

What these critiques share is an attempt to portray the contrast between disciplinarity and interdisciplinarity as more unstable than it first appears. The complexity of this relationship is the focus of the following subsection, which

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[5] I attended a job interview at the Wellcome Collection in London to participate in their 'experimental entanglements'. Although I was not successful, discussing with this community of critics of interdisciplinarity in such an environment was a great experience.

approaches the issue by examining studies that either draw on the concept of 'boundary work' (Gieryn 1983, 1999) or are similar to it.

2.3.1 The flexible boundary work of disciplines and interdisciplines

The concept of 'boundary work' offers an intelligible way of thinking about the relation between disciplinarity and interdisciplinarity, a more fluid alternative to framings that portray disciplinary boundaries as rigid and interdisciplinarity as the solution to such rigidity. Gieryn (1983, 1999) initially put forward the concept of boundary work as a way to overcome the challenges faced by philosophers, historians and sociologists of science to demarcate science from non-science. In the process he outlines how demarcation is not just an analytical problem for scholars but also a practical problem for scientists. By the concept of 'boundary work' Gieryn (1983) refers to the rhetorical work carried out by scientists for purposes of demarcation, noting that the characteristics of science are not inherent and unique, but represent ideological efforts to distinguish this activity – and the value of this activity – from others. Boundary work facilitates professional opportunities and provides advantages to scientists, such as intellectual authority, autonomy and material resources that are denied to others. In this sense, boundaries are rhetorically constructed in a way that is 'ambiguous, flexible, historically changing, contextually variable, internally inconsistent, and sometimes disputed' (Gieryn 1983:792). Thus, science can at once be 'theoretical and empirical, pure and applied, objective and subjective, exact and estimative, democratic and elitist, limitless and limited' (Gieryn 1983:792).

Other scholars can be seen as exploring the boundary work of interdisciplinary discourse implicitly or explicitly. Weingart (2000) notes that disciplinarity and interdisciplinarity take on contrasting values when compared with one another: if disciplines are described as 'static, rigid, conservative and averse to innovation', then interdisciplinarity is seen as 'dynamic, flexible, liberal and innovative' (p. 29). By contrast, if disciplines are associated with 'tough-mindedness, order and control', which are 'prerequisites of progress and innovation', then interdisciplinarity is seen as 'suspicious of vagueness and lack of rigidity' (p. 29) or rigour. Moreover, Weingart (2000) observes that in the discourse of interdisciplinarity, specialisation is seen as negative and integration as positive, a view coming from the assumption that innovation results from the meeting of two different kinds of thinking.

Another characteristic of the discourse of interdisciplinarity is that it is said to be embedded in the context of application, in contrast to disciplines that are said to overlook the complexity of so-called real world problems. To Weingart (2000), however, this view derives from an 'old-fashioned realist epistemology' (p. 37) overlooking the fact that even if various disciplines were combined to address real world problems, there would still be 'particular blind spots' (p. 38); these blind spots arise because all structures of knowledge production are selective. Weingart (2000) expands this argument by describing how structures of knowledge do not fit the real world but *perceptions* of the world, which are social constructs: 'products of long and complex social interactions, subject to social processes that involve vested interests, argumentation, modes of conviction, and differential perceptions and communications' (p. 39). He argues that at some moments these structures will

take advantage of integration strategies and at other moments these will take advantage of demarcation and specialisation, therefore specialisation and integration should not be seen as mutually exclusive but as complementary. Indeed, this may well address the conundrum of why specialisation continues to grow even though interdisciplinarity has been promoted for decades at local, national and international levels.

If the concept of boundary work is mobilised in its broadest sense, different studies of interdisciplinarity can be grouped under this label. Greckhamer et al. (2008) make a distinction between interdisciplinarity as a sign (the use of the label 'interdisciplinarity') and interdisciplinarity as an act (the potential production of knowledge in such fashion) in order to reflect on the feasibility of interdisciplinarity. They argue that *as a sign* interdisciplinarity is legitimate because it is well regarded in research policy agendas, so the label can be used to attract funding from different sources. As a sign, interdisciplinarity 'allows research institutions to symbolically comply with demands from their institutional environments' (Greckhamer et al. 2008:316). By contrast, they note that establishing the legitimacy of *the act* of interdisciplinarity is a more complex task, since disciplines decide what counts as legitimate knowledge, including which theories, methods and techniques are considered legitimate to produce knowledge. Interdisciplinary knowledge would have to be accommodated to established disciplines in order to be legitimated, and Greckhamer et al. (2008) argue that:

> Those who are unable or unwilling to accommodate their work to legitimate theories are likely to be rejected by a discipline and either proceed in isolation

(producing *illegitimate* knowledge) or attach themselves to some other group

that accepts the scholars' work as legitimate (p. 318).

Since Greckhamer et al. note that interdisciplinary work has to be accommodated within a particular discipline it is possible to agree with Osborne and Jacobs on their view that the boundaries amongst disciplines and between disciplinarity and interdisciplinarity are more flexible than one would normally assume.

Interdisciplinarity can be seen as a type of boundary work, flexible and oriented to accomplish different purposes. Moran (2006) argues that interdisciplinarity should be understood 'as a strategy that potentially solves problems faced by many different interests opposed to […] disciplinary elites' and that 'the fact that it can be used for so many different purposes explains its popularity, but it also reveals its fatal weakness' (p. 82). He notes that, paradoxically, interdisciplinarity is supported equally by 'hierarchically minded managers' and by 'idiosyncratically minded intellectuals' (Moran 2006:73). Among the multiple purposes that interdisciplinarity can be put to, Moran (2006) reports that managers may praise it in order to reduce the power of disciplines and to attack 'the disciplinary baronies that are so often the despair of academic managers' (p. 77). Another function he describes is the 'reinvention' of disciplines that are in decline because of the erosion of the cultural foundations that supported them in the first place, as is the case of geography and anthropology, which grew out of imperialist ideals and for imperialist purposes. Moran also notes that interdisciplinarity can allow intellectual pluralism within disciplines, but he notes that disciplines

'simultaneously defend and endanger intellectual innovation' (Moran 2006:81).

One of the most pertinent questions that arises from these studies relates to how the boundary work of interdisciplinarity differs from the boundary work of disciplines. Friman (2010) addresses this question by drawing on Laclau and Mouffe's (2001) discourse theory. He argues that disciplinary boundary work consists of positioning the knowledge of a particular discipline as superior to other bodies of knowledge. If interdisciplinarity is said to be superior to other modes of knowledge production (i.e. disciplinarity), then, Friman argues, the boundary work of interdisciplinarity closely resembles that of disciplinarity. As an alternative, he suggests that interdisciplinary boundary work can be seen as a practice that 'undermine[s] the possibility of monopolising knowledge claims' (Friman 2010:15) which in contrast accepts 'the legitimacy of various perspectives' (p. 13). In this way interdisciplinary boundary work celebrates the pluralism of forms of knowledge and prevents closing down specific perspectives and approaches (see Develaki, 2008; Miller et al., 2008). Although appealing, Friman's study is somewhat limited in that he draws not on an empirical analysis of interdisciplinary and disciplinary boundary work but a theoretical reflection.

This section has contrasted different ways in which the relationship between disciplinarity and interdisciplinarity can be perceived. Disciplines may not necessarily be seen as isolated silos, and interdisciplinarity and disciplinarity may not necessarily be mutually exclusive. Having recounted these two paths in envisioning a history of these practices, the next section moves on to

synthesise literature focused on the challenges that arise in attempts to develop and implement interdisciplinarity.

2.4 Challenges of interdisciplinarity

So far this chapter has described two versions of the history of (inter)disciplinarity. One suggests that disciplinary boundaries are well defined and rigid, but that disciplines are isolated silos. In such accounts interdisciplinarity is suggested as a way to overcome this isolation. The other version suggests that disciplinary boundaries are actually porous and that there is more flexible boundary work (Gieryn 1983, 1999) between disciplinarity and interdisciplinarity: at times interdisciplinarity is welcome, at other times it is not. Regardless of which version is more accurate, interdisciplinarity is a challenge for scientists engaged in it and for those taking it as an object of study. Moreover, initiatives to support interdisciplinarity also face practical challenges. This section explores different challenges around defining, promoting and doing interdisciplinary research.

2.4.1 Challenges of defining and researching interdisciplinarity

Research on interdisciplinarity has involved different approaches and different methodologies, including philosophical analysis (e.g. Balsamo and Mitcham 2010; Schmidt 2011), a variety of quantitative and bibliometric analyses (e.g. Leydesdorff and Rafols 2011; Porter and Rafols 2009) and a broad range of qualitative approaches (e.g. Lingard et al., 2007; Garforth and Kerr, 2011). One main challenge in researching interdisciplinarity stems from the lack of consensus about terminology. Practitioners involved in interdisciplinary research face a similar problem, since their practices are limited by what they

understand by interdisciplinarity (Vincenti 2005). Peer-reviewed literature is of limited help in resolving this ambiguity; Wagner et al. (2011) argue that different quantitative analyses of interdisciplinarity draw on different tools, datasets and definitions and therefore they shed light on different aspects of interdisciplinarity. Moreover, they argue, different approaches have inherent advantages and disadvantages. Key issues of measuring interdisciplinarity include the challenge to decide when inputs or outputs can be considered integrated, as well as the observation that 'integration can occur within a single mind as well as among a team' (Wagner et al. 2011:14). Furthermore, they argue that while measurements of interdisciplinarity continue to be of academic interest, if measures are intended to be used for research policy and evaluation, then they produce more confusion than insight.

Rather than a detailed review of possibilities and limitations of different types of analyses, this subsection focuses on attempts to define and distinguish different types of interdisciplinarity and relations between disciplines. This can be considered one of the most important aspects of the literature because all results and all observations depend on how one defines the practice under analysis.

The most common distinction of practices across disciplines is between multidisciplinarity, interdisciplinarity and transdisciplinarity. According to Klein (2010) multidisciplinarity exists when two or more disciplines explore a common topic but each of them draws on their own theories, methods and concepts. When there is integration of theories, methods or objects then one can begin to talk about interdisciplinarity. However, Klein (2010) notes that even though interdisciplinarity is often taken as a synonym for collaboration, it

is not, since a single individual can draw on resources from different disciplines. Drawing on her work on systems biology, Calvert (2011) distinguishes between *individual* and *collaborative* interdisciplinarity depending on whether it is done by a single individual or by a group of different experts. To Klein (2010) transdisciplinarity implies the transformation or transgression of disciplines; to Gibbons et al. (1994) however it implies the participation of non-academics. Of the three terms, multi-, inter-, and trans-disciplinarity the broadest is interdisciplinarity, because at times it is taken as the umbrella term but also because there can be different types of interdisciplinarity. A number of typologies are described below, including one taxonomy Klein suggests, drawing on other authors, and a widely used typology developed by Barry, Born and Weskalnys (2008).

Typologies

The integration of elements from different disciplines can vary in degree and in purpose (Klein 2010). A discipline can provide a service to another without actual integration taking place, or the relationship can be more symmetrical with disciplines beginning to share theories, methods etc. Schmidt (2007) distinguishes between methodology-oriented, epistemology-oriented, and ontology-oriented interdisciplinarity, dependant on where the integration happens. Integration can be done temporarily or it can result in the establishment of new specialities. Klein (2010) argues that some but not all interdisciplinary collaborations become new fields, either as a disciplinary subfield or between different disciplines. For example, sociolinguistics is a subfield of linguistics, and physical chemistry is a field between physics and chemistry. The establishment of new fields may depend on intellectual success

but also on the external attention and funding they attract. This is exemplified by comparing molecular biology with social psychology; while the former attracted large amounts of funding and as a result is now well institutionalised, for the latter this is not the case (Klein 2010). Interdisciplinarity can also be problem-oriented, as is regenerative medicine, or critical, which 'interrogates the dominant structures of knowledge and education with the aim of transforming them' (Klein 2010:23), as is the case of critical psychology or medical humanities. One application of distinguishing between types of interdisciplinarity is, as Huutoniemi (2012) suggests, facilitating the evaluation of research proposals, since different types are likely to necessitate different evaluation criteria.

One limitation of thinking in terms of typologies is the risk of assuming that the relationship between two disciplines is stable and cannot move from one type of interdisciplinarity to another. In practice, one field can at times be critical of the main discipline, yet at other times can contribute to it, as is the case of international historical sociology and international relations (Tansel 2015). Typologies are also susceptible to taking the previous existence of boundaries between disciplines for granted. Fitzgerald and collaborators (Fitzgerald and Callard 2015; Fitzgerald et al. 2014) argue that in collaborations between the neuroscientists and social scientists, for instance, it is not adequate to take for granted the boundary that differentiates the object of study of these disciplines. Rather than 'real' they argue that such boundaries and the definition of each discipline's object of study have been defined and transformed historically, and therefore, the possibility of integration should not be assumed. A different and more dynamic approach, which considers both the

relations between disciplines and their underlying motivations, is suggested by Barry and colleagues (Barry et al. 2008; Barry and Born 2013). This approach is described below.

Modes and logics of interdisciplinarity

Barry, Born and Weszkalkys (2008; Barry and Born 2013) developed their approach highlighting that interdisciplinarity is not new and that it is not a unified practice, but that it has existed in different ways and has followed numerous motives. They focus in particular on contemporary attempts to bring together social and natural sciences and the arts, intending to transform the relationship between science and society. Moreover, they emphasise a critical stance towards views of disciplines as stable and of interdisciplinarity as the outcome of integration of two or more antecedent disciplines. They also argue that interdisciplinarity 'may on occasions generate knowledge practices and forms, and may have effects, that cannot be understood merely as instrumental or as a response to broader political demands' (Barry and Born 2013:4).

Regardless of the diversity of practices referred to as interdisciplinarity, they suggest there are three ideal-typical 'modes': *integrative-synthesis*, *subordination-service*, and *agonistic-antagonistic*. The *integrative-synthesis* mode is perhaps the most frequently imagined, in which theories and methods of different disciplines are brought together to cross-fertilise each other in a symmetrical way. The *subordination-service* mode refers to a relation in which one or few disciplines provide their service to a 'master' discipline. Barry and Born (2013) exemplify this mode with recent projects that bring together art and science with the intention that art facilitates public communication of science. They consider that the situation may be more reciprocal than one

might think, as science may provide the arts with resources or equipment so these can be used to produce other forms of art. The *agonistic-antagonistic* mode refers to 'criticism or opposition to the limits of established disciplines, or the status of academic research or instrumental knowledge production in general' (Barry and Born 2013:12). Barry and Born note that the agonistic-antagonistic mode is more radical in the sense that it can ideally bring about epistemological and ontological transformations of disciplines and practices. An example here is the application of ethnography in the information technology (IT) industry, where advocates argue ethnography is occupying a space that is antagonistic to sociology and other studies of technology (Barry and Born 2013), as rather than an isolated study, ethnography can provide insight to the design of information technologies.

Barry and Born (2013) argue, however, that these modes say little about *why* interdisciplinarity is perceived as necessary, and they complement their modes with three *logics*: the logic of accountability, the logic of innovation and the logic of ontology. However, they caution that the list is not exhaustive. Also, they argue that these logics are more than ways of thinking and can take material and immaterial forms which can be interdependent.

The logic of accountability can be exemplified by the use of art or social science to emphasise the social and economic relevance of science, as when art is used to communicate science or when social sciences explore public attitudes toward science. The logic of innovation underlines that interdisciplinarity can be oriented to foster the economy through the production of novel products, and Barry and Born explain that ethnography can be used in the IT industry to provide valuable feedback for product design.

The logic of ontology subsumes practices of interdisciplinarity which can transform and produce new practices, objects and subjectivities. Barry and Born illustrate the transformative potential of interdisciplinarity with the case of art-science collaboration. They note that this is motivated not only by the idea that artists can facilitate the bringing of science to wider audiences, but also by the idea that artists can use scientific equipment and materials to produce new forms of art, new concepts and new meanings; and provide the scientists with feedback based on their impressions on new technologies. However, Barry and Born observe that such transformative potential does not always take place, since in art-science projects the asymmetric power relation between scientists and artists remain, and only on a few occasions do artists engage at a deeper level with the scientists, going on to use different equipment and materials.

As an exception, it is worth to mention the Synthetic Aesthetics project, which brings together bioengineers, social scientists and designers (Synthetic Aesthetics 2015) to inform each other about the potential uses of new materials developed (or imagined) in synthetic biology as materials for art and design. The project can be considered successful because it has run since 2010 and the materials produced have been exhibited around the world. Last year a book describing multiple projects resulting from a number of workshops was published (Ginsberg et al. 2014). Here, one can see the logic of ontology come into view, illustrated by the question 'How might our contemporary understanding of art and design be challenged by interaction with synthetic biology?' which is included on the project's website. Comparable success in

other art-science projects has proved elusive, arguably because of a precarious funding environment (Born and Barry 2013).

This section has considered different types, modes and logics of interdisciplinarity. The next subsections describe some of the challenges of promoting and doing interdisciplinarity.

2.4.2 Challenges of promoting interdisciplinary research

As discussed above and in the introduction to this thesis, interdisciplinarity is funded and promoted in different countries, and also by international organisations such as the OECD and the European Commission. However, scholars have pointed to the absence of consensus about how disciplinarity can be achieved, particularly when one acknowledges that it does not occur automatically or on demand (Hansson 1999; Lyall and Fletcher 2013), 'even when public funding encourages it' (Lyall and Fletcher 2013:2). In Buller's (2008) terms, interdisciplinarity 'can't be preordained or pre-constructed […] It is discovered, performed and enacted though researchers and scientists voluntarily' (p. 401).

In the UK, much insight was gained from the multimillion project 'Rural Economy and Land Use' (RELU) funded by ESRC, BBSRC and NERC. The project ran from 2004 to 2013 and was oriented towards developing capabilities for interdisciplinary research addressing rural issues (Meagher 2012). The project participants published a number of articles regarding interdisciplinarity and some of those are included in the literature review of this thesis (Lowe and Phillipson 2006; Marzano, Carss, and Bell 2006; Oughton and Bracken 2009). Research funders play an essential role in the

development of interdisciplinarity, but according to Lyall et al. (2013) there is little research on how to support large scale initiatives. Funding bodies have the task of identifying questions that could benefit from interdisciplinary approaches and developing initiatives oriented to address them. Lyall et al. also suggest that it is less problematic to fund interdisciplinary research through specific calls rather than through general calls. Amongst a range of recommendations Lyall et al. suggest that the funding of interdisciplinary research has to be flexible and able to support less visible scaffolding processes such as 'warm-up activities, seed-corn support, team-building interactions, network- and community-building' (Lyall et al. 2013:70). Lyall and Fletcher (2013) add that interdisciplinary researchers can benefit from long term initiatives because these provide a solid base from which to develop personal research agendas and publication strategies. As a tempering note, Lingner (2011) argues that despite the expected benefits of interdisciplinarity it is not always necessary and careless and uncritical use of the term risks devaluing it, therefore it should not become a buzzword. Once a number of challenges of supporting interdisciplinarity have been presented, the discussion moves on to the challenges of doing interdisciplinary research.

2.4.3 Challenges of doing interdisciplinary research

As argued in section 2.2.1, academic disciplines structure the academic job market and provide a clear career track for their disciples (Abbott 2001; Turner 2000). Also entrenching disciplinary structure is the fact that methods of knowledge production differ from discipline to discipline (Knorr-Cetina 1999). In the first comparative study of knowledge production practices drawing on extended observation in high-energy physics and molecular biology

laboratories, Knorr-Cetina (1999) suggests that disciplines are machineries of knowledge production which have their own 'strategies and policies of knowing' (p. 2), and these have different 'architectures of empirical approaches, specific constructions of the referent, particular ontologies of instruments, and different social machines' (p. 3). It is because of these cultural-epistemic differences that interdisciplinary success depends on having a good grasp of the knowledge, symbolic communication and rituals of disciplines other than one's own discipline. It also depends on the development of good interpersonal relations; although demanding time, resources and focus, this is critical in making communication between different disciplines possible (Marzano et al. 2006).

Interdisciplinary research is intellectually problematic because researchers who intend to engage in it 'must risk dilettantism to gain [their] bird's eye view', they may 'slide into naïve generalism' and can be seen as 'jack[s] of all trades, master[s] of none' (Nissani 1997:212). This last phrase is found frequently in the literature (Lau and Pasquini 2008) and also in the talk of research participants for this PhD project. Bridle et al. (2013) point out that the time researchers spend developing knowledge in other disciplines is time not invested in their own discipline. Furthermore, interdisciplinary researchers may be viewed with suspicion and as competitors because they may get resources from one discipline without contributing back to it, as 'using the tools but not playing the game' (Rodgers, Booth, and Eveline 2003:13). The next chapter reviews in greater detail issues of reputation and career trajectories of interdisciplinary researchers.

Interdisciplinary research also carries 'concerns about the loss of quality within individual disciplines' (Lyall and Meagher 2012:611). Since peer review is still mainly discipline-based, it is difficult to get interdisciplinary research published in high ranking-peer reviewed journals, and often funding grant referees judge interdisciplinary proposals more harshly than others (Bridle et al. 2013; Lyall and Fletcher 2013). In a notorious study of academic evaluation practices, Lamont (2009) describes how reviewers on cross-disciplinary evaluation panels occasionally make decisions based on their own discipline's criteria of excellence, the consequence being that interdisciplinary research is simultaneously submitted to the criteria of multiple disciplines, which disadvantages it in often highly competitive environments. As an example, a sociologist assessed by a panel of scientists may be disfavoured by scientists' expectations: while natural scientists may aim to publish in *Nature,* which has an impact factor of 42.351, a sociologists' aim might be to publish in the most renowned sociology journal, *American Sociological Review*, which has an impact factor of 4.266. As noted in chapter 1, in the UK academics have expressed concerns about the negative impact of the Research Excellence Framework (REF) on interdisciplinarity. Rafols et al. (2012) suggest that school managers, at least in the areas of business studies and innovation studies, tend to submit to the REF publications in high ranking journals, which are normally more disciplinary based. Since journals that accept interdisciplinary research are not highly ranked these are normally not submitted to the REF and therefore an indirect prejudice attached to interdisciplinary publications can be perceived.

Researchers may also face challenges when their discipline provides a service or is a subordinate to another (in the spirit of Barry and Born's subordinate-service mode). Medical sociologist Pilnick (2013) provides a reflection about applying conversation analysis skills to explore the interaction of medical doctors and patients. She argues that while the contribution for the medical profession can be easily pinned down, it is harder to identify what sociology gains from these projects, and she also notes that there is the ethical risk of legitimising medical practices. The challenges of being a service provider to other disciplines are also highlighted by Strathern and Rockhill (2013). They describe the case of academics working on ethical, legal and social issues (ELSI) in the Cambridge Genomics Knowledge Park. In contrast to the scientific disciplines, ELSI disciplines lacked a representative on the executive board. Their work was not seen as valuable and was qualified as entirely academic, as opposed to the practical knowledge aimed to be produced at the Park. Under-represented, ELSI scholars were not able to provide input from their disciplines to the overall research strategy, and they did not have a say on the definition of their own research agenda.

Other social scientists involved in ELSI research in projects with natural sciences have written about the challenges of being subordinate contributors rather than equal collaborators. Calvert and Martin (2009) argue that when the UK research councils called for the involvement of social scientists in synthetic biology, they seemed to be expected to work as *contributors* to an agenda already established. In contrast, they suggest that social scientists can have a more valuable role if they are positioned as *collaborators* who can also set or change the research agenda. As *contributors*, the social scientists' role is

limited to representing the public or to translating between publics and scientists once the latter have done their work. As *collaborators*, by contrast, social scientists could explore assumptions about what is taken as 'good science' and move forward the usual ways of communication between social and natural scientists. A few years after this paper was published, Calvert and Martin, together with other social scientists with similar research and collaborative backgrounds developed a 'manifesto for experimental collaborations between social and natural scientists'. In this manifesto they argue for the need to develop 'an open dialogue that goes beyond narrow framings of environmental and health risks' in order to 'enrich the processes of scientific imagination, discovery and invention' (Balmer et al. 2012:1). The manifesto describes seven 'guiding principles' that include 'undertaking collective experiments, practicing reflexivity, promoting pluralism, enriching understanding of science and technology, ensuring good governance, taking risk, [and] being hospitable' (Balmer et al. 2012:1).

In a more recent publication, Calvert (2013) notes that in some of her collaborations with synthetic biologists the division of roles between researcher (the social scientist) and research participant (the natural scientists) are not so clear anymore. On the one hand, she notes that the position as a 'detached observer' cannot be held when the social scientist is, to some extent, also shaping and perhaps legitimising the observed field. On the other hand, the research participants (natural scientists) can also be reflexive observers who happen to be good ethnographers, therefore she suggests they are better described as 'epistemic partners' (Holmes and Marcus 2008), who contribute to the production of knowledge. Thus, she suggests that collaboration can be

considered a research method in itself. This is, however, not the usual situation.

Interdisciplinary collaboration across the natural and social sciences is challenging even when there is financial support and the willingness to exploring new alternatives. Rabinow and Bennett (2012), for instance, were involved in a large synthetic biology project across prestigious US universities, supported by the National Science Foundation (NSF). The NSF made the funding of the project conditional on the involvement of social scientists, whose role was to design a new approach to ethical practice that differed from ELSI, upstream rather than downstream. However, Rabinow and Bennett describe the lack of interest of the scientists and engineers in engaging in the experimental practices they were designing and suggesting. This situation produced tension and in the end Rabinow was removed from his position. This event points to the relevance of individuals' dispositions, such as curiosity, flexibility and willingness to understand new perspectives, as well as communicative skills, for interdisciplinary success; a topic explored in the following chapter.

2.5 Conclusions

This literature review has covered both historical antecedents and the contemporary practical challenges of interdisciplinary research. The chapter began by contrasting two versions of the history of disciplinary and interdisciplinarity. In the first, 'functionalist' history, disciplines are perceived as rigid and old fashioned, fulfilling a variety of institutional, social and cultural functions. In this version interdisciplinarity is seen as a means of

overcoming the limitations of disciplines and a means of addressing real world problems. In the second version, the relationship between disciplinarity and interdisciplinarity is seen as more complex with the boundaries between disciplines more flexible and porous than the functionalist version suggests. It should be stressed, however, that these two histories of (inter)disciplinarity are themselves porous and overlapping, and both make reasonable arguments. The chapter also described a number of challenges faced by individuals in charge of developing policies to support interdisciplinary research, by individuals who engage in interdisciplinary research and by researchers who study interdisciplinarity itself.

By means of concluding this review of previous studies, a number of contradictory claims can be identified. The first is that sometimes interdisciplinarity is described as different to disciplinarity, because disciplines are meant to be unified, but at other times disciplines are described as hybrid, porous or 'internally' interdisciplinary. The second contradiction is that specialisation can be described as the opposite to integration, but these can also be seen as complementary, as Weingart suggests. A third contradiction relates to the freedom and autonomy of academics. While Nissani argues that interdisciplinarity increases academic freedom, Jacobs argues that if universities were organised around interdisciplinary problems, academic freedom would decrease because structures would be changed more often and decision making would be centralised. These contradictions can be felt by those engaging in both disciplinary and interdisciplinary work, and they serve to illustrate how discourses of disciplinarity and interdisciplinarity are flexible and can be used for different purposes.

The next chapter engages to a greater extent with the literature focused on the individuals who engage in interdisciplinary research, their career trajectories, and their ideal traits and skills. Furthermore, a gap in that literature is revealed.

Chapter 3. The self and expertise in studies of interdisciplinarity

3.1 Introduction

The previous chapter provided an overview of the history, research, and practice of interdisciplinarity. However, not much was said about the individuals who engage in interdisciplinary research. This chapter focuses on claims about these individuals and in so doing it reveals a gap in the literature, which this thesis intends to address. While the development of interdisciplinary research depends on individuals' personality, attitudes, and dispositions (Bruce, Lyall, Tait, & Williams, 2004), scholars focused on the practice of interdisciplinarity do not show much engagement with social scientific perspectives on the self, such as those described in chapter 1. Moreover, while the literature notes that interdisciplinary researchers risk not being perceived as experts by their peers, university administrators, and by research funders (Pfirman and Martin 2010), there has not been much engagement with contemporary and critical studies of expertise. This chapter also reviews this body of literature and sets the ground for the analytic approach of this thesis.

The chapter is organised as follows. Section 3.2 contains accounts found in the literature about reputation, career trajectories, traits and skills of

interdisciplinary individuals. The section concludes by highlighting the lack of attention given to literatures on self and expertise. Section 3.3 reviews the literature on expertise, predominantly focusing on sociology and STS but with acknowledgement of a range of other field's perspectives on expertise. The chapter concludes by presenting an approach for studying the 'interdisciplinary self', in section 3.4.

3.2 Perspectives on interdisciplinary individuals

This section explores descriptions, assumptions and expectations of interdisciplinary researchers often made in the literature. One could argue that these are perspectives on the 'interdisciplinary self', as the self refers to 'all those qualities, attributes, beliefs, desires, goals, intentions, preferences, motivations, emotions, feelings, and moral sentiments that a person assumes to be his or her own' (Tsekeris 2015:1). The common thread between the studies included in this section is that they overlook that, in contemporary social science, the self is considered 'reflexively open, socially embedded and interactively created' (Tsekeris 2015:1), rather than an immutable essence; in other words the self is socially and discursively constructed (Callero 2003). Therefore, rather than being read as factual, descriptions of interdisciplinary individuals in the literature are read here as narratives. The section starts by describing narratives of the reputation and the career trajectories of interdisciplinary individuals, and then it describes narratives of their traits and skills.

3.2.1 Narratives of reputation and career trajectories of interdisciplinary individuals

This section illustrates different perspectives about the reputation and career trajectories of individuals who develop an interdisciplinary career. A key contradiction identified here is that while some authors and their research participants associate interdisciplinarity with professional success, others describe it as a professional risk.

As noted in chapter 2, interdisciplinarity has been described as 'very risky both professionally and intellectually' (Apter 2009:191) because it engenders 'concerns about the loss of quality within individual disciplines' (Buanes and Jentoft 2009; Lyall and Meagher 2012:611). Moreover, interdisciplinary researchers are often negatively described as 'jack[s] of all trades, master[s] of none' (Nissani 1997:212). The literature describes other issues faced by interdisciplinary researchers. Pfirman and Martin (2010) note that there is a lack of incentives for interdisciplinarity and that interdisciplinary researchers tend to have a sense of vulnerability, tension and insecurity, because they risk being considered amateurs who claim knowing too much. Pfirman and Martin note that such risks are higher for researchers who do interdisciplinary work by themselves, rather than in collaboration with experts from different fields, an argument similar to that of Calvert (2011) when she distinguishes between interdisciplinarity at the individual level and at the collaborative level (see p. 45). Pfirman and Martin recommend that, because of such negative views, researchers and students interested in interdisciplinarity should 'avoid spreading [themselves] too thin' (p.395), which implies getting superficially informed in many different fields. Buanes and Jentoft (2009) note that

'breadth' and 'depth' of knowledge are usually seen as mutually exclusive, thus those who have a broad knowledge may risk being perceived as lacking depth.

Besides those reputational risks, Robinson (2008) notes that interdisciplinary research is more time consuming and requires a greater amount of effort than disciplinary research. One would easily agree with Robinson because of the time and effort required for reading the literature of different fields, identifying collaborators, developing trust and effective forms of communication (Harris, Lyon, and Clarke 2008), and searching for publishing venues and funding opportunities. Moreover, different authors note that publishing takes longer than in disciplinary research (Castán Broto, Gislason, and Ehlers 2009; Rhoten and Pfirman 2007; Robinson 2008). Paradoxically, besides the extra efforts, van Rijnsoever and Hessels (2011) note that 'disciplinary collaborations contribute more to career development than interdisciplinary collaborations' (p. 463). Furthermore, there are also the risks of providing a service to other disciplines (Barry et al. 2008; Nerlich 2012; Pilnick 2013; Strathern and Rockhill 2013), which may not bring recognition within one's home discipline and home department.

Considering these risks and career expectations, one would wonder what motivates researchers to engage in interdisciplinary work. Interdisciplinarity can take different forms, as argued in the previous chapter, but it also has different meanings for different people. To some it may mean integration, to others it may mean critique of a discipline, and to others it may mean providing or receiving a service from another discipline; to some it may mean individual work and to others collaborative work. Moreover, to some it may be

well regarded but not to others. Motivations and perceived risks and challenges differ depending on individuals' background and biographies, as well as the particular field they work within, and, as noted below, on the institutions they work within. Lau and Pasquini (2008) observe that the definition of oneself as interdisciplinary is constantly under negotiation, because definitions, perceptions and expectations of interdisciplinarity change depending on individuals' background. These authors explore the understanding of interdisciplinary in geography, a diverse discipline itself, and they note that geographers' perceptions differ depending on their age but also on their specialisation in social, human or physical geography. Some geographers think interdisciplinarity happens between different types of geography, others that it happens between geography and other disciplines; and to some it is more valuable than to others.

Individuals engage in interdisciplinary research because of different reasons and following different trajectories. According to Oughton and Bracken (2009) individuals may follow three routes of interdisciplinary engagement, which are not mutually exclusive; collaborating with experts from other disciplines while remaining in their own, reading and developing understanding of other disciplines, and getting formal training in a new discipline. Castán Broto et al. (2009) suggest that individuals engage in interdisciplinarity because of the practical problem they intend to address, because they may perceive it as the most adequate way of approaching a research question, or because it is a requirement of funders and employers. Yet, other reasons require consideration. Van Rijnsoever and Hessels (2011) include individuals' motivations such as the joy of collaboration; interest in research questions

individuals cannot answer by themselves or drawing on their own disciplines alone; and expected benefits such as publications, recognition and funding. As can be noted, to some authors and their research participants interdisciplinary work lacks rewards, but to others such is not the case.

Different studies have found that female researchers tend to engage in interdisciplinarity more than male researchers (Rhoten and Pfirman 2007; van Rijnsoever and Hessels 2011). Rhoten and Pfirman explore why this occurs, but instead of taking gender as the explanatory factor, they focus on the intrapersonal, interpersonal and socio-structural factors that produce this tendency. They suggest that female researchers are attracted to interdisciplinarity because it is often team-based, problem-oriented and socially relevant, but also because interdisciplinary fields are less competitive than male-dominated disciplinary fields. They also note that interdisciplinarity tends to be attractive for researchers who feel marginalised, 'blocked, overshadowed, ignored or even excluded within traditional domains' (Rhoten and Pfirman 2007:69). However, they warn that policies should not be oriented to bring more female researchers to interdisciplinarity if it is not first made clear that this sort of work is well recognised and rewarded.

Besides biographies, personal background and fields of research, the way interdisciplinarity is perceived and practiced is influenced by institutional contexts, since these can either facilitate or hinder it (Castán Broto et al. 2009). Different types of organisation influence researchers' personal trajectories differently and shape researchers' engagement with interdisciplinarity. Noting that there is not much research focused on this issue, Garforth and Kerr (2011) argue they 'reinsert academic selves and institutions […] back into debates

about the future of the disciplines and the increasingly insistent calls to interdisciplinarity in the social sciences' (2011:658). Drawing on Bourdieu (1988) they argue that academic work involves different forms of capital, including academic capital, symbolic capital and scientific capital; and researchers' access to them vary depending on their type of institution, namely teaching departments and research units; but also on their career trajectories. Academic capital refers to prestige within traditional disciplinary departments and influence in the academic board; scientific capital refers to scientific prestige, expressed in publications and citations; and symbolic capital is more diverse, and it may include involvement in political activities external to academia. While senior researchers in teaching departments may report having accumulated different forms of capital by keeping a balance between disciplinary and interdisciplinary work, younger scholars may find it more convenient to engage strongly with disciplinary work. Researchers at research units may not have much access to academic capital because their positions may be temporary; neither may they have much access to scientific capital because they may not publish in high-ranking journals. In contrast, their access to symbolic capital can increase by their interdisciplinary collaborations with actors outside academia.

Garforth and Kerr conclude that associating individuals' professional success simply with either disciplinary or interdisciplinary work is not accurate. This suggestion is at odds with those of authors suggested at the start of this subsection, such as Apter, Pfirman and Martin, and van Rijnsoever and Hessels. Castán Broto et al. (2009) note that even though interdisciplinarity involves difficulties, researchers tend to describe it as personally and

professionally satisfying. Drawing on an analysis of interviews with mature interdisciplinary researchers they suggest that 'if people combine knowledge and have a certain quality of mind and personality they will enjoy conducting interdisciplinary research despite, and because of, its challenges' (Castán Broto et al. 2009:928). The following section focuses on such 'qualities of mind and personality' attributed to interdisciplinary researchers.

3.2.2 Narratives of traits and skills of interdisciplinary individuals

Scholars have argued that identifying characteristics of individuals who succeed in interdisciplinarity can be useful for the design of policies that support this type of research (Jacobs and Frickel 2009; van Rijnsoever and Hessels 2011). This assertion makes it more surprising that studies of interdisciplinarity have not engaged more seriously with scholarship on the self.

Klein (1990) dedicates part of her conclusions to describe characteristics of interdisciplinary individuals. She argues that interdisciplinary researchers are divergent thinkers 'who may not be too narrow to deal with cross-cutting issues', who have 'a high degree of ego strength, a tolerance for ambiguity, considerable initiative and assertiveness, a broad education, and a sense of dissatisfaction with monodisciplinary constraints (Klein 1990:183). Other characteristics she adds to the list include 'reliability, flexibility, patience, resilience, sensitivity to others, risk-taking, a thick skin, and a preference for diversity and new social roles' (Klein 1990:183). More recently, van Rijnsoever and Hessels (2011) identify characteristics associated with interdisciplinary collaboration as having worked at different universities,

coming from application-oriented disciplines, having worked in firms and being female.

Among the characteristics associated with interdisciplinary researchers, the literature includes a large number of skills. Klein (1990) includes skills such as having 'not only the general capacity to look at things from different perspectives but also the skills of differentiating, comparing, contrasting, relating, clarifying, reconciling and synthesising' (p. 183), the ability to learn, and 'being open to other possible explanations' (p. 185). Moreover, she argues that individuals must be able to 'overcome problems created by differences in disciplinary language and world view' (p. 188). The list of skills has been adopted unquestioningly and extended ever since. Romm (1998) suggests that the capacity of being reflexive is the most relevant skill for interdisciplinary work. This allows individuals to recognise the limitations of their own disciplines and accept other possibilities and modes of action. Buanes and Jentoft (2009) add that besides the capacity for perceiving different perspectives, interdisciplinary researchers should feel enthusiasm for shifting between different perceptions. To Develaki (2008), the willingness to understand other perspectives should be complemented by a willingness to develop discussion. Similarly, Miller et al. (2008) suggest that 'in any given research context, there may be several valuable ways of knowing, and […] accommodating this plurality can lead to more successful integrated study' (p. 1). They argue that accommodating such a plurality of perspectives requires the continuous negotiation of different disciplinary values, which they call 'epistemological pluralism'. Vincenti (2005) suggests that interdisciplinarity is facilitated by individuals' 'extroversion, a sense of security, and self-

confidence in sharing ideas and receiving criticism' (p. 101); and she adds that collaborative groups and individuals should share equal status and power.

As can be noted, skills are similar to dispositions, and it is possible to identify in the literature an *ethos* of interdisciplinarity, which indicates how it can be best practiced. Stember (1991) distinguishes between researchers who are genuinely 'broad in their perspective, have a taste for adventure into the unknown and unfamiliar, and have flexibility and versatility in semantics, theoretical orientation, and modes of inquiry' (p. 6); and others who have more instrumental interests, 'for whom collaboration is a chance to enhance personal prestige by working with someone of higher prestige or to establish a reputation in an important new substantive area' (p. 7). One can distinguish a 'right' and a 'wrong' way of being 'interdisciplinarily motivated', however one could argue that the line at times may be blurry. Balsamo and Mitcham (2010) suggest five ethical habits or virtues that facilitate interdisciplinary work, including:

> *Intellectual generosity*. A genuine acknowledgement of others' work […]
>
> *Intellectual confidence*. A belief that one has something important to contribute […]
>
> *Intellectual humility*. A recognition that one's knowledge is partial, incomplete, and can always be extended and revised. This is a quality that allows people to admit they do not know something without suffering loss of confidence or self-esteem […]
>
> *Intellectual flexibility*. The ability to change one's perspective, especially based on new insights from others. This can include a capacity for play, for

suspending judgement and imagining other ways of being in the world and other worlds to be within [;]

Intellectual integrity. The exercise of responsible participation (p. 270).

These virtues sound relevant and even similar to characteristics other scholars highlight, but Balsamo and Mitcham do not describe how they identified them. Taking a different approach, Giri (2002) argues that interdisciplinarity gives no room for overcoming disciplinary chauvinism, and instead he suggests engaging in 'creative transdisciplinarity'. To him learning concepts and methods from other disciplines is not the only requirement, but also a *self-preparation,* which would allow researchers to rethink their disciplinary identity in order to overcome the feeling of threat created by interdisciplinarity. This self-preparation depends on adopting a number of virtues, such as: relativising the universality of one's own discipline, which requires recognition of relational dependence among disciplines; the virtue of *dialogue*, which allows the suspension of our own point of view as the only valid one; the *art of authentic embeddedness*, which means that one does not abandon prior disciplinary knowledge but widens one's horizons; and the realisation that 'our own discipline has within it multiple perspectives', that 'it is not an integrated whole, nor is it a seamless field of homogeneity' but in itself 'there are diversities and differences' (Giri 2002:108). This perspective resonates with Schaffer's (2013) and Osborne's (2013) views of disciplines as hybrid rather than homogeneous, as noted in chapter 2. Other virtues Giri describes are the *courage* to abandon one's own discipline, but notes that such abandonment is partial because there is a 'homecoming'; and finally the *acknowledgement of pain*, which stresses that the abandonment of one's disciplinary comfort zone

can be disturbing. Chapters 7 and 9 discuss the virtues Giri and Balsamo and Mitcham suggest.

Regarding disciplinary identities, Pinch (1990) suggests that rather than being fixed, these should be seen as flexible resources used by scientists 'for a variety of argumentative purposes' (p. 302). Access to different forms of capital, as Garforth and Kerr suggest, could drive such argumentative purposes. Brew (2007) draws on Pinch to explore the disciplinary and interdisciplinary identities of 71 researchers from the UK and Australia. From her interviewees only one third of defined their identity within traditional single disciplines. The rest of them provided tentative 'nested' or 'confluent' identities between or across different disciplines and specialisms using phrases such as 'I suppose', 'I think you could say', 'I guess', 'it could also be' (Brew 2007). Brew concludes that formulations of identity are not represented by *fixed* territorial metaphors commonly used to refer to the relationship between disciplinarity and interdisciplinarity and neither by institutional structures and systems of academic evaluation. Studies such as those of Brew, Pinch, and Garforth and Kerr, point to a more complex and dynamic relation between individuals' motivations for engaging in interdisciplinarity, their identities, and the institutions in which they work. Disciplinary and interdisciplinary identities and motivations may change according to the opportunities and limitations offered by their institutions of affiliation, but probably also by the teams and projects researchers engage with.

So far this chapter has described studies that focus either on individuals' traits and skills, as those included in this subsection, or on the relations between individuals and the institutions that shape their career trajectiories, as those

included in the previous subsection. In contrast, Mansilla, Lamont and Sato (2012) suggest an integrative approach that pays equal attention to the cognitive, the social, and the emotional, as well as the institutional elements that shape and enable successful interdisciplinary collaborations. Thus, they discuss not only individuals' motivations for collaboration, but also group dynamics and how these are shaped by the institutions that support interdisciplinary research. Their approach emphasises the central role of 'emotion, academic identities, and preservation of self' (Mansilla et al. 2012:5) in collaborative success. Taking these dimensions into account, and based on long term observation of nine research networks, they suggest the concept of *shared socio-emotional-cognitive (SSEC) platforms* to refer to spaces 'in which participating individuals engage socially, emotionally, and cognitively to examine a relatively common problem of study and advance productive insights through interdisciplinary exchange' (Mansilla et al. 2012:5). They argue that these platforms are continuously in the making, are relatively unstable and have blurred boundaries, and therefore researchers from different disciplines can attach their own research agenda to a common project. In these platforms notions of success are 'malleable, relatively transient, and interactively calibrated' (p. 5). Mansilla et al. also observe that funding and funders' expectations of projects affect the social dynamics of these research groups, which align to those expectations and define situations and success accordingly. Being aware of funders and institutions' expectations and being able to align to them may help to accumulate different forms of capital, as Garforth and Kerr (2011) note. This can be regarded as a skill in itself.

In Mansilla et al.'s approach, the sense of group identity, which includes the feeling of having shared moral norms and working styles, is considered crucial for success. However, they note that group identity should not exclude the confirmation of participants' sense of self and disciplinary identity. Based on their observations they identify an *archetype of the good interdisciplinary collaborator*, noting that their respondents construct

> a communal climate through value-laden and tacitly-coordinated interactive routines that include deferring to their peers' expertise, exhibiting innocence in domains other that their own, demonstrating proactive curiosity, and sharing expertise generously when needed. Values and routines structure what eventually becomes acceptable behaviour for the group and give rise to an emerging archetype of "the good interdisciplinary collaborator" which in turn informs adjustments in individual behaviours, group identity and shared routines (Mansilla et al. 2012:12).

Two elements of Mansilla and collaborators' approach are important in the context of this thesis: firstly, the fact that it considers different dimensions of interdisciplinarity as equally relevant for collaborative success. Secondly, it recognises the importance of reconciling group and individual identities without threatening an individuals' sense of self. This is also recognised by Lingard et al. (2007) in their reflection on their own project on healthcare education.

Based on an ethnographic study in a cancer research institute Centellas, Smardon and Fifield (2013) find that rather than being softened, interdisciplinary collaboration makes disciplinary boundaries and identities more robust. They propose the concept of 'calibration' to refer to the 'ongoing,

day-to-day negotiation and alignment of personal identities, disciplinary commitments, and research group customs that occur during face-to-face group deliberations around everyday research concerns' (Centellas et al. 2013:313). They argue that calibration 'facilitates interdisciplinary collaboration by allowing an efficient division of labour that aligns traditional disciplinary expertise with particular tasks and responsibilities' (Centellas et al. 2013:329). Centellas et al. note that it is because of 'calibration' that there can be collaboration without consensus. Moreover, calibration explains why disciplinary precision is not lost in interdisciplinary research.

The concepts of calibration (Centellas et al. 2013) and SSEC platforms (Mansilla et al. 2012) illustrate that there are different types of skills and dispositions required for interdisciplinary research, and that these are not limited to the acquisition of technical competence in different disciplines. Negotiating different perspectives, interacting with team members from different disciplines and aligning to institutional drives are relevant skills and, one may argue, forms of expertise. Furthermore, switching between different identities, disciplinary and interdisciplinary, is a crucial skill too. As Ku (2012) notes in her paper on the development of expertise in translational nanomedicine,

> to be a 'nanoscientist', one has to know how to use disciplinary identifiers cleverly to establish one's autonomy whilst simultaneously leaving sufficient interpretive flexibility in order to immerse oneself or engage others in forming collaborations for mutual benefit (p. 370).

And also

the formation of interdisciplinary expertise is not simply a process of knowledge exchange at the conceptual level. Rather, new technical and managerial skills in bridging existing discipline-based knowledge, new social relations in mobilizing resources kept in university, industry, and the government [...] have to be invented as a package to realize interdisciplinary collaborations in the production of translational nanomedicine (Ku 2012:70 my emphasis).

Ku's research takes a position similar to Centellas et al. and Mansilla et al., by paying attention to the multiple dimensions that interdisciplinary collaboration involves, and to the importance of disciplinary identity. Moreover, similar to Pinch and Brew, Ku notes that individuals' disciplinary identities are not fixed but flexible. Yet, it is striking that hers is the only text that discusses what would count as expertise in interdisciplinary research, and thus conceptualises *interdisciplinary expertise*.

This chapter has shown so far that there is academic interest in the characteristics, skills and motivations of interdisciplinary researchers, as well as in the relationship between these individuals and the institutions in which they work and which fund their research. It has also shown that interdisciplinarity can create a feeling of threat to individuals' disciplinary identity (Giri 2002), and to their preservation of self (Mansilla et al. 2012), which might be linked to a lack of sense of expertise. A limitation can be identified in the literature, produced by a simultaneous lack of attention to scholarship focused on expertise and a lack of attention to scholarship focused on *the self*. Moreover, it is problematic that the skills and characteristics attributed to interdisciplinary researchers are generally taken for granted. By

contrast, sociologists and STS scholars have questioned the characteristics commonly attributed to scientific experts, as will be described in the following section (see in particular Mulkay, 1976).

The concept of self is important because it is the individual's self who negotiates and adopts disciplinary identities, expresses attitudes towards interdisciplinary research and claims certain skills. The self is also challenged when the identity as an expert is not recognised. However, the self is not an immutable essence but rather, following Goffman (1959), displaying and achieving a specific self is the purpose of the individual.

Although in contemporary scholarship the distinction between identity (the social category) and subjectivity (the entity that experiences that social category) is considered inadequate (Wetherell 2008), in the literature on interdisciplinarity identity is reduced to the established fields or disciplines to which individuals affiliate. Moreover, taking individuals' motivations and attitudes towards interdisciplinarity as stable is problematic because this misses the point that they may be aware of the different meanings that are attached to interdisciplinarity: is it more or less valuable than disciplinary work? Is it compatible or incompatible with disciplinary work? Does the effort invested pay off? Are interdisciplinary researchers seen as experts? In order to suggest an approach to fill this gap in the literature, the rest of the chapter presents different bodies of scholarship focused on expertise, and it concludes by describing a theoretical and methodological approach that can be used for exploring the self and expertise of the interdisciplinary individual.

3.3 Perspectives on experts and expertise

In 1946, Schutz suggested that 'the expert's knowledge is restricted to a limited field but therein it is clear and distinct. His opinions are based upon warranted assumptions; his judgements are not mere guesswork or loose suppositions' (Schutz 1946:464). Six decades later Fuller (2007) argued that expertise is commonly associated with individual disciplines. However, there have been more critical views of this concept. Jasanoff (2003a), for instance, criticises the simplification often made about the demarcation between experts and non-experts and stresses that exploring in greater detail the processes that separate these identities is required. She points out that 'expertise often does not pre-exist the disputes the expert is summoned to settle, but is contingently produced within the very context of disputation' (Jasanoff 2003a:159). Moreover, she argues that in legal procedures what is considered science and who counts as an expert depend on judges' perceptions, which are not questioned or subject to debate (Jasanoff 1995). She notes that juries and judges' assessments of the validity of experts' claims are not limited to epistemic arguments but also include 'social and cultural factors such as demeanour, personality, interests, and rhetorical skills' (Jasanoff 1995:54). Thus, what counts as expertise in these cases depends on contingent elements, assumptions and taken for granted divisions of roles.

In the last two or three decades, STS and other fields have questioned common assumptions about expertise and about who counts as an expert. Nevertheless, Frodeman (2010) argues in his introduction to the *Oxford Handbook of Interdisciplinarity* that 'the literature on expertise has grown significantly in recent years, but it has not connected its points to questions of

interdisciplinarity' (p. xxxiv). This section reviews literature on expertise in order to inform the analytic approach to studying the 'interdisciplinary self' that this thesis adopts. 'Being' an expert and achieving the presentation of an expert self could be seen as the aim of interdisciplinary selves, therefore there is a link between self and expertise. Or, as Daston and Galison (2007) argue, the practice of science depends on the fusion of ethos and epistemology.

The section is organised as follows. Subsection 3.3.1 provides a classification of approaches to expertise deriving from different disciplines. Subsection 3.3.2 focuses on STS and sociological work on experts and expertise, and subsection 3.3.3 describes ethnomethodological and rhetorical approaches to expertise. The chapter then closes with section 3.4, which describes how these studies inform the approach of this thesis.

3.3.1 Classification of approaches to expertise

Different disciplines including computer science, education, cognitive psychology, communication studies, and sociology and STS[6] have taken experts and expertise as a topic worth studying (Ericsson et al. 2006; Hartelius 2011). Coming from such diverse disciplines, the perspectives differ considerably. Although the main focus of this section is on sociology and STS and communication studies, a classification of studies of expertise, depending on their principal assumptions, is provided. The purpose is to locate in a broader map which bodies of thought are considered relevant for this thesis. *Table 1* summarises a classification of approaches to expertise.

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[6] The distinction between sociology and STS is made here because some authors define themselves as sociologists and others as STS scholars. Jasanoff (2013) describes political issues about the unity and disunity of these fields.

Uncritical		Critical		
Education, computer science, cognitive psychology		Sociology and STS, communication studies		
Absolute	Relative	Attributionalist	Substantivist	Beyond substance and attribution
Expertise is possessed only by a few exceptional people	Anyone can acquire expertise	Expertise is attributed to those belonging to a certain group	Expertise is real, amount of tacit knowledge obtained by interaction with groups of specialists	Expertise is performed and negotiated in argumentation

Table 1. Approaches to experts and expertise

According to Hartelius (2011) the literature on expertise can be divided in two groups, firstly one that *reifies* the concept of expertise, which 'buy[s] it wholesale' (p. 11) or which takes for granted the meaning of the concept. These can be considered as uncritical studies of expertise, and this is the case of research in education, computer science, and cognitive psychology. The other group of studies questions the meaning of expertise, challenges common assumptions, intends to extend or transform the concept, and explores how the concept is used in social interaction. These studies can be considered critical of expertise, and this is generally the case of work rooted in sociology and STS, and communication studies. Yet, these two groups have further divisions. Cognitive psychologist Chi (2006) identifies two approaches of psychological studies, taken here as uncritical: an *absolute* approach, which studies 'truly exceptional people with the goal of understanding how they perform in their domain of expertise' (p. 21); and a *relative* approach, which 'assumes that expertise is a level of proficiency that novices can achieve' (Chi 2006:22). In

the absolute approach, experts are only those with exceptional minds and capacities, but in the relative approach anyone can become an expert.

In sociology, STS, and communication studies Collins and Evans (2007), Eyal and Pok (2011) and Hartelius (2011) distinguish between *attributionalist* and *substantivist* approaches. In the former expertise is seen as an identity attributed to certain people because of their relation to groups whose expertise is socially recognised; in the latter expertise is substantive, real and possessed by individuals. However, there are limitations with this division because authors refer to different things with these approaches, and use them primarily to contrast their own approaches against other ones. Collins and Evans describe their substantivist approach as more adequate than previous STS and sociological studies they classify as attributionalist. Howerver, Eyal and Pok and Hartelius suggest alternatives that overcome the limitations of both attributionalist and substantivist approaches. Before moving on to explain these studies in more detail, it is worth describing a number of common assumptions about experts.

Cognitive psychologist Chi (2006) describes seven ways in which experts excel and seven in which they fall short: 1) Experts generate the best solution, move or design, in a faster and more accurate way than common people; 2) 'experts can detect and see features that novices cannot' (p. 23); 3) experts invest relatively longer than non-experts analysing problems qualitatively; 4) experts are better at monitoring and detecting errors in their understanding; 5) experts 'are most successful at choosing the appropriate strategies to use than novices' (p. 24); 6) they are more opportunistic; and 7) they can understand complex information with less effort than novices. In contrast, experts -1) 'do

not excel in recall for domains in which they have no expertise' (Chi 2006:24); -2) are overly confident; -3) are good at understanding 'the deep structure' of a problem but overlook details; -4) 'rely on contextual cues' (p. 24); -5) sometimes find it difficult to adapt to 'changes in problems that have a deep structure that deviates from those that are "acceptable" in [their] domain' (p. 26), or are *inflexible*; -6) can be 'inaccurate in their prediction of novice performance' (p. 26); and -7) are biased and tend to prefer explanations that 'correspond to their field of expertise' (p. 27) over other possible ones.

While these descriptions are valuable and inform our understanding of what experts are, one should bear in mind that these are only traditional assumptions that can be questioned and seen as limited. It would not be appropriate to assume that all these characteristics would apply to interdisciplinary experts, and these can be considered from a critical point of view. On the one hand, terms such as 'best solution', 'most successful', and 'appropriate strategy' may depend on who is judging and establishing them as such. On the other hand, overlooking details (-3) and relying on contextual cues (-4), may rather be an advantage for succeeding in interdisciplinary research. Thus, common assumptions of expertise may be challenged by interdisciplinarity, and therefore critical perspectives on expertise are required. The following subsection provides a background to recent critical studies of expertise coming from sociology and STS.

3.3.2 Expertise and experts in sociology and STS

Providing a comprehensive history of sociology of science and STS scholarship is beyond the scope of this thesis, but current work focused on

expertise can be understood better if located within a broader theoretical context. In this subsection I describe work about the norms, ideology and boundaries of science; then I describe studies that pay more attention to the credibility of scientific experts and consider the possibility of alternative forms of expertise; and then I describe an approach to study experts and expertise, developed by Harry Collins and Robert Evans. This approach is explored in greater detail because it has been used in the study of interdisciplinarity, but also because it has been widely commented on and critiqued.

Norms, ideology and boundaries of science

In the first half of the 20th Century Merton (1938) developed a sociology of science focused on the social norms that motivate and control scientists to pursue the development of scientific knowledge. Mulkay (1976) notes that to Merton the norms that secured scientific development could not be limited to the characteristics of scientists but must be based on something larger than them, such as a well-established normative system. The demarcation of science from non-science, and experts from non-experts, can be taken as limited to the adherence to the norms of universalism, communalism, disinterestedness and organised scepticism. In the Mertonian functionalist sociology of science, science should not be disturbed by external social influence in order to protect these idealised norms (Mulkay 1976), since violations to these norms would result in distorted knowledge claims. As empirical studies of science increased, the norms of science were found to be too regularly violated. Merton responded to those observations by arguing that science develops through the tension produced by a set of norms and a set of counter-norms. As an example, on occasions communalism may be replaced by secrecy, but rather than

distorting the quality of science, it strengthens it because it allows scientists to 'confirm the validity of [their] work' (Mulkay 1976:640) before it is challenged and prematurely rejected by the scientific community. Thus, secrecy can be as beneficial as communalism.

Challenging this perspective, Mulkay (1976) provides an alternative interpretation of those empirical observations. To him the two opposed sets of norms could be taken as different ways of using language, oriented to justify scientists' actions in different contexts. He argues that in some contexts, as when scientists interact with lay people and politicians, accounts about their work would be formulated in terms of the Mertonian norms; however, in other contexts, as when scientists discuss with their peers, they would provide arguments that differ from and contradict such norms. To Mulkay, different uses of language represent structures of argumentation oriented to serve the social interests of scientists, for example the capacity of obtaining public funds while at the same time preserving their autonomy from external control; therefore to him the so-called norms of science are merely an ideology. Mulkay argues that the public dissemination of this ideology has also allowed scientists to construct a positively distorted image of themselves, attributing to themselves characteristics such as humility, objectivity, loyalty to truth, individualism, social withdrawal, self-sufficiency, perseverance, rationality, devotion to knowledge, selflessness, modesty, simplicity and straightforwardness. Mulkay notes that 'the absence of these attributes would prevent the scientists from gaining a correct understanding of the relations between phenomena' (Mulkay 1976:652). These ideologically attributed

characteristics have been used by scientists to distinguish themselves from lay people, and thus to construct the boundary between experts and non-experts.

Mulkay's work on the ideology of science is taken up by Gieryn (1983) to develop his concept of boundary work, described in the previous chapter (section 2.3.1). It is worth recalling that boundary work is a rhetorical style used by scientists to accomplish ideological ends, in order to distinguish them and their activities from those of non-scientists, and to claim rights such as intellectual authority and to legitimise forms of expertise. Studies such as those of Mulkay and Gieryn point to the need to question common assumptions about characteristics associated with specific individuals. The characteristics attributed to scientists underlined by Mulkay are similar to characteristics attributed to interdisciplinary individuals: flexibility, open-mindedness, curiosity, tolerance, generosity, and many others. However, the literature does not question the accuracy of such attributed characteristics nor analyse how those are claimed and negotiated by individuals. This makes clear the gap in the literature of interdisciplinarity described earlier, namely attention to scholarship on self and expertise. While interdisciplinary individuals are unquestionably attributed certain attitudes and traits – in other words a certain self –, there is no attention to what the self is; and while interdisciplinary individuals are not considered experts, there is no attention paid to what it is to be an expert.

While studies of institutional norms of science could be taken as defining and protecting the boundaries between scientists and non-scientists, Mulkay and Gieryn shift the focus to consider how boundaries are established. The

following section presents studies carried out once such boundaries are perceived as socially constructed.

Credibility, scientific experts and 'lay experts'

Once the boundaries between science and non-science are seen partly as an ideological product that serves the interests of specific groups, alternative interpretations of the relationship between experts and lay people can be articulated. Moreover, the authority and credibility of scientific experts has been challenged by scientific controversies that turn into sociotechnical catastrophes, and medical and natural disasters. Studies of controversies have led STS scholars to question common assumptions about scientific expertise and have also paid attention to other forms of expertise.

In an influential study, Wynne (1992) presents a case in which the credibility of scientific experts was questioned by sheep farmers in the north of England. The controversy took place when the government sent scientists to measure the levels of radioactive caesium isotopes supposedly brought about as a consequence of the Chernobyl nuclear plant explosion in 1986. The farmers had a stake in the issue because of the potential radioactive contamination of their sheep, and the restriction on selling their meat represented a significant loss of their income. The farmers questioned the credibility of the scientists and lost their trust in them because in previous environmental accidents in the region the farmers had considered the government's response to be inadequate and irresponsible. In other words, they were questioning the expertise of these scientists. Moreover, on this occasion the scientists provided contradictory diagnoses of the problem, which was interpreted by the farmers as either a conspiracy against themselves or as incompetence on the part of the scientists.

The farmers saw the scientists as arrogant individuals, ignorant of soil and land characteristics and their influence on the sheep's radioactive contamination, and also ignorant of high hill farming practices. Furthermore, the scientists refused to take into account the farmers' hill grazing knowledge and undermined any possibility of using the farmers' input to improve their diagnoses. The farmers had also gathered evidence that could have been used by the scientists but this was ignored too. Wynne argues that the farmers were able to identify limitations in their own knowledge and to integrate their local knowledge with scientific knowledge, but the scientists lacked this reflexive skill. According to Wynne the farmers' identity as experts, based on their local knowledge, was challenged when it was not acknowledged by the scientists, and this contributed to the farmers' loss of trust. The relevance of acknowledging others' identity as experts is also relevant for interdisciplinarity, as noted earlier in the chapter (Centellas et al. 2013; Mansilla et al. 2012). When interacting whith specialists form a different field one has to be willing to acknowledge one's own limitations and recognise the value of other perspectives. The sheep farmers' study also demonstrates that the negotiation of trust and credibility plays a crucial role in the definition of who the experts are.

While in the case Wynne analyses the status of experts was not attributed to the farmers, the case was different for a group of activists aiming to influence biomedical research regarding AIDS and HIV treatments. Different groups of actors including 'grassroots activists […] health educators, journalists, writers, service providers, people with AIDS or HIV infection, and other members of the affected communities' (Epstein 1995: 413) were involved in the movement

since AIDS was recognised as an epidemic in 1981. Epstein (1995) notes that these activists were skillful enough to negotiate their identity as credible 'people who might legitimately speak in the language of medical science', able to intervene 'into the design, conduct and interpretation of clinical trials used to test the safety and efficacy of AIDS drugs' (p. 410). The case of AIDS activism is particular because of the lack of success of medical experts to find solutions to the problem, which has diminished public credibility in them and 'opened up more space for dissident voices' (Epstein 1995:411).

Epstein underlines other particularities, such as the fact that the majority of people affected by AIDS and HIV were in their twenties and thirties, who would not be waiting passively for their death at such a young age; also, groups of people infected were already stigmatised because AIDS and HIV were associated with controversial practices like sex and drug use. Along with this fact, gay activists were already in close contact with the medical community arguing for the 'demedicalisation' of homosexuality. Besides these particularities, Epstein argues that AIDS activists used four strategies to construct their credibility and to position themselves as a particular type of expert. These strategies included acquiring competence in the language of biomedical research, establishing 'political representation' of a group of the population, combining ethical and knowledge claims, and taking 'sides in pre-existing methodological disputes' (Epstein 1995:410). This study is relevant for the topic of this thesis because it demonstrates that groups of people who would not be recognised as experts, according to conventional assumptions, can and indeed have been recognised as such. Interdisciplinary researchers

might also be able to negotiate their status as experts, drawing perhaps on specific strategies.

Since the authority of scientific knowledge and expertise has been challenged by technical failures, natural disasters and public controversies, scholars have intended to develop frameworks that allow identifying and including other forms of expertise and experience in technical decision-making in issues of public concern (Brint 1994; Maassen and Weingart 2005; Stehr and Grundmann 2011). Studies of this kind are not reviewed here because this thesis is limited to the relationship between experts within academia, and to perceptions of academic expertise, leaving aside issues of democratic participation. The following section presents Collins and Evans' approach to the study and identification of experts and expertise, not necessarily because it is the most valuable but because it is the most discussed and because it has been used for the study of interdisciplinarity.

Collins and Evans' studies of expertise and experience

In a body of scholarship developed in the last thirteen years, Collins and Evans (2002, 2007, 2014) have tried to re-emphasise the value of scientific expertise after this has been questioned and strongly criticised. They argue that once the boundaries between experts and non-experts and between science and society have been removed or at least weakened, alternative and more adequate boundaries are required. While they recognise that decision-making groups in issues of public concern should include experts other than certified scientific experts, they argue that there should be restrictions to such openness. They suggest a novel typology of expertise in order to avoid fast track categorisations as 'expert' and 'lay people', which they represent in a 'periodic

table of expertise'. They argue that 'though science and technology do not touch the divine they are still the best way to distil human experience of an uncertain world' (Collins and Evans 2007:2). They suggest that their approach is a sociology of the content of expertise rather than a sociology 'of the acquisition of expert status which […] may have little to do with the possession of real and substantive expertise' (Collins and Evans 2007:2).

In their 'periodic table of expertise', Collins and Evans describe different types of expertise, based on the possession of formal knowledge (the content of a book, for example) but also of *tacit knowledge*, which is the knowledge associated with a practice but which cannot be described. The purpose of the typology is to allow STS scholars, as Collins and Evans themselves, to have a say on who can be included in decision making processes because of their knowledge, rather than because of their credentials or other attributions. They note that there are two types of tacit knowledge: ubiquitous and specialist. Ubiquitous tacit knowledge is knowledge about any activity: riding a bike, speaking, making a bed, etc. Specialist tacit knowledge requires more competence than just reciting 'facts and fact-like relationships' (Collins and Evans 2007:14), and can be acquired only through direct interaction with a specialist expert community. Collins and Evans argue that if one spends much time outside such a community, his or her tacit knowledge would be lost.

Collins and Evans differentiate between three types of expertise based on the amount of specialist tacit knowledge possessed. The lowest type is no expertise. The highest type is 'contributory' expertise, which is that of a community member of an esoteric science, for example particle physics. People in this community, also called 'core-set' can contribute something to

the development of the specialism because of their amount of specialist tacit knowledge. In between no expertise and contributory expertise there is 'interactional' expertise, defined as 'the ability to master the language of a specialist domain in the absence of practical competence' (Collins and Evans 2007:14). Collins and Evans suggest that it is interactional expertise which allows the sociologist of scientific knowledge to talk with his or her research participants about the technicalities of their fields, even though he or she would not be able to contribute to the development of specialist knowledge. Collins reports that he acquired interactional expertise in the field of gravitational waves after many years of interacting with gravitational wave scientists. It is however difficult to judge how possible it is for other people to develop international expertise without so much contact with a 'core-set', or if it is only an aspiration. A different type of expertise is 'referred' expertise, which consists of the experience of knowing what it is and what it takes to be an expert (contributory expert) in a field.

The notion of interactional expertise has been identified as relevant for the study of interdisciplinarity. Gorman (2002) adopts Collins and Evans' typology to explore the possibility of interdisciplinary collaborations. These three scholars have worked together to further develop Collins and Evans' approach to expertise, combining it with Galison's (1997) concept of *trading zones*, which are those contexts in which two groups can collaborate '*despite* the differences in classification, significance, and standards of demonstration' (p. 803). They suggest that there can be four types of trading zones, each characterised by their level of homogeneity and cohesion, and with each of them based on a particular form of communication. Interactional expertise is

the central component of one of those trading zones, namely that in which there is 'successful linguistic socialisation' (p. 661) without complete immersion in the other culture, and without the development of a creole language. This is, without one group adopting the language and customs of another one, or developing a new language through a combination of those of two different groups. As an example, they describe a project about water management in Arizona that required collaboration between social and natural scientists alongside indigenous groups. They argue that the social scientists were able to collaborate with the natural scientists because they acquired interactional expertise; however they were unable to produce a new language that indigenous people could use to interact with the scientists. It could be argued that rather than language, power relationships could be taken into account to explain such a failure.

Stone (2014) also uses the notion of interactional expertise to explore how interdisciplinary collaborations can be enhanced. His concern is how to develop interactional expertise in a more efficient way. He draws on hermeneutic phenomenology to argue that interactional expertise requires more than linguistic fluency. He argues that collaborators should find out both their own and others' practical, methodological, epistemological and ontological assumptions. Once these are identified one has to 'attune' to the collaborators' assumptions. One difficulty with Stone's suggestion is that it does not provide explanation on what to do if assumptions of different researchers are competing or even contradictory.

Although interactional expertise and of Collins and Evans' approach in general, is relevant for the study of interdisciplinarity, one should take into

account the criticisms their approach has received. The main critiques have to do with their assumptions that expertise is substantial and that there are well established 'core-sets' of experts. Critiques are explained in more detail below.

Comments on Collins and Evans' work

Leading STS scholars have highlighted weaknesses in Collins and Evans' approach since it was first published. Wynne (2003) criticises that they oversimplify a number of previous STS analyses, and also argues that explaining controversies within science and between science and society in similar terms does not work. Jasanoff (2003b) criticises the essentialist position Collins and Evans adopt on expertise, and she argues that they undermine historical, political and cultural contingencies that shape the meaning of expertise. Moreover, she finds Collins and Evans classification of STS studies misleading, noting that they put under the same category studies that differ greatly from each other. This criticism also highlights the limitation of the attribution-substance distinction of studies of expertise.

Jasanoff also notes that it is only possible to know what the 'core-sets' are once disputes and controversies are over, because it is not possible to know what counts as relevant knowledge in advance. Rip (2003) argues that there are problems in which 'core-sets' are not yet available, because the closure that comes to define what 'core-sets' are is a historical achievement. Even if there are 'core-sets', their members have to 'argue for their epistemic rights to relevant expertise, just as other contestants must do' (Rip 2003:423). Furthermore, Rip notes that involvement of certain groups in a controversy 'need not be limited to those who can show relevant substantial expertise' (Rip 2003:425). Therefore interactional expertise is not as relevant for Rip as

Collins and Evans suggest, and he argues that it is not the only element that allows lay people to take part in technical decision-making.

What these criticisms say about the study of interdisciplinarity is that interactional expertise is not the only characteristic that makes collaboration possible. To be considered an interdisciplinary expert an individual may require interactional expertise, but his or her success in interdisciplinary work and his or her access to collaborative spaces will not be explained by interactional expertise alone. As argued earlier in this chapter, interdisciplinary success depends, in addition to cognitive and technical competence in different fields, on establishing common ground, defining group and individual success, dividing tasks according to individual competence, sharing enthusiasm, and aligning to institutional requirements and expectations (Centellas et al. 2013; Ku 2012; Mansilla et al. 2012). Rip's observation that even if there were core-sets they would have to *argue* for their epistemic rights to be recognised problematises the division between substantivist and attributionalist approaches to expertise. Thus, the notion of tacit knowledge, the real and substantial element of expertise, has to be recognised by somebody to count as relevant, therefore substance and attribution cannot be seen as divided.

Eyal and Pok (2011) emphasise other limitations of the attributionalist and substantivist approaches. They criticise the attributionalist approach because it does not pay attention to the content of expertise and to *what experts do*; and they criticise Collins and Evans' substantivist approach because to them expertise depends on individuals' accumulation of tacit knowledge, and this avoids the study of expert systems. However, this is not a problem for the attributionalist approach. Eyal and Pok argue that Collins and Evans 'throw the

(relational) baby [out] with the (attributional) bathwater' (2011:7), ignoring that experts achieve such status by doing things in relation to other subjects and objects. An alternative approach, thus, is to observe what experts *do* in order to be recognised as such. The following section presents a number of studies that focus on interaction, rhetoric and argumentation.

3.3.3 Performing and arguing expertise

A number of scholars drawing on different research traditions have studied how individuals achieve their status as experts. Approaches drawing on ethnomethodology (some carried out by STS scholars) and on communication studies are presented in this section.

Ethnomethodology and expertise

In a recently published study of diabetic retinopathy grading, Coopmans and Button (2014) argue that Collins and Evans do not engage much with how expertise is 'made' by actors, and they suggest it is necessary to explore empirically, through ethnomethodology for example, how knowledge and expertise are 'displayed and witnessed as and in ordinary courses of action' (p. 23). Ethnomethodology has been used before to analyse experts' and professionals' performance. Goodwin (1994) analyses different professionals' practices, including the interaction between an expert and a novice archaeologist in an excavation site and an expert witness in court. He notes that both professionals include in their performance the articulation of three practices including *coding schemes*, consisting of identifying, categorising and naming through standardised codes elements, such as layers of soil in the archaeological site or sequences in a video recording in a legal trial;

highlighting, which is the emphasis of some features over others in the soil or in the video recording; and the '*articulation of material representations*' (Goodwin 1994:606), for example pausing the video recording and pointing with the finger at a feature of the image, or tracing a circle around an object with a shovel while providing an explanation of the object. According to Goodwin, the expertise of professionals is produced by these displayed practices, which in turn demonstrate to their audience, a novice archaeologist or the jury in a trial, how experts *see*.

In the legal trial of four police officers accused of attacking a motorist unprovoked, Goodwin explains that the expert witness drew on 'coding schemes', 'highlighting', and 'material representations' to explain that the actions of the police officers, which would otherwise look like a brutal attack on a defenceless man, should instead be seen as rational, disciplined and systematic police craftwork.

In a second ethnomethodological example Lynch (2004) argues that the meaning of categories such as 'science', 'scientific' and 'expert' is co-produced by formal definitions and by their usage in specific interactional contexts. These terms, taken by Lynch as *membership categories*, have pragmatic implications in social interaction because they provide privileges such as epistemic authority to those identified as 'experts'. Therefore, the assignment of such labels is strongly controlled and contested during interaction.

The membership category of 'expert' is also made relevant or irrelevant depending on what is being disputed. Lynch analyses how the category of

expert is claimed, attributed, contested and made relevant in a legal trial in which the validity of DNA fingerprints used as evidence is in dispute. In this case a statistician whose career is focused on population genetics is called to testify as expert witness. Lynch describes how the background of the expert witness is presented by a routine exchange of questions and answers to establish his identity as a qualified scientist with 'impressing credentials'. However, during cross-examination an interrogator questions the relevance of this scientist's expertise to this case, noting that he is not a geneticist or a forensic scientist, and that therefore he does not count as having the practical knowledge and experience of examining DNA to testify as an expert witness. To this, the scientist replies that judgement about the validity of DNA samples is a statistical issue, and that a single DNA profile is not enough for making such validity claims. Furthermore, he argues that forensic scientists at times may get the statistics wrong. Thus, because of his background in one field rather than another this statistician positions himself as entitled to make judgements about the evidence and his identity as a relevant expert is validated. Lynch concludes that categories of 'expert' and 'scientist'

> are not boxes with stable boundaries between inside and outside. Instead, the discursive movement of self-identification, qualification and disavowal, and other-attribution and challenge, simultaneously resolve the configuration of the category and place the candidate member within it (Lynch 2004:178).

It is worth adding that in situations like the one just described, individuals with credentials may not succeed in being assigned the label of experts. Such was the case of STS scholar Simon Cole when he was called to testify in a case because of his research on how fingerprints became established as reliable in

criminal trials. In an outstandingly original article, Lynch and Cole (2005) combine and analyse Cole's interrogation transcript and also transcripts of Lynch and Cole commenting on this. They identify a number of dilemmas faced by STS scholars when their expertise is put in question. The dilemmas Lynch and Cole identify are, first, whether STS should be presented as a field that demarcates science from non-science or not. Second, what is STS scholars' relevant scientific community? Is Cole's community formed by forensic scientists or by other STS scholars, who may know nothing about fingerprints? Third, should STS scholars identify themselves as scientists, as the ones they study and critique, or as historians? In Cole's case none of the two options were convenient. Fourth, how can STS scholars talk about limitations of their field without undermining their own status as expert? In the end Cole was described by the judge a 'critical sceptic' and his work was classified as 'junk science'. Part of the issue is that Cole did not intend – neither did he feel he had the opportunity – to educate the court about the constructionist perspectives of science, in contrast to positivist perspectives. This article is relevant for the study of interdisciplinarity because it points to the troubles and dilemmas faced by individuals working on new, unconventional and little known fields and problems, when they intend to position themselves as experts.

The rhetorical approach

Ethnomethodological studies of expertise share some similarities with perspectives coming from communication studies. According to Hartelius (2011), 'to be an expert is to rhetorically gain sanctioned rights to a specific topic or mode of knowledge (p. 1). She argues that expertise is 'instituted and

negotiated as a function of the rhetorical situation, its participants, and its constraints' (Hartelius 2011:3). The rhetorical approach moves beyond attributionalist and substantivist approaches of expertise because experts 'use both their "real" knowledge and experience in a specific field *and* their rhetorical prowess to persuade an audience' (Hartelius 2011:9). Moreover, Hartelius notes that expertise is 'a matter of personal identity' (Hartelius 2011:13), but also a collective phenomenon. As such, individuals have to commit to established customs and formal expectations to qualify as experts. It is worth arguing here that the literature on interdisciplinarity has not explored what are the established customs, if there are any, to claim an expert identity in interdisciplinary research.

There is also a second rhetorical approach to expertise that draws on Hartelius. Majdik and Keith (2011a, 2011b) focus in particular on the role of argumentation in their conceptualisation of expertise. Majdik and Keith agree with Hartelius on the fact that expertise is rhetoric and therefore negotiated, but they critique the position that expertise is limited to knowledge. In contrast, Majdik and Keith underline that expertise can also be understood as a problem-oriented practice. They suggest that expertise is a kind of argument and an argumentative practice based on judgement. Judgement consists of arguing about the best possible solution to a problem. They note that

> Given a focus on problem-solving as the locus of expertise, different actors
> will define differently, for any given concrete situation, the exact problem
> (and the values and interests that are part of it), and what would count as an
> acceptable solution. For expertise to produce 'good' solutions would require a

dialogic mechanism for including the input of the stakeholders in the outcome (Majdik and Keith 2011a:373).

From their perspective, experts are those who 'can make arguments about things that best respond to a particular problem, and who possess an expertise consisting in their ability to make a case for a particular definition of problem or solution' (Majdik and Keith 2011a:374). Thus, their approach has dialogical and intersubjective dimensions, which imply that an individual would only count as an expert if he or she is able to transmit judgement about a problem and its solution to another person, in a way that would appear meaningful or rational to the other person. It is relevant to add that the materials through which one can make judgements about problems and their solutions are products of argument: 'claims, warrants, evidence, reasons; their testing and contesting' (Majdik and Keith 2011a:374). The solution to a problem should involve 'an ability to negotiate the various normative contexts (technical/economical, religious, familial/traditions, etc.)' (Majdik and Keith 2011a:377), therefore Majdik and Keith's approach to expertise is multidimensional, in contrast to approaches that limit expertise to the possession of knowledge. Considering expertise as argumentative and multidimensional makes possible to pay analytical attention to more than claims of substantive knowledge possession.

Considering expertise as multidimensional brings to mind the shared socio-emotional-cognitive (SSEC) platforms Mansilla et al. (2012) identify as necessary for interdisciplinary success, and also the accounts of interdisciplinary expertise given by Ku (2012). Moreover, the case of the AIDS activists Epstein (1995) analyses can be considered an example of

expertise as multidimensional, since activists had to be able to combine technical and ethical accounts to construct judgements about medical treatments. Burri (2008) describes the multiple sorts of arguments presented by radiologists to present themselves as the most relevant experts for the use of Magnetic Resonance Imaging (MRI) scanners. She notes that radiologists construct their expertise and their disciplinary identity not only by arguing about their image interpretations skills, but also by discussing the proper way of installing the MRI scanners and how to take better economic advantage of them.

The literature on expertise offers much for the study of interdisciplinary individuals and of interdisciplinarity in general. What is needed is to consider expertise as having dimensions other than knowledge, dependent not only on formal knowledge but also on performance and argumentation in specific interactional contexts. Moreover, rather than a fixed identity or characteristic of individuals, expertise has to be seen as negotiated, performed and subject to challenge. The following section describes methodological limitations in studies of interdisciplinarity and introduces an approach that can overcome them.

3.4 Conclusion: Towards a study of the interdisciplinary self

This chapter has described two bodies of literature, one focused on the motivations, characteristics and skills of individuals engaged in interdisciplinarity; and one body of literature focused on experts and expertise. It was argued that the literature on interdisciplinarity is limited because it has

not engaged much with literature on the self nor with literature on expertise. These themes are strongly connected because expertise is a crucial aspect of academic individuals' descriptions and perceptions of 'who they are'. Those assigned the label 'expert' have access to privileges (Lynch 2004), but if such identity is not acknowledged, individual selves are threatened. A review of the literature on expertise is valuable for the study of interdisciplinarity because it illustrates that the content and meaning of 'expert' are not fixed but malleable depending on the situation. Moreover, the literature demonstrates that both the meaning and identity of 'expert' are subject to negotiation, and individuals can use different strategies to claim such an identity. Once these observations are taken into consideration, the seemingly common-sense view of interdisciplinary researchers as 'jacks of all trades, masters of none' can be questioned. This is but one among many ways to perceive and describe interdisciplinary researchers. Moreover, individuals are able to reject and formulate alternative meanings of such a 'troubled' identity (Taylor 2015; Wetherell 1998). The blind spot in the literature lies in the fact that selves, identities and traits people attribute to themselves are not necessarily descriptions of a fixed reality but negotiated during interaction. This thesis contributes to the literature by covering this gap in the literature.

Such a blind spot is understandable. Scholars who take interdisciplinarity as their research topic are driven by other interests, such as what is going on with their own disciplines and with their own projects. In the case of STS scholars, they are interested in the disciplines and projects they observe and participate in, and in how knowledge is produced. The main focus is the (inter)discipline, the project, the knowledge or the technology produced, the policy strategy; but

not so much the self that lives and engages in interdisciplinary research. Moreover, when motivations, characteristics, skills and virtues are the focus of study, there are theoretical and methodological limitations, since scholars seem to adopt an *essentialist* view of the self. Even though positivist and essentialist views of science and knowledge are rejected by studies of interdisciplinarity informed by STS, the self 'inside' the social actor is not problematised. In contrast, as noted in chapter 1, there is a long tradition that questions the essentialist view of the self. As Callero (2003) states:

> There is today a consensus within the discipline [sociology] that the self is at some level a social construction. Whether phenomenal or discursive, fragmentary or unitary, stable or transitory, emotional or rational, linguistic or embodied, the self is assumed to be a product of social interaction (p. 121).

Since studies dealing with interdisciplinarity are not informed by contemporary literature on self and expertise, little is known about *how interdisciplinary selves are constructed in and through discourse*, and about *how they negotiate the issue of expertise in interdisciplinary research*. These questions can be more easily addressed when taking into consideration that interdisciplinarity involves multiple dimensions, such as emotional, cognitive, social, and institutional (Ku 2012; Mansilla et al. 2012), and thus individuals have different opportunities to negotiate expertise.

In this thesis, the approach used for the study of interdisciplinarity is discursive psychology, a type of discourse analysis developed in social psychology, which draws on different research traditions including social constructionism, STS and ethnomethodology, among others (Potter and Wetherell 1987).

Discursive psychology focuses on how language is used in interaction to construct versions of self, world and events (Edwards and Potter 1992). It deals with how psychological themes such as attitudes, identities, emotions, understanding, and the self, are used in interaction. Discursive psychology is proposed here as a valuable approach for the study of the 'interdisciplinary self' because it allows us to explore how individuals deal with the complex project of adopting an identity that is both positively and negatively regarded. The following chapter explains this approach in more detail and presents the research design of this thesis.

Chapter 4. Research design and approach

4.1 Introduction

The previous chapters provided an overview of the literature focused on the history and studies of interdisciplinarity. Chapter 2 stressed that that the relationship between disciplinarity and interdisciplinarity can be understood in different ways and that interdisciplinarity therefore carries different meanings and expectations. Chapter 3 described studies focused on the interdisciplinary individual and it was complemented by a review of the normally neglected literature on expertise. It was noted that the characteristics that interdisciplinary individuals are supposed to have are normally taken for granted rather than critically analysed, and the chapter closed with proposing discursive psychology as an approach to exploring how individuals deal with the contradictory meanings and expectations of interdisciplinarity. The present chapter describes the research approach, the research process and a number of theoretical implications.

The chapter is organised as follows. Section 4.2 begins with a narrative of how developed the research topic, the research questions and the main method of analysis. Section 4.3 presents a general overview of discourse analysis and the specific type used in this thesis, which is a variation of discursive psychology applied to biographical narrative. Section 4.4 describes the research design and process, including sampling, access to participants, interview procedure and

analysis. Section 4.5 presents a reflection on the ethical issue of anonymity. In section 4.6 I discuss philosophical assumptions around relativism and reflexivity, and finally some conclusions are presented.

4.2 A narrative of the topic design

A thesis focused on researchers' career narratives drawing on discursive psychology should emphasise that biographical narratives are, rather than merely descriptions of the past, constructed for a purpose, context dependent and oriented to action (Taylor and Littleton 2006; Taylor 2007). This theoretical background is extended below, and for the moment I describe how the topic of this thesis was shaped by theoretical, methodological and personal interests. The following may not be the only possible version of how I came up with the topic and it may also be a purified version, but this is the version that suits best the context of this thesis.

I would explain my interests in STS as an outcome of being a sociology student and having academic researchers in my close family, and also coming from a country with strong commitments but limited resources to develop scientific research. This background may have attracted my interest in the dynamics between intellectual and political-economic expectations of scientific research. During my Master's course[7] I became interested in the concept of boundary work (Gieryn 1983, 1999) and in the analysis of scientific discourse (Gilbert and Mulkay 1984), since these are used to demarcate science from non-science, and scientific beliefs from other types of beliefs such as magic or religion. Although I had a few theoretical and methodological interests, I did

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[7] The Master's degree was on Research Methods with a specialism in STS

not have a good enough grasp of science which could help me to define a dissertation topic. My MA supervisor, who is still one of my supervisors, directed me to a network of social scientists that were organising seminars to discuss the role of social scientists in synthetic biology (Calvert et al. 2012). I came to understand that the UK Research Councils, and organisations such as the European Commission were, and are, interested in bringing social scientists to collaborate on research projects in order to anticipate the ethical, legal and social implications (ELSI) of scientific and technological developments. This implies that the role of social scientists in these projects is already relatively narrowly framed according to interests other than their own. As a consequence, these social scientists were themselves seeking to define and negotiate less restricted roles, in order to enrich the outcomes of interdisciplinary collaboration (Balmer et al. 2012; Calvert and Martin 2009; Molyneux-Hodgson and Meyer 2009).

By attending this seminar series I developed interests on the boundary work involved in interdisciplinary collaboration and I decided to focus my Master's dissertation on the politics of interdisciplinary research. This meant that I intended to explore how interdisciplinary projects are shaped by the interests of different disciplines but also by institutional and individual interests. I interviewed two natural scientists, one working in synthetic biology and the other in nanotechnology. During the interviews one of them argued[8] that their position was a result of *always having loved the wonders of different disciplines*, but also that he/she would have obtained his/her professorship earlier *had he/she not done so much interdisciplinary work*. The other argued

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[8] These are not direct quotations.

that interdisciplinarity is a way to *solve complex problems* but that *many times you just end up reinventing the wheel*. This interviewee also argued that many people working in nanotechnology go to biology because that is *where they think the money is*. Moreover, both argued that interdisciplinary collaborations should come up in a *natural* or *organic* way rather than being forced to happen, and that not everybody can do interdisciplinary work because it is difficult to understand different disciplinary 'languages'. Thus, I identified different ways of talking about interdisciplinarity, which could even be seen as contradictory.

These interviews shaped the topic for my PhD. They made me interested in exploring boundary work to demarcate between 'genuine' and 'non-genuine' interests for interdisciplinary research, as well as researchers' presentation of themselves as skilled for, and genuinely interested in interdisciplinarity. From the general literature on qualitative research covered in my Master's degree, I had learned that interviews are not necessarily neutral descriptions of reality, and that interviewees provide answers 'in order to perform certain interactive functions, for example appearing to be a good interviewee, or using expressions in order to convince the interviewer that he or she […] is an expert on this topic' (Smith 1995:10). Following Murphy and Dingwall (2003) 'interviews are occasions for informants to display themselves as adequate parents, good patients, well-informed citizens, responsible adults, and competent professionals - or to produce socially acceptable explanation of their failure' (p. 95-96). I also have learned from Gilbert and Mulkay's (1984) analysis of scientists' discourse that scientists draw on different *interpretative repertoires* to describe their own theoretical beliefs and those of others. In their

analysis of the development and establishment of the chemiosmotic theory in biochemistry, Gilbert and Mulkay found that when scientists presented their own beliefs, these were meant to be based on empirical reality and on experimental observation. In contrast, the beliefs of their opponents were said to be based on emotional involvement with certain groups or theories, on irrational factors or in dogmatic attitudes. These forms of accounting are identified, respectively, as the 'empiricist' and the 'contingent' repertoires.

As I was exploring the literature on interdisciplinarity, in particular the literature focused on the individual (presented in chapter 3), I observed that not a lot of research had been carried out into the self-presentation of researchers during qualitative interviews (Lee and Roth 2004), and in contrast there were long lists of traits and characteristics identified as making individuals succeed in interdisciplinary research. I engaged more with literature on discourse analysis (Potter and Wetherell 1987) and the sociology of the self (Cahill 1998; Callero 2003; Holstein and Gubrium 2000; Immergut and Kaufman 2014) and formulated the following research questions:

- *What discursive resources do individuals draw on to make sense of interdisciplinarity?*

- *How are interdisciplinary selves constructed in and through discourse[9]?*

- *How do interviewees negotiate the issue of expertise in interdisciplinary research?*

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[9] This question involves analysing how an individual presents oneself as interdisciplinary, how staff and administrators talk about interdisciplinary researchers, how peer researchers talk about interdisciplinary researchers?

- *How are interdisciplinary careers constructed and negotiated as worthwhile?*

The following sections extend the theoretical-methodological approach and the research design.

4.3 Theoretical-methodological approach: discourse analysis/discursive psychology

The theoretical-methodological approach was crucial for the development of the research design and the originality of the thesis is based to a large extent on the application of this approach to the topic of interdisciplinarity. Therefore it is worth providing a comprehensive description of it, starting with a general definition of discourse analysis and by distinguisning the specific approach used here. This is relevant because there are many types of discourse analysis and these make different theoretical assumptions. Later in the chapter the specific approach used here is distinguished from different discursive studies of interdisciplinarity. According to Wetherell (2001):

> Discourse analysis is concerned with the meanings that events and experiences hold for social actors. It offers new methods and techniques for the social researcher interested in meaning-making. More than this, however, discourse analysis is also a theory about language and communication, a perspective on social interaction and an approach to knowledge construction across history, societies and cultures […]. To enter into the study of discourse, therefore, is to enter into debates about the nature of meaning (p. 1-5).

Discursive approaches in general are valuable for interdisciplinarity because of the attention given to meaning-making. It will be more convenient to leave the

discussion of philosophical assumptions to a further section, once the principles of methodology and characteristics of the project have been presented. At the moment, however, it should be pointed out that the type of discourse analysis used in this thesis is qualitative, primarily inductive and draws on a constructionist paradigm.

4.3.1 Mapping discursive approaches

According to Edley and Wetherell (1997; Wetherell 1998) different types of discourse analysis can be summarised in two categories: a top-down approach inspired by post-structuralism and Foucault's (1988) work, focused explicitly on power and domination (van Dijk 1997; Fairclough and Wodak 1997; Jørgensen and Phillips 2002; Laclau and Mouffe 2001), and a bottom-up approach, which draws strongly on ethnomethodology and conversation analysis, focused on the construction of meaning in natural interaction (Edwards 1994, 2000; Wiggins and Potter 2003). The top-down approach is generally identified either as Foucauldian discourse analysis or as Critical Discourse Analysis (CDA) and the bottom-up approach is known as discursive psychology, and there are different variations of these two approaches. The approach adopted in this thesis is a variation of discursive psychology that is not as interested in natural conversation recordings as a mainstream version is, and in contrasts pays more attention to the construction of self and identity during interviews, giving more room to issues of power and ideology. It is known as *critical discursive psychology*. While the top-down approaches assume that subjects are formed and constrained *by* discourse, and bottom-up approaches assume that subjects are formed during interaction, *critical discursive psychology* assumes that 'people are simultaneously the products

and the producers of discourse' (Edley and Wetherell 1997:207, emphasis in the original). This means that subjects are positioned by discourse, but they can also negotiate new positions and new meanings of those positions. Yet, as Edley (2001) points out, 'reconstructing identities is not a simple matter of voluntary action' because 'establishing one's identity' is 'inextricably bound up with the exercise of power' (p. 193-194). This is, he argues, because identities claimed have to be authorised and recognised.

Critical discursive psychology has been applied to the study of racism (Wetherell and Potter 1992), masculinity (Edley and Wetherell 1997; Wetherell and Edley 1999) and singleness (Reynolds et al. 2007; Reynolds 2006). A further characteristic of the approach adopted here is that it adds a broader focus on narrative to critical discursive psychology; therefore it is called the *synthetic narrative-discursive* approach. This specific approach has been used to explore creative identities (Taylor and Littleton 2006, 2008, 2012; Taylor 2015). The main characteristic of this approach is that it applies the principles of discursive psychology to the study of biographical talk. The rest of the section describes the general characteristics of (critical) discursive psychology and of the narrative-discursive approach. Once these are presented, the value of this particular approach for the study of interdisciplinarity can be assessed.

4.3.2 Discursive psychology

Discursive psychology can be seen as a further development of the approach to discourse analysis started by Gilbert and Mulkay (1984). In fact, one of the key figures in discursive psychology, Jonathan Potter, did his PhD with Michael

Mulkay and they have published together about the analysis of scientific discourse (Mulkay, Potter, and Yearley 1983). More contemporary STS work has also drawn on discursive psychology principles (Arribas-Ayllon, Bartlett, and Featherstone 2010; Brown and Michael 2001; Kerr, Cunningham-Burley, and Tutton 2007; Rappert 2005).

STS's influence on discursive psychology can be identified in different ways. First, discursive psychology makes no distinction between the truth and falsity of accounts, which is similar to the *impartiality* and *symmetry* principles in the strong programme of sociology of scientific knowledge (Bloor 1991). Second, following Gilbert and Mulkay's analysis, discursive psychology explores the ways 'in which descriptions are established as neutral, factual and independent of the speaker' (Potter 1996b:202). Third, also influenced by Gilbert and Mulkay, discursive psychology focuses on the variability of accounts. In their analysis Gilbert and Mulkay noted that scientists provide different versions of events in different contexts. In informal talk, scientists emphasise the excitement of getting results, but in publications they write in an impersonal style. Other characteristics of discursive psychology are presented below.

The primary focus of discursive psychology is the use of psychological themes, such as intentionality, interest, attitudes, identity and personality *in* and *for* interaction (Potter 2010a, 2010b). It is anti-cognitivist, which means that it does not take phrases such as 'I believe', 'I feel', 'I love', 'I hate', as descriptions of activities going on in the brain; rather these are seen as having a purpose in interaction (Billig 2009; Edwards and Potter 1992). Other main characteristics are that discourse is taken as constructed and constructive, variable, action-oriented, and situated. Discourse is *constructed* because it is

formed by common discursive resources such as narrative forms, interpretative repertoires, metaphors, and other devices that are part of a culture's common sense. It is *constructive* because it puts together versions of people, events, objects and the world, depending on the situation and the action these constructs intend to accomplish (Potter 2012a). According to Potter (2012a), discourse is *situated* in different contexts, and versions are constructed depending on the context. It is situated in the immediate interactional context, but also *institutionally* and *rhetorically*. It is situated institutionally because, following Potter (2012a) 'institutions often embody special identities [and] actions will be understood in relation to those identities' (p. 123), and rhetorically because 'descriptions are built to counter actual or potential alternatives, and they are organised in ways that manage actual or possible attempts to undermine them' (p. 123). The rhetorical element requires further explanation.

Discursive psychology has been both influenced and partly developed by Michael Billig, who emphasises the relevance of ideology and argumentation in individuals' thought. Billig's approach to psychology and ideology draws on ancient rhetoric. This is not a rhetoric of style and resources for embellishing speech but a rhetoric of argumentation, represented mainly by Protagoras, who claimed that 'there are always two sides to every issue' (Billig 1996:3), and that for every argument, there is always a counter-argument. From this perspective, the rhetorical meaning of arguments derives 'both from what is being supported and from what is being rejected' (Billig 1996:2). Thus, when a speaker gives an opinion, this is also an opinion against the idea and against those who hold it. Most importantly, according to the premise of contradiction,

common sense and ideology are not unified systems of thought but rather they contain contrary themes. Because of these contrary themes individuals face *dilemmas* when they argue.

Billig's rhetorical approach to psychology is an alternative to cognitive and ideological theories. As he and his collaborators argue:

> In stressing the dilemmatic aspects of ideology, we hope to oppose the implications of both cognitive and ideological theory, which ignore the social nature of thinking. In contrast to the cognitive psychologists, we stress the *ideological* nature of thought; in contrast to theorists of ideology, we stress the *thoughtful* nature of ideology (Billig et al. 1988:2).

The existence of dilemmas of common sense and ideology implies that there is a connection between arguing and thinking, because the form and content of thought are social.

To highlight the two-sidedness of ideology and common sense, common sense indicates that 'more hands make the work less', but also that 'many cooks spoil the broth'. We also see that '[t]he risk-taker can be described as reckless or [as] courageous' (Billig et al. 1988:16). Turning to the dilemmas of ideology, we may support freedom and liberal values, but we notice that too much freedom may turn into anarchy. Also, while we idealise individuality, we are aware that it can turn into 'selfishness and lack of social responsibility' (Billig et al. 1988:35). We can also face dilemmas occasioned by the contradictions between an *intellectual* ideology and a *lived* ideology. We praise equality, but we know that in an unequal world we need to be practical and therefore there is not always room for equality. Billig et al. (1988) also argue that individuals

cannot permanently solve dilemmas of common sense and ideology because these have a social nature, and even when they find partial solutions, 'other problems emerge as the ideologically constituted dilemma expresses itself in other forms' (p. 6). As will be shown in the analytical chapters, these thoughts turn out to be remarkably important for the study of interdisciplinarity.

4.3.3 Self, identity and biographical talk

Discursive psychology offers an original understanding of self and identity. These are seen as '*accomplished* in the course of social interactions, reconstructed from moment to moment within specific discursive and rhetorical contexts, and *distributed* across social contexts' (Edley and Wetherell 1997:205, emphasis in the original). According to Potter and Wetherell (1987) 'the self is [...] articulated in discourse in ways that will maximise one's warrant or claim to be heard' and 'some versions of the self will thus come to predominate in some contexts' (p. 108). This perspective rejects traditional or mainstream psychological theories that take the self to be a permanent essence located somewhere in the organism waiting to be discovered. Thus, this view is different to *trait theory*, which suggests that a 'person's behaviour or actions are thought to be largely determined by the combination of traits they possess' (Potter and Wetherell 1987:96), and to *role theory*, which suggests that individuals behave according to the pre-established social positions they adopt, assuming there is a 'real' self behind those adopted positions. To Potter and Wetherell these theories only represent different discursive resources that can be used by people to provide accounts about themselves and others. The literature on interdisciplinarity presented in chapter

3 can be seen as drawing on trait and role theories. In contrast, this thesis explores the 'interdisciplinary self' from a discursive perspective.

Discursive psychology's view of the self and identity are similar to those of contemporary theories of the self (Burkitt 2009; Callero 2003). They are all influenced in one way or another by symbolic interactionism, ethnomethodology, post-structuralism and critical social psychology. It is worth underlining that discursive psychology has abandoned the concepts of 'subjectivity' and 'identity' to distinguish between the features or functions of the 'internal' and 'personal' and of the 'external' and 'public'. Wetherell (2008) argues that distinctions between the 'internal' and the 'external' are not analytically useful and are rather misleading. Alternatively she suggests *psycho-discursive practices* to be a more convenient unit of analysis. These are defined as 'recognisable, conventional, collective and social procedures through which character, self, identity, the psychological, the emotional, motives, intentions and beliefs are performed, formulated and constituted' (Wetherell 2008:80). In this thesis self, subjectivity and identity will be used to refer to these psycho-discursive practices. This alternative concept is valuable because it emphasises that the focus is on discourse rather than on what speakers *really* think, feel, remember or intend. Now that the perspectives of (critical) discursive psychology on self and identity have been presented, the specific focus of the narrative-discursive approach can be introduced.

The narrative-discursive approach focuses on more extended accounts, either occurring in 'natural' settings or during a research interview. This makes possible to explore how identities are claimed and constructed in biographical talk. According to Taylor and Littleton, (2006), biography is 'a situated

construction' in which the 'wider discursive environment is implicated' (p. 23). They argue that biographical talk 'is shaped by both the unique circumstances of people's lives and by the meanings in play within the wider society and culture' (Taylor and Littleton 2006:23). By wider discursive environment they refer to 'established categorisations of people and places, values attached to particular categories […] expected connections of sequence and consequence' and 'expectations about the appropriate trajectory of a life' (Taylor and Littleton 2006:23). An approach that combines discursive psychology and narrative analysis can explore how self and identity are constructed and how 'available meanings are taken up or resisted and (re-) negotiated' (Taylor and Littleton 2006:23). Thus, it 'offers a way of investigating the social nature of biographical talk' (Taylor and Littleton 2006:23).

Taylor and Littleton argue that although individuals are already positioned within broader categories, they are active and can negotiate new positions and meanings for their positions, and this emphasises the reflexive work involved in biographical narrative. However, they also argue that individuals are not entirely free to construct their identities, because they are constrained by common understandings of the broader social and cultural context, by their own biographies, and by what they have said before. Those established social and cultural understandings are, indeed, power-related. The whole purpose of the reflexive negotiation of positions and identities is gaining some empowerment, whenever possible, and when individuals are aware of the lack of privilege their positions imply.

4.3.4 A narrative-discursive study of interdisciplinary selves

In this section I shall outline the assumptions of a narrative-discursive study of interdisciplinary selves and emphasise the value of this approach. Drawing on the principles of impartiality and symmetry (Bloor 1991), this approach adopts a neutral position regarding the value of disciplinarity and interdisciplinarity[10]. As shown in chapter 2, the value of these practices depends on how these are framed in contrast to each other (Weingart 2000): disciplinary work can be seen as rigorous but also as conservative; interdisciplinary work can be seen as innovative, but also as lacking rigour; interdisciplinary researchers can be seen as valuable, but also as jacks of all trades and masters of none. These contradictions resonate with the premise of Protagoras, that there are always two sides to every issue (Billig 1996). This emphasises the value of analysing interdisciplinarity as rhetorically situated.

Also, the principles of impartiality and symmetry are extended to the accounts provided by interviewees, which are not assessed as being objective or subjective, true or false, interested or disinterested. In this approach, identities such as 'expert', 'specialist', 'disciplinary', 'interdisciplinary', are seen as achievements of the interview, and this resonates with ethnomethodological and rhetorical studies of expertise (Lynch 2004; Majdik and Keith 2011a, 2011b). Rather than assuming that identities of 'expert' and 'interdisciplinary' are mutually exclusive, the purpose is to explore empirically how interviewees negotiate these identities drawing on and resisting meanings available in the wider social and cultural environment, and also resources made available by

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[10] The approach taken here implies doing an interdisciplinary study of interdisciplinarity, which may not seem as impartial as claimed. In a further section I reflect on this dilemma.

their own biographies (Taylor and Littleton 2006; Taylor 2007). Thus, biographical narrative is seen as a discursive construction in which multiple identities, but also contrary values associated with interdisciplinarity, are negotiated and accommodated alongside individuals' life events.

Discourse theory has been shown to be valuable for the study of interdisciplinarity on a few occasions. As noted in chapter 2, Friman (2010) suggests an interpretation of interdisciplinary boundary work drawing on Laclau and Mouffe's discourse theory (see section 2.3.1). However he does not provide an empirical analysis. A different case is Martimianakis' study. In her PhD thesis, Martimianakis (2011) draws on a Foucauldian discourse analysis to identify how a dominant discourse of interdisciplinarity shapes researchers' practices. According to Martimianakis, a dominant discourse of interdisciplinarity has been developed and promoted by the OECD, then adopted by universities in country members. She argues that according to this discourse, 'knowledge-makers are expected to diversify through collaboration in order to innovate and produce knowledge that is useful and marketable' (Martimianakis 2011:iii). Martimianakis' study is a significant contribution to studies of interdisciplinarity because it represents a genealogy of this practice, drawing on rigorous analysis of different sources. However, the Foucauldian approach makes no room for alternative interpretations. The approach emphasises one single dominant discourse, implying only one main rationale for the value of interdisciplinarity. This implies that other rationales behind interdisciplinarity are taken as 'resistance'. This analysis can be seen as limited if compared with Barry and collaborators' (2008) interpretation, which suggests there are different logics of interdisciplinarity operating at different

times, sometimes in combination with others, namely the logic of accountability, the logic of innovation and the logic of ontology.

Two technical differences between Martimianakis' approach and the one I suggest can be underlined. In this form of analysis, attention is not paid to what interviewees *do* with their talk and what is the identity work they perform during the interview. Martimianakis also argues that she analyses how researchers *experience* the dominant discourse of interdisciplinarity. Discursive psychologists, in contrast, would not claim being able to analyse such a cognitive activity, or otherwise they would explore how displays of experience are used during interactions (Potter 2012b). Furthermore, the Foucauldian approach does not pay attention to how membership categories such as 'expert', 'good collaborator' or 'interdisciplinary' are achieved during an interview, as is the focus of my thesis. The following section describes the research design and procedure.

4.4 Research design and process

4.4.1 Semi-structured interviews

Once the main focus of the thesis was defined, namely individuals' accounts of interdisciplinary engagement and the discursive construction of themselves as interdisciplinary, the research project was designed. Since the research focus was defined based on data from qualitative, semi-structured interviews, it was decided at an early stage that these were the most adequate method of data collection. Besides the opportunity of obtaining data about self-construction, semi-structured interviews are convenient because they facilitate access to research participants (Murphy and Dingwall 2003). Semi-structured interviews

require a small number of questions to explore themes but are flexible enough to allow the formulation of additional questions during the development of the interview (Wilson and MacLean 2011). Additionally, their flexibility allows the interviewee to develop themes they consider relevant.

Qualitative interviews have received different criticisms, Potter and Hepburn (2005) argue that these are driven by the interests and agendas of social researchers rather than by the interests of the interviewees, and also social researchers often fail to see interviews as interaction in their own right. Thus, Potter and Hepburn argue that social researchers ignore their own influence on the production of interview data. However, Taylor and Littleton (2006) argue that 'interviews are culturally rooted communication situations in which meanings are reinforced, challenged and negotiated between interlocutors' (p. 28). This emphasises the value of interviews for the topic of this thesis. Rather than taking for granted what interviewees say about certain topics or about themselves, the aim is to explore how versions of self, world and events are put together, what discursive resources are used and what their rhetorical purposes are within the interview. Thus, the influence of the researcher is taken into account in the design of interview guides and on the analysis.

Besides interview talk, in the early stages of the project other types of data were also considered. While I was searching for literature, I identified blogs and articles in which researchers wrote accounts about their personal engagement with interdisciplinarity. I then carried out a systematic search for this type of documents in the websites of *Nature Careers*, *Science Jobs* and *New Scientist,* published from January 2000 to August 2012. Only those written in the first person by researchers or interviews with researchers were

collected, making a total of 27 articles. I used these articles to start developing my analytical skills and also to inform the interview guides. These sources are not included in the thesis but an analysis can be seen in Cuevas-Garcia (2015). Similar discursive resources were identified in these articles and in the interviews, but the articles were not used as a way to achieve generalisation[11].

Alternative or complementary methods of data collection could have included ethnography and focus groups. It is worth pointing out why these were not chosen. Ethnography has been used in studies of interdisciplinarity on numerous occasions (Barry and Born 2013; Mansilla et al. 2012), and certainly negotiation of identities can be explored ethnographically (Centellas et al. 2013). The possible sites of observation could have been interdisciplinary teams' meetings or events oriented to promote interdisciplinary collaboration. However, it would not have been wise to assume people would discuss their interdisciplinary engagement in such spaces. During the first year of the PhD I attended one event organised by my university oriented to motivate people to engage in collaborative work. I identified only one occasion in which issues of having an interdisciplinary profile were discussed. Furthermore, the selection of cases or groups to observe and access to them would have involved longer planning. Gilbert and Mulkay (1984) argue that even when observations of scientific practice are made, the analyst relies on the scientists' explanations, which are already shaped by the interpretative work and the discursive practices of the scientists. Ethnographic observation of interdisciplinary practices and reunions can, indeed, be object of future research, following

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[11] These articles are not included in the thesis in order to limit the data to one single institution.

Wetherell's (2007) suggestion of combining discursive psychology and linguistic ethnography.

Focus groups could have represented a valuable method since these would have allowed collecting rich discussion about the value and challenges of interdisciplinary research. This method of data collection has not been used much in studies of interdisciplinarity (Garforth and Kerr 2011; Sedgwick 2011). But regardless of this method's value there were potential difficulties. The first was related to scheduling, since it would have been difficult to bring a number of busy researchers together at the same time. An alternative would have been to run focus groups with PhD students, but they would have less experience with the actual challenges and benefits of interdisciplinary research, and their accounts would have been limited only to their expectations. A different challenge was of a technical nature since transcribing focus groups' recordings is more complicated and time consuming than transcribing interview recordings. The value of focus groups can still be considered for future research, as well as the study of students' expectations of interdisciplinary research.

4.4.2 Sampling

In social research sampling is often associated with the possibility of generalising the results based on the representativeness of a sample (Bryman 2008). However, generalisation is difficult in qualitative research, and even then there is disagreement on whether the main qualitative sampling technique, *purposive sampling*, can be used to generalise. According to Collingridge and Gantt (2008) it is possible, but to Bryman (2008) it is not. In this project,

different qualitative sampling techniques were combined and used at different stages of fieldwork, including purposive, convenience and snowball sampling (Bryman 2008). *Purposive sampling* means selecting participants that are relevant for the research questions; *convenience sampling* is based on the accessibility of the researcher to the sample; and *snowball sampling* consists of asking research participants to recommend people who could be relevant for the research purposes (Bryman 2008). It should be emphasised first that, in principle, making a representative sample of interdisciplinary researchers would be impossible since, as noted in the literature review, different individuals define interdisciplinarity differently (Lau and Pasquini 2008), and also because disciplines are not isolated silos (Jacobs 2013; Osborne 2013), so any researcher could claim to be doing interdisciplinary research.

Because of the specific focus of the project, there was great flexibility for selecting research participants. The purpose was to select researchers with experience of doing interdisciplinary research, either individually or in collaboration with other researchers; and also university administrative and support staff involved in the development of institutional research strategies. Thus, a purposive sampling strategy was followed. In order to narrow down the universe of potential participants, the first decision was to limit the research to only one academic institution. This would allow asking the participants about characteristics of specific institutional research policies. Because of the interviews carried out for my Masters' dissertation, it was known that different individuals provide different opinions about the institutional support of interdisciplinarity, and that even the same individual may provide different opinions during the interview. Focusing only on one

institution also offered the advantages of acquiring geographical familiarity and of reducing travel costs[12], thus the sampling strategy included convenience sampling. Also, participants were asked to recommend additional potential interviewees, thus snowball sampling was involved. It was decided that the most convenient institution would be a large research oriented university in the Midlands, with an explicit component of interdisciplinarity in its research strategy. The name of the university selected is not provided in order to guarantee the anonymity of the participants. The ethics section includes a discussion about anonymising interview data.

At the time this project was being developed, in the first half of 2012, the selected university had a research strategy in which a number of research groups, focused on interdisciplinary areas, were receiving particular support. These interdisciplinary groups cut across the social and natural sciences, engineering, arts and humanities. At an initial stage people leading or involved in these groups were selected, involving professors, associate professors, lecturers and research fellows. In addition, university administrators and other staff members were contacted, including the research development officers of particular schools, but also high profile administrative staff. It was decided to contact participants by email[13]. Initially a total of 10 researchers from the natural sciences and engineering, 10 researchers from the social sciences, arts and humanities, and 10 university administrators and research development officers were contacted. A number of them did not reply to two attempts to contact them and they were replaced either by people I identified through reviewing personal webpages or later on by people recommended by

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[12] My scholarship does not include travel and research expenses.
[13] Details of the email are described in the section on Access to participants and procedure.

participants. In that sense, the sampling was affected by my own interests and preferences and also by my own understanding of interdisciplinarity, broadly defined as any involvement by a researcher with two or more disciplines.

In the end I interviewed a total of 27 individuals, including:

- o 7 social scientists, (1 head of school, 3 in other high profile administrative positions)
- o 4 arts and humanities researchers,
- o 11 natural scientists (3 in high profile administrative positions)
- o 1 engineer
- o 4 administrative staff, non-researchers (1 had a PhD)

From these, one social scientist and one arts researcher were working within a medical/health sciences faculty at the time of the interview. 13 of the participants were female and 14 male. The purpose of selecting a varied group of participants was to obtain more variability of accounts, but comparisons or generalisations were not intended.

4.4.3 Research procedure

Reflection on participants' initial contact

Qualitative researchers should be aware that their presence during interviews, their identity and the way they formulate questions have an impact on the data produced (Potter and Hepburn 2005; Taylor 2001). Stanley (2004) adds that researchers need to be reflexive about the way they introduce and position themselves when they make first contact with the potential participants. Stanley's PhD was a discursive psychology analysis of doctoral education from the point of view of doctoral students rather than the supervisors, and

since his identity was very similar to that of his interviewees, he had to pay particular attention to how he introduced himself to his participants in the information sheets he provided. In his study it was problematic to present himself either as a student or as a professional researcher, both because of the way research participants could perceive him but also because of the particular position he was taking in his research. I do not consider it necessary to be quite so cautious, but it is worth acknowledging that the way I was framing my research in the email to participants could have influenced the way they presented themselves during the interview.

In the emails to participants I described myself as a:

> *PhD student in Science and Technology Studies focusing on thoughts and experiences about interdisciplinary research.*[14]

This way of presenting myself and my research could have been interpreted by the participants as if I was uncritically in favour of interdisciplinary research. My participants could have formulated their career narratives in order to emphasise their positive experiences of doing interdisciplinary work and to undermine their negative experiences. They could also have planned to restrict or to repress critical views of interdisciplinarity. Yet, this should not be considered negative, since no version of a biography is more accurate than another.

Interview guide

The interview guide was developed in order to cover general themes about interviewees' careers, general details of interdisciplinarity, a specific section of

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[14] See Email for participants in appendix 2.

interdisciplinary researchers' characteristics and skills, and general details about institutional support for research, at the levels of the school, the university and funding bodies. A general interview guide was developed but a few spaces were left blank so that specific themes and questions addressed to particular interviewees could be added. These were formulated after reviewing personal webpages of the participants or the websites of their departments, in the case of administrative and research development staff. An initial version of the general interview guide was sent to my supervisors and re-drafted taking their feedback into account. Pilot interviews were carried out with selected participants I had already met. Since they were social scientists I asked them for feedback on my interview once these were over. A few questions were modified according to their comments and to the notes I took. Other specific terms used or specific questions were slightly modified through the data collection period.

The final interview guide for researchers was divided in the following broader themes, with more specific questions:

   1. Background: education, career, research

   2. Interdisciplinarity at institutional levels (support, challenges, etc.)

   3. About interdisciplinarity and self (skills, characteristics, good collaborators)

   4. Interdisciplinarity: critiques, criticisms

   5. Other issues about interdisciplinarity

   6. Future research and career plans

7. Additional comments

In case of university staff members and administrators who were not researchers there were less additional questions in section 1, section 2 was more focused on their particular departments and roles, and there were not many questions about future career plans. I also asked about the relationship between researchers and research policies. In the case of researchers I would ask if their views of interdisciplinarity, its challenges and expectations, had changed during their careers, if this was not covered by them. In addition, I asked about how interdisciplinary work was seen in their fields or if it was common in their disciplines.

The interviews, including the two pilot ones, were carried out from November 2012 to September 2013. Once the interview guide was ready after the pilot interviews, potential participants were asked if they would be happy to take part in an informal, face to face interview that would last 40 to 70 minutes. They were asked if they were happy to be recorded but also were informed that the recorder could be switched off and the interview stopped at any moment. They were also informed that all personal details would be carefully removed to preserve anonymity, and that this project had been approved by the Ethics Committee of the School of Sociology and Social Policy from the University of Nottingham. I let them know that the interviews could take place either in their offices or in other place of their preference. Once they had replied I would go into more detail about the time and place to meet up. Most interviews took place at participants' offices, at meeting rooms at their departments or in rooms they kindly booked. Only one interviewee did not agree to be recorded. Yet I decided to carry out the interview and as the

participant was speaking slowly, I could write down information I thought relevant, and on occasions I would write down his own words, when I considered the accounts were relevant for his self-presentation. These notes were submitted to analysis drawing on discursive psychology.

During the interviews

Before starting the interviews I gave the participants two copies of the information sheet and an ethics checklist and consent form, which I asked them to read. If they did not have any questions I asked them to fill in the checklist and form. Each of us signed and kept one copy. Then I asked for permission to switch the voice recorder on and start the interview. At moments when I felt interviewees were hesitating to provide any information I told them I could switch off the recorder if they preferred. At the end of the interviews I would ask the participants if they wanted me to send the transcripts once I had them, in case they wanted me to avoid using any section. Only one interviewee asked for the transcript but she was fine with it once she checked it and once I told her how I would use the pseudonyms in her case. On average interviews lasted approximately 51 minutes and the total time recorded was 1,318.4 minutes. The longest interview lasted 80 minutes and the shortest 30.

Transcription

All interviews were transcribed in full at different times during the period January-September 2013. Transcription was done in MS Word but it was facilitated by *Express Scribe Pro* software (2015), which improves the audio quality, allows controlling the speed of the track and also allows stopping, going back and forth using a normal PC keyboard.

Different types of discourse analysis and discursive psychology require different types of transcription notation (Taylor 2001). Discursive psychologists drawing strongly on conversation analysis use very detailed and standardised transcription conventions (Jefferson 2004; Potter 2012a). This is because they pay more attention to length of pauses, hesitations, overlaps and interjections. Since my analysis focuses on overall accounts and content rather than minute linguistic detail, my transcripts include only few details: pauses, background noises, laughs, emphases on certain words and prolongation of sounds. These details were included for illustrative rather than analytical purposes[15].

Since my first language is not English, at times I would ask native English speakers for help with specific words or expressions; in other cases my supervisors would suggest what the word or phrase used could be, based on the context; or in extreme cases I would email the interviewees, if I thought the specific section was relevant for the analysis. The section on ethical reflection provides more details about anonymising interview data.

4.4.4 Analysis: categories and procedure

In chapter 3 I described Goodwin's (1994) analysis of professional vision. He notes that professionals use already-established *coding schemes* to refer to features on the materials they work with, and they also *highlight* specific features in order to show what is relevant and what should be understood. That way the professional shows the audience what and how to 'look' at something. But he also notes that his analysis applies the same procedure as the professionals he observes, namely using coding schemes, highlighting, and

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[15] The transcription notation can be found in appendix 1.

using graphic representations. Here I shall describe my categories of analysis, how I used them and how I came up with the findings.

In discourse analysis, analysis means *identifying* 'features' or 'patterns' of language use and *interpreting* what functions these are accomplishing (Antaki et al. 2003). These patterns of language use are considered *discursive resources*. It can be said that what makes types of discourse analysis different is the categories of analysis they look for and the theoretical assumptions about these. I use extracts of interview transcripts and draw on the categories of analysis provided by the literature in discourse analysis (the 'synthetic narrative-discursive approach') to highlight what is relevant within the extracts. These categories or discursive resources are: *interpretative repertoires, ideological dilemmas, subject positions, and canonical narratives* (Edley 2001; Taylor and Littleton 2006; Wetherell 1998). Although the research process is not deductive, it is not entirely inductive because what I was looking for in the data was shaped by these concepts and the theory and rationale behind them.

Interpretative repertoires have been described in different, yet related ways since the first time it was used. As indicated earlier, the term comes from Gilbert and Mulkay (1984), but Potter and Wetherell (1987) extended its use to explore other topics and functions and to substitute the notion of 'social representations' more widely used in psychology. Interpretative repertoires are:

> recognizable routines of arguments, descriptions and evaluations found in people's talk often distinguished by familiar clichés, anecdotes and tropes. They are the building blocks through which people develop accounts and

> versions of significant events and through which they perform social life. Interpretative repertoires consist of "what everyone knows" about a topic (Reynolds and Wetherell 2003:497).

> Clusters of terms, descriptions and figures of speech often assembled around metaphors and vivid images (Potter and Wetherell 1995:89).

People construct their accounts drawing on different interpretative repertoires, depending on how these fit with the actions they intend to achieve and the positions they intend to adopt. Thus, it is not that an interpretative repertoire is used only by one group of people, or that an individual will only use some repertoires but not others. It is worth bearing in mind that the notion of interpretative repertoires has some limitations because it is difficult to judge how consistent are the boundaries between one repertoire and another (Potter 1996a). Attached to the notion of interpretative repertoires is that of *ideological dilemmas*. As noted in a previous section, common sense and ideology contain contrary themes, their own thesis and antithesis (Billig et al. 1988). People may build arguments drawing on contradictions, but they may also face contradictions while they argue. If interpretative repertoires are the themes that organise common sense and what everybody knows, ideological dilemmas are both the contradictions contained in those themes, and the contradictions that emerge from the use of different repertoires.

In discursive psychology, *subject positions* are understood as 'locations' within a conversation' or 'the identities made relevant by specific ways of talking', and since 'those ways of talking can change both within and between conversations […] so too do the identities of the speakers' (Edley 2001:210).

According to Edley (2001), subject positions connect 'the wider notions of discourses and interpretative repertoires to the social construction of particular selves' (p. 210). Two points have to be made regarding the concept of subject positions. The first is that there are some subject positions that are more fixed than others, which are difficult to reject or negotiate, and which are incompatible with others, such as being male rather than female, young rather than old, a student rather than a professional. The second point is that subject positions have a historical background of power relationships, and different subject positions represent different amounts of power (Edley 2001; Wetherell 1998). For example, a student cannot claim the same amount of proficiency in an activity than a professional, and a young person cannot claim the same amounts of wisdom and experience than an older person. In this thesis more attention is given to those subject positions that are more fluid, in which there is more room for negotiation of power and of alternative meanings. In more stable subject positions power can be taken for granted, but I consider that this taken-for-granted-ness may impose limited interpretations of the data and the discursive work of the interviewees.

Subject positions can be troubled or untroubled (Wetherell 1998). A troubled position is that which is 'challengeable by others as implausible or inconsistent with other identities [or positions] that are claimed' (Taylor 2007:120). Troubled positions are also those positions that are not convenient for individuals to adopt in particular contexts. For example, an individual will be considered odd if an authoritarian position is adopted in an equal and democratic community. When speakers fall into a troubled position, they may have to provide further explanation, or repair (Taylor and Littleton 2006).

Finally, a *canonical narrative* is an 'established understanding of sequence and consequence, such as a potential life trajectory, which becomes a discursive resource for speakers to draw on (Taylor 2007:114)'. A canonical narrative 'can provide a logic for talking about personal circumstances, life stories and decisions' (Taylor 2007:116). Taylor and Littleton illustrate this concept with the case of art students: most of their interviewees described early proficiency in artistic and creative work, and having grown up in a creative milieu; but students whose case was not like this, had it more problematic to construct a creative identity. Taylor and Littleton note, speakers may find trouble when they breach the chain of sequence and consequence established by a canonical narrative.

All the analytical concepts introduced above are linked to each other (Edley 2001; Reynolds et al. 2007): interpretative repertoires provide subject positions to the speakers who use them, and they can shift between different subject positions as they build up arguments drawing on different interpretative repertoires. Interpretative repertoires can also be integrated into canonical narratives, and these can thus reinforce the subject positions adopted by interviewees, or provide opportunities to negotiate alternative meanings for those positions. It is crucial noticing that some interpretative repertoires might be incompatible with others or even contradictory, which might bring speakers to encounter ideological dilemmas and troubled positions. Furthermore, some interpretative repertoires are more dominant and better established than others, which might be easily overshadowed or undermined (Reynolds and Wetherell 2003). Power, thus, can be identified in interpretative repertoires that have stood long time as the 'winning arguments' (Edley 2001), and provide power

to the people who draw on them. In the case of interdisciplinarity it might be difficult to identify what these winning arguments are, as both interdisciplinarity and disciplinarity can be successfully defended or criticised.

Once the analytical concepts have been introduced, I can proceed to explain the analytic process. Discourse analysis involves an iterative process (Taylor and Littleton 2006) of reading, coding, analysing and writing. I started the process by getting familiar with transcripts and with the literature on discursive psychology, paying attention to how the concepts had been used in other studies and how I could use them to develop understanding of my data. At an early stage I was writing notes on the margins of printed copies of the transcripts, and then I carried out different strategies of coding, first coping and pasting transcripts' sections in MS Word, but then using the Software package Nvivo (QSR International Pty LTD 2012). Although this software has multiple functions for facilitating coding and analysis, I used only the basic functions for coding. The advantage over copying and pasting in MS Word is that with Nvivo it is easier to identify where coded sections come from. I carried out different attempts of coding according to different criteria, at times focusing on actions, at times focusing on discursive resources, and at times focusing on more general themes. As time went by I developed more understanding of my data but also of the literature on discursive psychology.

As I was getting more familiar with the texts, different categories were becoming more relevant to interpret what was going on in the data. Once I acquired a better understanding of how the categories could be applied and once I identified a number of repertoires, positions, narratives and dilemmas, I printed a number of transcripts in full and stapled half sheets of paper on the

right side in order to make 'extensions' of the margins. I then marked manually what discursive resources were being used by interviewees and made notes about what function these could be accomplishing. The process was then continued in Nvivo until it was time to define how the analytical chapters of the thesis could be designed. Although I first wrote chapter drafts divided by different categories (a chapter of repertoires, a chapter of positions, and so on), then I realised it was more convenient to divide chapters in terms of general themes and actions. This new presentation plan involved further and richer analysis, because it allowed seeing interviewees' use of discursive resources in combination. This way the analysis emphasises interviewees' voice rather than giving the impression of 'attribut[ing] action to technical entities rather than [to] people' (Billig 2009:13). This highlights the central role of writing in the analytical process.

4.5 Reflection on ethical issues

This research was approved by the Ethics Committee of my School before the participants were contacted. The practice of social research and qualitative research in particular require the researcher to act ethically towards research participants during and after the research is carried out (British Sociological Association 2002; Bryman 2008; O'Connell Davidson 2008). Researchers have to anticipate and avoid any potential harm to participants, secure their anonymity and confidentiality, obtain their informed consent, avoid invading their privacy and avoid deception (Bryman 2008). The main ethical concern to be reflected upon in this research is related to anonymity. This implies that participants' details are deleted or changed for pseudonyms in order to keep

their identities protected. Although I would consider that the interviews did not cover sensitive topics, it is still appropriate to avoid the participants from being identified, since the use or misuse of publications containing their quotations cannot be anticipated.

Protecting anonymity, however, is problematic, and there are some issues that have to be taken into account. The first is that 'even with all our efforts, anonymity cannot be completely guaranteed' (Saunders et al., 2014: 14). The second is that anonymising decontextualises the data, but this does not imply that data and results can be generalised (Nespor 2000). The third is that social researchers face a dilemma produced, as Billig would argue, by opposed ideologies they have to engage in: on the one hand 'maximising protection of participants' identities', and on the other 'maintaining the value and integrity of the data' (Saunders, Kitzinger, and Kitzinger 2014:2). Anonymising data implies that valuable details might be lost. This is a disadvantage for the researcher when doing the analysis, and for the reader, who may find the information provided vague.

In order to become more familiar with the data I decided not to anonymise the transcripts completely. Instead, particular sections have been anonymised before including them in conference presentations or in this thesis. Since a number of my interviewees have unusual combinations of academic and professional backgrounds, or take part in rather unique interdisciplinary projects, they are easy to identify. I decided to remove not only the name of the university, but also names of disciplines and fields of research. In order to avoid losing so much detail I included more general field names and refer to them, for example as 'social scientist working within a Faculty of medicine

and health sciences'. Thus, at times information is vague, and at times anonymity could be perceived as slightly at risk. For future publications, research participants will be contacted in order to negotiate what details can be kept and which ones should be removed. Thus, both informed consent and anonymity are ongoing processes rather than a singular occurrence (O'Connell Davidson 2008; Saunders et al. 2014).

4.6 Philosophical assumptions, limitations and reflexivity

Both STS and discursive psychology have constructionist roots (Berger and Luckman 1966). However, scholars in both fields have different opinions regarding the level of that constructionism, if it is at the epistemological or at the ontological level (Lynch 2013; Potter 2010a; Wetherell 2007). The difference is the assumption that, on the one hand, *knowledge* is socially constructed, and on the other hand, *reality* itself is constructed. Potter (1996b) argues that discursive psychology is interested in how versions of the world are constructed as real and objective through talk but rejects making claims about the sorts of things that are out there in the world. In contrast, Wetherell (2007) does assume an ontological position arguing that *subjectivity is constituted* by psycho-discursive practices, by 'personal working up and collision of communal methods of self-accounting, vocabularies of motive, culturally recognisable emotional performances and personal histories of sense-making' (p. 676). It could be that since discursive psychology is still a psychological project, there is more awareness of the ontological claims scholars would make. As psychologists, they do have a commitment to investigate what the

mind is. In contrast, STS does not necessarily have such commitments, as Lynch (2013) argues:

> If STS has anything to say about a reality that precedes the slicing and dicing operation produced through historical discourses, it is that this reality does not come packaged with clearly marked-off boundaries between subjective and objective domains. In line with the programmatic dissolution of the subject/object dichotomy and other traditional concepts and distinctions, epistemology and ontology are no longer clearly distinguishable from each other (p. 452).

Rather than making philosophical commitments, Lynch recommends the concept of 'ontography' to refer to 'investigations of particular world-making and world-sustaining practices that do not begin by assuming a general picture of the world' (Lynch 2013:444). In this thesis various questions have to be addressed, such as: what sort of entity is the 'interdisciplinary self'? And what is the status of the knowledge that can be generated by this research? It would be a great commitment either affirming or rejecting that there are *really* particular selves or personalities which are more proficient than others at interdisciplinary research. That would be a psychological project. It is more convenient to commit only to exploring what is said about these real or fictive personalities, hence to the discursive practices that establish them either as existent or non-existent. The same commitment is made about assumptions about interdisciplinarity; the purpose is not to explore if interdisciplinary research is or is not more valuable than discipline-based research (or if these practices are *really* different). The same can be said about the value of interdisciplinary careers.

The results of this thesis are my interpretations, limited by my own analytical interests and based on theoretically informed patterns identified in interviews with a limited population. The information provided by the participants is, as Michael (1991) would argue 'conditioned by the exigencies of the immediate interview situation […] this constitutes one context out of many' (p. 8). However, these interpretations are grounded in rigorous analysis and on evidence provided in form of extracts and explanation of the use of discursive resources. These interpretations have been in most cases discussed with my two supervisors, who also have a specific research focus on language use.

There are other elements that shaped the data and are worth considering. First, I searched for participants that openly support interdisciplinarity. Although I identified critical voices, I could have included more 'disciplinary-minded' people. Second, in the email to potential participants, rather than describing my research as focused particularly on interdisciplinarity, I could have said I was interested in views about disciplinary and interdisciplinary practices, and about the relation between these. Finally, it is worth considering that when designing the interview guide I was taking interdisciplinarity as a unitary category, offering the interviewees room for interpretation. Additionally, I could also have asked about different types of interdisciplinarity, for example views of the subordination-service mode, integration-synthesis mode, and agonistic-antagonistic mode (Barry and Born 2013). These are valuable considerations for future research; and indeed some of these modes emerged unprompted from the interviews.

4.6.1 Relativism, reflexivity and an interdisciplinary study of interdisciplinarity

Because of the position adopted above, this research would be classified as relativist, and the critic could make two observations: the first is about reflexivity; and the second is about the value of a relativist study. According to Lynch (2000) there is 'no particular advantage to "being" reflexive, or "doing" reflexive analysis, unless something provocative, interesting or revealing comes from it' (p. 42). In this case a provocative argument can be made. By doing a study of interdisciplinarity drawing on different fields that are interdisciplinary themselves, I face a dilemma. On the one hand, I could be seen as advocating for the value of interdisciplinarity, and rather than neutral, impartial and symmetric, my study would be biased. On the other hand, if I am sceptical of the value of interdisciplinarity, I deny the value of my own work. It is worth considering a way out of this dilemma.

Paraphrasing Cicero, Billig (1996) notes that 'when faced by a dilemma posed by an opponent "you are refuted, whichever alternative you grant"', but he adds that 'in such cases, one should not passively accept the question as it is phrased, but should undermine the appropriateness of the challenge' (p. 254). If I am asked 'do I support interdisciplinarity?' I would respond 'yes and no': yes if it is taken as a common disciplinary practice, as Schaffer (2013) and Osborne (2013) argue, and complementary to specialisation (Weingart 2000); but no if it is used as a criticism of disciplines, or if it is criticised as lacking rigour or imposed on researchers from the outside. As Billig (1996) points out, 'it is important […] to examine attitudes in their rhetorical context' (p. 254).

The second observation is about the value of a relativist study. Two points can be made here. As Edwards, Ashmore and Potter (1995) argue, 'relativism is social science *par excellence*' (p. 42, emphasis in the original). Moreover, as Jasanoff (1996) points out, 'what [STS scholars] represent is not merely a 'side' in a controversy but an entire worldview: one that is deeply committed to seeing science as a dynamic and integral part of society' (p. 409), and '[b]y adopting a relativizing pose' STS 'adds to the repertoire of possible explanations' (p. 412), 'against reductionist story-telling' (p. 413). Thus, this thesis emphasises the value of considering interdisciplinarity as situated in institutional and rhetorical contexts, and therefore its value or the value of interdisciplinary careers should not be simply assumed or discarded.

4.7 Conclusions

This chapter has described the research protocol for this thesis. It explained the specific method of analysis and the theory underlying it, and the philosophical assumptions were also discussed. It engaged in reflections on ethical issues, contacting participants, and carrying out an interdisciplinary study of interdisciplinarity. Thinking about the last topic was necessary because I also claimed being neutral about the value of interdisciplinarity and interdisciplinary careers. Drawing on the synthetic narrative-discursive approach that Taylor and Littleton (2006, 2008, 2012) suggest, self and identity are constructed in talk, and individuals draw on understandings, meanings, discourses, narratives, repertoires and positions that are available in the social and cultural environment. These are combined with more 'local'

resources of their life events, and both of these allow and restrict the individual's different discursive moves.

The following 4 chapters present the analysis. Chapter 5 introduces a number of interpretative repertoires commonly used in talk about interdisciplinarity. It examines these repertoires and how these relate to each other. Chapters 6, 7 and 8 present the analysis of how the repertoires were used by the interviewees in their biographical talk.

Chapter 5. The discursive environment of interdisciplinarity

5.1 Introduction

Jerome Bruner (1990), an influential psychologist who studied the relationship between cognition and culture, notes that 'people have beliefs and desires: we *believe* that the world is organised in certain ways, that we *want* certain things, that some things *matter* more than others', and people should 'not believe (or want) seemingly irreconcilable things' (p. 39, italics in the original). This thesis is interested in how individuals make sense of interdisciplinarity and in how they construct their self as interdisciplinary. Before analysing how the interviewees negotiate their selves and identities as interdisciplinary (and perhaps wanting or having to deal with 'seemingly irreconcilable things'), it is necessary to identify common reasons given for why interdisciplinarity matters, why people would want to engage in it, but also why people *would not* want to be interdisciplinary researchers. In discourse analysis, these 'reasons' and 'beliefs' are taken as discursive resources. Thus, the first research question the thesis addresses is '*what discursive resources do individuals draw on to make sense of interdisciplinarity?*' This chapter has two purposes, the first is to present a number of discursive resources that run through talk and text about interdisciplinarity, and the second is to show that there are contradictions between these commonly used resources.

The chapter focuses on discursive resources known as interpretative repertoires, which are 'coherent ways of talking about objects and events […] the building blocks of conversation […] part and parcel of any community's common sense, [which provides] the basis for shared social understanding' (Edley 2001:198). To use other metaphors, these are the 'common places' of common sense frequently 'visited' by speakers, or 'bits of folk wisdom' (Billig 1996:226). Common sense is understood as 'shared values and beliefs' (Billig 1996:226), and the notion encompasses both *good* common sense but also evil prejudices, since 'common sense is not a harmonious system of interlocking beliefs, but is composed of contraries' (Billig 1996:235), or following Protagoras, 'there are always two sides for every issue' (Billig 1996:3). As an example of these contraries or contradictions one can think of the proverb 'absence make[s] the heart grow fonder' and 'out of sight, out of mind' (Billig 1996:236). In the case of interdisciplinarity common sense indicates that interdisciplinarity can be referred to as flexible and innovative but also as lacking rigour; disciplines, in turn, can be portrayed as rigorous or as limited and old-fashioned (Weingart 2000). Thus, when interviewees argue, they take a side in a pre-existing argument and against the counter-argument.

This chapter introduces twelve interpretative repertoires. Most of these are considered 'understandings which prevail in the wider discursive environment' (Taylor and Littleton 2006:23), as can also be identified in the literature reviewed in chapters 2 and 3. The reader may wonder why so many repertoires, if Gilbert and Mulkay (1984) identified only two, namely the empiricist and the contingent repertoires. This is because their analyses focuses only on accounts of 'right' and 'wrong' beliefs, and in contrast talk about

interdisciplinarity is linked to a number of diverse topics such as innovation, access to funding, the joy of work, and the challenges of academic life, among others. The chapter is divided into five further sections. Section 5.2 describes the similarities and differences between the *logics* of interdisciplinarity identified by Barry et al. (2008) and the concept of interpretative repertoires; and these are illustrated with extracts from the interviews I conducted. Section 5.3 presents interpretative repertoires used when interviewees talk about the intellectual dimension of interdisciplinarity. Section 5.4 introduces interpretative repertoires used in interviewees' accounts about institutional dimensions of interdisciplinarity. Some repertoires presented in this chapter are arguments *for* interdisciplinarity and others are arguments *against* interdisciplinarity, or about the perils of interdisciplinarity. Thus, the chapter highlights the rhetorical context of interdisciplinarity. Section 5.5 provides conclusions to the chapter.

5.2 Logics of interdisciplinarity and interpretative repertoires

As noted in chapter 2, Barry et al. (2008; Barry and Born 2013) identify three logics or rationales that explain why interdisciplinarity is considered necessary or desirable, namely the logics of accountability, innovation, and ontology. These logics are useful for the analysis presented here, since my interviewees provided accounts that resonated with these logics. However, it is worth considering some similarities and differences between these categories and that of interpretative repertoires.

Barry and collaborators' logics of interdisciplinarity are based on findings from ethnographical observation and interviews. In the cases of the logic of innovation and the logic of accountability, these do seem similar to interpretative repertoires since their content and their functions are clear, it is easy to distinguish one from the other, and they seem like common places in talk about interdisciplinarity. The logic of innovation explains that interdisciplinarity fosters innovation, as shown in the following extracts[16] from my interviews.

Extract 1

Dr Miranda: Yea::h when (.) when you do interdisciplinary stuff in general (.) is when – is when new things appear (.) Ok?

(Male, professor, faculty of science)

Extract 2

Dr McCarty: It's been shown so often in in industry that a multidisciplinary team will come up with something that you'd never have found if you had only one discipline (.) and there are certain things that are being done within biology where it was a multidisciplinary team that made the discovery first (.) I mean the PRIME example ahh the two people who worked out the structure of DNA and the fact that that was the genetic material ahh because one was a biologist and the other was ahh I suppose a physicist [C: Yeah it was a physicist] (.) ahh but then there are been various other examples since

(Male, professor, faculty of science)

It is worth noting that most interviewees used the terms 'multidisciplinary' and 'interdisciplinary' interchangeably, as they stated when I asked about that. As

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[16] The transcription notation can be found in appendix 1.

shown in the literature review, different authors suggest different typologies and as there is no consensus between scholars studying interdisciplinarity, consensus should not be expected among interviewees. At the moment the relevant point to make is that both Dr McCarty and Dr Miranda claim that interdisciplinarity is associated with innovation.

The logic of accountability is derived from statements of, for example the proponents of Mode 2 production of knowledge (Gibbons et al. 1994; Nowotny et al. 2001), who emphasise the role of interdisciplinarity in addressing problems of social relevance, beyond academic interests. To Barry et al. (2008) the logic of accountability states that 'interdisciplinarity is guided by the idea that it helps to foster a culture of accountability, breaking down the barriers between science and society, leading to greater interaction, for instance, between scientists and various publics and stakeholders' (p. 31). This logic was a recurring theme in my interviewees.

Extract 3

Dr Cook: one of the kind of things that has developed through this kind of *[research group]* which we have is the the ahh the recognition of the importance of the social sciences in particular on contributing to that agenda (.) because all of the challenges that you want to solve (.) if you don't kind of take into account that kind of social science aspects, and probably to a certain extent some of the cultural aspects as well [C: yeah] then you are not (.) you know (.) you are not gonna make (.) you're not gonna address the major challenges of global you know climate change and things like that

(Male, university administrator)

Extract 4

Dr Masters: our bi::g job is actually to generate these big interdisciplinary themes

and to get the kind of big bits of money that are now floating around

[C: mhm] ahh to deal with I guess quite kind of serious sort of social

questions really (.) for which a single discipline doesn't have an

answer

(Female, university administrator and faculty of social sciences)

In extract 3 Dr Cook describes an interdisciplinary research group that had
been supported by the university. He emphasises the role of social sciences'
disciplines to address major global challenges such as climate change. The
purpose of having those interdisciplinary groups is described as making a
contribution to problems that are relevant beyond academia, which also have
social and cultural dimensions. Similarly, in extract 4 Dr Masters describes the
university's aim of generating interdisciplinary themes in order to attract large
amounts of funding oriented to address serious social questions. Thus, in the
two extracts these interviewees associate interdisciplinarity with the social
relevance of themes and social accountability. Other interpretative repertoires
can be identified here too, since interdisciplinarity is described also as a
strategy to attract funding. This will be described later as the
'interdisciplinarity as institutional desire' repertoire (note she is a university
administrator). Barry et al. argue that the logics they identify reinforce each
other, but that one cannot be reduced to the other. In that sense, these logics
may be regarded as different interpretative repertoires that can be used at
different moments in a conversation or in an interview. At times the logic of
accountability may be foregrounded, but at other times the logic of innovation

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may suit the requirements of the interaction better. A major difference is that Barry and collaborators' logics refer to *material* practices rather than to *discursive* practices or resources. However, changing the names of these logics to repertoires, such as 'the innovation repertoire' and 'the accountability repertoire', would just produce pointless terminology. Throughout the thesis I will refer to these logics, but these will be understood as interpretative repertoires.

While Barry's logics of innovation and accountability can be understood as interpretative repertoires, the case is different for the logic of ontology. This logic emphasises that interdisciplinarity is valuable because it can lead to 'ontological transformation in the objects and relations of research' (Barry et al. 2008:20). This is the case, for example, when data obtained through ethnographical observation provides input to the design of new technological devices (Barry et al. 2008). In Barry and collaborators' case it seems to be the task of the analyst to decide what counts as a transformation of practices, drawing on their observations or on the accounts of their interviewees. In the latter case this implies a realist assumption of interview data, since it would mean that the analyst takes interviewees' accounts as accurate descriptions of the world. By contrast, from a discursive approach the focus is only on the interviewees' use of language, and making claims about the transformation of material practices is beyond the aim of the discourse analyst.

From a discursive approach it would be difficult to distinguish between the logic of ontology and the logic of innovation. However, Barry et al. also argue through the logic of ontology that interdisciplinarity can create new subjects,

as when students of a Masters' programme are meant to be trained in different disciplines. The focus of this thesis is on how interdisciplinary subjectivities (or selves) are constructed in discourse and life narrative, and therefore the logic of ontology could be suggested as consisting on the use of multiple discursive and narrative resources. If a researcher interprets his or her observations of interdisciplinarity as producing new subjectivities, this might be because of the discursive resources the research participants draw on to talk about themselves, as well as other material practices they may draw on. This thesis, however, does not make claims about the ontological reality of such new subjectivities.

My interviewees did talk, on many occasions, about interdisciplinarity addressing 'real world problems' which are too big to be dealt with by single disciplines, which sounds like an ontological claim. The following two extracts illustrate these arguments.

Extract 5

Dr Lawson: social and technological controversies are highly complex and it does take more than just the one discipline these days to ahh to address them (.)

(Female, lecturer, faculty of social sciences)

Extract 6

Dr Johnson: So (.) I think the current (.) sort of global set of challenges (.) are probably not only the biggest challenges we've ever faced over the last two hundred three hundred years perhaps (.) but more importantly they're probably here for a long long time […] And also probably for the first time they cover most of the things that we are the most bothered about […] But the point is (.) interdisciplinary working

allows you to tackle these things much more effectively (.) Single

disciplines ain't going to solve the problems (.) they are too big

(Male, lecturer, faculty of engineering)

In these two extracts global challenges, and social and technical controversies, are positioned as requiring more than single disciplines to be addressed, emphasising the need for interdisciplinarity. I identify this way of talking about world or social problems as the 'nature as interdisciplinary' repertoire. As noted in chapter 2, Weingart (2000) claims that one characteristic of the 'discourse' of interdisciplinarity is to criticise disciplines because they cannot approach real world problems, but he argues that these accounts draw on an 'old-fashioned realist epistemology' (p. 37). Other authors have argued for the value of interdisciplinarity because it can address 'real world problems' (Brewer 1999; Paglieri 2010; Petts, Owens, and Bulkeley 2008; Rhoten and Pfirman 2007), and one could argue that they also draw on the 'nature as interdisciplinary' repertoire. By taking these descriptions of problems and nature as an interpretative repertoire I focus on the situated function of interviewees' accounts, rather than on the accuracy of such claims.

Having distinguished between Barry and collaborators' approach from a discursive approach, and having introduced the 'nature as interdisciplinary' repertoire, whilst drawing on extracts from my interviews, I shall describe repertoires used in arguments about the intellectual value of interdisciplinarity.

5.3 Intellectual dimensions of interdisciplinarity

This section introduces not only the interpretative repertoires used by my research participants to account for the intellectual value of interdisciplinarity, but also repertoires that emphasise the potential intellectual downsides of interdisciplinarity. These repertoires present disciplines as restricted and restrictive, interdisciplinarity as an intellectual bonus and as intellectually rewarding; but also as an intellectual challenge and as non-rigorous.

Disciplines as restricted/restrictive

As noted in the literature review (see section 2.3 and 2.6), it is common to identify claims for the value of interdisciplinarity when it is presented as an alternative or as a solution to the weaknesses and limitations of disciplines. When contrasted to interdisciplinarity, disciplines are often described as, among other criticism, isolated from other disciplines and the rest of society, as old-fashioned, conservative, rigid and restrictive of researchers' interests, and unable to tackle practical problems (Aldrich 2014; Gibbons et al. 1994; Jacobs 2013; Moran 2006). However, a number of authors note that these are inaccurate descriptions (Jacobs 2013) and that disciplines are not as internally coherent depicted (Barry and Born 2013; Galison 1997; Schaffer 2013). These accounts of disciplines as restrictive and restricted are supported in different ways in my interviewees' talk, as the following extracts illustrate.

Extract 7

Dr Graham: I'm curious to know what people did, why and what implications it has and therefore I ask as many people as possible. I don't think my discipline has all of the answers [C: mhm]

(Female, associate professor, faculty of arts)

Extract 8

Dr Truman: I think arts suffers a little bit from the kind of ivory tower syndrome

of being a little bit too ah insular [C:mhm] and actually being

interdisciplinary is a way to kind of break that down a little bit I think

[C: yeah that's] what I think is good for the discipline as well I think

(Female, assistant professor, faculty of arts)

Extract 9

Ms Pearce: for instance if you got a you know a new piece of wonderful

technology that you're developing (.) and you're developing it for a

particular ah ah market or whatever (.) and let's say a sense of a new

medical device or something (.) It could be that that could be applied

into:: ahh you know plant sciences' areas or it could be it could be put

into ahh you know a home environment (.) you know there are

different routes perhaps for a particular piece of technology a:nd if an

if an academic is focused on one particular area they may not have

considered some of these other areas

(Female, research development)

In these three extracts the interviewees draw on a resource that can be called

the 'disciplines as restricted/restrictive' repertoire. When this repertoire is

used, disciplines are described as isolated, limited, restricted, and restrictive. In

the interview, Dr Graham was describing what would be her normal way of

working, and she argued that in order to understand her topic better she would

look for support from other disciplines' specialists. In this case, it is not that

she is restricted by her discipline, but that the discipline can offer only limited

insight into her research topic. In extract 8 Dr Truman argues that

interdisciplinarity can be used to compensate for the 'insularity' of arts'

disciplines. In extract 9 Ms Pearce's account is more oriented to extending a new device's possible applications. While she argues that interdisciplinarity offers those possibilities, she also notes that a researcher focused on only one area would miss those opportunities. Thus, in this case one area of research is said to restrict a researcher's sight. In these three extracts disciplines are constructed as having or imposing restrictions on researchers and on research applications. Interdisciplinarity, by contrast, is presented as a way to overcome such restrictions or limitations.

Interdisciplinarity as intellectual bonus

Interdisciplinarity is generally described as offering something different and better than disciplines can offer, partly because disciplines are referred to as restricted or restrictive, as the interviewees argue in the previous extracts. As Nissani (1997) suggests, interdisciplinarity is seen as fostering creativity, it also offers the opportunity of researching unexplored topics that fall between disciplines, with researchers coming to a discipline other than their own identifying the mistakes of that discipline and making original contributions. The saying 'two heads think better than one' contributes to a positive image of interdisciplinary research, in the sense that more people working together may produce more ideas and also combine different knowledge bases. This type of talk about interdisciplinarity uses the 'interdisciplinarity as intellectual bonus' repertoire. In the following extracts interviewees draw on this repertoire.

Extract 10

Dr Blanc: many times ahh you don't realize the meaning of what you're doing

    until you challenge them with new things (.) and interdisciplinarity

    always brings new ways of ahh adapting or re-using or applying what

you do in your home discipline (.) and many times you find new

challenges or fix them and then you can face different challenges (.)

so it's a whole cycle that ehh reinforces each other (.) so yeah (.) It

had really helped me a lot over time all the interdisciplinary research.

(Male, lecturer, faculty of science)

Extract 11

Ms Pearce: having mo:re people looking at a problem ahh or more people looking

at a piece of research and and recommending or suggesting areas of

of development ahh I just think enriches – enriches the research

(Female, research development)

Extract 12

Dr Shawn: the motivation has come from seeing that there's a world of

opportunity if you work with people in different fields [C: mhm]

becau – you know (.) you meet really interesting people (.) you learn

about different aspects of your work (.) you:: enhance your own

personal knowledge, and and can (.)

(Male, professor, university administrator and faculty of science)

In these three extracts interdisciplinarity is described as a bonus, in the sense

that it offers 'a boon or gift over and above what is normally due as

remuneration to the receiver, and which is therefore something wholly "to the

good"' (OED 2015). The three interviewees draw on the 'interdisciplinarity as

intellectual bonus' repertoire, since interdisciplinarity enriches the research,

fixes and creates new challenges, brings opportunities to meet interesting

people and learn new things about the work, and enhances the researcher's

personal knowledge. These arguments about interdisciplinarity are different

from arguments drawing on the logics of accountability and innovation (Barry

et al. 2008), and also to those emphasising the possibility it offers for addressing real world problems or criticisms for disciplines. In contrast to those arguments, the ones presented here have at their core the notion that interdisciplinarity enriches people's intellect. All these discursive resources are compatible with each other rather than contradictory.

Interdisciplinarity as rewarding in itself

A different argument commonly made about interdisciplinarity is that it is a practice that can actually be enjoyed. As van Rijnsoever and Hessels (2011) argue, individuals engaged in interdisciplinarity are motivated by the joy of collaboration and of addressing research questions beyond their disciplines, or traveling to new lands, as Klein (1990) has argued. Similarly, Castán Broto et al. (2009) note that interdisciplinarity is often described as personally and professionally satisfying. Arguing that interdisciplinarity is enjoyable is as much about interdisciplinarity as about the individual who makes such a claim, namely the self who *enjoys* doing such type of work. In the following extracts my interviewees illustrate a discursive resource that can be identified as the 'interdisciplinarity as rewarding in itself' repertoire.

Extract 13

Dr Johnson: and to be absolutely frank with you my experience with interdisciplinarity is that I don't re::ally want to do anything that isn't interdisciplinary anymore [C: alright!] because it is fantastically rewarding

(Male, lecturer, faculty of engineering)

Extract 14

Dr DePaul: I just think is so exciting, the possibilities of when you actually can

get people – and also is an educative process because the more you

work with other people from other disciplines (.) the more you learn

about other meth – other ways of doing research, and other ways of

understanding the world, so for me:: I like doing it for all the things

I've already said (.) but I like doing it because I learned a lot [C:

mhm] I learn other approaches (.) and I think that's really exciting

(Male, professor, faculty of social sciences and university administrator)

The accounts provided by Dr Johnson and Dr DePaul are very similar in that they use affective terms to add meaning to their involvement to interdisciplinary research. While these arguments may be observed as the research participants' psycho-discursive practices (Wetherell 2008) it should, first of all, be taken into account that describing interdisciplinarity as a rewarding activity is widespread in a way that such arguments are not strange or unusual. As in the case of the 'interdisciplinarity as intellectual bonus' repertoire, the 'interdisciplinarity as rewarding in itself' repertoire does not contradict other discursive resources presented so far but, instead, complements them.

Thus far I have provided evidence from my interviews and from the literature that present interdisciplinarity in a positive light. However, according to Protagoras and to Billig (1996), the opposite argument can be made. The following two interpretative repertoires illustrate the other side of the issue.

Interdisciplinarity as intellectual challenge

Interdisciplinarity can be described, intellectually, as a good thing to engage in because it makes researchers learn from other areas, obtain different perspectives of their work, and that it can be enjoyed. By contrast, and following Apter (2009), interdisciplinarity can also be described as an intellectual challenge. As Robinson suggests (2008), it requires much effort and is time consuming. The following extracts from interviews with Dr Reed and Dr Thalassa illustrate this point.

Extract 15

Dr Thalassa: I should be reading *[omitted]* journals sociology journals (.) ahh maybe some politics' journals ahh some general sociology journals and then more specific (.) *[omitted]* journals or something (.) ahh *[omitted]* journals (.) I should be reading bioethics journals (.) possibly some philosophy journals (.) ahh it's completely ridiculous

(Female, lecturer, faculty of health sciences)

Extract 16

Dr Reed: so there's lots of different areas where you're expected to be in:terested so you always have to have a different hat on for different days and different meetings (.) and use different languages to explain the same thing (.) so you've got to be a very flexible – you've got to have a very flexible brain to be able to do that and a – some people can't do it I know that (.) they're much better off in one area they become very good in that one area ahh sometimes I wish I've done that (laughs) stay in one area and just become really good at it […] So yeah you just feel like you're a jack of all trades and a master of none really

In these extracts the interviewees describe the intellectually challenging side of interdisciplinarity, and this form of talking can be described as the 'interdisciplinarity as intellectual challenge' repertoire. Dr Thalassa describes the amount and variety of work she has to review as 'ridiculous'. Dr Reed argues that she is 'expected' to be interested in many different areas, that she has to present differently in different meetings and be able to 'use different languages', and above all she does not feel she is really good in any area, ending with the commonly used phrase 'you're a jack of all trades and a master of none'. Dr Reed's account illustrates that regardless of the different skills required for interdisciplinary work, which involve not only acquiring skills in different 'disciplinary languages', one is not considered an expert, and that such identity is limited to those who manage to become 'really good' at one single field. Once these challenges are considered, interdisciplinarity does not seem so rewarding. The following repertoire adds to a negative view of interdisciplinarity and interdisciplinary researchers.

Interdisciplinarity as non-rigorous

A number of authors note that interdisciplinarity may not be so well regarded, since it may not necessarily satisfy the established quality criteria of individual disciplines (Lyall and Meagher 2012; Nissani 1997; Rodgers et al. 2003). Moreover, interdisciplinary researchers may be seen as non-serious and therefore as not engaging with the rigour expected by the discipline, at least not to the extent of somebody working only within one area (Buanes and Jentoft 2009; Pfirman and Martin 2010). Although disciplines are not

necessarily as rigid as some authors may argue and interdisciplinarity and specialisation are not necessarily mutually exclusive (Schaffer 2013; Weingart 2000), such arguments are not the most commonly used; therefore interdisciplinarity tends to be described as non-rigorous or inferior to discipline-based research. The extracts below illustrate such arguments.

Extract 17

Dr Winston: Ahh a:nd there's also the the ah view – which is prevalent I think that interdisciplinary work is not (.) ahh standard of it (.) is lower than in the purer sciences (.) if you like [C: Ok]

(Male, research development)

Extract 18

Dr Cook: I think there are quite a lot number of challenges actually I mean I think (.) you know agh (.) For a start there isn't a sort of clear understanding of what interdisciplinarity is and you know some people will immediately think that ahh if you're doing interdisciplinary stuff that means you are giving less focus to ahh you know to the discipline (.) the strengths from disciplines

(Male, university administrator)

Extract 19

Dr Lindsay: I think that interdisciplinarity (.) is – can serve (.) and does (.) in many cases serve as a refuge for people who:: aren't methodologically as rigorous as their own discipline might (.) require (.) Ahh a::nd so:: to the extent that they are refugees that un:: that undermines their value [C:mhm] ahh as generators of knowledge (.) Ahh (.) so:: you know – so an interdisc – IDEALLY an interdisciplinary research centre is greater than the sum of its parts (.)

and that's not gonna be the case if its ahh attracting the refugees from

disciplines who:: just don't made it great (.) in their own discipline

(Female, associate professor, faculty of social sciences)

In the case of the first two extracts, a discursive resource that can be defined as the 'interdisciplinarity as non-rigorous' repertoire is used in a rhetorical way, meaning that it is presented not as the opinion held by Dr Winston and Dr Cook, but as the opinion of *others*. In contrast, Dr Lindsay does draw on this interpretative repertoire to formulate her own opinion about the interdisciplinary work of others. This shows how the same repertoire can be used in flexible ways. The content of the repertoire is the same, but its usage produces different versions of interdisciplinarity, with the interviewees taking different and contrary positions: argument and counter-argument. These extracts could even be seen as if Dr Winston and Dr Cook were referring to Dr Lindsay's opinion, and her opinion is also described by Dr Cook as not based on 'clear understanding of what interdisciplinarity is'. The attractive of the methodology adopted in this thesis is that no interviewee is seen as speaking more truth than others. The following section presents arguments and counter-arguments about interdisciplinarity when considered as an institutionally located practice.

5.4 Institutional dimensions of interdisciplinarity

This section introduces six interpretative repertoires identified in my interviewees' talk about interdisciplinarity as an institutionally situated activity. This means, interdisciplinarity is funded, evaluated, and potentially facilitated by multiple organisations. Researchers' work, prestige and

reputation are produced within institutional contexts; therefore interdisciplinarity has an institutional dimension, besides its intellectual dimension. The interpretative repertoires presented in this section describe interdisciplinarity as depending on institutional support, as an institutional desire but also as an institutional challenge; as an instrumental bonus but also as *purely* instrumental, and as precarious.

Institutional support as fundamental for interdisciplinarity

The previous section might give the impression that interdisciplinarity depends purely on the curiosity of researchers, on the problems they intend to address and on their intellectual skills. However, interdisciplinary research does not depend only on researchers' preferences, since projects require funding and different types of institutional support (Bruce et al. 2004; Lyall et al. 2013). Interdisciplinarity is not only chosen by researchers; it can also be imposed on them. By institutional support I refer to funding but also to any other sort of facilitating (and sometimes coercive) activities and regulations. The following extracts emphasise the need for institutional support and construct interdisciplinarity as depending on institutional mechanisms.

Extract 20

Dr Johnson: you can rely on things happening by accident and you can rely on individuals sitting out other people to collaborate with (.) but if you additionally have some kind of environment that encourages it positively and invite people to bid and so on (.) is not a bad thing (.) And also is a good practice (.) If people bid for *[university programme]* they've got to fill in a form (.) they've got to think about

the proposal (.) when they go for bigger money they've got to write the same kind of stuff (.) so it's good practice as well

<div align="right">(Male, lecturer, faculty of engineering)</div>

Extract 21

Dr Curie: Unless the top down initiatives are in place you can have the best idea in the world BUT unless you can fund your laboratory then you can't do great deal with it (.) you need students you need consumables you need equipment (.) so it's (.) let's say three researchers got together in a room and they were coming from different areas (.) one was a physicist one was a biologist one was a chemist (.) They had a great idea (.) that's good (.) They can go away and perhaps do a tiny little bit of that great idea with the resources they already have (.) But once they start to see that it might work they are going to want to have a studentship or a postdoc or just consumables […] well (.) a postdoc will cost close to sixty thousand pounds a year minimum in salary and overheads and that's before they do anything in the lab (.) So unless the research councils provide a mechanism for that group of interdisciplinary researchers to make an application for funding (.) they can only take that research idea so far

<div align="right">(Female, research associate, faculty of sciences)</div>

Although these two accounts are presented here as drawing on the same repertoire, one difference is worth noting. To Dr Johnson, it is possible for interdisciplinary research to happen regardless of institutional support, since it can be developed 'by accident'. By contrast, Dr Curie argues that interdisciplinary research ideas can reach only a certain development unless these receive funding and supporting mechanisms. It might be that to Dr

<div align="center">165</div>

Johnson institutional support is not as crucial because coming from an engineering faculty he believes that individuals can attract funding from many different sources, regardless of university and research council support. Dr Curie, on the other hand, works in a basic science area that requires expensive equipment and depends mainly on public funding. Yet, Dr Johnson notes that the development of different skills required for interdisciplinary research can be facilitated by institutional support. In Dr Curie's account, institutional support is presented as fundamental, and therefore interdisciplinarity is constructed as depending on such support.

Interdisciplinarity as institutional desire

As noted in chapters 1 and 2, international organisations such as the OECD, the European Commission, national science funding bodies and universities have shown increasing interest in interdisciplinary research in the last years and even decades in some cases. When interviewees talk about institutions being keen on supporting interdisciplinarity, this way of talking can be identified as the 'interdisciplinarity as institutional desire' repertoire. Even though institutional strategies differ and may be assessed differently, even as insufficient or ineffective, my interviewees underlined that institutions are interested and committed to support interdisciplinarity, as shown in the extracts below. It is worth noticing that these individuals have been largely involved in developing research support strategies at the university studied and in national funding bodies, therefore their accounts represent institutional interests in the development of interdisciplinarity.

Extract 22

Dr Cook: one of the early things that we started doing was encouraging interdisciplinary activity between different parts of the university – So have a sort of overview of you know (.) the research portfolio of the university a:nd I suppose sort of questions we were asking how can we do more (.) better (.) and you know (.) how can we compete with other universities that are doing more better [C: mhm] and I think one of the ways one can do that is look at the interfaces between disciplines ahh from the research perspectives and say (.) you know (.) these (.) a lot of the (.) I suppose leading edge research activities tend to come out of interfaces between disciplines ahh you know (.) can we support that in different ways

(Male, university administrator)

Extract 23

Dr Anderson: these days if you wanna get funding you have to be (.) big enough and competitive enough to go fo:r the big pots of money (.) 'cause that's the way the research councils are packaging them [C:mhm] ahh (.) And in in order to be competitive there you have to be interdisciplinary (.) you know? And you have to address the:: - other research councils have set out their – however many challenges there are (.) these programmes like *[programme names omitted]* and so on (.) they're all clearly ah interdisciplinary [C:mhm] (.) Ah so: (.) our university would be crazy not to have an interdisciplinary strategy

(Female, professor, faculty of science and university administrator)

In these two extracts the interviewees argue that the university has mechanisms to support and to encourage interdisciplinary research. Universities and funding bodies support interdisciplinarity because they believe it creates

innovation and interesting research, but also universities align their research strategies according to the interests of funding bodies. The 'interdisciplinarity as institutional desire' repertoire can be used in different ways, and individuals can refer to this as a good thing or as a bad thing. Some individuals may draw on this repertoire to express feelings of facilitation but others could express feelings of imposition. The next three analytic chapters provide both accounts.

Interdisciplinarity as institutional challenge

The previous two interpretative repertoires suggested that interdisciplinarity depends on the support from both the university and from funding bodies and that, fortunately, these institutions are keen to foster interdisciplinary research. So it would seem that if researchers have a good interdisciplinary research proposal then they will get resources to carry it out and their work will face no obstacles other than technical ones, which researchers can individually solve if they are skilful enough. However, things are not so straightforward. As Hansson (1999) notes, interdisciplinarity does not happen automatically or on demand, and following Lyall and Fletcher (2013), not 'even when public funding encourages it' (p. 2). Interdisciplinarity can be said to be an institutional challenge because most academic structures have prioritised disciplines; and, also, disciplinary structures keep reproducing themselves (Abbott 2001; Turner 2000). Thus, as noted in chapter 1, there is a real tension then between interdisciplinary aspirations and institutional and disciplinary realities and, in the UK in particular, individuals have expressed concerns about contradictions between research councils and the REF regarding how welcome interdisciplinary research is (Donald 2015; Rafols et al. 2012). The following extracts emphasise that even though interdisciplinarity is an

institutional desire, institutions struggle to support it. This way of talking can be called the 'interdisciplinarity as institutional challenge' repertoire.

Extract 24

Dr Walsh: So more and more departments – more and more universities while openly promoting interdisciplinarity (.) are restructuring themselves in ways that actually undercut genuine interdisciplinarity […] So:: I kind of see the same processes and the same dynamic operating in most (.) big universities (.) So::me put a little bit more emphasis on interdisciplinary centres and institutes ahh that gather together different scholars (.) but more and more they are being broken up and being rehoused within disciplinary units and then what exists is sort of overarching networks but then is all sorts of budgetary problems [*problems omitted*] Ahh so all sorts of institutional policies and structures actually undermine the very interdisciplinarity

(Male, associate professor, faculty of arts)

Extract 25

Ms Pearce: one of the ahh I suppose structural issues ahh about interdisciplinary working is ahh ah which is problematic or can be problematic is how this stuff is financed [C: aha] ok? Because (.) at *[university name]* at the institutional level the actual way that money is divided up between schools or between academics can be quite complicated [C: ah] so: the way that you you manage interdisciplinary working when it's when it's going you know perhaps more than two or three schools starts to become quite complicated in the way that it can be done and managed (.) So there is a kind of structural administrative aspect to to this which is – ca:n be seen as a bit of a barrier

(Female, research development)

In these two extracts the interviewees note that even though the university is willing to facilitate interdisciplinary research, the university structure and the way budgets are managed across schools create difficulties for interdisciplinary projects. As other interviewees noted, financial challenges exist when a grant has to be divided between more than two departments, when schools create joint appointments, when PhD students have supervisors in different schools, or when researchers have to be rewarded from contributing to a project based in a department other than their own. Allocation and maintenance of equipment also creates budgetary challenges for the university, and geographical distance between schools can be described as a challenge for interdisciplinary research. Other institutions face challenges too, for example when peer review is done, since getting interdisciplinary panels to assess publications and grant applications is a difficult task (Huutoniemi 2012; Lamont 2009). Furthermore Lyall and collaborators emphasise the challenges funding bodies face to provide support to research oriented institutions (Lyall and Fletcher 2013; Lyall et al. 2013). .

Interdisciplinarity as instrumental bonus

While the previous section included one interpretative repertoire that depicts interdisciplinarity as an *intellectual bonus*, it can also be represented as a different sort of bonus. Since interdisciplinarity can be described as an *institutional desire*, it follows that it is also an *instrumental bonus*. By the 'interdisciplinarity as instrumental bonus' repertoire I refer to speakers' accounts in which they depict interdisciplinarity as a way to access resources not available within disciplinary settings. Interdisciplinary research can be

described as an intellectual practice, but also as the means to instrumental ends. Some of these instrumental ends are discussed in the following extracts.

Extract 26

Dr Curie: you're more likely to get some money because you're working with somebody else (.) so for example within this university if you put in for a studentship (.) if you're working with somebody from a different school you're more likely to get it than if you're just within your own school

<div align="right">(Female, research associate, faculty of sciences)</div>

Extract 27

Dr. Truman: Ahh I mean the other practical thing I would say is the ahh working with ah *[science/engineering field]* brings access to more money (.) Ahh being in the arts and humanities there's not a lot of money for research

<div align="right">(Female, assistant professor, faculty of arts)</div>

Extract 28

Dr Winston: I'll tell you what it does do (.) It gives the impression that we're a friendly university [C: mhm] If you can get people from different departments to work with each other (.) then it's breaking down barriers that perhaps are PERCEIVED to exist or actually DO exist between different departments (.) A::nd gives the impression that is a happy university that is a nice place to work (.) that people like being here (.) that that that they like interacting with other departments (.) that that's encouraged for a start

<div align="right">(Male, research development)</div>

Dr Curie describes interdisciplinarity as a way of securing access to funds; Dr Truman describes it as a way to get access to funds not available in his discipline; and, in a rather unexpected way, Dr Winston describes interdisciplinarity as a way to enhance the university's image. In these three different but somehow related cases, interdisciplinarity is framed as a strategy for pursuing different aims. However, referring to interdisciplinarity only or mainly in these ways, drawing on the 'interdisciplinarity as instrumental bonus' repertoire, may be risky. As Moran (2006) would argue, the multiple purposes of interdisciplinarity reveal its weaknesses. Moreover, if the instrumental aspect of interdisciplinarity is overemphasised, the intellectual aspect may be weakened or turned dubious. If that was the case, interdisciplinarity would be perceived as non-rigorous, as a previous interpretative repertoire suggests. The following interpretative repertoire refers to such an issue.

Authentic vs purely instrumental interdisciplinarity

So far a number of argumentative resources about interdisciplinarity have been presented and illustrated. Interdisciplinarity can be associated with innovation and with social accountability; it can address real world problems; it is a fun thing to do; it adds to the intellectual value of projects and people; it increases the range of applications of knowledge, and therefore institutions are keen to support it. However it can also be described as an intellectual challenge, and those who cannot deal with the challenge may be described as doing work that is not of the quality expected in individual disciplines. Yet, since interdisciplinarity can be used instrumentally, intellectually weak individuals could take advantage of that. Some might call them charlatans (Nissani 1997).

What can individuals do to overcome potential accusations of charlatanism? Fortunately, there is always another argument to be made. According to Billig (1996), individuals have the capacity to categorise and to particularise, and interdisciplinary researchers can place those particular individuals who are not engaging 'seriously' with interdisciplinarity outside the category of 'the good' or the 'genuine' interdisciplinary researchers. In the following extracts the interviewees can be seen as drawing on a resource that can be called the 'authentic vs purely instrumental interdisciplinarity' repertoire.

Extract 29

Dr Curie: I think [interdisciplinarity] is sometimes used to provide facilities where people go on doing what they were going to do anyway ahh in their own way (.) but because is branded as an interdisciplinary centre it attracts increased funding from the research councils

                                        (Female, research associate, faculty of sciences)

Extract 30

Dr Reed: I think there are people that do it badly (.) I mean I'm on a funding body that gets some te:rrible bids in (.) people haven't got a clue (.) and yet the *[organisation name omitted]* where somebody thought ohh bloody hell we won't get this funded if we don't have a *[X specialist]* and you can see how the *[X specialists]* have been asked to write a bid two days before the bid deadline

                                        (Female, professor, faculty of sciences)

Extract 31

Dr DePaul: Ahh but ahh but generally people may talk the talk (.) but they don't walk the walk [C: mhm] of interdisciplinarity [C: yeah] and that's what disappoints me the most about being in this department

In these three extracts my interviewees distance themselves from others who may not be seen as doing proper interdisciplinary research. In extract 26 Dr Curie described the instrumental uses of interdisciplinarity, noting that it can be used to secure funding. But in this case she notes that in some cases people may brand their usual work as interdisciplinary without it being so. Thus, she can be seen as distinguishing between those who do carry out genuine interdisciplinary work from others who only use it symbolically and instrumentally. Dr Reed and Dr DePaul distance themselves from those who do interdisciplinarity 'badly' and from those who 'talk the talk but do not walk the walk'.

Interdisciplinarity as precarious

As some of the interpretative repertoires presented above suggest, interdisciplinarity can be described as an institutional desire, and this can lead people to describe it as an instrumental bonus. However, it was also noted that interdisciplinarity can be an institutional challenge. What follows from that interpretation is that engaging in interdisciplinarity may not be as convenient professionally as it might appear. Gibbons et al. (1994) argue that disciplines are 'pattern[s] of cognitive and social control' that can 'treat harshly those who [try] to circumvent its controls' (p. 10). Thus, it may be difficult to get hired in a disciplinary department, to get positive evaluations from grant panels and referees and it is more difficult to publish interdisciplinary research in high-ranking journals (Bridle et al. 2013; Rafols et al. 2012). The following extracts illustrate the 'interdisciplinarity as precarious' repertoire.

Extract 32

Dr Robins: if you look at the impact factors of international – of interdisciplinary journals they're generally quite low, compared to other areas [C: mhhm]

(Female, professor, faculty of social sciences and university administrator)

Extract 33

Dr Lawson: I think the (.) strategic priority is about aligning the strategies of the university with those of where the money is coming from (.) basically (.) But if if the government and the research councils turn around next year and say no no we sorted that one out or (.) we've left it too late or is a too big a challenge or whatever or we now think this one is more important and change its focus to something else I'm sure the university will cut the funding on *[particular research area]* and change its focus too so it's (.)It's all interconnected it's not a random choice I think

(Female, lecturer, faculty of social sciences)

Extract 34

Ms Pearce: there are also concerns in the academic community about how the:ir work will vi - vie::wed ahh particularly in things like REF (.) whe::re their (.) their discipline is being reviewed (.) not the interdisciplinary work (.) I mean (.) there's some mention of interdisciplinary work but basically it's you know it's the discipline field that's being reviewed in totality (.) And there's less opportunity for ahh you know gaining credibility and good reputation as a result for interdisciplinary working (.) And I think the same also goes for certain (.) research developments when you are applying for external funding as well (.) or again in certain disciplines I think there's a certain sense that it is

better for the peer review perspective to maintain a:: you know a strong core research activity that doesn't include interdisciplinary work

(Female, research development)

In these extracts the interviewees provide different arguments about the professional risks of pursuing an interdisciplinary career. As Dr Robins note, interdisciplinary journals tend to have lower impact factors than those of other areas; Dr Lawson argues that focusing one's career on an interdisciplinary topic is not sensible because funding interests can fade away in short periods of time; and in the last extract Ms Pearce argues that academics have multiple concerns about interdisciplinarity. She notes that researchers may see the REF as not giving much importance to interdisciplinary research (see also Rafols et al., 2012), that they may feel they would not gain credibility and good reputation from their interdisciplinary work and that getting funding may be difficult. This resonates with Pfirman and Martin (2010), who stress that there is a lack of incentives for interdisciplinarity and that interdisciplinary researchers tend to have a sense of vulnerability, tension and insecurity.

The interpretative repertoires presented in this section demonstrate that talk about the institutional dimensions of interdisciplinarity is as varied as talk about its intellectual dimensions, and there are also contradictions between some repertoires: interdisciplinarity is rewarding in itself, but also an intellectual challenge; interdisciplinarity is an intellectual bonus and may lead to innovation, but it risks being seen as non-rigorous; interdisciplinarity is an institutional desire, but also an institutional challenge, and it is precarious. Furthermore, interdisciplinary research can be accused of being only

instrumentally driven rather than following an intellectual motive. When individuals construct accounts about interdisciplinarity, they have to downplay the negative meanings of interdisciplinarity. Such different and contradictory views of interdisciplinarity are part of a pre-existing argumentative and rhetorical context that cannot be resolved by the single speaker in a conversation. Once the 12 interpretative repertoires used in talk about interdisciplinarity have been presented, I can provide some conclusions to the chapter.

5.5 Conclusions

This chapter has introduced twelve interpretative repertoires used to describe interdisciplinarity as a reasonable practice to engage in, but also as an inconvenient one, as desirable and undesirable, rewarding and frustrating; supported by institutions but also sidelined by them. Thus, as a conclusion to the chapter, it can be stressed that the discursive environment of interdisciplinarity is rich and ambivalent. The chapter has also shown that the interpretative repertoires are flexible and can be presented as one's own opinion, as a general opinion, as a fact or as somebody else's misleading opinion. This last case shows that individuals are aware of the existence of competing and contradictory discursive resources, which can be described as the rhetorical context of interdisciplinarity. The following analytical chapters examine how the interpretative repertoires presented here are articulated alongside biographical details in the discursive and narrative construction of the self, or the 'interdisciplinary self'.

Chapter 6. The rhetoric of constructing (inter)disciplinary selves

6.1 Introduction

The previous chapter introduced a number of interpretative repertoires used by my interviewees to construct accounts and assessments of interdisciplinarity. Since these repertoires can also be identified in the literature, they can be considered resources available in the wider social and cultural environment. Moreover, the chapter stressed the contradictory nature of such resources, since every interpretative repertoire can be countered by another one. The present chapter continues the analysis by exploring *how interdisciplinary selves are constructed in and through discourse[17],* drawing on the interpretative repertoires already introduced and on the subject positions these make available. It will be shown that, since these interpretative repertoires can be contradictory, interviewees may face an 'ideological dilemma' and a number of 'troubled positions' when constructing disciplinary and interdisciplinary selves and identities.

The chapter focuses on interviewees' biographical narratives, understood here as accounts about past life events (Taylor and Littleton 2006; Taylor 2007, 2015). Studying biographies of researchers is useful for different and

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[17] *Including how individuals present themselves as interdisciplinary, but also how administrators and peer researchers portrait interdisciplinary researchers.*

contrasting reasons. While Klein (1990) suggests that exploring interdisciplinary biographies and autobiographies might provide insight into how individuals acquire their skills, van Rijswoud (2010, 2012) notes that the analysis of biographical narrative allows the exploration of how individuals combine boundary work and identity work to position themselves as experts. As noted in chapter 4, rather than being merely authentic descriptions of individuals' lives, biographical narratives are seen as constructions oriented to satisfying the demands of the immediate interactional context. Thus, biographical talk is reflexive. As an example, in the following extract the interviewee articulates a short biographical account that is addressed to the specific interactional context.

Extract 1

Dr Miranda: Well my background (.) Ok so:: for somebody who is interested in interdisciplinary research ahh I have probably a very interdisciplinary background

(Male, professor, faculty of science)

Dr Miranda's account emphasises that his life narrative will be formulated as addressing the topic of the interview, in the knowledge that only those practising or facilitating interdisciplinary research were interviewed for this project. In this brief account he makes clear how his account should be understood and also he positions himself as entitled to talk about such a topic. On other occasions he might construct his biography differently, emphasising other life events that better fit the situation. Individuals construct biographical narratives drawing on resources made available by their particular life events, but also drawing on broadly established social and cultural meanings. Besides

the interactional context, biographical accounts are located in rhetorical (or argumentative) and institutional contexts. The rhetorical context can be illustrated by a few interpretative repertoires. As noted in the previous chapter, disciplines can be described as restricted and restrictive, but interdisciplinarity can be described as non-rigorous. In either case individuals struggle to negotiate an untroubled subject position, to avoid appearing as a 'one trick pony' or as a 'jack of all trades but master of none' (Donald 2015; Lau and Pasquini 2008; Nissani 1997). If individuals intend to claim interdisciplinary identities, they have to present themselves in a way that fulfils the expectations of 'having a certain quality of mind and personality' (Castán Broto et al. 2009:928), being divergent thinkers, flexible, motivated by collaboration and by research questions beyond their own disciplines (Klein 1990; van Rijnsoever and Hessels 2011). This chapter focuses only on negotiations of disciplinary and interdisciplinary identities, and negotiations of expertise and success are left for chapters 7 and 8.

The chapter is organised as follows. Section 6.2 presents contrasting accounts that position interdisciplinary researchers either as ordinary or as special individuals. Section 6.2 also suggests replacing fixed typologies of individuals as disciplinary or interdisciplinary for a more convenient model drawing on the concept of 'subject positions'. The value of this approach is emphasised by presenting accounts that describe interdisciplinary researchers either as special or as ordinary. Section 6.3 introduces a discursive resource that can be considered the 'canonical narrative' of the scientific expert. Section 6.4 introduces troubled positions faced by my interviewees and the ideological dilemma of openness and rigour. Section 6.5 illustrates how two interviewees

construct their careers as coherent in contrasting ways, one following a specialist line and the other following an interdisciplinary line. The last section presents a number of conclusions.

6.2 From fixed categories to flexible subject positions

The literature on interdisciplinarity describes a number of characteristics that individuals are meant to possess or develop if they intend to succeed in interdisciplinary research (Castán Broto et al. 2009; Klein 1990; van Rijnsoever and Hessels 2011). Some authors describe those characteristics in a way that brings to mind essentialist perspectives on the self (Burkitt 2009; Immergut and Kaufman 2014), as if some substance or essence within individuals would predispose them to interdisciplinary research. Ideal descriptions of interdisciplinary researchers refer to their *perspective* and *taste* (Stember 1991:6) and their *mind* and *personality* (Castán Broto et al. 2009:928). Interdisciplinary researchers would therefore seem from the literature to be a very particular type of people. Before analysing biographical accounts it is relevant to illustrate that my interviewees formulate different categories of researchers. In the interviews I asked the research participants if, in their opinion, any individual could do interdisciplinary research. In the following extract Dr Robins and Dr Cook provide similar answers to my question.

Extract 2

Dr Robins   I think I think there are some naturals (.) I think somebody energetic

excited by all sorts of things (.) I think you've got a group like that (.)

I think you've got another group that a::re just (.) this is what I do::

and then kind of you got people that can:: they might not start off like that but they could – they can gain those skills.

(Female, professor, faculty of social sciences and university administrator)

Extract 3

Dr Cook: There are:: you know there are some gifted individuals who are natural interdisciplinarians in that they have expertise in more than one discipline (.) but I think normally it is actually people contributing from different disciplines in different ways

(Male, university administrator)

Dr Robins and Dr Cook consider there a number of individuals who are 'naturals' at doing interdisciplinary work. These 'naturals' are meant to be 'energetic' and 'excited by all sorts of things', and 'gifted' individuals who 'have expertise in more than one discipline'. In the previous chapter an interpretative repertoire named 'nature as interdisciplinary' was introduced, which is used to describe world challenges as requiring interdisciplinary approaches to be addressed and potentially solved (Gibbons et al. 1994; Weingart 2000). Interestingly, this repertoire can also be used in accounts about individuals' 'internal nature'. This 'internal nature' is meant to make individuals interested in different sorts of things and allow them to develop expertise in different disciplines.

Dr Robins and Dr Cook also describe other types of individuals. Dr Robins distinguishes between firstly the natural interdisciplinary individuals, secondly a group of individuals interested in only one thing, who could well be described as 'narrow-minded', and thirdly others who can develop interdisciplinary skills, regardless of not being 'naturals'. While Dr Robins'

focuses particularly on single individuals, Dr Cook distinguishes, between the unusual category ('*some* individuals') of 'natural interdisciplinarians', and 'normal' people from different disciplines who collaborate.

When used to describe people's traits, the 'nature as interdisciplinary' repertoire can be used in flexible and even in contradictory ways. 'Natural' can mean 'common' or 'special', as the interviewees show in the extracts presented below.

Extract 4

Dr Masters: you know it's – within ourselves I guess there are various kind of disciplinary identities I suppose [C: mhm]

(Female, professor, university administrator, faculty of social sciences)

Extract 5

Dr Yusuf: I think that (.) that the life is interdisciplinary isn't it? You know if you look at the life ahh you have roles (.) you have family roles you have roles in work you have maybe other roles in society (.) you have all these roles but you are the one unit (.) you are the one person (.) so I think most people are actually inherently interdisciplinary in their biography […] I think that's true of most people I don't think that's exceptional I think it's actually the norm (.) I think if you interview most people they will if you

(Male, professor, faculty of health and medicine)

While Dr Robins and Dr Cook describe natural interdisciplinary researchers as a special and extraordinary type of individuals, Dr Masters and Yusuf describe such internal interdisciplinary nature as a common characteristic of all individuals. Dr Yusuf even describes life in general as interdisciplinary, and

argues that most people are inherently interdisciplinary. In that way, Dr Yusuf could be seen as drawing on the 'nature as interdisciplinary' repertoire. Moreover, it is interesting to notice that he draws on role theory to construct an account of people in general. He notes that people have different roles in society but they are still a single unit. Dr Masters' argument that individuals have different identities also sounds similar to a role theory account of the self. As noted in early work in discursive psychology (Potter and Wetherell 1987), individuals can construct themselves at times in terms of trait theory, at times in role theory, and at times through a combination of these and other theories. From a discourse analysis perspective, none of these theories is superior to others but these only represent different discursive resources. Potter and Wetherell (1987) argue that these theories may have been elaborated 'upon the conventional ways people are described in this particular society' and are 'part of a culture common sense about the self' (p. 103). Similar to the previous extracts, in extract 6 Dr Young notes that most scientists have multiple skills.

Extract 6

Dr Young: I think if you ask somebody if they're doing science you know they're putting in all sorts of skill sets ahh and there's usually one scientific question and they draw on those different skill sets (.) I think most scientists really are very broad disciplinarians

(Male, professor, faculty of science)

Dr Young argues that most scientists are broad disciplinarians, implying that individuals have multiple skills, which can be applied as required by the scientific questions. This resonates with the accounts of Dr Masters and Dr Yusuf (above), but also with descriptions of disciplines as internally

differentiated (Galison 1997; Giri 2002; Osborne 2013; Schaffer 2013). If disciplines are internally different, then individuals formed within them are in possession of different skills. Even though Dr Young does not draw on the 'nature as interdisciplinary' repertoire, his account could be taken as a rejection of the different types or categories of individuals Dr Robins and Dr Cook suggest. Thus, categorising people seems inadequate because the essence of categories can be a topic of argumentation (Billig 1996).

An alternative to thinking of individuals in terms of rigid types is offered by the analytical category of subject positions. These are the identities made available by different ways of talking about a topic (Davies and Harré 1990). Since individuals can speak differently about a topic during a conversation (using different interpretative repertoires), they can shift between different subject positions, and they can also give different positions to others (Edley 2001; Wetherell 1998). As in the case of the 'nature as interdisciplinary' repertoire, interdisciplinary individuals can be positioned as special but also as ordinary. This is because subject positions can have different and even contradictory meanings (Davies and Harré 1990). Subject positions can refer to general attitudes, emotions and dispositions (happy, sad, honest, focused, sceptical), or to roles, categories and cultural stereotypes (police officer, mother, expert, president, mad scientist). Each subject position entails a storyline, duties and responsibilities that are expected from the adopted characters.

Some subject positions are troubled and some are untroubled, in the sense that these are undesirable to adopt or incoherent with previous accounts given about oneself; but also some untroubled positions can be turned into troubled

positions. As an example, interdisciplinary researchers can be positioned as broad intellectuals, but also as dilettantistic, as special or as ordinary, as I described above. Moreover, there are situations in which it is problematic to adopt and display a commonly well-regarded position, as is the case of the individual who acts like a leader in an equal and leaderless team (Billig et al. 1988); and there are situations in which adopting a vulnerable position can actually turn empowering (Wetherell 2007), as when a colleague who claims 'I don't know how to…' motivates others to offer help and support.

Although the essence of categories can be a matter of argumentation, individuals can take up categories and organise biographical accounts around such categories. Interdisciplinary researchers can be perceived as special rather than ordinary because of the way they position themselves in their accounts, as shown in the following extracts.

Extract 7

Dr Truman: I was kind of the weird one doing something a bit different anyway

(Female, assistant professor, faculty of arts)

Extract 8

Dr May: I suppose personally for me I feel like I'm quite (.) probably I would struggle to be just a specialist in just kind of one area, that's not my niche so yeah

(Female, lecturer, faculty of social sciences)

In these extracts the interviewees position themselves, if not necessarily as naturally or inherently interdisciplinary, as special or out of the ordinary. In the first case Dr Truman describes herself as the 'weird one' referring to what she was focusing on during her PhD. By positioning herself as 'weird' and

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'different', she emphasises *not* being like the rest of her colleagues, who would then be positioned as 'normal' or 'common'. In the second case, Dr May argues that 'personally' she would struggle to be a specialist in only one area, and she describes that such a struggle would be 'personal' rather than professional or of any other kind. In her account she can be seen as using the 'disciplines as restricted/restrictive' repertoire, and such restriction would be the cause of her struggle. Dr May also distinguishes between being an interdisciplinary researcher and being a specialist, thus these categories are presented as mutually exclusive. Although Weingart (2000) suggests that interdisciplinarity and specialisation are not mutually exclusive, the focus here is not on which perspective is more accurate; rather it is interesting to observe that the argument can be used as a resource for the construction of the self. Both Dr May and Dr Truman position themselves in contrast to a more common or normal category (or subject position), that of the single discipline expert or specialist. The following section explores such usual or commonly expected positions.

6.3 The canonical narrative of the scientific expert

A canonical narrative can be used in different ways as a discursive resource. Individuals can draw on a canonical narrative in order to make their life trajectories sound familiar to the interlocutors. Alternatively they can distance from this narrative by making it problematic or presenting their own life trajectories as troubled because they do not fulfill the social and cultural expectations. In these cases individuals may have to provide *repair*, or further explanation to justify decisions and positions adopted (Bruner 1990). In their

narrative-discursive approach to creative careers and identities, Taylor and Littleton (2006, 2008, 2012) identify a canonical narrative that indicates that creative individuals come from a creative or artistic family environment, that since early in life they could always be found drawing or doing something artistic, and that they tend to be lonely and isolated individuals, immersed in their own work. A canonical narrative offers different subject positions that individuals can adopt and give to others during a conversation, either attaching to it or distancing from it.

If interdisciplinary selves are often considered unusual it is because a dominant discourse establishes disciplinary research, careers and identities as the norm. Disciplines establish how academic careers should proceed from undergraduate to professorial levels (Abbott 2001; Turner 2000; Weingart 2010). Moreover, expertise is commonly associated with individual disciplines (Fuller 2007). In contrast, it is not clear how interdisciplinary careers are reproduced in the academic job market (Abbott 2001). The predominance of the discipline over interdisciplinarity establishes a narrative of how academic lives are expected to develop, and this can be called here the 'canonical narrative of the scientific expert' or of the 'single discipline specialist'. The narrative should sound familiar: scientific experts are those who were interested in a specific discipline or phenomenon from a young age, who excelled in college and went to university, finished a first degree in one discipline and continued in that discipline from the PhD to their professorship, publishing extensively in one field and not deviating much from it. Even though academic lives may not proceed in that specific way, the canonical narrative describes a cultural stereotype.

In the following extracts the interviewees provide biographical accounts that can be considered the conventional way in which individuals become academics and specialists.

Extract 9

Dr Taylor: Ahh well (.) I think I always – I (.) was always my ambition to become a scientist of some kind or another (.) From (.) as long ago as I can:: really remember ahh to that –probably goes back to primary school […] I foun::d when I started doin:g A level and further maths (.) maths was really:: I enjoyed it (.) and I was pretty good at it actually (.) A:nd I enjoyed the physics (.) chemistry:: not so much but ahh and ahh I basically ah decided then I wanted to ah (.) you know (.) re::ally wanted to go to university and do science

(Male, professor, faculty of science)

Extract 10

Dr Connor: Ahh I suppose quite early on – I was always quite good at science

(Female, research associate, faculty of sciences)

Dr Taylor and Dr Connor present themselves as having been interested in science since early stages of their lives, and they also note having 'always' been good at it. It can be noted that Dr Taylor describes in particular proficiency and joy for mathematics and physics, contrasting these two to chemistry, therefore his specialist expertise could be seen as founded in his lifelong involvement in the field. At the moment of the interview, Dr Taylor was professor in a department of physics and mathematics. A biographical narrative can be seen as more than a neutral description of a life since it offers speakers an opportunity to present themselves in a positive light. It is not

surprising that Dr Taylor emphasises proficiency in mathematics from an early age.

By focusing on the subject position and the canonical narrative of the specialist expert it is possible to identify discursive resources used by individuals to construct themselves as interdisciplinary or as 'natural interdisciplinarians'. In the following extract Dr Graham distances herself from the canonical narrative and provides an explanation for her interdisciplinary career.

Extract 11

Dr Graham: throughout my school years I was told that I was very very stupid indeed ahh and ahh that – you know I shouldn't go to college that I shouldn't go to university there were all these things that I just wasn't clever enough to go ahh and they were probably right (.) but part of it was because I don't think I've found the thing that I was interested in and then I went to university to study *geography* and suddenly I didn't feel so stupid anymore ahh because I was (.) I suppose studying other things that I did before (.) *geography* is about every aspect of human life society culture so it's kind of relevant to everything so through one discipline I was able to study all the things that I'd done badly before but though a different kind of lens

(Female, associate professor, faculty of arts)

The narrative provided by Dr Graham and the way she positions herself within that narrative differs to a large extent from the accounts given by Dr Taylor and Dr Connor. While they describe themselves as being 'always' good at school and at science, Dr Graham describes herself as a different type of person, 'very very stupid indeed'. Features of the canonical narrative presented above can be identified in Dr Graham's description of people's opinions about

herself: only clever people, like Dr Connor and Dr Taylor, are expected to go to university, and there is no room for those who do not do well in school. However, in the second half of the extract she provides repair to the troubled position of 'stupid' and 'not clever enough'. Instead of taking those negative descriptions as accurate she provides an alternative interpretation, arguing that the problem was that she had not yet found what she was interested in. Thus, her biographical account is both a description of her life but also a site of argumentation between conflicting views of herself and the world. On the one hand, stupid people will keep being stupid and therefore they should not go to university; on the other hand, stupid people could be intelligent people whose talents are harder to uncover. Again, categories of people and the essence of categories can be challenged.

The actual area Dr Graham studied has been changed to geography in the abstract, yet it still captures the essence that it can be 'about every aspect of human life'. A heterogeneous – or interdisciplinary – field is described as providing a different lens, which was not only more appealing to Dr Graham but also revealed intellectual skills she did not know she had. Dr Graham could be thus identified as a 'natural interdisciplinarian', even though at a younger age she did not know she was one. Furthermore, the position of 'natural interdisciplinarian' can be used to counter established understandings of who counts as academically skilled and who does not. The point here is not to take such descriptions of events and traits as real, but to show how an 'interdisciplinary self' can be constructed in biographical narrative.

Narratives of interdisciplinary identity and engagement can take other forms, and researchers can describe themselves as establishing distance from the

canonical narrative at different times of their careers. The following sections explore accounts different from that offered by Dr Graham.

6.3.1 Narratives of interdisciplinary engagement

As noted in subsection 3.2.1 the literature has been focused on circumstances that lead researchers into interdisciplinarity. Oughton and Bracken (2009) suggest that researchers can follow 'three different, although not mutually exclusive, routes' (p. 388) into interdisciplinary engagement. These routes include, 'collaboration whilst remaining within your own area of expertise but being willing to trust others' expertise', 'reading adventurously and developing understandings that allow one to work critically with others in different disciplines', and finally 'undertaking a training in a completely new area' (p. 388). Other authors suggest that researchers may involve themselves in interdisciplinary research because the problem they focus on requires it, because they may perceive it as a convenient approach, because the funders may demand it, or also because of the professional opportunities it offers (Castán Broto et al. 2009; Garforth and Kerr 2011; Rhoten and Pfirman 2007).

Three observations can be made about these routes and reasons for interdisciplinary engagement. First, there may be other reasons and other routes, for example the case of Dr Graham presented above. Second, there is the risk of deducing that these routes represent different categories of people, but as shown above, the essence of categories can be challenged. Third, focusing on the 'end point' of the trajectory obscures the identity work done by researchers when they provide explanations for their interdisciplinary engagement. For example, in the first route described by Oughton and

Bracken, above, their interviewees had to position themselves as experts in one area but also as 'willing to trust others' expertise'. Others would be seen as not willing to trust others' expertise. It could also be that individuals provide different explanations depending on the situation and on how they wish to portray themselves in particular interactions. In the following extract Dr Blanc positions himself as interdisciplinary but not as 'naturally interdisciplinary'.

Extract 12

Dr Blanc: Ok so ahh my background is computer science ahh I studied straight computer sciences from my undergraduate up to the PhD (.) which I did in the area of *[omitted]* ahh (.) and then I was looking for postdocs in my research area (.)I found one which was application of *[his specialist area]* to bioinformatics here at [university] (.) And that's when my ah ah I started to open to other ahh started doing ahh a bit of interdisciplinary research (.) was still core computer science but of course we had chemist collaborators so it was the time I started understanding new languages and seeing different ahh (.) cultures […] And now most of the work I do is ahh ahh is applied and in collaboration with experimentalists ahh ahh mostly in in biology but across different schools

(Male, lecturer, faculty of science)

In the first lines of the extract Dr Blanc provides an account that resonates with the canonical narrative of the specialist expert. He started studying one discipline and continued all his education specialising in the same discipline, and after the PhD he obtained a postdoctoral position focused on the same speciality. Since he is able to provide such an account he can be positioned as a specialist expert without trouble. He then notes that during his postdoctoral

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period he 'started to open' to interdisciplinary research, yet noticing that his work was 'still computer science'. The particular condition of his field, which can be applied to and contribute to many other disciplines allows him to argue he kept doing 'core computer science' work. Moreover, he also positions himself as somebody capable of doing such interdisciplinary collaborative research because he could 'understand new areas' and 'see different cultures'. He does not describe any troubled position even though 'most of the work' he does is in collaboration with people from other schools. Other interviewees, in contrast, argued that understanding other disciplines was difficult and that collaborating with researchers from other departments was problematic. One last observation to make about this extract is that it could be considered problematic if, on the one hand, specialists would not 'open' to understand other disciplines; on the other hand, if once open, specialists stop doing 'core' specialist or disciplinary work. This situation is explored later in this chapter. In the following extract Dr Curie also draws strongly on the canonical narrative to position herself as a specialist.

Extract 13

Dr Curie: Ok so I:: I started ahh my higher education at *[omitted]* University ahh throughout my undergraduate work and I did a masters and then a PhD (.) I concentrated (.) I would've been described as a laboratory based spectroscopist (.) So I did most of my work in a laboratory and I would take spectra of molecular species in different states (.) and I specialised in *[X type]* spectroscopy […] And after that I spent about a period of somewhere between six and eight years depending on how you count the years – six or eight years doing postdocs

(Female, research associate, faculty of sciences)

Similar to Dr Blanc, and even to a higher extent, Dr Curie emphasises her position as a specialist. Curiously she does not mention the name of her bachelor's and master's degree but goes straight to say she 'would've been described as a laboratory based spectroscopist'. This way, one would argue that to Dr Curie her specialist identity is stronger than a more general disciplinary identity. Moreover, she then notes she specialised in a more specific type of spectroscopy, followed by up to eight years of postdoctoral work. Later in the interview she provides the account presented below, in which she switches from a rather narrow specialist position to one more 'open' to interdisciplinary research.

Extract 14

Dr Curie: Ten or twelve years ago was the first time I started working with *engineers* a:nd really doing what I would regard as interdisciplinary work […] Prior to that the only element of interdisciplinarity in my work was that during my laboratory based work I started looking at compounds that *[unclear]* biological mimics and so:: I did have some contact with people who were interested in these biological mim- mimics from a biology or biochemistry or medicinal (.) but it was a very small interaction or a very small amount of input (.) so I'd say from two thousand is when I started doing interdisciplinary work

Once Dr Curie has adopted a specialist position, she later includes in her narrative an account of her interdisciplinary engagement. She points out she has been working with engineers (actual discipline replaced) for ten or twelve years, not necessarily doing laboratory based work. Yet, she describes such work as genuinely interdisciplinary by contrasting it with previous work with biologists, described as a 'very small interaction'. Thus, in the two extracts Dr

Curie switches between different positions, one as a narrow specialist, yet open to small interactions with people from a different discipline, and another one as seriously engaged in interdisciplinary research.

While Dr Blanc and Dr Curie draw on the canonical narrative to position themselves as specialists, and only afterwards deviate from it, other interviewees highlight a breach from it earlier in their academic trajectory, as in the cases described below.

Extract 15

Dr Young: when I was looking around for at the end of that for a PhD topic I found all the PhD topics in all the UK quite dull (.) I didn't really wanted to study fluids or magnets or condensed matter systems [C: so the ones in physics] yeah:: so there are lots of interesting areas of physics but I just couldn't find a project you know that suited me

<div align="right">(Male, professor, faculty of science)</div>

Extract 16

Dr Truman: we did a module on the first semester of my MA where ah it was sort of revealed that you could look at *[omitted]* (.) and I was like ohh! I wanna do that [C: mhm] ahh 'cause I think at heart it was always more interesting to look at kind of more social aspects of *[omitted]* theory but I didn't (.) coming from a: literary studies background that was never presented to me as an option.

<div align="right">(Female, assistant professor, faculty of arts)</div>

Dr Young and Dr Truman describe a breach from the expected career track earlier on during their formation. In their accounts, Dr Young and Dr Truman note being dissatisfied with the conventional research topics of their

disciplines. In both cases, the interviewees draw on the 'disciplines as restricted/restrictive repertoire', and interdisciplinarity is seen as a solution, offering more attractive research options (as the repertoires of interdisciplinarity as intellectual bonus, and as rewarding in itself would suggest). In these extracts, however, they do not position themselves as 'natural interdisciplinarians' having interests in everything. It is relevant noticing that, as presented in extract 7, Dr Truman describes herself as 'the weird one' because of her unconventional research interests. In contrast, even though Dr Young positions himself as dissatisfied with the conventional topics of his discipline, he does not position himself as 'the weird one', and rather he argues that all researchers are 'broad disciplinarians', as noted in extract 4. Thus, positioning oneself as special or ordinary depends on individuals' trajectories but also on the local cultural frameworks provided by different disciplines, and moreover, on the image individuals intend to display in the interactional context.

Other interviewees describe their interdisciplinary involvement as influenced by other factors, as in the case of Dr Reed presented below.

Extract 17

Dr Reed: And so my head of department said oh there must be some research out there (.) and so he put me in touch with ahh the professor *P* […] he said well actually there's a scheme that is being funded by *[omitted]* and what they're trying to do is pump prime the *[clinical]* profession with social science skills and what you have to do is register for a postgraduate degree a masters or a PhD somewhere in a school of social science

As suggested by other authors (Castán Broto et al. 2009; Oughton and Bracken 2009), researchers may engage with interdisciplinarity because it is required by the problem they focus on, or because funders require it. In the case of Dr Reed, who initially was a clinical professional, she undertook training in a social science discipline because of a problem that needed to be addressed at her clinical institution, and there was also institutional support to combine clinical expertise and social science skills. In the extract she does not position herself in a specific way, other than perhaps problem driven or institutionally engaged, but her case is different to that of interviewees presented above, who take a more protagonistic position in their accounts. Dr Reed deviates herself from the canonical narrative of the single discipline specialist but such deviation is presented as institutionally and problem driven, rather than by her own research interests. In the following extract Dr Walsh provides an account that would locate him in different categories simultaneously.

Extract 18

Dr Walsh: Ahh I've been passionate about *anthropology* since I was a child (.) ahh but also about ah literature and literature and history not to the exclusion of the sciences and geography and everything else right? Through school (.) ahh so I always wanted to keep my education as broad as possible which is a problem in Britain because you are forced to specialise quite early *[long description of academic background, combining arts, humanities and social sciences omitted]* (.) I've never been involved in a single discipline (.) Having said that I've always considered myself *an anthropologist* (.) I've always been in *anthropology*

Some interviewees position themselves as 'natural interdisciplinarians' and others as single disciplinarians who opened up to interdisciplinary research later in life. However, Dr Walsh presents a biographical account that combines both a specific disciplinary position and an inherently interdisciplinary one. While other interviewees shift between positions in their accounts, Dr Walsh instead describes himself as occupying the two positions without the need for a shift between them. In the omitted section Dr Walsh described having a double undergraduate degree and the master and doctorate degrees he describes combine disciplines of arts and social sciences for the study of a specific world region, associated to a multidisciplinary centre that existed in a university. Dr Walsh's narrative would exemplify the argument made by Dr Masters that individuals have different disciplinary identities within themselves. Individuals who can claim different disciplinary identities may face dilemmas and troubled positions, because the discourse of interdisciplinary, as common sense and ideology (Billig 1996; Billig et al. 1988), contain contrary themes.

6.4 Trouble and dilemma in (inter)disciplinary identities

The notion of identity trouble or troubled position is used in discursive psychology to refer to positions and identities that are 'challengeable by others as implausible or inconsistent with other identities that are claimed' (Taylor 2007:120). Moreover, as Lemke (2008) notes, 'one can never make a person or an artefact or discourse that includes *only* the features we are seeking to build in. There will always also be "accidental" features and side-effects not under our control' (p. 35, emphasis in the original).The 'common places' in the

discourse of interdisciplinarity contain contrary ideas, as was claimed in the previous chapter: interdisciplinarity may foster innovation, but it also comprises concerns about loss of disciplinary detail and precision; interdisciplinarity can be described as an institutional desire, but also as a precarious activity. The label 'interdisciplinary researcher' also contains contrary themes. Academics involved in interdisciplinary research can be considered flexible individuals with a broad perspective, but also 'jacks of all trades and masters of none'. Single discipline specialists can also be perceived in contrary ways, since they can be thought of as serious and rigorous, but also as having a narrow focus, as the following interviewees argue.

Extract 19

Dr Winston: what I tend to find in my work is that I know a little bit of information about a lot of people (.) whereas academics tend to know a lot of information about their specific area

(Male, research development)

Extract 20

Dr Cook: academics aren't always very good at ahh connecting across ahh laterally and ahh they are very good at you know going deeper and deeper into a hole and you know being the world leading expert on a particular area but – not all of them you know but some of them aren't very good at you know sort of connecting at things

(Male, university administrator)

In these two extracts the interviewees describe academics equally in a positive and in a negative way. On the one hand academics have much knowledge about a particular area, on the other hand such specific or narrow focus may

make them unable to appreciate knowledge outside their discipline, and to make connections between theirs and other areas of knowledge. Thus, the untroubled position of the single discipline expert can be turned into a troubled position. In chapter 3 a number of limitations of experts were summarised, such as being inflexible, not succeeding in domains different from their own and being biased to explanations that correspond to their own fields (Chi 2006). The accounts of Dr Winston and Dr Cook resonate with those images of experts. Dr Winston and Dr Cook's' accounts can be read as drawing on the interpretative repertoire of 'disciplines as restricted/restrictive', and they use this common discursive resource to assign positions as 'narrow-minded' to others. In the extracts it can also be noted that the term 'academics' is used to refer to single discipline specialists, and thus this academic identity is presented as the most common. By contrast, interdisciplinary identity and skills would be understood as the uncommon. From these two extracts one can assume that even though the canonical narrative of the single disciplinary specialist is an effective discursive resource to describe one's career as the expected, breaches from it such as 'opening up' to other disciplinary cultures and languages can at times be well regarded. In the following extract Dr Robins constructs an account in which, by positioning specialists in a negative light (a troubled position), she can emphasise the trouble she has faced in her career, and thus she also assigns a troubled position to herself.

Extract 21

Dr Robins: So if you ask people if have they found it – you know if you do an
                interdisciplinary – or you put an interdisciplinary research grant (.) it
                goes to specialists to be:: assessed and often they don't fully
                understa::nd what different components are for to say to understand

THAT particular area (.) and you get series of reviews that tend to be ahh not think about the broader context (.) they think on the narrow specific or THEIR area (.) […] So I think is re::ally ha::rd to get – to bring in interdisciplinary teams together where you have got you know a whole you know medics *anthropologists* historians […] my experience has been you just end up bashing your head against a wall and feel frustrated because that always – they always say you've got to go down the discipline

(Female, professor, faculty of social sciences and university administrator)

In this extract, Dr Robins is able to describe professional challenges, drawing on the 'interdisciplinarity as precarious' repertoire and by positioning research grant reviewers as narrow minded specialists. These specialists 'don't fully understand' an interdisciplinary research proposal, they 'don't think about the broader context' and think in terms of their own 'narrow specific area'. One can derive from this image of specialist others that interdisciplinary researchers may 'feel frustrated' because research proposals have to satisfy the disciplinary criteria specialist-reviewers expect to find. The argument echoes Lamont's (2009) findings, which suggest that interdisciplinary proposals are disadvantaged because these are assessed by the criteria of individual disciplines. Similarly Greckhamer et al. (2008) suggest that interdisciplinary knowledge has to be accommodated to disciplinary standards to be legitimised. A solution is proposed by Huutoniemi (2012), who suggests that review panels could combine specialists and generalists with broad knowledge beyond disciplines. However, 'generalist' may not be a position many researchers would happily adopt, or at least not in all situations. As the chapter has

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suggested so far, the essence of categories is not entirely fixed. Since the academic community is generally described as dominated by disciplinary specialists, individuals claiming interdisciplinary identities face a number of ideological dilemmas. The following section describes the first of four ideological dilemmas identified in this thesis.

6.4.1 The ideological dilemma of openness and rigour

'Ideological dilemmas' is an analytical category used in discursive psychology. It derives from the rhetorical approach to social psychology, which considers common sense and ideology as contradictory rather than as unified systems of thought (see section 4.3.2). Ideological dilemmas are the contradictions that can be identified in people's discourse and arguments. Besides the view of common sense and ideology being internally contradictory, individuals face dilemmas because the content of thought and argument involves both 'a lived ideology that adjusts one to mundane life, and an intellectual ideology that seeks to overturn everyday reality' (Billig et al. 1988:34). Academic researchers may feel attracted to interdisciplinarity because it is commonly depicted as an intellectual and rewarding activity expected to overcome the limitations of traditional disciplines, foster innovation and make research more socially accountable. However, it is also imagined as a risky and precarious activity, difficult to carry out and with unclear professional benefits, because it entails, perhaps apocryphal, perhaps actual, losses of disciplinary rigour, detail and precision. Thus, researchers may feel – or rather argue - that they are 'pushed and pulled in opposing directions' by 'conflicting values […] born out of a culture which produces more than one possible ideal world [and] more

than one hierarchical arrangement of power, value and interest' (Billig et al. 1988:163).

The ideological dilemma presented here, of 'openness and rigour', refers to accounts identified in my interviews that state that, although it is well regarded to be intellectually, practically or ideologically 'open' to other disciplinary perspectives, the extent of such 'openness' is problematic. As the title of a recent blog post problematises, 'how broad is broad?' (Donald 2015). The following extracts illustrate my interviewees' use of both sides of this dilemma.

Extract 22

Carlos: Alright (.) yeah thanks for that one as well (.) Ah an:d now if we could talk about the ahh well conce::rns and the challenges that are involved in doing the ah interdisciplinary work (.) what ah what are the ones that come to your mind? Or from your experience

Dr Shawn: I think dilution of subject specific expertise is the yeah you have to be really careful (.) because (.) in reality you want to avoid having a university full of generalists whe::re [C: mhm] everyone knows a little bit about something but but there's no depth (.) so so you know it's really important to maintain subject specific knowledge and make sure that's really strong (.) And at the same time ensure that the people who do understand chemistry talk to the biologists and the physicists [C: mhm] and maintaining – maintaining both their own credibility and a broader perspective

                                    (Male, professor, faculty of science, administrator)

In this extract Dr Shawn argues that, on the one hand, 'having a university full of generalists' is not desirable because that would represent the '*dilution* of subject specific expertise'; on the other hand, specialists should be able to 'understand' and to 'talk' to people in other disciplines without putting their credibility at risk. It is worth noticing that credibility is associated only with disciplinary research but not with interdisciplinary research. Different 'categories' of researchers are described in a problematic – or troubled – way. To be a generalist is problematic, but so is being a specialist and not interacting with specialists from other disciplines. One could also argue that even specialists with a broader perspective could put their credibility at risk. It is not difficult to assume there are situations in which keeping a broad perspective without endangering one's position as a specialist expert is easier said than done. Also, demonstrating having a 'broader perspective' can be as challenging as achieving a specialist expert identity. If one remembers the categories of approaches to expertise distinguished by Collins and Evans (2002, 2007) and Eyal and Pok (2011), namely attributionalist and substantivist, Dr Shawn's approach refers to both dimensions. In the first sentence of the extract, his account could be read as adopting a substantivist view of expertise, talking about the *actual* and *real* expertise. In contrast, in the last sentence expertise may be described as an attribution: one may have it but it may not be recognised by their peers. In chapter 7 I explore how individuals negotiate different sorts of expertise.

There is one further observation about Dr Shawn's interview. Even though in the extract reproduced above he suggests specialist knowledge and interdisciplinarity are mutually exclusive, he argued later that it is not so

problematic to assess a chemist who has many papers in biology journals because at the end 'most of the subject areas are inherently interdisciplinary'. Thus, there is variability in his accounts: once he constructed an account drawing on the ideological dilemma of openness and rigour, once he did not. By contrast, in the following extracts interviewees emphasise the problem of losing credibility and a disciplinary identity.

Extract 23

Dr Anderson: They want us to be crossing boundaries and the big questions that are important in society (.) the grand challenges all require interdisciplinarity (.) But when it comes to advising early career researchers ahh (.) despite my belief in it and enthusiasm for it *[for interdisciplinarity]* I often (.) find myself saying look just be careful that you understand who you are and that other people will understand who you are when you go for a job and so you must target these journals and are you *a psychologist* or an *economist* or whatever ahh because if you want a job in *an economics* department you want to look like you are going to be able to contribute to that discipline

(Female, professor, faculty of science and university administrator)

Previously in the interview Dr Anderson was describing contradictory messages she perceives from the research councils and the Research Excellence Framework. She argued that the former encourages interdisciplinarity but the latter discourages it. The situation contributes to the understanding of interdisciplinarity as precarious, and in the extract she describes awareness she provides to early career researchers. Different interpretative repertoires can be identified in Dr Anderson's account, and these allow her to express the ideological dilemma of openness and rigour. At the

start of the extract she draws on the repertoire of 'interdisciplinarity as institutional desire', to emphasise that research councils want researchers to 'cross boundaries'. She then adds to her account the 'nature as interdisciplinary repertoire', noting that 'big questions' and 'grand challenges' require interdisciplinary approaches. However, these repertoires only construct one side of the dilemma.

Although she positions herself as an enthusiast of interdisciplinarity, she argues that she has to make early career researchers aware of the challenges it entails. In her 'advisory' account she notes that individuals should be able to construct a clear disciplinary identity by targeting certain journals; that means, being able to position themselves as rigorous and specialist experts, rather than 'jacks of all trades but masters of none'. However, in such a situation the dilemma would appear again because such early career researchers could then undermine their position as flexible academics with a broad perspective, and could run the risk of appearing like a 'one trick pony'. As Billig et al. (1988) argue, individuals cannot solve ideological dilemmas permanently, and even when these are partially solved, they appear in other situations. In the following extracts the interviewees use the dilemma of openness and rigour to position themselves in a troubled way.

Extract 24

Dr Reed: I think it's really important that you get people ahh to do the discipline spanning thing (.) but I think there's an underestimation as to how (.) it's very challenging because for some – somebody like me I feel like I'm not really a brilliant *social science specialist* anymore and I'll never be a proper *clinical professional*

It is worth recalling that in extract 17 Dr Reed described her interdisciplinary engagement as driven by a challenge faced at the clinical institution she was working at. She narrated that she undertook a PhD in a social science department funded by an institution interested in bringing social scientific skills to the clinical profession she was affiliated with before becoming an academic researcher. In the extract Dr Reed emphasises the importance of having people doing 'the discipline spanning thing', which is part of the 'interdisciplinarity as intellectual bonus' repertoire. However, she presents as a counter-argument that she is neither a 'brilliant' science specialist, nor a 'proper' clinical professional. Thus, while she is able to position herself as a flexible intellectual who succeeded in a PhD in a field distant from her profession, and who was driven by a professional problem, she also undermines her position as a specialist. The case of Dr Robins is similar.

Extract 25

Dr Robins: Where it becomes a problem (.) is that with me as a *general psychologist* I am a master of all trades and mistress of none (.) So I'm – I am for example the only professor OF *psychology* (.) There are lots of professors in my department (.) in this type of *psychology*, or that type of *psychology* (.) you know there's the human *psychology*, *educational psychology*, *clinical psychology*, *cognitive neuroscience* but there's nobody that is A *psychologist* (.) And ahh – to me there are enormous benefits (.) because I can talk to people 'cause we all talk different languages (.) There are also huge negatives (.) in that I'm not seen as an expert in anything [C: ahh] and that's the downside

(Female, professor, faculty of social sciences and university administrator)

As with the previous interviewees, Dr Robins constructs an account which includes an argument and a counter-argument. She positions herself as a 'master of trades and mistress of none', and in contrast to 'lots of professors' of different specialist fields in her department, she positions herself as the only professor of psychology (her real discipline is kept anonymous). On the one hand, she argues there are 'enormous benefits' because she can talk to people in other fields and disciplines. On the other hand, even though she argues she has the skill of understanding different disciplinary languages, the downside is 'not [being] seen as an expert in anything'. In the particular case of Dr Robins she can be seen as facing another dilemma, since even though she tries to emphasise the downsides of having an interdisciplinary identity, she holds a professorial chair and a high position at the university's executive board. Moreover, in the abstract she positions herself as unique, noticing she is the 'only' professor who can 'talk different languages' and enjoy the 'enormous benefits' this brings.

6.5 Constructing coherent academic identities

In this chapter I have presented a number of discursive resources used by my interviewees to construct disciplinary and interdisciplinary identities. Interviewees draw on their own life events and also on widely established discursive resources, such as interpretative repertoires, subject positions and a canonical narrative. However, these discursive resources are contradictory: there are multiple troubled positions, untroubled positions can be turned into troubled, and there is also an ideological dilemma. Interviewees have to draw

on these contradictory resources and deal with them in their biographical accounts and their identity work. Biographical identity work is limited by these resources and by the contrary meanings and values they express, therefore individuals are not entirely free to construct their identities (Taylor and Littleton 2006, 2012). Moreover, biographical accounts have to appear coherent, since inconsistency is a source of trouble (Taylor 2007). In this section I analyse a series of different interview sections to illustrate the way in which two interviewees construct their (inter)disciplinary identities as coherent. In the first case, Dr Lindsay emphasises her disciplinary identity, and in the second case, by contrast, Dr Lawson underlines her interdisciplinary identity.

6.5.1 Coherence down the specialist line

In extract 19 of chapter 5, Dr Lindsay's account was used to illustrate the interpretative repertoire of 'interdisciplinarity as non-rigorous'. She argued that interdisciplinarity is on many occasions a refuge for those who are not as methodologically rigorous as their discipline may require. It is relevant to bear her argument in mind because her biographical account can be read as if she intended to distance herself from those 'interdisciplinary refugees'. Before coming to the account presented in extract 26 Dr Lindsay indicated that she did economics from undergraduate to PhD, and noted that during the PhD she became interested in a particular approach to decision making (original approach anonymised).

Extract 26

Dr Lindsay: In my early postdoc work I was seeking (.) ideas about methods that

could be used to do empirical work for the subject I was interested in

ahh a::nd I didn't restrict myself to talk to economists (.) Ahh –So:: that (.) basically I became ah interdisciplinary interested on that time I guess

(Female, associate professor, faculty of social sciences)

Drawing on the explanation I provided above and in this extract, it can be noted that Dr Lindsay shifts from a disciplinary or from a specialist position to one of a specialist who is *open* to other disciplines. She argues that during her postdoctoral work she was looking for methods to pin down the approach to decision-making she became interested in during her PhD and she did not restrict herself to talking to economists. She explains that the approach to decision-making she became interested in was also being used in other disciplines, and by saying she also talked to researchers from those disciplines, Dr Lindsay avoids being seen as a narrow-minded specialist. Later in the interview she made the following statement.

Extract 27

Dr Lindsay: oh! I should say one more thing (.) so ah ma- I have been interested in *decision making* since (.) the age of sixteen (.) I studied economics because I was interested in *decision making* [C:mhm]

This statement is similar to those of Dr Taylor and Dr Connor in extracts 9 and 10, in which the interviewees express having had interests and proficiency in science since early stages of their lives. As in those cases, Dr Lindsay draws on the canonical narrative of the specialist expert, and her argument could be interpreted as a strategy to avoid giving the appearance of being a non-serious or a dilettantistic scholar. The argument of having interests for decision making 'since the age of sixteen' implies that she has a clear focus on a

specific area. In the interview I also asked if it was normal in economics to do interdisciplinary work and she responded in the negative. An interpretation of her accounts is that she is aware of the image economists give about themselves, and she is used to presenting herself according to the institutional and disciplinary expectations. In the following extract she again negotiates her position primarily as a specialist in economics, rather than as an interdisciplinary scholar.

Extract 28

Dr Lindsay: I want to say one more thing about that [C: yeah] because the panel that I mentioned that I was on [C: mhm] the other three panellists were all what you might call intrinsically interdisciplinary (.) so they THEMSELVES no – no longer identified with a particular discipline (.) they saw themselves as: entities that were into – interdisciplinary [C: mhm] (.) I:: I'm an economist (.) I sort of – There've been times in my life when I've wondered about that [C: mhm] but now I'm:: happy to describe myself as an economist (.) My:: my expertise is essentially that of an economist (.) an empirical economist but an economist nevertheless (.) Ahh so my:: interdisciplinary research involves collaborating with somebody from another discipline (.) who identifies with that other discipline (.) So I think there – so: this interdisciplin::ary research you could type in that way [C: mhm] is it done by an interdisciplinary individual or is it done by:: individuals that are discipline specific who are collaborating (.) yeah

As in extract 27, Dr Lindsay adds details to her account in order to elaborate a clearer picture of her academic identity. The extracts start with the phrases 'I should say one more thing' and 'I want to say one more thing'. These accounts

could have been added by Dr Lindsay in order to avoid the interviewee taking her as a non-rigorous or incoherent scholar. In extract 28, she distances herself from other researchers she met on an interdisciplinary panel who she categorises as 'intrinsically interdisciplinary'. Dr Lindsay describes those in this category as 'entities' 'no longer identified with a particular discipline'. In contrast, she positions herself as an expert in economics, 'an empirical economist but an economist nevertheless'. She follows by noting she 'has wondered about that' at different times in her life. In the last section of the extract she argues her interdisciplinary research is collaborative rather than at the individual level, as Calvert (2011) distinguishes. Collaborative interdisciplinarity allows researchers to adopt untroubled positions, in contrast to individual interdisciplinarity, in which individuals' expertise may not be clearly defined. In these extracts it is possible to observe that Dr Lindsay distances herself first from disciplinary-restricted individuals but then also from intrinsically interdisciplinary individuals, and in the end to her it is less problematic to identify herself as a single discipline expert – who collaborates with other single discipline experts. This position might be the most convenient to adopt since it is different from that of the generalist and of the narrow-minded specialist. Thus, Dr Lindsay's biographical identity work allows her to present herself in a positive light in the interactional, institutional and rhetorical contexts.

6.5.2 Coherence down the interdisciplinary line

Contrasting with Dr Lindsay's account, Dr Lawson constructs herself in biographical talk as inherently interdisciplinary, and she stresses this position at different moments during the interview. When I asked the first question she

described having a 'general background in' an interdisciplinary field of the social sciences and described her research interests broadly. I asked if she also had a first degree in this field, and she provided the following answer.

Extract 29

Dr Lawson: Ohh! Oh I have a very potted (.) academic background

(Female, lecturer, faculty of social sciences)

While I was doing the analysis I confirmed by email what she meant by this and she replied 'a bit of this and a bit of that'. This account implies a breach from the canonical narrative of the single discipline expert because it is not compatible with the expected way specialists' lives develop. She continued describing that she did a first degree in an arts discipline and was pursuing a career outside of academia, which is an unusual background for people working in her current interdisciplinary field. She then provided the accounts presented below.

Extract 30

Dr Lawson: ahh at some point just decided on a change of career an:d didn't really had really an idea about what I wanted to do and got a job as a research assistant at a university

[…]

and said this is what I want to do […] I've no background in it but it interests me: (.) so I did a few undergraduate ahh modules then some masters modules before I knew I was enrolled in a PhD programme (.) So it all kind of moved fairly quickly

[…]

so yeah so different (.) different sort of background

These extracts are included to emphasise that there are narratives which do not correspond with dominant cultural stereotypes, such as the prematurely-clearly-focused expert. Dr Lawson notes that at a particular time in her life she wanted a change of career even though she did not have a clear idea of what to do. She took a research assistant position and developed interests in the field her work focused on, and later she pursued the training required for that field. In her case, she does not express early life interests for a topic nor having moved from one field to another motivated by a research question or a problem to focus on, as in the case of most of interviewees presented in this chapter. With such background it would be difficult for Dr Lawson to claim expertise in an individual discipline, but also her field is more heterogeneous and it is more welcoming for people with different backgrounds. Therefore, despite being unconventional, her account can be interpreted as institutionally situated. In the following extracts Dr Lawson emphasises her interdisciplinary identity.

Extract 31

Dr Lawson: So so from my own background it's very much interdisciplinary and has been right through from my training into my academic ahh sort of life (.) so it is not just something of (.) taking on board since for example moving to *[current place of work]* or whatever but it has always been there

Extract 32

Dr Lawson: because most of what I do is interdisciplinary (.) ahh I think there's very few occasions I can see where I might apply for research funding as either a single person or for a single subject or discipline (.) that

just doesn't appeal to me because I'm interested in the broader
context of something

While other interviewees draw on the canonical narrative to emphasise their specialist position, as Dr Lindsay did, the case is different for somebody working in a field in which an interdisciplinary perspective is expected. In such cases it might be impossible or even undesirable to claim a single disciplinary identity. In an interdisciplinary field there should not be 'one trick ponies'. In these extracts Dr Lawson emphasises being driven by interdisciplinarity; in extract 31 she claims all her academic life has been interdisciplinary and in extract 32 she argues that it would be rare for her to apply for individual and single discipline research funding. On both of these occasions the arguments are presented in contrast to opposite alternatives. In extract 31 the contrast is made between her interdisciplinary deep roots ('has been right through my training'), so to say (she also noted having a supervisor in a science faculty and a supervisor in a social science faculty during her PhD), and the idea that such an approach is more superficial ('not just something taking on board for example since moving to [current place of work]…'). Thus, the contrast is between old and authentic, and recent and superficial. Her interdisciplinary approach is presented as authentic because 'it has always been there'.

In extract 32 she reinforces that 'authentically interdisciplinary' position noticing 'most of what I do is interdisciplinary'. In contrast, individual and single disciplinary work 'just doesn't appeal' to her. A second contrast can be identified between 'single subject' and 'broader context of something'. This contrast stresses the common place in interdisciplinary discourse which

describes disciplines as restricted and restrictive. Focusing on 'the broader context of something' gives the impression of major precision or major understanding of a research problem. Emphasising a deeply rooted 'appeal' for a 'broader context of something' could be interpreted as a form of rigour. Thus, rather than appearing a dilettante, Dr Lawson constructs and presents herself as a serious and rigorous scholar with a coherent academic career, although in a nuanced way.

6.6 Conclusions

This chapter focused on the discursive construction of disciplinary and interdisciplinary selves. The analysis drew on the interpretative repertoires introduced in chapter 5 to illustrate how these are taken up by interviewees and integrated into accounts of their lives. It was also shown that these repertoires can be used in flexible and even contradictory ways. This was the case of the 'nature as interdisciplinary' repertoire, which interviewees used to describe interdisciplinary individuals as special and as ordinary. In this way, the chapter illustrated that categorising people according to fixed identities is not entirely adequate because people can adopt different identities at different moments. Categories of people can be subject to argumentation. Just as disciplines can be described as internally heterogeneous, so can individuals be said to have multiple disciplinary identities within themselves. The concept of subject positions, as used in discursive psychology, was suggested as a more convenient and fruitful unit of analysis than rigid categories.

The chapter also suggested that individuals can draw on or distance themselves from an expected narrative of how academic lives develop in order to construct

biographical accounts. This canonical narrative is that of the scientific expert or of the single discipline specialist. Different uses of this canonical narrative as a discursive resource were identified. Just as with identities adopted, individuals may provide different narratives of interdisciplinary engagement at different moments; therefore biographical accounts should be seen as constructed according to the interactional context. Moreover, biographical narratives are situated in institutional and rhetorical contexts: in institutional contexta, because these can follow protocols of what is the expected within different disciplines; in rhetorical contexts, because accounts support certain values and counter other ones, and in different cases the counter-argument can be adopted. At times it is good to adopt a 'flexible' position, at other times a 'rigorous' position is more convenient. This creates an ideological dilemma identified in this thesis, named here the dilemma of openness and rigour.

A final point raised in this chapter was that even though different positions can be adopted in biographical accounts, individuals aim overall to construct coherent identities and to show consistency in their careers. Coherence and consistency allow researchers to make accounts of a well-defined research focus, because it is commonly known that expertise cannot be developed by 'globe-trotting' (Donald 2015). The following chapter will explore how individuals account for the possession of specialist skills and also the skills required for interdisciplinary research.

Chapter 7. Negotiating dilemmatic expert positions

7.1 Introduction

Researchers draw on their particular life events and on meanings established in the wider social and cultural context to construct retrospective narratives (Taylor 2015) of their engagement with interdisciplinarity. However, those narratives are situated in a rhetorical context because established meanings contain competing and contradictory messages. This is to say, individuals' stories about their lives and careers should sound coherent so that they can pre-empt potential accusations of not being serious scholars who engage with interdisciplinarity opportunistically while failing to achieve disciplinary rigour. Moreover, researchers also have to avoid being perceived as narrow-minded specialists. These were the topics of the two previous analytical chapters. This chapter follows up those analyses to explore how the interviewees construct themselves as proficient interdisciplinary researchers.

Interdisciplinary research involves not only the willingness to engage with other disciplines, but it also requires different types of skills. Researchers have to construct themselves as both 'open' to interdisciplinarity but also as being able to do it successfully, even within interactional contexts such as a semi-structured interview. Chapter 6 showed that not all interviewees positioned themselves as disciplinary specialists; some of them even adopted troubled positions saying that they were no longer brilliant in a single discipline (Dr

Reed, extract 24) or being a 'jack of all trades and mistress of none' (Dr Robins, extract 25). This chapter suggests that in the context of interdisciplinary research other forms of expertise can be negotiated, and that ideological dilemmas can be encountered during such negotiations (see Lynch and Cole 2005). The chapter draws on discursive psychology and the literature on interdisciplinarity and expertise to address the question '*how do interviewees negotiate the issue of expertise in interdisciplinary research?*'

As noted in chapter 3, Jasanoff (2003a) finds it problematic that experts and non-experts are differentiated in a straightforward way. She underlines the need to explore in greater detail how these identities are constituted and suggests that such explorations require 'thick description'. Chapter 3 also presented a number of studies that suggest that there are different types of expertise (Collins and Evans 2007), that expertise is constituted in interaction (Coopmans and Button 2014; Hartelius 2011; Lynch 2004), through argumentation (Hartelius 2011), and that it is multidimensional because it involves the 'ability to negotiate […] various normative contexts (technical/economical, religious, familial/traditions, etc.)' (Majdik and Keith 2011a:377). Expertise is, therefore, about having different skills and about providing accounts about having those skills.

This chapter explores different ways in which interviewees account for their interdisciplinary skills and expertise, and it is organised as follows. Section 7.1.1 illustrates that my interviewees highlighted that interdisciplinary research requires skills and dispositions other than 'openness' to other disciplines. Section 7.2 explores how interviewees who positioned themselves as non-specialists account for having skills required for practicing interdisciplinarity.

Section 7.3 analyses how specialists account for their interdisciplinary engagement and skills. This section also describes an ideological dilemma faced by specialists when accounting for their interdisciplinary engagement, named here the 'disciplinary tolerance and expert prejudice' dilemma. Section 7.4 focuses on the skill of identifying and managing mismatching interests across individuals and disciplines. This section introduces a second ideological dilemma, that I call the 'individualism and collectivism' dilemma. Section 7.5 explores how different skills are invoked in an interviewee's talk, and finally section 7.6 presents the conclusions to the chapter.

7.1.1 'Interdisciplinarily skilled' selves and non-skilled others

According to Klein (1990) interdisciplinary individuals have (or should have) characteristics such as 'reliability, flexibility, patience, resilience, sensitivity to others, risk-taking […] the skills of differentiating, comparing, contrasting, relating, clarifying, reconciling and synthesising' (p. 183) and 'being open to other possible explanations' (p. 185). Moreover, Mansilla et al. (2012) suggest that successful interdisciplinary collaborations involve cognitive, social, emotional and institutional elements; and in a similar way, according to Ku (2012) *interdisciplinary expertise* involves knowledge exchange but also technical and managerial skills, as well as skills for mobilising resources from different institutions. Thus, individuals can construct themselves as interdisciplinary experts or as 'interdisciplinarily skilled' by adding different elements to their self-narratives. Before moving on to the analysis it is worth providing illustrations of how participants described interdisciplinarily skilled selves and non-skilled others.

Extract 1

Dr DePaul: I mean (.) any academic (.) as academics we know that we know very little (.) A good academic realises we know very little [C: Ok] ahh an arrogant academic thinks they know a lot and (.) and – the more you work with people outside your discipline the more you realise that there are potentially many other ways of understanding the world that we:: do not know because we've not been trained or come from that particular background

(Male, professor, faculty of social sciences and university administrator)

Extract 2

Dr Johnson: Yeah I think some struggle to to appreciate other people's perspectives (.) I think ahh there are some very good people who recognise the different ahh (.) languages that exist in different disciplines (.) Not just the languages but the ahh the approach (.) It's quite interesting (.) And those who are more AWARE of it are the ones that are more successful I think (.) [C:mhm] because they recognise how they can engage and bring ALL of this together to bring new - a much mo::re ahh wider info::rmed solution [C: alright] yeah?

(Male, lecturer, faculty of engineering)

Extract 3

Dr Truman: If somebody asks what seems like a really basic question (.) that is actually just the result of disciplinary difference (.) that that is acknowledged that it is not a stupid question (.) that it is actually an Ok question to ask

(Female, assistant professor, faculty of arts)

In these extracts the interviewees distinguish between individuals who have or don't have the necessary skills and dispositions required for interdisciplinary research. Dr DePaul notes that 'good academics' should be humble and accept that they know 'very little', and in contrast 'arrogant academics' 'think they know a lot'. Not surprisingly he positions himself within the well regarded category (note the inclusive noun 'we'). It is worth noticing that he draws on the 'disciplines as restricted/restrictive' repertoire to formulate his account. No discipline has all the knowledge, all the skills and all the answers, and having contact with people from other disciplines might help academics to see how little they know. But such a realisation depends on academics' humility to acknowledge their own limitations. In the second extract Dr Johnson distinguishes between academics who are and who are not aware of different disciplinary languages and approaches. Individuals in the first group are described as those who can bring different approaches together into a 'much more wider [and] informed solution'. The expectations of interdisciplinarity as a problem-solving approach are described as dependent on particular skills and on the individuals who possess them. In the third extract Dr Truman suggests that questions that seem to be stupid or naïve should be welcomed, since these are rooted in disciplinary differences.

Contrasting these accounts, in the following extract Dr Lawson emphasises the limitations of skills and dispositions for interdisciplinarity, since interdisciplinary projects depend on their particular contexts.

Extract 4

Dr Lawson: so interdisciplinary collaboration is very much of big part of what I
               do but I don't claim to be an expert in it (.) at a:::ll 'cause the

> landscape and the expectations change with each project depending
> on who your collaborators are, who is funding it amm and the amount
> of (.) I guess financial risk involved as well

<div align="right">(Female, lecturer, faculty of social sciences)</div>

Dr Lawson describes interdisciplinary expertise as limited because it is context-dependent. Through this account Dr Lawson also positions herself as a humble or modest academic who is open about her own limitations. Interdisciplinary collaborations are described as difficult and risky for a variety of reasons. As a social scientist Dr Lawson may work with a natural sciences' discipline for one year and with a different discipline the year after thus having to be flexible, adaptable and 'open' to acquiring new knowledge all the time. Beyond this adaptability, she might also have to develop skills of collaboration, which are different from acquiring disciplinary or interdisciplinary knowledge. These skills, such as, perhaps, tact and diplomacy, people management and so on, are however at the core of being a true interdisciplinary expert or an expert who can engage in interdisciplinary research.

These extracts show that interdisciplinary expertise consists of different levels of awareness about one's discipline's limitations, about other disciplinary languages and approaches, about others' assumptions and understandings, and awareness of institutional constraints and projects' risks. These types of awareness are meant to facilitate interdisciplinary research and collaboration. The following sections explore how interviewees construct accounts in order to negotiate a position as 'interdisciplinarily skilled'.

7.2 Non-specialists as 'interdisciplinarily skilled'

This section explores accounts of interviewees who positioned themselves not as specialist experts, a topic explored in chapter 6. These interviewees distanced themselves from the canonical narrative of the single discipline specialist in various ways and two interviewees built arguments around the dilemma of openness and rigour. In the extracts analysed here, interviewees describe skills that allow them to add intellectual value to their research and to their collaborative work.

In chapter 6, extract 11, (p. 179) Dr Graham claimed that at school she was seen as 'very stupid indeed', but she subsequently challenged that view of herself, arguing once she went to an interdisciplinary course she could see other things she had studied before through a different lens. The following extract is the continuation of her narrative.

Extract 5

Dr Graham   perhaps I had my poor performance at school and college to thank that ah sort of taking an interdisciplinary approach because I still maintain that (.) part – the way that I work is I know very little (laughs) about lots of stuff (.) ahh and it's the way I kind of bring them together that turns into something new that people perceive to be ahh slightly more interesting (.) [C: mhm] I still think that I'm quite stupid though (laughs) but I'm just (.) yeah little knowledge but weaved together in an unusual way (.) that seems to have (.) turned into a more original approach

(Female, associate professor, faculty of arts)

In extract 11, in chapter 6, Dr Graham argued that in school she was described as 'very stupid', but she then emphasised her 'interdisciplinary self' to challenge such a negative description. However, in the above extract she underlines a non-specialist position ('I know very little about lots of stuff') and re-adopts the position of 'very stupid' to emphasise a particular skill, namely being able to 'weave' things together in 'an unusual way'. In this extract she also reinforces her own descriptions of her work as 'original' by constructing corroborations of others ('something new that people perceive to be ahh slightly more interesting'). Thus, she refers to mental activities (perceptions) of others (perceptions) to account for the value of her work. In this extract then, a previous biographical account and a negative version of herself are taken up to account for an original and well regarded skill. In such an account having 'little knowledge', while being able to integrate little bits of knowledge into something new and interesting, is presented as an advantage for interdisciplinary and innovative research. Moreover, by highlighting negative characteristics or self-mockery, she undermines self-aggrandisement, and thus she does not seem arrogant even though she describes herself as 'original, 'innovative' and knowledgeable in 'lots of stuff' (see Dyer and Keller-Cohen 2000).

Similar to Dr Graham, Dr Robins also rejects a position as specialist but emphasises her skills in making original connections across fields. In chapter 6, extract 25, Dr Robins drew on the dilemma of openness and rigour to account for the advantages and the disadvantages of being the only professor in *general psychology* (fictional discipline) in her department. Her account presented below is her response to my previous question, about the benefits of

moving from one university to another. She argued that while in her previous university she had a reputation as a specialist, in her current university she defined herself as a *general psychologist*, which brought her more opportunities. That narrative continues with the account reproduced here.

Extract 6

Dr Robins: More opportunities (.) I was able to join with people from archaeology, I was able to join with histo:rians, chemists so – You know, very quickly I was able to sort of establish myself not as somebody who would do a particular sort of *psychology* but as someone who would (.) link up with people across disciplines [C: mhm] So when I look at the sorts of – where I had links at the university and what made me stand out I think as a *psychologist* is I had links with people in politics in sociology in chemistry in the medical schoo:l ahh you know (.) so all wide (.) so I've worked in lots of – economics (.) so:: you know (.) quite routi::nely I would have papers with people (.) who are for example in the medical school (.) so I've published in *[prestigious medical journal]* (.) ahh on *X issue* with a *X* specialist (.) I've published in:: ahh the journal of *Y* (.) because I've worked with medics (.) I have published in (.) MAINSTREAM economics journals in *Z* theory but drawing on the sort of work I'm doing (.) So (.) but with people (.) not on my own but with people (.) we work together

(Female, professor, faculty of social sciences and university administrator)

In this extract Dr Robins stresses her identity as a *general psychologist* to emphasise her possibilities to 'join' with people from other disciplines, in contrast to the specialists of her department. Her position as a '*generalist*' is

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used here, curiously, not to emphasise a common characteristic but an unusual one, since that is what made her 'stand out' as a *psychologist*. It is worth noticing that Dr Robins also describes her publications in different discipline journals, including a prestigious medical journal as 'quite routine'. In that way, her collaborations across fields are not the work of a dilettante but the systematic and constant work of a world class researcher. When she describes the work published in a mainstream economics journal she emphasises that this publication drew on 'the sort of work' she does combined with a theory from economics, thus she highlights how she does contribute substantially to the paper's content. At the end of the extract she emphasises again that this work is not done on her own but with collaborators. Her interdisciplinary collaborative research is thus presented as an established routine, providing valuable input to frequent publications in prestigious core disciplinary journals. This account could be taken as a repertoire of evidence of Dr Robins' rigour and seriousness as a researcher, as well as her skills for making valuable connections across disciplines.

One may question how possible it is for a researcher to be fluent in *many* disciplinary languages, and Dr Robins' account could be challenged. Later on in the interview Dr Robins provided the following account.

Extract 7

Dr Robins   I also have worked with economists (.) and it was the first time of my life where we all spoke English quite well (.) but one person eventually had to act as an interpreter between me and the *[omitted]* - the the theoretical economist because we were speaking a completely different language (.) and you get these conversations over coffee

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where *[the interpreter]* will say so what Dr Robins is doing is this this and this (.) So we literally had an interpreter there but we were all speaking English (.) because we couldn't understand the language of the disciplines when we first got to know each other (.) So we had to learn a different language (.) And that's it it takes a lot of time to:: work out what it was that we were trying to say (.) And it worked in the end (.) but it took us more work to get to our final endpoint

(Female, professor, faculty of social sciences and university administrator)

Dr Robins describes an occasion in which she could not understand an interlocutor from a different discipline, theoretical economics, so a third person who understood the two speakers' disciplines had to work as an interpreter. In this account this third party is presented as being able to understand different disciplinary languages and also to translate one into the other. This is a particular skill for interdisciplinary research, but the narrative also adds to Dr Robins' description of herself. She argues that these conversations would occur 'over coffee', so these are presented as ordinary and part of her routine, rather than as an exceptional event that required earlier preparation. Furthermore, Dr Robins emphasises both that she and the economist had to learn 'a different language' and that this 'takes a lot of time' and 'work'. Thus, her narrative allows her to adopt a position as 'successful' in a challenging task by combining descriptions of mundane, routine events and others that take longer to develop, and by shifting from a non-capable to a capable position. Her narrative goes from a confusing and challenging start, to a successful conclusion. In the following extract Dr Reed, who claimed in chapter 6 (extract

25) that she is not a 'brilliant *social science specialist*' but neither a 'Proper *clinical scientist*', emphasises her particular skill as a translator.

Extract 8

Dr Reed: A:nd one of the things that I am really good at (.) what is really useful for us when I'm on the research team I'm always the *[social science specialist]* ahh I can expla:in the *[social science details]* to the other researchers (.) and a lot of them have said to me you know I've been on four or five projects with *[social scientists]* and this is the first time I understood it (.) so I know the – because I've got this boundary spanning you know I have a foot on both camps I'm able to explain the clinical stuff to the *[social scientists]* and the *[social science]* to the clinical people

(Female, professor, faculty of sciences)

In the extract presented in the previous chapter Dr Reed referred to herself as not a brilliant *social science specialist* (specialism omitted), however in the extract included here she defines herself as *the* specialist when she is among her clinical research collaborators. In that way, expertise acquires a relational dimension and positioning oneself as an expert depends on who the peers are. Among other social science specialists, Dr Reed may not identify herself as an expert, but the situation changes when she is with the clinical research collaborators. Her expertise in the social science specialism is more than that of the clinicians, but less than her peer social scientists. Thus, the meaning of expertise acquires sense from her relationship with her different groups of peers (Gergen 2009; Lynch 2004). In the subsequent lines Dr Reed validates her possession of 'translating' skills by ventriloquizing her collaborators' words, arguing that 'a lot of them' have said 'I've been on four or five projects

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with *social scientists* and this is the first time I understood it'. Thus, she first points out having such a specific skill and then a collaborator's account is used for corroborating her possession of such skill. So, both social scientists and clinical scientists use disciplinary jargon and she is able to translate between these jargons using ordinary language. One can imagine that is indeed a very rare skill.

This section has analysed the way researchers who adopted non-specialist expert positions in the interview then negotiated other forms of expertise required for interdisciplinary research. The following section explores accounts of interdisciplinary skills of interviewees who did position themselves as specialist experts.

7.3 Specialists as 'interdisciplinarily skilled'

In the previous section Dr Reed, Dr Robins and Dr Graham disclosed non-specialist positions and instead talked about their skills of connecting ideas in original ways and translating between different disciplines. This section, by contrast, focuses on the accounts of interviewees who emphasised their specialist positions and also described other skills they use in interdisciplinary research. The section also introduces an ideological dilemma I identified in my interviewees' talk, that I call the 'disciplinary tolerance and expert prejudice' dilemma. The section then shows how some interviewees tried to avoid this dilemma. In the following extract Dr Anderson shifts between expert and non-expert positions in order to account for her abilities in interdisciplinary research.

Extract 9

Dr Anderson: If if I'm working in the field that I'm working in (.) the relevant

disciplines are *anthropology [other discipline omitted]* and computer

science (.) Do I have to be an expert in all three? Well clearly the

answer is no I can't [C: mhm] So:: I think you always have to have (.)

a primary discipline and be expert in that discipline (.) but you can't

understand or talk to other people or work with them in other

disciplines unless you have quite a deep knowledge of that discipline

(.) the agendas the values ah the (.) you know philosophy of science

that comes with that discipline [C: yeah precisely] so (.) so you do

have to get under the skin (.) I I have to be able to think like a

computer scientist at times you know? And I've worked in big

projects where:: as *an anthropologist* I wanted to focus on producing

particular kinds of outputs but (.) those out – those kinds of outputs I

think don't mean the journals themselves but (.) what's the value as a

research finding [C: mhm] is not necessarily valued by my computer

science colleagues (.) they (.) are more interested in novel techniques

than (.) you know discoveries about *culture*

(Female, professor, faculty of science and university administrator)

In this extract Dr Anderson uses different discursive resources both to stress a specific disciplinary identity but also to present herself as capable of doing interdisciplinary research. She starts describing the three disciplines that are relevant in her interdisciplinary field, and then presents arguments in the form of well-established facts: first, it is impossible to be an expert in all disciplines; second, one has to have a primary discipline and be an expert in it; and third,

even though it is impossible to be an expert in all disciplines, 'deep knowledge' of another discipline is required for collaborating with members of that discipline.

Once having presented these facts, Dr Anderson is able to describe her skills and to construct herself according to what can and what cannot be expected from a researcher. In other words, her initial statements define how her account is to be understood. In the second half of the extract, her account 'I have to be able to think like a computer scientist' should be understood in the context of the disclaimer concerning 'full' expertise in computer science. She then positions herself 'as *an anthropologist*', clearly demarcating her area of expertise and distinguishing what is relevant from what is not relevant to her field. In the final portion of the extract, when she describes the mismatching interest of both fields, she reinforces her disciplinary identity but also her familiarity or experience in interdisciplinary research. Thus, these accounts follow her statements that a) one cannot be an expert in different disciplines, b) that one needs to be a specialist before collaborating with other fields, and c) one needs to 'get under the skin' of experts in a different discipline (computer science in her case).

These extracts might give the impression that interdisciplinary research does not in fact weaken disciplinary expertise and identity as much as strengthen them, as Centellas et al. (2013) would argue. It is also worth noticing that interdisciplinary research requires not only knowledge of another field, or interactional expertise, as Collins and Evans (2002, 2007) have suggested. It also depends on knowing what is valuable in the other discipline and on distinguishing clearly between different disciplinary commitments. Later in the

chapter I go back to such mismatches between disciplinary interests and describe a dilemma that these produce. In the following extract Dr Johnson also clearly emphasises an expert identity within a specific discipline, commitments to that discipline, and also accounts for his interdisciplinary skills. Dr Johnson is an engineer embedded in tissue engineering or regenerative medicine.

Extract 10

Carlos: And is it ahh easy or how do you develop the knowledge of the ahh well to be able to work with many biological parts (.) well how do you do that?

Dr Johnson: Well (.) brilliant it's brilliant (.) it's ahh (.) is a process of you read papers (.) you set off but you immerse yourself in opportunities to learn more (.) so for example in interdisciplinary discussions you ask questions (.) So somebody comes to you and says I want to do ahh I want to try to produce a replica of *[biological organism]* […] (.) and then you say well Ok but I don't understand you know (.) And then they talk about cell differentiation and you think yeah I know a little bit about stem cells and then you read something in New Scientist (.) you read a couple of papers and then you go back to them and sa:y alright! is this an example of stem cell niche? And they say yes:, and then you say can you explain the differentiation process and then they tell you (.) and then from talking to me as an engineer they appreciate that I need to know dimensions material specifications etcetera etcetera (.) So I'm obsessed with the logical detail (.) where they're more interested in the biological processes (.) yeah? So::

              […]

I've been - I got myself into a position where I've had about a year or a year and a half now of ahh you know *[learning a biology technique]* and understanding about different cells and signalling a::nd (.) I wouldn't say – I wouldn't say I could teach it to anyone but at least understand it enough to help ahh provide an interface and solution from engineering [C:alright] So (.) so it's been a kind of (.) it's been quite challenging but is very fascinating (.) a:nd and also at the same time it is important that you recognise yo:u're always delivering something back from engineering (.) so you're educating people about processes (.) about manufacturing processes about design about (.) the importance of underpinning (.) ahh about much as calculations but also mechanical property testing etcetera etcetera

(Male, lecturer, faculty of engineering)

In the first part of the extract Dr Johnson, an engineer, describes the procedure to develop skills to work with bioscientists. This procedure involves reading papers but also getting involved in opportunities to learn more and being willing to ask questions. It is interesting to recall the account Dr Truman provided in extract 3, in which she suggested that basic questions are welcome in interdisciplinary discussions and that, rather than 'stupid', these questions should be seen as a consequence of disciplinary differences. The dialogue Dr Johnson describes between himself and a colleague from biosciences is interesting because it might illustrate ideal characteristics of good interdisciplinary collaborators. Dr Johnson first adopts a position as non-knowledgeable but curious about his colleague's field and his colleague is depicted as willing to explain technical, perhaps basic, details. The colleagues, now in plural, are then described as able to understand Dr Johnson's

disciplinary needs ('from talking to me *as an engineer'*). Dr Johnson then attributes to himself what could be understood as a stereotypical characteristic of engineers ('I'm obsessed with the logical detail'), and also demarcates clearly between the interests of engineers and bioscientists. This 'vivid description' (Potter 1996b) resonates with Ku's (2012) description of interdisciplinary expertise, namely that 'one has to know how to use disciplinary identifiers cleverly to establish one's autonomy whilst simultaneously leaving sufficient interpretive flexibility in order to immerse oneself or engage others in forming collaborations for mutual benefit' (p. 370).

In the second part of the extract Dr Johnson describes having been involved for longer than one year in bioscientific bench work. However, he uses a disclaimer to specify he should not be seen as an expert in the technique *but* as having enough skills to contribute *from his specific area of expertise* ('I wouldn't say I could teach it to anyone but at least understand it enough to help ahh provide an interface and solution from engineering'). He then describes the process as challenging but also as fascinating, which brings to mind Castán Broto and collaborators' (2009) argument that 'if people combine knowledge and have a certain quality of mind and personality they will enjoy conducting interdisciplinary research despite, and because of, its challenges' (p. 928). In this thesis, the point is not that such traits exist, but that these are constructed and attributed to oneself in discourse. Finally, in the extract Dr Johnson reinforces his disciplinary identity, arguing he is also educating people about engineering. With this account he avoids being perceived as not having a clear disciplinary identity, as not being serious or not contributing back to his discipline (Pilnick 2013; Rodgers et al. 2003). Thus, Dr Johnson

presents an interdisciplinary identity that does not exclude a strong disciplinary expert identity.

Although it is possible to present oneself at the same time as a specialist expert and as having skills required for interdisciplinarity, a number of interviewees faced an ideological dilemma while intending to negotiate such position. This dilemma is presented below.

7.3.1 The ideological dilemma of disciplinary tolerance and expert prejudice

In the previous chapter an ideological dilemma, emerging from the tension between being 'open' to different disciplines and preserving disciplinary rigour, was presented. This section introduces another dilemma I identified in the interviewees' talk, which emerges from the contradiction between claiming tolerance of disciplinary differences and making judgements against other disciplines, drawing on one's own disciplinary values. While researchers claim they appreciate other disciplines' methods, theories and points of view, they may also present restrictions based on their disciplinary commitments, thus including some intolerance within broader expressions of tolerance. I was able to formulate this dilemma drawing on a combination of two ideological dilemmas previously suggested by Billig et al. (1988). They, firstly, argue that it is problematic to claim expertise in an environment that supports egalitarian values; and, secondly, that claims of tolerance may involve prejudice. Put in a different way, there is ambivalence both in claims of tolerance and in claims of equality. These ambivalences come together in the case of interdisciplinarity. It is worth explaining in more detail Billig and collaborators' dilemmas before illustrating the dilemma I suggest.

Billig et al. (1988) suggest that 'there is a tension between egalitarian and inegalitarian, liberal and authoritarian forces in the practice of expertise' (p. 79). Since modern democratic societies idealise equality, positioning oneself as an expert is problematic. Billig et al. (1988) note that in teams that claim to treat all of its members equally, 'if the expert is too direct in giving orders, there may be a reaction' however 'if commands are phrased too hesitantly as questions, the questioner may elicit in response a factual answer rather than a compliant action' (p. 70). Furthermore, 'if the expert is too friendly the claim of expertise is endangered, whereas too much technical expertise threatens the friendliness' (Billig et al. 1988:77). Thus, both positions, as expert or as equal might be problematic. According to Chi (2006), a limitation of experts is that they have difficulties in adapting to values that differ from those deemed as acceptable within their domains. Friman (2010) suggests that disciplines establish their knowledge as superior to other ways of knowledge, and disciplines discipline their disciples (Barry and Born 2013) in order to protect such superiority. If they abandon those claims of superiority then their expertise would not be special anymore. As Billig et al. (1988) argue, if a form of expertise is too ordinary, or too ubiquitous as Collins and Evans (2007) would say, then it loses relevance and cannot claim authority. This all means, when involved in interdisciplinarity, experts are expected to simultaneously see other disciplinary experts as equals and to defend the authority of their own areas of expertise.

Regarding the dilemma of tolerance and prejudice Billig et al. (1988) note that:

> The dialectic of prejudice is not a simple one, but includes contrary themes. We find the concept of prejudice being used in a way that simultaneously

claims a rationality for the speaker, by criticizing the irrational prejudices of
others, and that permits the expression of discriminatory views against other
groups (p. 5).

A key component of the dilemma Billig et al. discuss is the contrast between
'reasonable' and 'unreasonable' prejudice. They point out that 'those who deny
their own prejudice need, implicitly or explicitly, to envisage a boundary
between their own unprejudiced selves and the prejudiced bigot' (Billig et al.
1988:115). Moreover, they also suggest that the concepts of 'prejudice' and
'equality' are related to each other. The unprejudiced or tolerant individual
treats all people equally, claiming that it is the prejudiced one who 'show[s] an
unequal, and unjustifiably unequal, bias against certain others' (Billig et al.
1988:119).

As both interviewees and the literature (Buanes and Jentoft 2009; Giri 2002;
Miller et al. 2008; Romm 1998) suggest, in order to make interdisciplinary
collaborations work, researchers have to tolerate disciplines, methodologies
and forms of expertise different from their home discipline's and, further, these
have to be perceived as equal as, and no less important, than their own. If
individuals want to express intolerant views about other disciplines, these have
to appear rational and justifiable, in order to avoid being positioned as
irrationally prejudiced. The dilemma of 'disciplinary tolerance and expert
prejudice' arises because researchers may draw on their own disciplines and
expertise to appear rational, but if they do so, they present their expertise as
having a dominant status, and thus they appear to be simultaneously non-
egalitarian and intolerant. In other words, the dilemma can be identified in
accounts that are simultaneously egalitarian and authoritarian, tolerant and

intolerant, towards other disciplines and forms of expertise. In terms of the interpretative repertoire of 'disciplines as restricted/restrictive', presented in chapter 5, the dilemma arises because, at times, researchers may describe their disciplines as restricted or limited, emphasising the need for interdisciplinarity. However, at other times other disciplines are presented as the limited and flawed ones, thus the openness to other disciplines is abandoned.

This dilemma is illustrated in the extracts analysed below. In the first Dr Lindsay elaborates after responding negatively to my question 'have your views of interdisciplinarity changed during your career?' She describes her opinions about multiple disciplines' applications of a particular social theory crucial in her career. It is worth to recall that Dr Lindsay is an economist who claims being more open to qualitative research than other economists.

Extract 11

Dr Lindsay: I viewed a lot of what was being done with a – a great deal of scepticism (.) Ahh on the whole I guess I was more sceptical of the stuff outside my discipline [C: mhm] than the stuff inside (.) Ahh (.) but I think that's to do with disciplinary traditions (.) I mean economics is ahh puts very high value on deductive research [C: mhm] A::nd ah that restricts you –stops you kind of going into the:: *[qualitative research approaches omitted]* I:: vie::wed the work I was seeing fro:m another social scientists with a degree of scepticism (.) some was great (.) some I didn't value [C:mhm] (.) and I guess (.) that process of discrimination if you like (.) or or being discerning (.) has informed who I've collaborated with in other disciplines a::nd ah it's still very much with me (.) I'm I'm interested in:: a scientific approach [C:mhm] to:: these issues [C:mhm] A::nd so I don't – I

don't mind what discipline somebody comes from but they –I'm I'm
un –I'm likely only to read their work frequently and collaborate with
them if the:y (.) adhere to the same values as I do (.) Really (.) Yeah

(Female, associate professor, faculty of social sciences)

The first thing to note in this extract is that it is difficult to assess whether Dr
Lindsay is or is not open and tolerant of other disciplinary approaches. She
describes scepticism on her part but also how she has worked with people from
other disciplines; she argues she does not mind what the discipline of potential
collaborators is but also that she only collaborates if they 'adhere' to 'the same
values' as she does. Curiously, Dr Lindsay presents her scepticism towards
work from other disciplines as a consequence of her disciplinary tradition, as
an impersonal rather than a personal or private characteristic. With this, rather
than an irrational prejudice, she provides a 'rational' explanation for her
scepticism. It is also worth noticing that in this extract she describes her
discipline, economics, as restrictive of the research approaches one may adopt,
but at the same time she embodies such restrictive characteristic when she
expresses adherence to specific values, meaning probably epistemic or
methodological values. It is worth bearing in mind that in extract 28 in chapter
6 (see p. 198) she positioned herself clearly as an economist, distancing herself
from researchers who identify themselves as 'intrinsically interdisciplinary'.
Furthermore, in chapter 5, extract 19 (see p. 154) she argued that
interdisciplinarity is many times a 'refuge' for people who do not satisfy the
rigour expected in their own disciplines. Because of these reasons Dr
Lindsay's accounts can be interpreted as protecting herself from appearing to
be a non-rigorous interdisciplinary researcher.

In the following extract Dr Taylor provides an account which could be taken equally as tolerant and intolerant of disciplinary differences.

Extract 12

Dr Taylor: I think most of the people I know would have a – if they – most of them have mercifully never had any expe – experience or exposure to this stuff like postmodern science (.) but I think (.) I think their view would be:: as disdainful a:nd scornful as mine is [C: mhm] ahh (.) and that sounds horribly arrogant (.) doesn't it [C: (laughs)] I think (.) you know (.) sometimes (.) ahh well Ok (.) I'm only:: critical of what they've done where:: it intersects with what I know about [C: mhm] right (.) And where that intersection leads me to think that what they are writing is rubbish (.) then I don't fee:l any ahh (.) I don't mind saying so (.) No – you know, I'm not a philosopher [C: mhm] ahh (.) but if a philosopher writes about ahh science that I know about (.) I'm thinking in particular about a paper that I read about *quantum theory* where they wrote (.) you know (.) I feel I'm (.) they've (.) ahh come into my territory (.) I can:: make a comment about it

[…]

I'm happy – I mean I'm I must sound a bit negative when (.) you get me (.) talking about things that (.) upset me (laughs) but ah mostly I'm I'm not an:: you know (.) I can appreciate the value of what other people do [C: mhm] and appreciate that I'm not in the position to:: criticise it [C: mhm] well (.) rather than a position just to ah ah learn what they're doing an::d you know ahh appreciate it has value

(Male, professor, faculty of science)

As with the previous extract, it is difficult to say straightforwardly whether Dr Taylor positions himself as tolerant or intolerant of other disciplines. In the first part of the extract Dr Taylor is quite open about his negativity and what it means for his self-presentation, arguing he might sound 'horribly arrogant' because of his 'disdainful and scornful' views. However, he justifies this position and argues that he 'doesn't mind saying so'. He argues that other scientific colleagues would agree with him, and that way his opinion appears as a general one rather than a personal one, as more objective than subjective. However, it is also a personal opinion because it 'upsets' him. Moreover, in order to lessen the negative of such a troubled position he presents his opinion as a particular case and then argues that he can appreciate the value of what people from other disciplines do, as long as it has nothing to do with his area of expertise.

It is also worth noticing that Dr Taylor describes science, and one theory in particular, *quantum* theory, as his 'territory'. This metaphor implies that both science and this particular theory are exclusive and closed to non-scientists. One can almost imagine a sign at the entrance to this territory indicating that *trespassers will be prosecuted*. Nevertheless, the theory he refers to is relevant to many areas of research, and not all these fields are necessarily part of Dr Taylor's territory. Since Dr Taylor allows himself to argue about this theory, but prohibits philosophers from doing likewise, he assigns more epistemic authority to science than to philosophy. Thus, his opinion is not an egalitarian one, as interdisciplinary research might require. His criticism of such philosophical work is not compatible with his final argument that he is in a position to learn from the work of others and appreciate it has value. One could

argue that perhaps he considers the work he describes as 'rubbish' because he does not understand it. A practical difficulty in interdisciplinary research is to decide when to defend one's discipline and when to learn from others in cases in which different discipline's contents are incompatible. In the following extract Dr Walsh also presents an ambivalent account, equally tolerant and prejudiced.

Extract 13

Dr Walsh: I suppose is to be able to have some intellectual flexibility and certainly openness:: you have to be op – you know open to (.) ideas from other disciplines (.) ahh and the language which sometimes is a bit ahh difficult *[inaudible]* (.) stupid in some cases (.) I I have strong feelings about cultural studies although I am a *[cultural branch of a discipline scholar]*

[…]

And I think that most ahh historians sociologists anthropologists (.) however theoretical inclined they are I would agree with that (.) you know (.) if you're studying society you – it is society that you study (.) whereas in modern languages and cultural studies even though what we do is – or what I do is exactly the same as visual culture and literary studies and film studies (.) I do a lot of film – and everything – I a::lways contextualise (.) and I get really pissed off when people are not interested in anything outside the text itself (.) So there's there's a line to this interdisciplinarity [C: oh that's brilliant] Yeah so interdisciplinarity doesn't mean universality does it?

(Male, associate professor, faculty of arts)

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As shown in extract 18 in chapter 6 (see p. 186), Dr Walsh described himself as having 'always' been interested in many disciplines but as 'always' having considered himself as an *anthropologist* (fictional disciplinary identity). In this extract Dr Walsh describes qualities required for interdisciplinary research, such as 'intellectual flexibility' and 'openness'. However, he also emphasises limitations to his own openness and flexibility saying he gets 'really pissed off' when disciplines fail to 'contextualise', a feature of his own discipline which he holds in high regard. Such an extreme feeling for other disciplines may question if he certainly has some openness and intellectual flexibility or if his engagement to such disciplines is only superficial.

It is worth emphasising that the purpose of this analysis is not to question the accuracy of interviewees' accounts but to illustrate that researchers intending to engage in interdisciplinary research may face dilemmas produced by contradictory value systems, on the one hand openness and tolerance towards other disciplines, and on the other hand engagement with one's home discipline's highest standards of quality. Moreover, judgements are not made on the quality or virtue of the interviewees. Instead, it has to be acknowledged that even if researchers do as well as they can they are pushed and pulled in different directions by different and contradictory discourses. The extracts analysed in this section illustrate that individuals' attitudes towards other disciplines and therefore towards interdisciplinary research are not so easy to define. This is because there are complex decisions to be made, and there are exceptions and limitations in the extent to which researchers are open to and tolerant towards disciplinary differences. This dilemma is something important to bear in mind, besides the more acknowledged need of understanding other

disciplines language and content. Collins and Evans' 'interactional expertise', for example, does not explain how dilemmas can be overcome.

The dilemma presented here also illustrates a contradiction in what Balsamo and Mitcham (2010) claim to be the virtues of interdisciplinarity. As noted in section 3.2.4, these virtues include intellectual generosity, intellectual confidence, intellectual humility, intellectual flexibility and intellectual integrity. When practicing interdisciplinarity contradictions may emerge between intellectual confidence, 'a belief that one has something important to contribute', intellectual flexibility 'the ability to change one's perspective […] based on new insights from others', and intellectual humility, 'a recognition that one's knowledge is partial, incomplete and can always be extended and revised' (Balsamo and Mitcham 2010:270). The dilemma occurs because individuals are supposed to be simultaneously confident in their own knowledge and recognise its partiality, be confident of what they know but also change their perspective. The skill of managing such dilemma, or at least being aware of these, can be suggested as a core aspect of interdisciplinary expertise, but this dilemma is overlooked in the literature. Some of my interviewees were skilful – at least in the context of the interviews – to get around the dilemmas presented here. Their accounts are presented in the following subsection.

7.3.2 A way around the dilemma

The extracts below illustrate arguments used by interviewees to avoid or to go around, at least partially, the dilemma of disciplinary tolerance and expert prejudice. At the same time, the following extracts might illustrate Miller and collaborators' (2008) notion of 'epistemological pluralism', which indicates

that 'in any given research context, there may be several valuable ways of knowing, and [...] accommodating this plurality can lead to more successful integrated study' (p. 1).

Extract 14

Dr Anderson: I've worked with this guy for many years now and we are quite good friends [C: mhm] ahh (.) and I thoroughly enjoy our conversations because I kno::w – I understand where he's coming from and (.) and I feel – well he's not gonna change my mind about the way I do my research but I can see the value in the way he does his research

(Female, professor, faculty of science and university administrator)

Extract 15

Dr DePaul: So not everything that I hear from psychologists or other people do I accept as a truth (.) I I accept them as contributions to my knowledge which may help my understanding and interpretation (.) but they don't crowd out or knock out my own understandings

(Male, professor, faculty of social sciences and university administrator)

Dr Anderson and Dr DePaul were more ingenious than the interviewees presented in the previous section to position themselves as specialists and tolerant of other disciplines. In extract 14 Dr Anderson describes a colleague whose research approach differs from her own, but she argues that she is able to work with him regardless of their differences. Later in the interview she said they were about to publish a chapter in a book of research methods, and through such an account Dr Anderson can be seen as adopting a 'intellectually flexible' position, in fact so intellectually flexible that she is even able to produce joint publications despite the different perspectives of his colleague. The case of Dr DePaul is similar. However, these strategies are only partial,

since the dilemma may appear again and again in other situations and researchers may struggle to decide when to value other disciplines' input and when not to do so.

Besides the skill to manage the dilemma of disciplinary tolerance and expert prejudice, and the dilemma of openness and rigour, other skills that may constitute interdisciplinary expertise are discussed in the following section, namely that of identifying what is success or what is appreciated in disciplines other than one's own.

7.4 Identifying mismatching interests across individuals and disciplines

Different disciplines have different ways of working, different bodies of knowledge, different languages, different machineries of knowledge production, as Knorr-Cetina (1999) would say, but disciplines also establish different intellectual and professional interests (Abbott 2001). As Dr Anderson argued in extract 9, her computer science collaborators are more interested in 'novel techniques', not in the questions about *culture* (fictional interest) she is interested in. Similarly, in extract 10 Dr Johnson, an engineer, argued that he was more interested in the technical detail while his collaborators were more interested in the biological process. Aligning individual, collective and institutional interests is required for interdisciplinary success and for preserving both group and individual's identity and sense of self (Mansilla et al. 2012). In this section I analyse accounts provided by my interviewees about being aware of and dealing with the different interests of collaborators but also of funding institutions. These accounts illustrate other skills that are required to

negotiate a position as expert in interdisciplinary research. This section also introduces a third ideological dilemma, produced by the tension between individualism and collectivism.

The following extract illustrates a brief passage of the interview with Dr McCarty, at that time one of the managers of a research institute which brings together engineers, biologists, computer scientists and mathematicians[18]. Prior to the exchange included in the extract, below, Dr McCarty was addressing my question 'can you think of other issues involved in multidisciplinary work?' His response was about the need for good communication between the different project managers.

Extract 16

Dr McCarty: there's a period for the managers to start [inaudible] to understand each other's discipline a bit more (.) then it was much about understanding the different cultures in the different disciplines a:nd (.) what is it? The different ahh working sty:les and then the metrics of esteem so ahh (.)

Carlos: What is this (.) the metrics of esteem?

Dr McCarty: Well (.) so (.) what would be the hallmark of (.) someone being ahh ahh an accomplished mathematician [C: Oh alright mhm] a::nd that could be some – that would be being awarded some particular prize (.) ahh (.) [C: and that would be the::] whereas in ahh I suppose in engineering it would be landing a particular lucrative contract with a company (.) ahh (.) s::o ahh and then in biology it's publishing the

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[18] Earlier in the interview Dr McCarty noted that he uses the terms multi- and interdisciplinarity interchangeably.

papers in particular journals that are (.) where the papers are cited very highly (.)

Carlos: And what would it be for a multidisciplinary person?

                […]

Dr McCarty: is really SUPERB that one of our mathematicians ahh went to a *[omitted]* biology meeting in *Bath* last year (.) and people in the audience didn't know she was a mathematician (.) because she used a biological language in precisely the right way a:nd when questions were asked she knew what they were talking about a:nd (.)[C: alright] and then I knew that (.) I've done my job properly

                              (Male, professor, faculty of sciences and administrator)

Dr McCarty describes relevant dimensions of what it is to get to know other disciplinary cultures, which are relevant for interdisciplinary research project managers. Collins and Evans' (Collins and Evans 2002, 2007) notion of 'referred expertise' implies that managers may not be experts in all the different specialist areas involved in a large project, but that their expertise in one field makes them aware of what it takes to be an expert in other fields. In a different way, Dr McCarty explains a dimension other than different disciplines' 'working styles', that managers (and possibly all research collaborators) should be aware of, namely the 'metrics of esteem' or the 'hallmarks' of accomplishment of different disciplinary cultures (Knorr-Cetina 1999). After my question of what he means by 'metrics of esteem' he describes different outcomes that are well regarded in different disciplines. Such awareness of differences between disciplines' professional aims is important for managers, and for collaborators in general, because such potential

outcomes are part of the negotiating and designing a project, and setting up its aims and objectives. Moreover, Dr McCarty's account emphasises that researchers involved in interdisciplinary projects do not relinquish their disciplinary commitments. The following subsection introduces a dilemma that researchers have to sort out, since there can be mismatches between their disciplinary commitments and those of the interdisciplinary projects they contribute to. But first, however, it is relevant to focus on the last part of the extract.

I asked Dr McCarthy what the 'metrics of esteem' would be in the case of multidisciplinary researchers. A large section of his response, not included in the extract, explained the need to find outputs that fit different discipline's criteria of success. In the section included in the extract (starting at 'is really superb') Dr McCarty provides a narrative which illustrates his own sense of accomplishment. In such narrative he positions himself as an accomplished and skilful interdisciplinary project manager because project participants have become proficient in other disciplinary languages. In such a narrative different selves are constructed: the meeting's audience is constructed as not 'aware' of the 'real' disciplinary identity of the presenter, the presenter is constructed as an 'interactional expert' (Collins and Evans 2002, 2007), and such an identity is corroborated by the convinced audience; and, finally, by constructing multiple others he can attribute recognition to himself.

The accuracy of the narrative is not important here; it does not matter if such a meeting took place, or whether the audience was truly convinced by the presenter's proficiency. From a discursive analytical perspective, it is (simply) important to notice how identities or positions as successful interdisciplinary

experts are accomplished in talk, by constructing versions of selves, cognition, events and reality (Edwards 1999; Potter and Wetherell 1987). Being aware of different disciplinary interests is required, but there also has to be awareness that collective and individual identities are not so easy to reconcile, and on occasion researchers may face a dilemma between following individualist or collectivist values. The following section discusses this dilemma.

7.4.1 The ideological dilemma of individualism and collectivism

As noted in chapter 2, interdisciplinary research is not necessarily collaborative (Calvert 2011; Klein 2010), although on many occasions it is. The dilemma of individualism and collectivism, however, is not limited to interdisciplinarity (e.g. Towns and Adams 2009). The dilemma may be inherent to all collaborative endeavours because, although collaborative efforts are often necessary, in contemporary academic life there is a culture of assessment that prioritises individual outputs (Billig 2013; Strathern 2000). Before analysing the interview extracts it is important to describe the place of individualism in modern society, which also reveals the importance of ideologies of collectivism.

As Billig et al. (1988) suggest, individualism is the main principle of modern capitalist societies. Individualism can be defined as 'a set of social theories whose distinguishing feature is the insistence on the social priority of the individual vis-à-vis the State, the established Church, social classes […] or other social groups' (Abercrombie, 1980, p. 56, in Billig et al., 1988, p. 34). According to Burkitt (2009) the ideals of freedom, liberty and individual autonomy are important because they can 'prevent us from submitting to

authorities that crave too much power, seeking to subjugate free people' (p. 2). However, Burkitt and Billig et al. point out that individualism has limitations, since it can be manifested in extreme forms such as 'self-contained individualism' or 'utilitarian individualism' (Gergen 2009). Burkitt (2009) observes that classic sociologist Durkheim was already aware of those dangers, because individualism 'can put the collective consciousness under strain' (p. 19). In a similar way Billig et al. (1988) note that 'the philosophy of individualism needs its structures against selfishness and lack of social responsibility' (p. 35). So, even though individualism is pervasive in modern society, collectivism is not dead. It can also be noticed that individualism is dilemmatic: it involves contradictory themes and also it is in conflict with the ideology of collectivism.

Researchers who have the chance to engage in collaboration with people from other disciplines may encounter tension between doing what is interesting and appealing to them and what collaborators and at times funders expect from them (Balmer et al. 2012; Calvert and Martin 2009; Rabinow and Bennett 2012). Their individual interests may be shaped by their disciplinary fields and by which they are evaluated in their institutions of affiliation. In contrast, their departments may not reward their interdisciplinary collaborative work. These two situations potentially lead the researcher towards troubled positions: if researchers are too individualistic, they can be perceived as selfish, but if they are too collectivistic, they fail to protect their own interests, and they can be considered as 'pets' rather than 'peers' (Clark et al. 2011) or merely as service providers (Barry and Born 2013). Yet, it is worth bearing in mind that, as Garforth and Kerr (2011) note, disciplinary and interdisciplinary work bring

different types of symbolic capital to researchers depending on the type of institution they work within. The dilemma of individualism and collectivism can be identified in the extracts analysed below.

Extract 17

Dr Young: Invariably the people that came to knock at my door wanted me to help them with the *chemical* analysis of the data (.) which is not really what I do ahh ahh you know not really what I want to do for my research (.) But sometimes – you know I'm a *chemist* and I have enough skill sets to help them a little bit or put them in the right direction (.) So quite often what happened is they knocked on my door and asked me to help and I would say – I wouldn't tell them that I really didn't want to help with their data analysis so I would help them a little bit and then talk to them about you know modelling (.) which is really what I wanted to do and and that worked well for me a couple of times

(Male, professor, faculty of science)

In this extract Dr Young struggles with the dilemma produced by individualist and collectivist ideologies, and he can be seen to be adopting both collectivistic and individualistic positions: collectivistic because he describes himself as willing to help colleagues who request it, but individualistic because he notes that he is asked to help with problems that are not part of his intellectual interests; collectivistic because he argues he helps 'a little' regardless of not being so interested, but individualistic because he tries to turn the collaboration closer to his own interests. Thus, two contradictory positions can be identified in his account. Although Dr Young's account can be understood as a way to avoid the dilemma in a satisfactory way, he can also be

seen as being aware of the problem of appearing either too individualistic or too collectivistic. In practice, however, it may be more complicated to help others 'a little' with the hope of changing their approach towards something more relevant to one's own research. The skill of identifying other disciplines' 'metrics of esteem' as Dr McCarty calls them, might have to be complemented by the skill of negotiating and aligning individual and group interests. However, it is possible that in different collaborations, or even at different stages of a collaborative project, the dilemma may manifest itself in a different form. While Dr Young is able to articulate a story of success, in the following extracts Dr Lawson tells a story that shows how difficult it sometimes is to reconcile individualist and collectivist ideologies.

Extract 18

Dr Lawson: it's often been the case in the *[project name omitted]* where we've had to think long and hard about whether or not we're selling (.) out our discipline so to speak […] by doing what they want us to do (.) And so there's there's been a little bit of conflict and tension there so we've been trying to negotiate that path through (.) so that we deliver what they want us to deliver but (.) but it also has meaning for us

[Later in the interview]

Dr Lawson: So I've certainly got to the point now where (.) when I'm approached by colleagues in science and engineering I kind of say Ok well (.) this is what I'm comfortable doing and this is what I'm not comfortable doing if you want me to do that (.) bad luck not interested in doing it see you later (.) So it's just like laying it on the line I'm not interested in being a take on (.) bit of social science wi:th – we have no

interaction and I just come at the end a:nd look at what you've done

and put some sort of social spin on it (.) not interested in doing that (.)

(Female, lecturer, faculty of social sciences)

In these extracts, which represent different moments of the interview, Dr Lawson describes the challenges that emerge when some see her discipline as a service provider for other disciplines (Nerlich 2012; Pilnick 2013). Dr Lawson can be seen as shifting between different positions along the extracts. While in the first extract she adopts a challenged position, in the second extract she positions herself in a more defensive way. She also deals differently with the dilemma between individualism and collectivism. In the first extract she emphasises both willingness to deliver what collaborators want them to deliver, and also the imperative of doing something valuable from her own discipline's perspective. She emphasises there is 'tension' and 'conflict' in negotiating what her role and the role of her colleagues will be within that project. It is not that individual and collective interests are necessarily mutually exclusive, but aligning those interests is not entirely straightforward. The main challenge in the extract is on the degree of collectivism, since too much involvement to the group's expectations of her and her discipline would imply, to Dr Lawson, 'selling out' her discipline.

In the second extract, by contrast, her individual interests are emphasised, probably as a consequence of the case she described earlier, in which her discipline might seem to be in a service-subordination mode of interdisciplinarity (Barry and Born 2013). The first project can be seen as a learning opportunity, and drawing on it in the second extract Dr Lawson can position herself as more experienced and confident in getting or not getting

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involved in other interdisciplinary collaborative projects. One can argue that the case Dr Lawson describes at the end of the second extract, in which social scientists have no interaction with the 'main' project, so to speak, and instead are just providing a social science 'spin' is not a case of authentic interdisciplinarity. The extracts also illustrate the troubled positions of other collaborators. If they define Dr Lawson's role without taking into account her disciplinary commitments, then they are being too individualistic, which is not a welcome position in interdisciplinary research.

Dr Young and Dr Lawson describe situations in which one can identify the dilemma of individualism and collectivism. The case of Dr Reed presented below is more complex, since it has to do with the department she is based in. While she presents her situation as professionally convenient, it is not so intellectually rewarding.

Extract 19

Dr Reed: part of me thinks I might end up leaving the school of *health sciences* and going into an *[social science]* group because I find very – is very hard to be seen as the expert which I am here (.) when I know that - I don't feel I am (.) so I don't feel like I le:arn as much about *[social science field]* because I spend so much time teaching it to everybody else [C: ha alright] either in my research team or my PhD students (.) ahh and so I feel that I would've – I I feel that my research would be better quality if I was in a *[social science group]* (.) But then I may not have had as many opportunities as I have had because I've been in a school of *health sciences*

(Female, professor, faculty of sciences)

In this extract Dr Reed uses a variety of discursive resources to describe what I call the individualism and collectivism dilemma. It is worth bearing in mind that Dr Reed went from being a clinical professional to a specialist area of the social sciences, but then developed her career in different health sciences departments and working among teams of clinical professionals. In the extract, she argues she may leave her current school and go to one where she could find specialists in her own area. She describes being in a different school as a disadvantage, because instead of developing further her own specialist expertise, she has to invest most of her time teaching the basics of social research to non-social scientists, that is, she has to put collective interests ahead of her own. It is worth noting that she describes her position as expert in a relational way: within her school she is perceived as an expert and a specialist, while she might not describe herself as such in other contexts. Thus, Dr Reed describes her expert position as challenged because of the disadvantage to develop her specialist expertise in a department alien to her discipline, and also because she is expected to prioritise collective rather than collective interests. It is relevant, then, noticing that a connection between the dilemma of individualism and collectivism, and the dilemma of openness and rigour (presented in chapter 6), can be identified. As Dr Reed's openness to work with the *health sciences* requires her to invest much of her time sharing her knowledge to others – this is, emphasising a collectivist ideology –, the rigour to which she can further her own specialist expertise is limited, and with that her chances to focus on her individual interests decrease.

At the end of the extract, Dr Reed emphasises how dilemmatic her situation is: in a different department her research would have more specialist quality;

however, in that case she would perhaps miss the opportunities open to her because of being located in a school of *health sciences.* This situation echoes Gartforth and Kerr (2011) findings, namely that disciplinary and interdisciplinary research bring about different types of symbolic capital.

So far this section has focused on the relevance of being aware of, and negotiating interests of single individuals and peers. The following subsection explores briefly the awareness of acknowledging and managing funders' interests. This skill might also be suggested as a component of interdisciplinary expertise.

7.4.1 Understanding research funders' interests

As Castán Broto et al. (2009) note, the way interdisciplinarity is perceived and practiced is shaped by institutional contexts, including research organisations and funding agencies. In a similar way, Mansilla et al. (2012) suggest that funding practices 'crucially shape intellectual enterprises, group culture, and working styles of interdisciplinary collaborations' (p. 16). While researchers might generally be familiar with the protocols of the traditional funding bodies of their disciplines, interdisciplinary research implies they have to frame their research in a way that satisfies other funding bodies' expectations. This suggests that being familiar with the 'languages' of different funding bodies is as necessary to interdisciplinary research as it is to be familiar with the 'language' of collaborators. Thus, interdisciplinary expertise might involve a skill of identifying and addressing research funders' interests. This is illustrated in the extracts below.

Extract 20

Dr Blanc   when things start growing is not just like a small collaboration for a
              paper but you want to put a grant (.) and then parts need to ahh be
              much more clear about ahh well for this council we need to focus on
              this (.) for the other council we need to focus on that (.) so and ah at
              the other part (.) understa:nd ahh what are the constraints of each
              council and it's full of funding and all that expectations and it has to
              be very clear for the parts what role each takes and what can you
              achieve with that (.) and that's something that with practice (.) with
              planning (.) you learn to do

                                                        (Male, lecturer, faculty of sciences)

Extract 21

Dr Lawson   it's very much the case of thinking what they're looking for and
              writing your proposal in such a way that makes them think that
              they're getting (.) what they're looking for (.) and it does come down
              to words and the language is impo:rtant so things particularly as a
              social scientist there are certain wo:rds that I don't feel comfortable
              with or terms

                                                   (Female, lecturer, faculty of social sciences)

In extract 20 Dr Blanc makes a distinction between the skills required for
smaller and larger interdisciplinary collaborations. While small collaborations
may require only that collaborators understand each other's ways of working,
larger collaborations involve more serious negotiations between collaborators,
and familiarity with different research councils' interests is required. It is
interesting that Dr Blanc points out that with practice and planning one can
'learn' those skills, and this implies that awareness of institutional constraints

can be seen as a sort of specialist knowledge that can be acquired. In the case of Dr Lawson, in extract 21 she describes in a more problematic way the relationship with funding bodies which seek out collaboration with social scientists but don't value them. In this case, science and engineering funding bodies may not be as familiar with, or appreciative of, social sciences' terminology, aims and capacities as true collaboration would require. Thus, researchers may find dilemmas when trying to align incompatible disciplinary commitments and funding bodies' commitments.

Before presenting some conclusions for the chapter it is worth analysing the accounts of one interviewee, in which a number of discursive resources introduced so far in the analysis chapters can be identified.

7.5 Negotiating multiple skills in discourse

As noted in chapter 3, Hartelius' (2011) suggests that expertise is 'negotiated as a function of the rhetorical situation, its participants, and its constraints' (p. 3), and that such negotiation involves both substantial knowledge but also recognition and attribution of an identity. It was also noted that Majdik and Keith (2011a, 2011b) suggest that expertise is not limited to knowledge but that in order to count as experts, individuals have to be able to 'make a case for a particular definition of problem or solution ' (Majdik and Keith 2011a:374), satisfying various normative contexts. Therefore, expertise is argumentative and involves making the case for different dimensions of a problem. In this chapter, it was noted that interviewees negotiated expert identities by claiming to have skills such as translating between disciplinary languages, making original connections, negotiating between individual and group interests, and

managing the dilemma between defending their discipline and seeing it as limited, restricted or restrictive. Moreover, interviewees also negotiated between being open to other disciplines without failing to satisfy disciplinary commitments. In the following extracts Dr Miranda provides an account of the different dimensions that have to be negotiated in interdisciplinary collaborations. His arguments also allow him to construct himself both as an expert in disciplinary and interdisciplinary research. He is a computer scientist who has collaborated with people from different fields, including engineering and life sciences.

Extract 22

Carlos: Oh alright that's (.) that's very good (.) Ahh yeah (.) and are there ahh maybe some challenges to the (.) do you have (.) that one can face when doing this kind of work

Dr Miranda: It can take a lot (.) of energy (.) it can take a while to:: to get (.) Ok, from my – from MY sort of stuff ahh a big challenge is ahh not becoming the the other discipline's IT person Ok (.) so you have to be a little selective (.) there are l – I do back away from projects in which there is no benefit in terms of computer science stuff (.) right? So if someone rings me up and says I want to ahh measure the length of that panel on that table (.) I will write back to them and say there are a bunch of techniques you can try (.) look at these papers (.) yea:::h I only really want to get involved in things that are challenging

[…]

Ahh the other difficulty is (.) is a linguistic one (.) is partly linguistic [C: Ok] partly at the level of understanding (.) so getting to a point where each discipline understan::ds what each other can and can't do

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(.) It takes a while (.) So we found that it was a good idea to break first rule and (.) do something for the *palaeontologists* early on that had very little value to us (.) but they got us into showing them what we could and couldn't do (.) and we did – we did a few things and (.) we ex- got to know the people [C: mhm] right? And I think that's something that I would do again (.) yeah? (.) So you have to be clear about what your aims are and what everybody's aims are (.) you have to get to understand each other (.) sometimes that means doing a little bit of loss leaking research

(Male, professor, faculty of science)

Several observations can be made about this large extract. The main element to note is that Dr Miranda describes two different skills. The first part of the extract is about being able to protect one's own professional identity and one's own interests. In the second part of the extract he emphasises the importance of understanding the languages, possibilities and limitations of the other discipline. However, in this part of the extract Dr Miranda seems to contradict himself, since there is tension between doing something that is of no benefit to one's own discipline, and doing it in order to learn about the other discipline. At the end he manages to reconcile the opposing values, but in practice that might be more difficult. While in talk we are able to describe events as facing no troubles or we can argue about how we have managed troubles, this does not mean such troubles were *actually* solved. Accounts given in interview represent only one version of events out of many possible ones.

Going into more detail, in the first part of the extract Dr Miranda draws on different subject positions and interpretative repertoires, and these are

mobilised in order to counter potential alternatives. He positions himself as a computer *scientist* and avoids being perceived merely as a technician ('the other discipline's IT person'). But he also distances himself from a purely narrow and individualistic position because he argues he would help others to some extent. Interdisciplinarity is depicted as an intellectual challenge, but also as an intellectual bonus and rewarding in itself, because Dr Miranda describes only wanting to do things that are challenging. Such an account allows him to downplay any possible accusation of being purely instrumentally motivated to engage in interdisciplinarity.

In the second part of the extract, Dr Miranda distances himself from the individualistic position adopted earlier in order to emphasise the value of doing research that might not be too valuable from a computer science perspective. Dr Miranda also presents himself as having intellectual integrity (Balsamo and Mitcham 2010), because he argues for the need to be clear about one's aims, as well as being aware of others' aims. Moreover, by arguing he would be willing to do some 'loss leaking research' in order to learn from others, his position can be interpreted as that of a good working colleague. Thus, in the extract he includes a number of technical and negotiating skills, as well as some ethical dispositions.

Dr Miranda's account emphasises that interdisciplinary research takes much energy, is time consuming, and it requires doing some work that may not be too valuable for the individual. Researchers should be able to sort those challenges in order to engage successfully in interdisciplinary research. Is it worth it? Is it valuable to engage in an activity which may take much effort but which may be a professional risk? That is the focus of the following chapter.

7.6 Conclusions

This chapter analysed researchers' accounts about skills and dispositions required for interdisciplinary research. Researchers draw on narratives to negotiate a position as 'interdisciplinarily skilled', and other characters and their dispositions are called upon in order to corroborate researchers' own positioning. Possessing skills and dispositions, then, also requires the skills to account for those skills[19].

The chapter also introduced two ideological dilemmas identified in interviewees' discursive practices. The first one, called here the 'disciplinary tolerance and expert prejudice' dilemma indicates that researchers may express themselves simultaneously as tolerant and intolerant of other disciplinary cultures; and when they intend to rationalise their intolerance, they then emphasise their authority as experts, downplaying the equality required for interdisciplinary research. This dilemma implies difficulties for defining individuals as willing or unwilling to embrace interdisciplinarity, since there is ambivalence and exceptions can – and perhaps have – to be made. The second ideological dilemma, of individualism and collectivism, implies that there can be mismatching interests between individuals and their potential collaborators. It may only be possible to overcome these dilemmas, temporaly though, as they may reappear in other situations.

The presence of these two dilemmas, alongside the dilemma of openness and rigour I presented in chapter 6, point to the need for individuals to manage the different challenges involved in interdisciplinary research. Interdisciplinary expertise can be described as multidimensional, as Ku (2012) has argued, but it

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[19] An observation that might be valuable also for anybody writing a CV or a cover letter.

can never be entirely achieved because dilemmas can only be partially solved.
The following chapter, which is the final analytical chapter, explores how
interviewees rationalise their involvement in such a dilemmatic activity.

Chapter 8. Negotiating value, success and uncertainty

8.1 Introduction

The previous chapters explored the ways in which interviewees construct and negotiate an 'interdisciplinary self', identity and expertise in their talk, drawing on a number of reoccurring discursive resources. In this last analytic chapter a broader issue is examined, concerning how interviewees rationalise difficulties and challenges emerging from their engagement in interdisciplinary research. Thus, the question this chapter addresses is *'how are interdisciplinary careers constructed and negotiated as worthwhile?* The chapter focuses on the 'projects of repair' (Taylor and Littleton 2012) carried out by the interviewees to present their (interdisciplinary) careers as reasonable, valuable, and successful in some cases, and, overall, as worthwhile, regardless of the uncertainties and obstacles encountered. By 'projects of repair' I refer to justifications and explanations given so that troubled positions can be turned into untroubled ones, or to make the undesirable seem slightly more desirable.

As has been pointed out in the previous chapters, narratives are as different as the lives lived by the individual interviewees. However, multiple patterns can be identified in these discourses of personal lives, which shape and are shaped by stories and meanings that circulate in the wider social and discursive context (Taylor and Littleton 2006). This chapter explores how individual interviewees negotiate interdisciplinary work and careers as valuable, by using

their own biographical resources but also drawing on wider discursive resources to reframe and rationalise challenges, dilemmas and uncertainties associated with interdisciplinarity. The analysis draws on, and uses as illustrations, extended extracts from interviews and multiple extracts from the same interviewees. These extracts were used to identify different discursive moves made by individuals in the interviews and thus to home in on the internal dynamics of interdisciplinary narratives.

The analysis is divided into three sections. Section 8.2 explores accounts of researchers who explicitly associate their interdisciplinary work with the success achieved in their careers. Section 8.3 examines accounts of researchers who associate success with interdisciplinarity, but who also express awareness of the need to fulfil more established institutional expectations, represented by traditional discipline-based work. Section 8.4 focuses on the accounts of researchers who describe interdisciplinarity as valuable, regardless of whether it might enhance their careers. These interviewees describe themselves as overtly embracing the uncertainty of an interdisciplinary career. Section 8.5 presents the case of one interviewee who questions the value of interdisciplinarity and who does not necessarily associate it with professional success. It is worth stressing that these categories, or rather discursive styles or ways of arguing, do not necessarily imply that one type of description is more accurate than another. Neither does it mean that these are the only possible descriptions of developing a career in the research fields of my interviewees. Each interview developed individually and themes did not emerge in the same order. Furthermore, interviewees' accounts could have been different had the

interviews taken place at another time or had they been conducted by a different interviewer.

8.2 Interdisciplinarity brings academic and professional success

A number of interviewees, including university administrators and researchers, described interdisciplinary research as a route to success, and interdisciplinary researchers as successful and well regarded. Different interpretative repertoires presented in chapter 5 were used to support claims that interdisciplinary work is related to success, particularly the 'interdisciplinarity as institutional desire' repertoire.

The first group of extracts I analyse are from Dr McCarty. Dr McCarty went back to academia to do a PhD after working for some years in industry, and his PhD involved different disciplines. After the PhD he stayed at the same university 'going from one lab to another' and he argued that this trajectory made him 'fluent' in different disciplinary languages. He then went back to work in industry. In the first extract he narrates events that took him from industry back to academia.

Extract 1

Dr McCarty: the company offered me several packages at the end of *[year]* Ahh but that coincided with the period when UK universities were creating chairs for people with my expertise [C: mhm, yeah] and in particular the multidisciplinary expertise [C: yeah that summed with the industrial side of things] yeah (.) right (.) Ahh so by the the end of the first week of January of [*year after*] I had been offered chairs by three different universities [C: alright] and the one that made – the one that

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was most appropriate for me on every aspect including closeness to family ahh turned out to be [*current institution*] so I came here a:nd it's (.) it's just blossomed beyond anything I might have expected.

(Male, professor, faculty of science)

In this extract Dr McCarty argues that his 'multidisciplinary expertise'[20] made him attractive to universities, since they were looking for people with such skills. He emphasises his attractiveness arguing he received three offers from different universities in a short period of time. His argument draws on the 'interdisciplinarity as institutional desire' repertoire, and his account allows him to position himself as successful. It is worth noting that in this narrative he combines positive understandings of interdisciplinarity and commonly well regarded work characteristics, such as being close to his family and exceeding his expectations. In his account, his interdisciplinary skills have brought him to a fulfilling job. The following extract presents Dr McCarty's talk about his success once he was established in that academic post.

Extract 2

Carlos: at the beginning you were saying that since you have the well the expertise in the different areas then it would be harder to get the funding from the research council

Dr McCarty: Well that's right, in [*year*] ahh the:: there wasn't any recognised funding for people with the type of multidisciplinary skills I had ahh and moving in to industry was the only option at the time ahh but not a long after that this area of *[research]* that I was working in began to be recognised and there started to be funding initiatives from the

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[20] He argued in the interview that he uses the words 'interdisciplinary' and 'multidisciplinary' interchangeably

research councils but I was in industry by then ahh and what eventually happened was that I was offered funding panels but I was on the – they would like to have me on the funding panels because I could bring the industry's own relevance to ahh to it all (.) Ahh and I – so my academic reputation continued to increase even though I wasn't in academia (.) [C: mhm] and then the biggest paradox of all the very first grant I was ever awarded by the research councils was [*omitted*] million pound thing (laughs) [C: right] And well, as I said as a joke to one of my colleagues one day (.) is not bad for a new investigator award (laughs)

My question included in this extract was intended to get Dr McCarty to elaborate on an argument he had provided earlier during the interview, about the lack of funding available for multi- and interdisciplinary researchers. While he had earlier complained about a lack of opportunities, in this extract he notes that the situation has either changed in his favour, or that at least it has in his case. This narrative could be interpreted as if he somehow anticipated the value of interdisciplinary approaches to his field. But perhaps it worked well in this instance only because he was in the right interdisciplinary 'place' at the right time, i.e. when institutions began to invest in interdisciplinary research and when university-industry links became more popular. In the extract he challenges established understandings about who gets to be seen as successful in and for academia. Rather than restricted to academic researchers, he argues his reputation was increasing 'even' when he was not an academic. Thus, his biography can be seen as constructed around a discourse related to mode 2 production of knowledge (Gibbons et al, 1995; Nowotny, 2001), presented in section 2.2.2 . Thus, Dr McCarty combines in his narrative 'local'

life events and widely established understandings of interdisciplinarity and professional success.

At the end of the extract Dr McCarty argues that he received a very large grant and describes a joke he made to a friend, noting that such an achievement was 'not too bad for a new investigator award'. There are two ways of understanding Dr McCarty's argument, firstly he might be challenging the common understanding that young researchers and interdisciplinary researchers do not get substantial funding, and secondly that *he* has been skilful to the extent of changing established patterns. In this account Dr McCarty draws on the repertoires of 'interdisciplinarity as instrumental bonus' and 'interdisciplinarity as institutional desire', and resists the 'interdisciplinarity as precarious' repertoire.

In the next group of extracts Dr Truman describes interdisciplinary research as a valuable activity and as a way to achieve intellectual and professional success. However she also describes some challenges to getting rewards, and she highlights the difficulty of communicating with researchers from other disciplines. Dr Truman comes from an arts and humanities background but she draws on social science methods when collaborating with researchers from science and engineering. In the following extracts she rationalises those difficulties and presents interdisciplinary work as worth doing.

Extract 3

Carlos: what you think is the interest of the university for ah yeah for having
             [*interdisciplinary centre*] […] why you think is there?

Dr Truman: Ah I think (.) I think there's a sort of a (.) will to have it (.) ahh a::nd
             you know I think is a strategic aim and stuff (.) Ahh there is – then

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there are some structures that make it a little bit more difficult in a::

practical way (.) so I have had problems in that [*interdisciplinary*

centre] ahh – isn't very good at rewarding it o:r compensating for

work for academics that are outside of [*interdisciplinary centre*] itself

(Female, assistant professor, faculty of arts)

In this extract Dr Truman argues that even though her university is interested

in supporting interdisciplinarity, there is a lack of mechanisms that reward

cross-school work. Regardless of this, in the next extracts she plays down such

inconveniences and emphasises positive elements of her engagement in

interdisciplinary work.

Extract 4

Dr Truman: Ahh but ahh yeah I think (.) do you know – there certainly seems to

be interests in the university (.) and I think I personally think you get

more innovative research out of it (.) Ahh I think (.) particularly with

ahh from an arts point of view one of the big things that ahh I've

heard from certain arts scholars is problems around the whole impact

issues with things like the REF (.) ahh and ahh funding councils and

things and the need to speak to or being relevant to broader society (.)

Ahh I think actually interdisciplinarity (.) with those subjects that do

that slightly more naturally is actually very helpful to the arts (.) Ahh

I mean again for me (.) given what I'm interested in it seems very

natural to do work that you know (.) I can then give to [*stakeholders*]

or whatever […] Ah so I think for the university the value of – to the

university is that you – I think you get far more interesting projects (.)

And is nice – you know (.) in terms of the intellectual curiosity and I

guess the intellectual imagination of the people working here (.) that

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expands a bit when you're talking to people who look at things in a very different way (.) Ahh so I think it's a healthier research environment ahh to be in

Extract 5

Dr Truman: I mean generally I I so far have had a RE:::ASONABLY good experience with it (.) Ahh I mean the other practical thing I would say is the ahh working with ah *sciences and engineering* brings access to more money (.) Ahh being in the arts and humanities there's no a lot of money for research

In extract 4 Dr Truman states again that she is aware of the university's interest in interdisciplinary ('interdisciplinarity as institutional desire' repertoire) and she includes in her account her 'personal' views about interdisciplinary research. These echo some of the discursive resources I described in chapter 5. She notes that interdisciplinarity stimulates 'more innovative research' and 'more interesting projects', and also increases the relevance of research for the broader society, as demanded by research councils. She then argues arts disciplines can benefit from involvement in interdisciplinary research especially in the context of the REF and its impact agenda. These accounts resonate with Barry and collaborators' logics (2008) of innovation and accountability. Thus, Dr Truman draws on established understandings of interdisciplinarity to account for the value of her work. She also highlights the value of her work arguing it is 'naturally' interdisciplinary and that it 'naturally' has societal relevance.

The values attached to interdisciplinary work highlighted in the first part of extract 4 can be linked to the repertoire of 'interdisciplinarity as instrumental

bonus'. This repertoire is also used in extract 5 where Dr Truman talks about the fact that interdisciplinary collaborations enabled her to have access to research money. However, she also draws on the 'interdisciplinarity as intellectual bonus' repertoire when she talks about intellectual curiosity and imagination, at the end of extract 4. Thus, Dr Truman expresses the value of her engagement in interdisciplinary research in intellectual and instrumental terms. As in the case of Dr McCarty, the value of interdisciplinarity is taken as given and thus the interviewees can present their interdisciplinary careers as worthwhile. The following section explores accounts of researchers who negotiate interdisciplinarity as worthwhile but also emphasise the importance of disciplinary work.

8.3 Success requires interdisciplinary and disciplinary work

In contrast to the accounts presented in the previous section, interviewees' accounts analysed here highlight the need to carry out traditional disciplinary work alongside interdisciplinary work in order to succeed professionally. In this section I also describe an ideological dilemma that I identify as the dilemma of 'effort and reward'. The first group of extracts comes from Dr Young, who works in a 'pure' scientific field allied to health and biological sciences. Like other interviewees, he uses the terms multi- and interdisciplinary work interchangeably.

Extract 6

Carlos: And is it ahh sorry (.) for the ahh, at the moment of evaluations or the
             in the department is there like (.) well seen ahh working on – well
             publishing in non-*chemistry* journals

Dr Young: It can (.) it can be a challenge (.) so I think the way I – the way I go

aro:und that is basically to write enough papers in *chemistry* journals

so the *chemistry* department can assess me as a *chemist* and I don't

need to worry about my multidisciplinary work [C: alright] So that's a

bit of a shame because you know (.) if I hadn't managed to do good

work in *chemistry* and sell it just as *chemistry* and good work in

multidisciplinary areas ahh it might've been awkward for my career

(Male, professor, faculty of science)

Dr Young responds to my question about where his department expects him to
publish his research that it 'can be a challenge' to live up to the department's
expectations. He notes that his department expects him to publish in core-
disciplinary journals rather than journals publishing applied research, or
interdisciplinary journals. He argues that the way he 'goes around' this
requirement is by publishing 'enough papers' both in disciplinary journals and
in interdisciplinary journals. That way, he argues he does not 'need to worry'
about his interdisciplinary work. In this assessment of interdisciplinary work as
worrisome, Dr Young draws on the 'interdisciplinarity as precarious'
repertoire, and this is also highlighted when he assesses this situation as a
'shame'. Then he explains that if he had not been good in his disciplinary work
that would have been 'awkward' for his career. In this account Dr Young can
be seen as arguing against – and protecting himself from the
'interdisciplinarity as non-rigorous' repertoire, affirming his position as
rigorous in his own discipline. But in this extract and at this moment of the
interview he has not yet accounted for the value of his interdisciplinary work.

Further on in the interview Dr Young describes an open access journal that

specialises in his applied area, which he and other colleagues launched with a major publishing house. He notes it is 'not just an output' but an outlet for his work and 'the work of the community'. His story about launching a specialist journal focusing explicitly on his interdisciplinary area of research shows that he values his interdisciplinary work deeply, alongside his disciplinary work – and, indeed, wants to see it being valued by others and spread its appeal more widely. However, a further dilemma can be perceived arising from Dr Young's accounts. On the one hand, he argues that it is mainly publications in discipline-based journals which count in evaluations, and on the other hand, he notes he developed an interdisciplinary journal, which one would imagine requires a large amount of effort but may not bring much formal recognition. In the following subsection I draw on concepts from work and occupations' psychology to formulate a dilemma I call the effort and reward dilemma. This dilemma allowed me to interpret interesting sections of the interviews. I go back to the analysis of Dr Young's accounts once I have presented the dilemma.

8.3.1 The ideological dilemma of effort and reward

In the field of work and occupations' psychology, Siegrist (1996) developed the 'effort and reward imbalance model', which suggests that strain is produced by 'a perceived imbalance between the effort that employees believe they put into their jobs and the rewards that they receive' (Kinman and Jones 2008:237). Kinman and Jones (2008) note that the imbalance between work effort and reward can be associated with 'cardiovascular risk factors and psychiatric disorders [and] less serious outcomes such as psychosomatic symptomatology, sleep disturbances, fatigue, problem alcohol consumption,

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absenteeism and turnover' (p. 238). The model focuses on perceived imbalances between much effort and little reward. However, no attention is paid to outcomes of the opposite phenomenon, namely when much rewards are expected from little effort. One would imagine that the outcomes of that other imbalance are not physical and psychological, but, I suggest, social and cultural, or even ideological.

If the Protestant work ethic is taken into account, work is a 'moral, personal, and social good, where dedication to labour [is] to be maintained and gratification deferred' (Rose 1999:103). I draw on insight from Rose (1999) to complement that neglected side of the dilemma. Rose notes that in the 1960s a 'new psycho-technology of work' aligned to a 'new psycho-technology of subjectivity' started to be developed and applied to human resources management. From these perspectives 'work itself could become the privileged space for the satisfaction of the social needs of individuals', and 'an essential element in the path to self-fulfilment' (Rose 1999:119). Thus, individuals are socially expected to work and to invest efforts in their work, and to feel satisfied from such work. One can see a contradiction between this views and the effort and reward imbalance model. On the one hand, individuals should work in order to feel privileged and self-fulfilled, but on the other hand they should avoid the situation of investing much effort and obtaining little reward in return.

It is worth taking into account one more contribution from scholarship in occupational psychology. Johnson and colleagues (2007) distinguish between 'intrinsic' and 'extrinsic' rewards to assess job quality, and they suggest that 'intrinsic rewards are those derived from work tasks themselves' and 'extrinsic

rewards are obtained from the job, but are external to the experience of working' (p. 291). Thinking in terms of the dilemma of effort and reward I suggest, it may be problematic if individuals invest much effort and obtain no extrinsic rewards and *only* intrinsic rewards, but it is also problematic to obtain much extrinsic rewards but no intrinsic rewards. After all, work should be satisfactory. Both situations would bring individuals into troubled positions. From a discursive psychology approach, intrinsic and extrinsic rewards can be taken as discursive resources that can be used by individuals to get around the dilemma of effort and reward. Moreover, as discursive resources are flexible individuals can also position others negatively referring to the efforts they invest and the rewards they expect to obtain. This dilemma manifests itself in different forms in my interviewees' talk about the value and the challenges interdisciplinary research brings to their work and their careers, as presented in the rest of the chapter.

The following extract from Dr Young's interview is analysed in terms of how he negotiates his success and the value of his work, and how he tries to distance himself from the troubled positions brought by the dilemma of effort and reward. In extract 9 he provides further arguments for the value of his applied interdisciplinary work. Before the account provided in the extract he mentioned that the European Union announced investing around one billion Euros in his applied field.

Extract 7

Dr Young: Yeah it's a good time for for our field, and its – basically I mean, you
                    know, if you're gonna work on ahh you know improving quality of
                    life, you know treating cancers, understanding brain disease, you

know these are problems that the man in the street can understand, and I think traditionally you would look to the clinicians and biologists to help solve such problems [C: mhm] but clinicians and biologists are now looking to [*his discipline*] to help to solve those problems

Dr Young notes that his field is in a good position at the moment, given the considerable amount the European Union has invested in it. Moreover, accounting for the value and the impact of his work is not difficult to him because the benefit of health related research can be considered as good for society and good in itself, and that is something that even 'the man in the street can understand'. Accounting for the value and potential impact of their research is much more difficult for other researchers. One could argue that contributing to an endeavour as important as health constitutes an intrinsic reward. Thus, in this extract Dr Young refers to both intrinsic and potential extrinsic rewards, represented by the amount of funding available in his research field. The following extracts illustrate the on-going negotiation required to get around the dilemma of effort and reward.

Extract 8

Dr Young: I enjoy talking to the colleagues in my school but I think I enjoy more talking to people outside my school, because they know so: many more things, you know compared to my background (.) a:nd it's just interesting to see what drives them, and if I can help in any way to push their scientific activities I find it really rewarding to join in [C: alright] It's hi:gh target to think of the really big scientific questions ahh so I'm happy to relay in other scientists to do that

In this extract Dr Young highlights the intrinsic rewards of his work. He stresses that he enjoys talking to people from other departments as well as acquiring a feeling for what they know. He also positions himself as willing to help others with their science in order to address 'really big scientific questions'. The interpretative repertoires of 'interdisciplinarity as intellectual bonus' and 'interdisciplinarity as rewarding in itself' allow him to build this argument. However, he argues later, one more time, that working across disciplines is not unproblematic.

Extract 9

Dr Young: in my career I try to be – make sure that if my head of school says are you a good *chemist* I can say absolutely yes and you can judge me excluding my multidisciplinary work [C: mhm] whereas I would prefer to just do multidisciplinary work.

In this extract Dr Young refers back to the constraint presented in extract 6, when he argued that in terms of departmental evaluations multi- and interdisciplinary work can be a challenge. Even though throughout the interview he accounted for the value of his multi- or interdisciplinary work in terms of getting funding, the rewards of doing it and its possible social impact, in this extract he highlights the tension between being considered a good disciplinary specialist and being a multi- or interdisciplinary researcher. He presents the issue of reputation and departmental evaluation as reasons for doing traditional disciplinary work. Thus, negotiating an 'interdisciplinary self' and one's work as valuable, requires constructing a good institutional disciplinary (and disciplined) self, while at the same time carving out a personal space for interdisciplinary work. However, as noted above, carrying

out both disciplinary and interdisciplinary research constitutes a huge effort, and these might not be worth the rewards, extrinsic and intrinsic, that could be obtained. This shows that regardless of how rewarding interdisciplinary research is, professional downsides do not disappear, thus the dilemma of effort and reward emerges again and again.

In the following extracts a different interviewee I call Dr Yusuf highlights the value of interdisciplinary research but also emphasises the relevance of doing discipline-based work. It is worth recalling that Dr Yusuf has a very interdisciplinary background, having studied and obtained degrees in the faculties of health sciences, social sciences and arts. In his case, he argues, working across various disciplines has been very positive as he points out he is the first person to hold a chair in his interdisciplinary field. Extract 12 brings together different passages of a long answer he provided to the question of what his motivation was for carrying out the degrees he described.

Extract 10

Dr Yusuf: in essence interdisciplinarity is ahh a key feature of any particular enquiry or any particular type of work ahh and we have an anti-intellectual – anti-intellectual ahh situation ahh with our universities a::re – they compartmentalise ehh knowledges (.) sort of school of English school of sociology school of history etcetera

[…]

And for me that's anti-intellectual (.) because most subject fields are inherently interdisciplinary (.) inherently (.) So to me it never made sense why why ahh people look at these ahh discrete units of knowledge formation [C: mhm] ahh (.) So I'm interested in how (.)

and in fact all my work at the university has been (.) directed (.) I guess mobilised (.) mobilised by ahh a sense that one kind of knowledge inter animates and can ahh either compete with or challenge o:r add to or combine with other knowledges

[…]

So (.) my own (.) personal experience has been that there is room to grow interdisciplinarity (.) ahh but I think you have to be quite canny about how you do that [C: mhm] I think what you need to do is ahh be ahh Gemini-faced (.) to have two faces (.) You have one face for the metric of your particular school (.) where you're housed (.) you know (.) to do the kind of outputs and all that stuff (.) that they need (.) and then you have a face for interdisciplinary activity which ahh can be (.) add value to your own school but also add value to other schools (.) Ahh but you have to do both (.) you can't just do – you can't do this by ahh just focusing on interdisciplinarity

(Male, professor, faculty of medicine and health science)

In the first part of the extract Dr Yusuf argues that interdisciplinarity is in essence 'a key feature of any enquiry or any particular type of work'. This means interdisciplinary is not an add-on or exceptional but the common amongst 'any type of work', which is quite an unusual argument. While other interviewees argued that *some* 'big world problems' require an interdisciplinary approach, to Dr Yusuf *any* problem or research question is in itself interdisciplinary. One could argue that Dr Yusuf draws on the 'nature as interdisciplinary' repertoire, if nature includes culture, society, language and any other aspect of reality and social reality. From that perspective the value of interdisciplinarity relies on the fact that it represents the 'right' approach to any

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question. In contrast, Dr Yusuf regards the division of universities by disciplines as anti-intellectual. If disciplinary division is posited as anti-intellectual, interdisciplinary research is posited by default as 'intellectual', and this argument could be part of the 'interdisciplinarity as intellectual bonus' repertoire.

In the second part of the extract he positions himself against such 'anti-intellectual situation' noting that to him it 'never made sense' why people limit themselves to work in single 'units of knowledge formation'. This argument helps Dr Yusuf to provide coherence to all the different disciplines he said he has studied. He follows up by saying that 'all his work' at the university has had the purpose of inter-animating, challenging or combining different types of knowledge. With this account he positions himself as a valuable researcher and perhaps a proto-type of an interdisciplinary worker, which, for him, should be the proto-type for all academics.

Regardless of the value he sees in interdisciplinarity, in the third part of the extract he notes that interdisciplinary work is not easy. Instead, he notes one has to be 'quite canny' and have a strategy for doing it, which is similar to Dr Young's account of publishing enough papers in discipline-based journals alongside his interdisciplinary publications. Dr Yusuf notes that one has to have 'two faces', which is similar to have two performing selves, in Goffman's sense, a disciplinary one and an interdisciplinary one: one contributes to one's own department, but the other contributes to other departments. The metaphor of being 'housed' in a particular school is useful to provide a sense of belonging without restriction to go or to work 'outside' of it. Thus, doing *only* interdisciplinary research is not an option. However, this strategy does not

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overcome the dilemma of effort and reward, since 'adding value' to different schools implies doing too much work. Instead of discussing this dilemma, Dr Yusuf criticises researchers who avoid doing the effort to contribute beyond their own disciplines, as shown in the following extract.

Extract 11

Carlos: And have you come across people that do not agree too much with the idea of interdisciplinarity or that try not to engage in that work or try to stop it (.)

Dr Yusuf: I don't think I have (.) but I have come across people who are ahh (.) say more focused on selfish ahh selfish aspects of academic life (.) So well I haven't I really haven't come across that many who are:: opposed to interdisciplinarity ahh and the logic of interdisciplinarity (.) but I have come across people who prefer not to ahh shall we say muddy the waters of their narrative [C: mhm] so they want to keep their narrative more linear a:nd almost cle::an (.) they want to keep it clean you know? Like a sort of hygiene process going on [C: mhm] Ok well that's not quite my programme you know? I need to narrate this (.) So they are not necessarily objecting to interdisciplinarity as a notion or as a meaningful thing but they are making a decision to: if you like keep themselves tidy (.) for narrating themselves perhaps to their own department and narrating themselves to the university (.) and maybe also narrating themselves to promotional reality [C: mhm] the reality of promotions and career [C: mhm] because that's a framework which is also (.) having an impact on the culture that operates (.) if ahh if you're getting promoted because you have a very tidy ahh articulated programme of work, which situates within your particular school (.) that is probably going to be more successful than

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you being innovative, outreaching, beyond (.) the expected narrative
and so on

In this extract Dr Yusuf constructs an account of researchers who 'focus on selfish aspects of academic life' and who therefore do not engage in interdisciplinary work. This displays quite a novel account of interdisciplinary work - it is something like a moral and intellectual imperative to him. During the interview he refers to universities, schools and researchers as being organised and following a 'discipline-based narrative'. He adds pollution metaphors (clean, muddy, hygiene, tidy) (Rodgers et al. 2003) to his account in order to criticise researchers who do not intend to risk their reputation and rewards. People who narrate their work in terms of a discipline keep their narrative and their disciplinary identity clean, and doing something beyond that disciplinary narrative would be to 'pollute' it. To Dr Yusuf, individuals who keep 'themselves tidy' have an advantage within the context of 'the reality of promotions and career', because departments and 'promotional reality' also follow a disciplinary narrative. In the last lines he argues that those who get promoted succeed because they have 'a very tidy and articulated programme of work', instead of being 'innovative' and 'outreaching', beyond 'the expected narrative'. These individuals who try to keep their narratives 'tidy' could be seen as expecting much reward from little effort, or making of reward their main drive. Thus, Dr Yusuf troubles the position of those who strategically keep their working agenda limited to their single discipline.

In Dr Yusuf's accounts, those who do only discipline-based work may be following only instrumental motivations, translated to promotions, or extrinsic rewards. In contrast, interdisciplinary research is driven by an intellectual

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motivation. In this, Dr Yusuf accounts are similar to Weingart's (2000) argument that disciplines have to be presented as rigid and old-fashioned so that interdisciplinarity can be presented as innovative. One could however also argue that it is perfectively possible to do innovative research within one discipline and even in a very narrow corner of that discipline.

So far, interviewees' accounts included in this section underline the requirement to carry out disciplinary research alongside interdisciplinary projects. The value of researchers' work and their success are negotiated as depending on doing both types of research. This section has also explored how researchers rationalise the trouble they face when they come across the ideological dilemma of effort and reward, as well their negotiation of different types of rewards, intrinsic and extrinsic. Furthermore, it was shown how the dilemma can be used to trouble the position of others. In the following group of extracts Dr Walsh intends to rationalise the professional challenges he faces because of his interdisciplinary work. Dr Walsh holds a chair in the faculty of arts and but he draws on social sciences' theories and methods and he also collaborates with social scientists.

Extract 12

Dr Walsh: Ahh so:: one does an awful lot mo:re than one is seen to do (.) because I'm always in other departments talking to different people [C: mhm] I mean is fun (.) I'm not complaining for that (.) it's the way it is and it makes life a bit harder

                                        (Male, associate professor, faculty of arts)

In this extract Dr Walsh stresses the effort that it takes to engage in collaborative interdisciplinary work, but he does not want to be seen

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complaining about it, arguing that 'that is the way is' and that 'it is fun'. 'Fun' would represent an intrinsic reward he gets from those interdisciplinary collaborations, and this argument is part of the 'interdisciplinarity as rewarding in itself' repertoire. However, later on in the interview he provides a different assessment of the situation. In extract 13, which is part of the same answer as extract 12, Dr Walsh negotiates the challenges one encounters in interdisciplinary research, partly emphasising the downsides and partly resigning himself to the situation, as a way of defending his position.

Extract 13

Dr Walsh: Ahh and so there are these sorts of expectations and standards and criteria of ahh I suppose (.) ahh which is problematic as well (.) Ahh so really the – I mean - it would be a lot easier just to be a single discipline scholar within the university (.) within the traditional university to do your thing within [*his main discipline*] (.) make it clearly branded as [*his main discipline*] (.) making sure everything is done sort of within the department (.) within the peer review of the department (.) so you're measured on everything you do (.) nothing falls outside that measurement everything is submissible to the REF nothing falls outside that (.) 'cause then they're not wasting effort as it were (.) but intellectually I find that a little bit kind of uninteresting [C: yeah] (.) I like going outside but then you just do things which don't really count (.) I think that's ahh one of the problems – But the university is doing its best I keep saying, you know, they they they are recognising it and they try to award interdisciplinarity to some extent (.) but the departments (.) by their by their nature (.) their structure and their purpose fight against that (.) Not con – I don't mean there's (.) individuals who consciously ahh fight against it but

the structures of the institution (.) still militate against some of the policies that they promote

As was the case in Dr Young's interview, Dr Walsh notes that interdisciplinary research makes it difficult to be accountable to one's department and to the REF. He then suggests that doing only discipline-based work and only work that brings recognition would make his career easier. That way, doing only discipline-based work is a way to avoid imbalances between effort and reward. In that situation, all his work would count for departmental evaluations, for the REF, and he would make the internal peer review process easier for his colleagues. This chain of sequence and consequence resonates with Dr Yusuf description of those researchers who try to keep a 'tidy' and 'clean' narrative, instead of being innovative by engaging in interdisciplinary research. Although Dr Walsh suggests this as a possible alternative, he then discards it. He argues that that way of working would be 'a little bit kind of uninteresting', which can be taken as a negotiation of extrinsic rewards versus intrinsic rewards. The negotiation continues when he argues that although he likes going to other departments he then ends doing 'things which don't really count', bringing back the relevance of extrinsic rewards and prioritising them over the intrinsic ones. This negotiation of rewards can also be interpreted in terms of instrumental vs intellectual drives: doing disciplinary work is instrumental because it helps to obtaining extrinsic rewards, but interdisciplinary work is an intellectual activity and it helps in obtaining intrinsic rewards. Thus, Dr Walsh's account can be taken as an illustration of the dilemma of effort and reward and the difficulty to find a balance between intrinsic and extrinsic rewards.

The last discursive strategy used by Dr Walsh in this extract consists of constructing a complicated account drawing on the interpretative repertoires of 'interdisciplinarity as institutional desire', and 'interdisciplinarity as institutional challenge'. He notes that even though his university tries to reward interdisciplinarity, its own structures 'militate against some of the policies that they promote'. With this strategy he avoids blaming individual actors and also makes the challenges seem more difficult to overcome.

So far in the interview Dr Walsh has positioned himself as boldly accepting the difficulties of carrying out an interdisciplinary career, and then he presents an alternative which is then discarded because of the lack of intrinsic rewards. In extracts 14 and 15 he continues negotiating an untroubled position, overcoming the dilemma of effort and reward and making his interdisciplinary career seem valuable.

Extract 14

Dr Walsh: I find I have to be a little bit more (.) I'm not being at the moment but I will have to be a little bit more careful about my interdisciplinary engagement

Although in previous sections of the interview Dr Walsh was dismissing or even rejecting what I call the effort and reward dilemma only by noting that 'that's the way it is', in extract 16 he provides an alternative to deal with the downsides of an interdisciplinary career. This new strategy consists of reducing his interdisciplinary compromises in the future. Although this is, at face value, a sensible strategy, Dr Walsh then presents yet another argument for the value of interdisciplinary, which focuses on the state of his discipline beyond his own contributions.

Extract 15

Dr Walsh: So the most sort of – the most sensible thing would just be to do what exactly what [*his discipline*] do – to draw in – and I know what – how *[his discipline]* defines itself and to do that, and nothing else. But it would be very sa:d (.) for *[his discipline]* well not MY study (.) not my – if I'd do that I'd be fine (.) wouldn't make any difference whatsoever (.) But if ALL *[scholars from his discipline]* close themselves off (.) or just on the fringes engaged rather than redefining themselves fundamentally in relation to other discipline (.) so that the notion of the discipline dissolves entirely (.) that would be intellectually I think a disaster (.) but that is what's happening [C: mhm mhm] and I think at least in this country those are the pressures on sort of young and mid-career professionals ahh to become more disciplinary minded not less disciplinary minded

This extract is really interesting because Dr Walsh intends to overcome the effort and reward imbalance by emphasising a collectivistic position over an individualistic one, a strategy that, nevertheless, is dilemmatic. As in extract 13, here Dr Walsh simultaneously suggests and discards the alternative of doing only discipline-based research. While this would be convenient in terms of the extrinsic rewards he would obtain, Dr Walsh argues that for him that would be quite boring. Thus, he prioritises intrinsic rewards over extrinsic ones. Moreover, he claims that if he were to do only discipline-based work, motivated by the extrinsic rewards it might bring, nothing would happen, but if all researchers were to follow the same strategy, this would, in the long run, be detrimental to the whole discipline. At the end of the extract he highlights how serious the intellectual problem is, saying that the lack of extrinsic rewards for

interdisciplinary researchers is spread across the country. Thus, in this argument Dr Walsh tries to present the effort and reward dilemma as justifiable by positioning himself as more collectivistic than individualistic, as if he was sacrificing his extrinsic rewards in return of a collective good, which could be seen as an intrinsic reward. This might be a good argument to manage the dilemma of effort and reward and to present an interdisciplinary career as worthwhile. However, one could argue that the lack of extrinsic rewards will always be problematic, and this way the dilemma of individualism and collectivism underlines another dimension of the problem.

This section has focused on accounts that take for granted interdisciplinarity as a medium for success, either by itself or by combining it with discipline-based work. Disciplinary work is positioned as less intrinsically rewarding but as necessary to achieve extrinsic rewards for oneself and for one's department. The following section presents accounts of interviewees who are more comfortable with the uncertainties of an interdisciplinary career.

8.4 Embracing uncertainty

A small number of interviewees stressed the value of interdisciplinary research regardless of the difficulties of carrying it out and regardless of the lack of extrinsic rewards and recognition. In contrast to other interviewees' ways of negotiating career value and success, these interviewees did not express the need to keep a balance between disciplinary and interdisciplinary work, and attributed less importance to discipline-based evaluations. Thus, these interviewees can be seen as embracing uncertainty. The analysis presented below examines the discursive strategies used in this context.

Extracts 16 and 17 come from an interview with Dr Johnson, who is a specialist in a branch of engineering. His work involves applications of his expertise to projects from other disciplines in the physical and biological sciences.

Extract 16

Dr Johnson: The thing about interdisciplinary funding tends to be that […] interdisciplinary projects tend to stumble between ahh funding opportunities [C: alright] ahh (.) and to be absolutely frank with you my experience with interdisciplinarity is that I don't re::ally want to do anything that isn't interdisciplinary anymore [C: alright!] because it is fantastically rewarding (.) and I find it so:: interesting to learn about (.) you know for example I had a PhD student from [*different school*] here an hour ago talking about [*theme omitted*] ahh and then the next minute I'm learning about [*omitted*] and then I'm learning about [*omitted*] algorithms from physics, and then I'm learning about [*omitted*] *biology* a:nd it's fantastic (.) And nothing is what you would call engineering (.) but I think this is where engineering has a bit of a benefit (.) because engineering is known as a problem solving discipline […] So:: no matter what you're doing (.) you know (.) if you're measuring something in [*field omitted*] you might need a piece of equipment (.) designing and manufacturing to do that

(Male, lecturer, faculty of engineering)

Dr Johnson's account can be seen as optimistic, yet dilemmatic. First he draws on the 'interdisciplinarity as precarious' repertoire, noting that 'interdisciplinary projects tend to stumble between funding opportunities', but then he emphasises the intrinsic rewards he obtains from his interdisciplinary

work. He provides a detailed account to validate his assessment of interdisciplinary work as 'fantastically rewarding', and he emphasises he is being 'absolutely frank' about this. He tries to minimise the effort and reward dilemma by emphasising how (intrinsically) rewarding doing interdisciplinary work is. He describes having encounters with different disciplines through first talking with a PhD student from a different school about one field, then 'next minute' he is learning about a different field and 'then' he is into something else involving algorithms. However, it might be that the dilemma reappears, because the multiplicity of fields may require a large amount of effort. In the last lines of the extract Dr Johnson describes the benefit of this work for engineering. Thus, he presents his interdisciplinary work as valuable not only because of the service he provides to other disciplines, but also because of the benefits for his home discipline. In chapter 7, extract 10, Dr Johnson also emphasised the value of his interdisciplinary work for engineering, thus it can be seen how he emphasises again and again his disciplinary identity.

Further on in the interview Dr Johnson highlights the value of his interdisciplinary work by focusing on the impact factor of the journals where he publishes. This argument differs from Dr Young's account about the need to publish in discipline-specific journals, presented in the previous section.

Extract 17

Carlos: Ah alright (.) at the time of having to publish papers I don't know is there any kind of restriction for engineers if it is not an engineering journal?

Dr Johnson: […] so I'm not really sure of the correct institutional answer to that question [C: Oh ok] ahh what tends to happen for example is that the

impact factor of a *[his applied field]* journal tends to be quite high

OK? So for example one of the famous ones […] are much more

higher impact factors than ahh for example one ahh I published in

[engineering journal] […] which has an impact factor of probably

one point something (.) I can't remember exactly what it is (.) is not

very high (.) whereas *[applied field journal]* is 7 [C: ah! Oh wow!

Ok] […] So it's quite interesting 'cause as a collaborator you of

course are one of many authors on the paper (.) but it's it's much

higher impact factor journal (.) so what's more important? It's a hard

one to judge (.) ahh and we'll find out I suppose in a way from the

REF exercise

Dr Johnson starts answering my question by disclosing his lack of knowledge

of departmental expectations and requirements about publication venues. Thus,

he either is not worried about institutional evaluations, or it could also be that

in faculties of engineering there is less pressure to publish in discipline-

specific journals. If this was the case, Dr Johnson argument reflects established

understandings of his discipline about what is more and less valuable. The

way Dr Johnson constructs and negotiates the value of his interdisciplinary

outputs and of his interdisciplinary career is also interesting. In order to

negotiate value he makes a contrast between journals' impact factors.

Interestingly, he argues that it can be advantageous to publish in a journal

outside one's own discipline, especially if that journal has a higher impact

factor. In contrast, individuals who work in disciplines with journals that

already have higher impact factors than interdisciplinary ones cannot draw on

such a local discursive resource, as is the case in the business studies journals

that Rafols et al. (2012) describe (see p. 54). However, there is also

uncertainty, as the success of the strategy he has adopted will only be revealed once the results of the REF have come out, more than a year after the interview took place.

In these two extracts, Dr Johnson has negotiated the value of interdisciplinary research in terms of intrinsic rewards, value for his main field (engineering) and impact factor of his research outputs. But these forms of accounting for the value of his interdisciplinary career could be challenged because of the amount of effort required, the lack of funding opportunities, and the uncertainty around the importance of publication venues for his evaluations within the department. In the end, Dr Johnson does not express much concern about the downsides of working in uncertain times and circumstances, but rather expresses comfort and excitement. At the end of the interview he noted that he will keep doing interdisciplinary work, thus he concluded by presenting his interdisciplinary career as worthwhile, despite of the downsides.

Dr Graham expresses similar sentiments, as illustrated in the following group of extracts. In extract 18 she addresses my question about what she thinks are universities and funding bodies' views of interdisciplinarity.

Extract 18

Dr Graham: everybody are up for interdisciplinarity (.) But it has – you can notice that it's been coming higher and higher up the research agenda (.) I think I've been lucky that my research has always been interdisciplinary – interdisciplinary so now that funding bodies are coming around to this way of thinking it's it's good because sort of I'm slightly ahead of their game

(Female, associate professor, faculty of arts)

As described in extract 11, chapter 6, (see p. 179) at the start of the interview Dr Graham positioned herself as inherently interdisciplinary, noting that education (or academia) became interesting to her only when she did a course that allowed her to see different subjects in an interconnected way. She also noted that she has worked in an interdisciplinary way since starting university, and continued to do so when she became a researcher. In this extract she notes that 'everybody', meaning universities and funding bodies, 'are up for interdisciplinarity', which can be considered part of the 'interdisciplinarity as institutional desire' repertoire, and that she has been lucky it has become more and more relevant for such institutions. In this extract, she constructs herself as 'coherent', since her 'research has *always* been interdisciplinary'. This coherent narrative allows her to present her interests as independent and not driven by institutions' agendas, and also allows her to make sense of her current success.

At this stage of the interview, Dr Graham has positioned herself and her career as successful, and her research as valuable. However, her coherent narrative and her position as inherently interdisciplinary can turn problematic if challenges brought up by interdisciplinarity are considered, or if interdisciplinary grants become harder to obtain. Extract 19 presents her answer to my question about any hype she could identify surrounding interdisciplinarity.

Extract 19

Dr Graham: for me I am not going to grump about it because is working for me at

the moment, you know, there'll come a moment when:: the way that I

do research will not be fashionable and people will move on and there

will be a new method of doing research and I won't ever get funding

ever again (.) so I am going to make HA::Y whilst the sun is shining

(.) I'll be terribly appreciative that interdisciplinarity and impact are

considered to be important and then understand that in five years I

will be obsolete (.) I will never get money again a:nd (.) yeah (.) I'll

continue probably doing exactly the same thing as I've always done

(.) and I will be the old school ahh that's (.) yeah just not important or

not interesting anymore (.) I'm just surfing at the moment the crest of

the wave (.) I'll be whimpering out soon

Dr Graham presents herself as conformist regarding the attention given by funding bodies to interdisciplinarity and to social impact of research. Moreover, she also accepts the possible scenario that in a brief period of time her way of working could stop receiving the support it has had so far; thus she embraces the uncertainty of an interdisciplinary career. With this argument Dr Graham emphasises the consistency of her way of working and the coherence in her career, but also she avoids being seen as instrumentally motivated to engage in interdisciplinarity. In contrast, she could be perceived as intellectually driven.

Although the position of the interdisciplinary researcher can be a troubled one, presenting oneself as prepared for the worst is a discursive strategy to minimise that trouble. Further on in the interview Dr Graham pointed out that she does 'very interdisciplinary' activities outside academia, and that she has already considered leaving academia and continue working elsewhere. Thus, she notes that the chance of not getting research funding in the future is not too problematic to her, but such an argument should be considered a 'local'

discursive resource made available by her own life trajectory. Such a resource might not be available to other researchers.

The following group of extracts are taken from my interview with Dr Lawson who, like Dr Johnson and Dr Graham, embraces the uncertainties faced when developing an interdisciplinary career. Dr Lawson works in a social science field that tends to be enrolled in projects with natural sciences and engineering disciplines, either because of the field's intrinsic interests or because of institutional demand and requirements. As noted in chapter 6 (see section 6.5.2), Dr Lawson positioned herself as inherently interdisciplinary throughout the entire interview. In extract 20 she describes the effort it takes to make her interdisciplinary collaborations work.

Extract 20

Dr Lawson: it takes a lot of work so (.) not only spending time and energy on taking your own re:search you're spending time and energy on making that relationship work (.) So it's like being in a relationship it's like being ma:rried to somebody (.) you have to wo:rk at it co:nstantly and occasionally it breaks down (.) occasionally it goes through rough patches ahh and dealing with that can take a lot of energy and a lot of time (.) so that I don't think is something that the research councils or heads of school appreciate (.) the sheer amount of time and energy that goes into managing the relationship ahh (.) […] 'cause you don't get any recognition for that (.) you don't get any work point credits or whatever for the (.) for the scho:ol (.) so it's just something that you're expected to have to do in your own time (.) basically so it's (.) and it does make people think about whether or not it's worthwhile sometimes (.)

This extract illustrates Dr Lawson's struggle with the ideological dilemma of effort and reward. She notes that it takes a lot of 'time and energy' to make collaborations between natural and social sciences work, but also notes that there is a lack of recognition and reward. She builds her argument around such a dilemma to emphasise both the challenges associated with collaborating with other disciplines, and the extreme importance of thinking through the value of collaborating in projects of that kind. Dr Lawson uses a 'marriage metaphor' to illustrate the dilemma. This metaphor suggests that interdisciplinary collaborations have an extended composition and that they require much effort from the parties involved in order to work. As noted by Dr Lawson, there are occasional 'breakdowns' and 'rough patches', but as in marriage, these have to be worked out continuously. Although the metaphor may seem useful, it also contains dilemmatic elements. Marriage offers different rewards and can be rewarding in itself, but not all the time. Despite the general agreement that marriage has its downsides one generally does not talk about private problems in public. Rather, since problems are so common, extra reward should not be expected. A different misleading element is that, in contrast to marriage, in academia people participate in different projects and collaborations, and it would be impossible to treat all of them as a marriage.

Here one can see again a connection between the ideological dilemma of effort and reward and the dilemma of individualism and collectivism. Dr Lawson notes that, on the one hand interdisciplinary collaboration takes time and effort and these are often not recognised, and on the other hand if she is not willing to take the effort to make the collaboration work she might not be a 'good

academic fellow'. However, efforts can also end up in one just becoming the service provider (Barry et al. 2008; Pilnick 2013) of a different discipline, with no much benefit to one's own discipline. The connection between these two dilemmas can also be seen in Dr Miranda's talk in extract 22, chapter 7 (section 7.5), when he argues that interdisciplinary research can take a lot of energy and that he has to take care becoming the other discipline's IT person. Interdisciplinary expertise then, involves not only understanding other disciplines but being able to get right the balance between effort and reward as well as the balance between individualism and collectivism.

Dr Lawson highlights different challenges involved in interdisciplinary collaborations between social and natural sciences. However, her strategy to rationalise the challenges is to accept and embrace them. The following extracts illustrate how she negotiates a comfortable and valuable position regardless of the challenges and dilemmas she described during the interview. Extract 21 contains part of Dr Lawson's answer to my question about her future research plans.

Extract 21

Dr Lawson: Ahh (.) I:: suppose in some wa:ys it's becoming more interdisciplinary […] I'm interested in actually doing it myself (.) so in some ways I want to start doing more (.) scientific (.) maybe quantitative work (.) but I want to do it in such a way that I can combi:ne it with qualitative

Regardless of the challenges interdisciplinary research involves, in this extract Dr Lawson emphasises that she would like to keep working with people from other disciplines. Moreover, she intends to become even 'more

interdisciplinary', as she wants to provide insight from qualitative methods to a type of quantitative analysis used by her collaborators from other disciplines. In extract 22 she provides further explanation about the uncertainties associated with her enterprise, but also she emphasises the value it may have.

Extract 22

Dr Lawson: maybe I'm completely mad for taking this on (.) ahh but ahh but I'm going to give it a go (.) if it gets funded of course (.) so the proposal is gone in and it's a bit radical I suppose the [*research council*] says (.) probably a big chance I won't get funded but ahh yes it's it's I guess taking that interdisciplinary collaboration further in that I am now sort of ahh (.) merging into the field of science […] so actually going to apply it so it's it's sort of the applied aspect that I think is going to be quite novel

Dr Lawson is obviously aware of the fact that 'becoming more interdisciplinary' is risky. She notes she could be positioned by others or even by me as being 'completely mad'. Yet, she is determined to 'give it a go', but adds the conditional 'if it gets funded'. In this extract Dr Lawson presents herself in two occasions as vulnerable to failure and she also acknowledges the possibility of being seen by others as being 'completely mad'. In order to rationalise these risks and to provide some repair to her bold pronouncement she adds that she thinks her approach 'is going to be quite novel'. Thus, accounting for 'novelty' is the discursive resource she uses to emphasise the value of her work and to minimise the trouble of her position, or to present it as a risk worth taking. In extract 23, below, she argues one more time she embraces the uncertainties of interdisciplinarity.

Extract 23

Carlos: And is there something else that you think we haven't covered about

            ahh the idea of interdisciplinarity or any of the other thing […]

Dr Lawson: Not (.) that I can think of (.) I think it is worthwhile ahh a:nd whilst

            you know I may say some critical things about my experience with

            the [*project*] ahh I think it's I'm not willing to abandon

            interdisciplinary research as a concept or as a mode of practice or a (.)

            a valuable ahh ahh sort of practice in terms of research (.) but I just

            think that those committed to doing it on paper need to provide the

            proper resources in order for it to be done successfully

In this final question of the interview, Dr Lawson notes that she is 'not willing

to abandon' interdisciplinarity as a 'valuable practice', regardless of the

challenges and dilemmas she described. Thus, her position as interdisciplinary

researcher and her interdisciplinary career are negotiated as valuable and as

worthwhile. But it is not straightforward to succeed in it, and neither is it to

construct successfully a coherent self and identity when much trouble and

dilemmas can be encountered. Finally, she draws on the repertoire of

'institutional support as fundamental for interdisciplinarity' to stress that

supporting it on paper is not enough, but 'proper resources' are required 'in

order for it to be done successfully'.

Dr Lawson's accounts and those of the other interviewees presented in this

section are at odds with those presented in the previous sections of this chapter.

While some interviewees took almost for granted the success that can be

brought by interdisciplinary work, and others note that they need to commit

also to discipline-based work, yet the interviewees presented in this section

emphasise the need of being willing to face uncertainties. One last way of talking about the relationship between interdisciplinary research and professional success, contrasting with the ones analysed so far, is presented in the following section.

8.5 Questioning the value of interdisciplinarity

Although most of my interviewees presented interdisciplinary research and interdisciplinary careers as valuable and worthwhile, in the following extracts Dr Lindsay provides a more sceptical view of interdisciplinarity. She is also critical of researchers who take the value of interdisciplinarity for granted.

Extract 24

Dr Lindsay: my plan is too collaborate when I think – collaborate across disciplinary boundaries when I think that that would add value to the project [C: mhm] Ahh a::nd so:: (.) I'm particularly interested i:n (.) exploring the extent to which we can use a particular method to generate insights that info:rm policy [C: mhm] […] (.) Ahh that's my agenda (.) ahh a::nd if any particular element that fits into that agenda ahh could be enhanced by:: ahh somebody who is an expert in a field other than my own (.) then I'll seek collaboration […] But I'm not out there kind of going I:: nee::d to be interdisciplinary (.) I need to work with people from other disciplines (.) and that is my driver and a – and that is more important than what it is I'm trying to (.) research

(Female, associate professor, faculty of social sciences)

In this extract Dr Lindsay emphasises the importance of having well-defined research interests and a particular research agenda, rather than making interdisciplinary research the main driver of her career. Thus, she does not

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assume that interdisciplinary research necessarily increases the value and impact of research. It is worth noting that to her interdisciplinary work consists of collaborating with experts from other fields, rather than doing it on her own. This account allows her to protect herself from the critique that interdisciplinary researchers are not rigorous and not expert enough, and to avoid being seen as a non-rigorous specialist. Furthermore, Dr Lindsay describes with ridicule those researchers who are 'out there kind of going I need to be interdisciplinary…' and who take interdisciplinary engagement to be more important than their particular research topics. In the following extract she elaborates on her views of interdisciplinarity.

Extract 25

Dr Lindsay: Yeah (.) well (.) interdisciplinarity is not (.) universally useful [C: mhm] you know (.) it's more useful for some questions (.) for addressing some questions than others [C: mhm] […] But (.) if I was an economist who was interested i::n monetary policy (.) ahh (.) there there would be VERY little value added by bringing an anthropologist or a psychologist on board (.) So:: enough is also dependent on people's research agendas

(Female, associate professor, faculty of social sciences)

Contradicting established understandings of interdisciplinarity, as framed, for example, through the 'interdisciplinarity as bonus' repertoire, Dr Lindsay argues that this is not 'universally useful' and it does not necessarily add value to research. This way, to her, success is not necessarily an outcome of her interdisciplinary work, as was argued by Dr McCarty and Dr Truman earlier on in this chapter.

8.6 Conclusions

This chapter has presented and analysed four different ways of arguing about the value of interdisciplinarity, interdisciplinary research and interdisciplinary careers. These are used, in most cases, to present interdisciplinary careers as worthwhile and in some cases as a way to achieve professional success, represented by extrinsic and intrinsic rewards. These ways of arguing are different in terms of what interviewees see to be the conditions for value and success. In the first way of arguing interdisciplinary work is assumed to be valuable and therefore brings success to the researcher. In the second, interviewees note that both interdisciplinary and disciplinary projects are required for developing a successful career. The third way of arguing contains more tolerance for trouble and uncertainty involved in interdisciplinary work. While interviewees drawing on the other two types of narrative include more signs of success and techniques to 'get around' challenges, in this type of talking interviewees describe themselves as not too disturbed by these. In one last discursive style or way of arguing Dr Lindsay questions the value of interdisciplinarity both intellectually and to her career.

Researchers negotiate value, success and uncertainty drawing mainly on arguments that can be summarised in the interpretative repertoires presented in chapter 5. It was noted that accounting for value requires in some cases contrasts between the *intellectual* and the *instrumental*, but also in other cases interviewees present their work as valuable because it is both *intellectual* and *instrumental*.

This chapter also presented the ideological dilemma of effort and reward, used

by interviewees to express the challenges of doing interdisciplinary research, but they also struggled to overcome the trouble this dilemma brings to the negotiation of their careers as worthwhile. Moreover, connections between this dilemma and the dilemma of individualism and collectivism can be identified.

The analysis shows that value and success can be negotiated in different ways, but these forms of negotiation have to be seen as situated within the interactional context of the interview, the local context of individual biographies, and the broader context of particular disciplines, departments and relevant research councils. Having presented the last analytic chapter, I move on to discuss the implications of my findings for the literature, and present some limitations of the analysis.

Chapter 9. Conclusions

9.1 Introduction

This thesis has explored the discursive construction of interdisciplinarity and of interdisciplinary selves. It has contributed to filling a gap in the intersection between three bodies of literature, namely, studies of interdisciplinarity, studies of expertise, and discourse studies focused on self and identity. The thesis addressed the following research questions:

- *What discursive resources do individuals draw on to make sense of interdisciplinarity?*
- *How are interdisciplinary selves constructed in and through discourse?*
- *How do interviewees negotiate the issue of expertise in interdisciplinary research?*
- *How are interdisciplinary careers constructed and negotiated as worthwhile?*

As shown in the analysis, interdisciplinarity and interdisciplinary selves are constructed through narratives of past, present and future, including descriptions of earlier life-events, anecdotes of usual days and routines, narratives of meeting people, stories of solving problems, and prospective career plans, amongst others. Moreover, on many occasions self and other are constructed in contrast to each other within narratives: interdisciplinary researchers may be constructed in contrast to 'narrow minded' specialists;

rigorous specialists may be constructed in contrast to non-rigorous researchers, and good collaborators in contrast to bad collaborators. The value of a discursive psychology approach lies in the fact that it does not question the authenticity and accuracy of descriptions of selves, minds, and events; instead the focus is on how different versions of selves, minds, worlds and events are constructed and presented as authentic and accurate (Edwards and Potter 1992; Potter and Wetherell 1987; Potter 1996b). Thus, judgements are not made about the 'real' skills and capacities of individuals, but on the patterns of language use, or rather the discursive resources individuals have at hand to construct accounts.

This concluding chapter is organised in three parts. Section 9.2 summarises the key findings of the analytic chapters and addresses each research question. Section 9.3 presents the limitations of the analysis. Section 9.4 describes the overarching claims of the thesis, suggesting a way in which interdisciplinary expertise can be conceptualised. This section also describes how the findings of this thesis inform other studies of interdisciplinarity. Section 9.5 considers possible avenues for future research and the practice of interdisciplinarity.

9.2 Main findings and the research questions

9.2.1 What discursive resources do individuals draw on to make sense of interdisciplinarity?

The purpose of chapter 5, the first analytic chapter, was to identify the discursive resources commonly used by my interviewees to formulate accounts of, and arguments about, interdisciplinarity. According to discourse analysis scholars, individuals have more than one way of talking about a topic, and can

express different views and opinions at different times in the same conversation, or across different conversations. In discursive psychology these different ways of talking are known as interpretative repertoires (Edley 2001; Potter and Wetherell 1995). These repertoires are flexible enough so that they can be put together in sequences of argumentation, and can also be presented not as one's own opinion but as the opinion of others. As an example, Dr Lindsay argued interdisciplinarity is not rigorous, but in contrast Dr Cook argued that a perceived lack of rigor is only the flawed opinion of some individuals (see section 5.3).

The chapter began by presenting Barry and collaborators' (2008) logics of innovation and accountability as discursive resources in narratives of interdisciplinarity, which could be identified both within the literature and in my interviewees' talk. While to Barry et al. these logics represent rationales for the value of interdisciplinarity, I took them as units of analysis and as resources for argumentation, for the interviewees. Barry and collaborators' logic of ontology, which suggests that interdisciplinarity can produce new practices, objects and subjects, is an insightful concept, but it was not taken up here as an interpretative repertoire because it is a more complex idea, not easily identified as such in people's talk. One could argue, however, that this thesis represents a detailed analysis of the discursive practices which individuals may use to account for those new subjectivities.

The chapter then introduced the interpretative repertoires identified in my interviewees' talk, which are also arguments that can be found in the literature on interdisciplinarity. It is worth naming some of these repertoires. One interpretative repertoire often identified in interviews and in the literature is the

'nature as interdisciplinary' repertoire, which suggests interdisciplinary approaches are necessary because real world problems, including social problems, 'do not come in discipline-shaped blocks' (Buanes and Jentoft 2009). A different interpretative repertoire suggests that disciplines are restricted and restrictive, therefore insufficient to tackle complex problems. It was noted that there are authors who question the accuracy of these arguments (Jacobs 2013; Weingart 2000), and this illustrates that discursive resources can be taken up or challenged. The rest of the chapter introduced interpretative repertoires around the intellectual and institutional dimensions of interdisciplinarity. Both dimensions included repertoires that can contradict other repertoires: Interdisciplinarity was at times described as an intellectual bonus, but at other times as an intellectual challenge; at times it was described as intellectually rewarding, and at other times as precarious. Other interviewees described interdisciplinarity not as genuine, intellectual or problem driven, but as purely instrumentally driven.

On the basis of these findings I suggested that since different repertoires can be used as arguments and counter-arguments, talk of interdisciplinarity is situated in a rhetorical context. This means that individuals construct versions of people, minds and events in order to support one side of an argument and to undermine any potential alternative (Billig 1996, 2009; Potter 2012a): I can present myself as rigorous providing a detailed account of my work, making it difficult for others to describe me as non-rigorous. Thus, a brief answer to the first research question is that, besides the logics of accountability and innovation, my interviewees constructed accounts to make sense of interdisciplinarity by drawing on a number of interpretative repertoires that

contain contrary themes. In chapters 6, 7 and 8, I explored how these discursive resources were integrated by the interviewees into their life narratives, and also identified other discursive resources.

9.2.2 How are interdisciplinary selves constructed in and through discourse?

In chapter 6, the second analytical chapter, the focus was on the discursive construction of interdisciplinary selves and identities. The chapter drew strongly on the unit of analysis known as 'subject positions' (Davies and Harré 1990). When interviewees built arguments drawing on the interpretative repertoires presented in chapter 5, they both adopted the subject positions made available by such repertoires and also attributed these subject positions to others. For example, Dr Johnson described himself as particularly intellectual because to him interdisciplinary work is rewarding, Dr Thalassa positioned herself as intellectually challenged because she needs to read journals from several specialities, Dr Reed argued some researchers do interdisciplinarity badly and Dr Lindsay positioned *other* interdisciplinary researchers as not as rigorous as their home disciplines require. In this chapter I also suggested that fixed categories of researchers such as 'interdisciplinary', 'natural interdisciplinarian' or 'narrow-minded specialist', among others, are not suitable for analysis, since speakers can always change or challenge the essence of a category. In other words, categories and the meaning of these categories are constantly in negotiation within discussions of interdisciplinarity. As an example, the analysis showed that 'natural' interdisciplinary researchers can be identified either as a special group of people, or alternatively all ordinary researchers can be described as being

natural interdisciplinarians. Positioning oneself as special or ordinary depends on individuals' trajectories, but also on the local cultural frameworks provided by different disciplines, and moreover, on the image individuals intend to display in the interactional context.

In this chapter, the analysis also explored how interviewees' biographical narratives are constructed by drawing on interpretative repertoires (and the subject positions these make available) and other widely established discursive resources, in addition to more 'local' resources from individuals' lives. It was argued that, since interpretative repertoires contain contrary themes, individuals may occupy and resist troubled positions (Taylor and Littleton 2006; Wetherell 1998), and therefore biographical talk is rhetorically situated and reflexive. Thus, as Taylor and Littleton argue, rather than neutral descriptions of life events, biographical narratives are sites in which widely established meanings, categories and understandings are taken up, resisted, or challenged.

In the chapter I also described a discursive resource I named the 'canonical narrative of the single discipline specialist'. The analysis demonstrated that interviewees can draw on this narrative to position themselves as disciplinary specialists, but also they distance themselves from it, in order to avoid being perceived as narrow-minded specialists. These findings are similar to Brew's (2007) argument that individuals' disciplinary and interdisciplinary identities are negotiated and are more 'fluid' than commonly thought. In contrast, the findings are at odds with those of authors who formulate typologies of researchers according to their interests, skills, motivations and trajectories (Aram 2004; Harris et al. 2008). Typologies and categories of people can

vanish, and talk about motivations and trajectories involves discursive and rhetorical work, so it is not adequate to take these as factual accounts of past events. It is more convenient to focus on the use and negotiation of subject positions because this analytical concept reminds us that attitudes and identities have to be interpreted within an interactional and rhetorical context. In certain contexts individuals may highlight their interdisciplinary self, and in other contexts they may find more convenient to emphasise a single specialist identity.

In a number of cases my interviewees provided accounts of the 'often uneasy identification and negotiation of oneself as an interdisciplinary scholar' which Lau and Pasquini (2008:552) describe. Since interpretative repertoires comprise contrary ways of talking, as noted in chapter 5, subject positions can contain positive and negative connotations. Single discipline specialists can be described as rigorous but also as 'one trick ponies' (Donald 2015), and interdisciplinary researchers can be described as flexible intellectuals but also as 'jacks of all trades, masters of none' (Lau and Pasquini 2008; Stember 1991). I also described the 'ideological dilemma of openness and rigour'. This dilemma highlights the risk of engaging in interdisciplinary research, as individuals may endanger their reputation as serious and rigorous scholars if they are *too* open to other disciplines, or because of being open to *several* disciplines. However, the lack of such disciplinary 'openness' is no less problematic, since one may appear to be a narrow-minded specialist. This was illustrated by the fact that Dr Winston and Dr Cook described specialists in an ambiguous fashion, both positively and negatively. In order to get around this dilemma researchers have to describe their trajectories as coherent, and it was

shown that while Dr Lawson constructed a coherent narrative, in describing herself as having always been interdisciplinary, Dr Lindsay emphasised her identification with one single discipline.

9.2.3 How do interviewees negotiate the issue of expertise in interdisciplinary research?

As noted in chapter 6, presenting oneself as interdisciplinary is risky because there are potential negative connotations, such as not being a serious scholar, not being rigorous and being a jack of all trades and master of none. Moreover, as one interpretative repertoire suggests (authentic vs purely instrumental), individuals who engage in interdisciplinarity can be accused of doing it badly or only superficially, motivated only by instrumental ends rather than by intellectual ends. The focus of chapter 7, then, was on how individuals present themselves as having the skills and expertise required to conduct *authentic* interdisciplinary research, since accounting for 'openness' to other disciplines is not enough. In other words, chapter 6 was about accounts of attitudes and motivations, and chapter 7 was about accounts of 'actual' skills and expertise.

As in chapter 6, in chapter 7 a number of interviewees emphasised a disciplinary specialist identity, but others embraced the dilemma of openness and rigour, discarding former identities as specialists. In all cases interviewees told stories in which they emphasised their possession of particular skills. Some argued for being able to integrate or to weave together the contents of different disciplines in original ways (Dr Graham, Dr Johnson), or they positioned themselves as translators (Dr Robins, Dr Reed). Those adopting specialist expert positions argued they could understand *enough* of other disciplines in order to deliver what collaborators required (Dr Johnson, Dr

Anderson), but rejected being experts in other disciplines. Some interviewees also stressed how necessary it is to understand what other disciplines value (Dr McCarty, Dr Anderson). More interesting were the ways in which the stories were told, since interviewees provided detailed reconstructions of events, including dialogues and representations of other characters' intentions, actions and understandings. The interviewees drew on these vivid descriptions (Potter 1996b) to present their possession of the skills needed for interdisciplinary research as factual. One could argue their expertise in interdisciplinary research was negotiated within these stories, which often resembled other authors' description of calibration (Centellas et al. 2013) and interactional expertise (Collins and Evans 2002, 2007). Section 9.4 provides a more detailed discussion about these similarities.

Chapter 7 also revealed interviewees' accounts of skills and dispositions, which went beyond the technical and epistemic. The ability to tolerate and engage with disciplinary differences, and the capacity to negotiate between individual and other disciplines' interests were commonplace in interviewees' accounts. However, the interviewees' accounts could be interpreted as being formulated around – and dealing with – two different ideological dilemmas. I named the first dilemma the 'disciplinary tolerance and expert prejudice' dilemma. Conceived as a combination of two dilemmas previously identified by Billig et al. (1988), the dilemma I introduced referred to accounts provided by individuals in which they simultaneously adopted tolerant and intolerant positions towards disciplinary differences. Moreover, individuals presented their intolerant views as rational by drawing on their own disciplinary perspectives, thus on their disciplinary expertise. Dr Lindsay argued she was

searching for methods beyond her discipline and that she would be willing to collaborate with people from other disciplines, *as long as* they adhere to *the same* values she has. Similarly, Dr Walsh argued that intellectual flexibility is required for interdisciplinary research; however, he gets '*pissed off*' when other disciplines differ from his way of working. Thus, individuals struggled to accommodate their positions as disciplinary experts, with their positions as individuals who are tolerant of disciplinary differences.

The second ideological dilemma, of 'individualism and collectivism', referred to interviewees' accounts in which they intended to accommodate both their own interests and disciplinary commitments and the interests of collaborators from other disciplines. In these accounts the interviewees intended to avoid both, on the one hand, being seen as selfish or too individualistic and, on the other hand, as being unable to protect their own interests and disciplinary commitments. While the interviewees presented themselves as good colleagues who would help people from other disciplines, they also argued they would back away from projects in which there was no value for their own disciplines. Besides the skill of identifying and negotiating different disciplinary interests, the interviewees emphasised the value of identifying and addressing funding bodies' expectations. I argued that managing the tension between the two dilemmas, emphasising epistemological pluralism (Miller et al. 2008) and identifying and negotiating mismatching interests can be regarded as skills that point to expertise in interdisciplinary research. Thus, constructing an identity as expert in interdisciplinary research requires displaying oneself as a good negotiator in the very narratives used during the interview. In the literature authors often take research participants' accounts as actual descriptions of their

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skills and of how events 'really' developed (e.g. (Collins and Evans 2007; Lattuca 2002). However, these accounts can also be explored in themselves, analysing what are research participants achieving through these accounts, what details are emphasised, what is presented as relevant, and what evidence is provided to make such accounts sound accurate. Moreover, it is valuable to focus on struggle, contradictions, tension and dilemmas.

9.2.4 How are interdisciplinary careers constructed and negotiated as worthwhile?

Chapter 8 focused on interviewees' accounts of how interdisciplinarity adds value to their careers and their research, or rather on what they said was the personal and professional value of engaging in interdisciplinary research. As in the previous three chapters, there was variability in the interviewees' accounts. There was variability in *what* they said and also in *how* they said it. Moreover, rather than emerging as clear attitudes that could be represented by a box ticking exercise, these accounts included negotiation and balancing between the positive and negative arguments around interdisciplinarity.

The chapter included accounts of interviewees who drew strong associations between interdisciplinarity and professional success, because, they said, it enabled more innovative research (logic of innovation), was a way to produce the impact expected by the REF (logic of accountability), was a way to get access to more research funding (institutional desire repertoire), or – in Dr Young's words – was a way of addressing problems that 'even the man on the street would understand' (nature as interdisciplinary repertoire/logic of accountability). However, in a further section such a view was contradicted by Dr Lindsay, who argued that interdisciplinarity does not necessarily produce

better outcomes, even though she emphasised that her objective was doing research which could have an impact on policy. Moreover, some ridicule could be perceived in her description of researchers who make interdisciplinarity their main driver. Other researchers argued for the need to be engaged in both disciplinary and interdisciplinary research. As Dr Yusuf noted, researchers have to be 'canny' in how they go about engaging in interdisciplinary research, and Dr Young noted he tries to publish enough disciplinary and interdisciplinary papers in order to fulfil his department's evaluation criteria. In contrast, Dr Walsh argued he should do less interdisciplinary work, since it produces no benefit for his career progression. These accounts underline that carrying out interdisciplinary research involves the skills to develop a professional strategy to negotiate potential minefields.

Chapter 8 also presented the last ideological dilemma identified in the thesis, namely the 'effort and reward' dilemma. I drew on the 'effort and reward imbalance' model (Siegrist 1996) from occupational psychology in order to interpret the data. Similar to the model, the ideological dilemma points to the trouble caused by investing much effort in activities which do not bring (enough) reward and recognition. However, I also argued that while the 'effort and reward' model emphasises the 'much-effort-little-reward' side, so to say, the opposite imbalance, namely on the 'little-effort-much-reward' side, can also be a source of trouble. Expecting substantial rewards from little effort, or trying to be successful 'the easy way' was generally regarded negatively by my interviewees. As noted above, Dr Walsh highlighted how problematic it is to engage in too much interdisciplinary research, since one may end up doing 'things don't really count'. By contrast, Dr Yusuf described researchers who

avoid engaging with other disciplines for selfish reasons in a negative way, especially those who only do discipline-based work because it brings more professional rewards. Thus, both types of imbalance are undesirable and are sources of identity trouble for researchers. Yet, individuals can negotiate less problematic positions by shifting the talk from professional rewards, to personal rewards. This emphasises that negotiating one's career as worthwhile is situated in a rhetorical context because individuals both problematise and distance themselves from not too desirable ways of achieving succeeding.

While some interviewees expressed concerns about the imbalances between effort and reward, others argued they would keep doing interdisciplinary research *as they always have*, despite its downsides and uncertainties (Dr Graham, extract 19; Dr Lawson, extract 22). Accounts of embracing uncertainties of interdisciplinary research allowed my interviewees to achieve coherence and consistency in their biographical narratives and therefore in the discursive construction of themselves.

As a summary of the analytic chapters, the construction of interdisciplinary selves is rhetorical and dilemmatic: rhetorical because individuals have to undermine and distance themselves from potential negative connotations; and dilemmatic because while distancing themselves from a negative connotation, individuals may face new problematic situations. Since no subject position is safe and untroubled at all times, individuals shift from one position to another at different moments during a conversation. Therefore, thinking about stable or fixed identities is misleading, for analysis and probably for practice. No individuals do the same discursive, positioning and rhetorical moves because these depend both on the interactional context and on what their life-specific

situations (main discipline included) allow them and restrict them to do. If such complex identity work is evident in one hour long interviews, one would wonder how problematic it is in everyday life. However, if some interviewees managed to achieve a coherent and consistent narrative in the interview, they may also be able to do so in other situations.

Throughout the analytical chapters not much was explicitly said about power and power relationships regarding interdisciplinarity. In the methodology it was said that it is not possible to know what discursive resources can be considered the 'winning arguments' (Edley 2001), as disciplinarity and interdisciplinarity can be equally defended and criticised. However, once having presented a large number of discursive resources and illustrated how these were used by the interviewees, it is possible to highlight where power and empowerment can be identified. Two discursive resources might be regarded as the more dominant over others, thus the ones that carry the most strength in the discursive environment of interdisciplinarity. These are the interdisciplinarity as non-rigorous repertoire, and the canonical narrative of the scientific expert or the single discipline specialist. If the interviewees described other skills and tried to negotiate a position as expert in unconventional ways, these can be seen as strategies of empowerment, also oriented to counter that interpretative repertoire and that canonical narrative.

Not being a rigorous and a specialist expert are disempowered positions, thus positions interviewees would try to avoid, drawing on many of the other discursive resources identified in the analysis. Being seen as a rigorous expert is so important that, as shown in chapter 7, individuals might try to position themselves as such even if they have to face the dilemma of disciplinary

tolerance and expert prejudice. Other disempowered positions are that of the service provider and the jack of all trades but master of none. However, it is worth noticing that researchers might gain some empowerment by showing awareness of how problematic these positions can be.

Having summarised the key findings, it is worth pointing out blind spots and limitations of the analysis.

9.3 Limitations of the empirical study

In chapter 4 I presented a number of limitations inherent in the research design of this thesis. Those limitations are typical for qualitative research, such as the fact that interviewees' accounts are influenced by the interactional context of the interview, and I also described contrasting opinions about the possibilities for generalisation (Bryman 2008; Collingridge and Gantt 2008). I noted that the sampling strategy, which included purposive, convenience and snowball sampling at different stages, make the results unsuitable for wider generalisation. I also argued that my initial email to contact the participants may have influenced the way they decided to construct their narratives during the interview. Moreover, the findings of the thesis are limited to the discursive, social and political environment of one single institution, in one specific country and during a specific period of time. It might be that interviewees' accounts would have been different had I interviewed them after the results of the REF came out. In this section, limitations are considered in terms of the analysis.

Partly because of the way I selected my research participants the analysis does not make it possible to make general comments about, for example, how the

benefits and challenges of interdisciplinary research and careers differ between science and engineering, the social sciences, and the arts and humanities; or between applied and basic research. It should be noted, however, that distinguishing between basic and applied research has its own difficulties. As Calvert (2001, 2006) suggests, the term basic research is ambiguous and flexible, and its use varies in different situations. Relying on the data I generated it would be difficult to ascertain whether differences and similarities between 'hard' and 'soft' disciplines have an impact on the way interdisciplinarity is perceived and practiced, or whether the personal situations of the speakers are more influential in shaping their narratives. Furthermore, it may be difficult to determine whether one is studying the same or different types of interdisciplinarity. As Barry and Born (2013) argue, interdisciplinarity is not only one homogeneous group of practices. Future research should inform participants about different types of interdisciplinary research and encourage them to reflect about what types they are familiar with, which ones describe their practices better, and which ones they find the most problematic.

One further limitation is that the analysis did not pay attention to differences in the discursive practices of female and male interviewees. Exploring this gender dimension would offer the possibility to increase the dialogue between discourse studies, studies of interdisciplinarity, and feminist science and technology studies (Haraway 1988; Reynolds et al. 2007; Rhoten and Pfirman 2007; Suchman 2008; Wagner and Wodak 2006).

A final limitation of the analysis is the lack of attention to the turn-taking, pauses and hesitations during the interviews, which are the common focus of approaches to discursive psychology more strongly engaged with conversation

analysis (Hepburn and Wiggins 2007). Such a focus could bring interesting findings about the role of the interviewer and his (my) own assumptions regarding disciplinary and interdisciplinary practices. The challenge for engaging in such a type of analysis is the time required for detailed transcription of the interviews and for developing familiarity and sensitivity to fine-grained details of the data.

Having addressed the research questions and considered the limitations of the study the next section describes the overarching argument of the thesis and what it contributes to the literature.

9.4 Towards a discursive and dilemmatic view of interdisciplinary experts and expertise

In this section I shall synthesise some of the key findings presented in the previous section, against the backdrop of the literature, and how these findings contribute to understandings of interdisciplinary individuals, their skills, and expertise. As I argued at the end of chapter 3, there are two main gaps in the literature on interdisciplinarity: one is the limited attention to the literature on expertise (Frodeman 2010), and the other is the lack of attention to contemporary studies of self and identity. It is possible to shed some light on the crossover between these areas of research by drawing on discursive psychology. As described earlier, one type of discursive psychology (Reynolds et al. 2007; Taylor and Littleton 2006; Taylor 2015) has been developed as an approach to self and identity, and discursive psychology in general has roots in rhetoric and ethnomethodology, as have some approaches to expertise (Hartelius 2011; Lynch 2004; Majdik and Keith 2011a, 2011b). Moreover, a

focus on biographical narrative has been shown to be valuable for studying the construction of expertise, as van Rijswoud (2010, 2012) suggests.

A discursive, narrative and rhetorical approach to interdisciplinary expertise makes it possible to take a critical and analytic stance towards research participants' accounts. Critical literature on expertise, especially within STS but also in communication studies, suggests that the category of expert has no 'stable boundaries between inside and outside' and rather membership categories are achieved during interaction (Lynch 2004:178). Experts, Majdik and Keith (2011a) argue, have the 'ability to make a case for a particular definition of problem or solution' (p. 374), and 'an ability to negotiate the various normative contexts (technical/economical, religious, familial/traditions, etc.)' (p. 377). Thus, the identity of 'expert' is achieved in discourse and argumentation, and involves multiple dimensions.

The focus on multiple dimensions recalls Ku's (2012) observation that 'interdisciplinary expertise' (in nanomedicine) requires a combination of technical and managerial skills, and also Mansilla and collaborators' (2012) notion of SSEC platforms, since with this they suggest that successful interdisciplinary collaborations involve a cognitive-intellectual dimension, an emotional dimension, and a socio-interactive dimension, and they note that institutional factors shape all of these. While it might be reasonable to agree on this, it might also be that Mansilla et al. and Ku take their interviewees' accounts as factual reporting. Similarly, Lattuca et al. (2002) draw on their interviewees' accounts to develop their sociocultural perspective of interdisciplinary learning. They argue that learning occurs 'in interaction and *in situ*' (p. 720), but this means that they developed a theory of situated

interaction drawing on interviewees' accounts of such interactions. As in these cases, other researchers also take research participants' accounts of emotions, motivations, attitudes, descriptions of self and other, and biographical accounts to be accurate (Harris et al. 2008; Lau and Pasquini 2008; Oughton and Bracken 2009). The risk of taking these accounts as factual is that the analyst may be reproducing interviewees' positively distorted and ideologically and rhetorically motivated views of how the world works.

An alternative, as done in this thesis, is to take interviewees' accounts as variable, action-oriented and situated in interactional and rhetorical contexts (Potter 2012a). These accounts are constructed by interviewees in order to present themselves as proficient interdisciplinary researchers and as good collaborators. Paying attention to the use of discourse may reveal struggle, contradictions and dilemmas that are not easily resolved, as when my interviewees positioned themselves as simultaneously tolerant and intolerant of disciplinary differences, or as simultaneously individualistic and collectivistic.

Drawing on my findings, I would suggest that interdisciplinary expertise consists, perhaps amongst other things, of individuals' capacities to overcome, at least partially and in specific situations, the ideological dilemmas I identified, namely of 'openness and rigour', 'disciplinary tolerance and expert prejudice', 'individualism and collectivism' and 'effort and reward'. Although dilemmas of a social and ideological nature cannot be resolved entirely and permanently, as Billig et al. (1988) suggest, individuals and groups of collaborators may be able to partially manage these dilemmas and the practical challenges they produce. The situation of partial solutions to all dilemmas

might be utopian, but at least it could encourage reflection, discussion and negotiation.

Being able to deal with these dilemmas, partially and in specific situations may require multiple skills, and at times awareness of the dilemmas may discourage some collaborations from happening, or make researchers distance themselves from problematic collaborations. Interactional expertise (Collins and Evans 2002, 2007), or technical competence in a discipline other than one's own, is of course necessary, but may not be sufficient. Interactional expertise may help individuals to avoid being perceived as narrow-minded specialists, but it does not explain how individuals can avoid being perceived as 'a jack of all trades and master of none'. Thus, individuals engaged in interdisciplinary research may find it valuable to develop interactional expertise, but they also may see value in being aware of the dilemmas they may face. Collins and Evans do not pay attention to *how* these types of expertise can be used in a fruitful way, not only within other disciplines but within one's own, in order to avoid being only a service provider of other disciplines. In other words, being 'fluent' in another discipline's language does not explain how to make a collaborative project fair, or ensure it satisfies the interests of all collaborators, a situation that which has been described elsewhere as problematic (Pilnick 2013; Rabinow and Bennett 2012; Strathern and Rockhill 2013). While individuals may invest time and effort in developing interactional expertise, they also may find useful to consider what to do to ensure that these efforts are fairly recognised by their institutions, or to minimise professional risks.

In collaboration with Gorman, Collins and Evans have developed an approach that combines their typology of expertise and Galison's notion of 'trading

zones' (see section 3.3.3), which has been used to analyse interdisciplinary collaboration. They suggest that interactional expertise is the language that allows communication in one type of trading zone (Collins, Evans, and Gorman 2007), and they suggest that trading zones disband if no common ground is found. This approach may be bolstered if they take into account that ideological dilemmas, similar to the ones I identified, could also be encountered by groups enrolling in those 'interactional expertise trading zones'. Moreover, attention to dilemmas and to how these are managed could help to identify other elements which make these trading zones work. It might be that some trading zones or SSEC platforms, to use Mansilla and collaborators' (2012) concept[21], are better suited to (partially) getting around such dilemmas.

Taking into account the dilemmas I have identified can contribute to thinking about the ethics or virtues of interdisciplinary collaboration, which a number of authors have put forward (Balsamo and Mitcham 2010; Giri 2002; Petts et al. 2008). These authors suggest, among other virtues, that individuals have to be confident in their own disciplinary knowledge, but also they have to acknowledge that this is partial and incomplete, and therefore they have to be intellectually flexible. The issue, however, is to decide when to be confident and when to be flexible. Although skilful researchers may be able to accommodate different disciplinary perspectives, perhaps through epistemological pluralism (Miller et al. 2008), there should be awareness that, in principle, these virtues are contradictory, as the dilemma of disciplinary

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[21] Mansilla et al. (2012) suggest their concept of SSEC platforms as superior to trading zones because, they argue, trading zones only focus on the cognitive-intellectual dimension but miss the institutional, the emotional and the socio-interactive dimension.

tolerance and expert prejudice illustrates. Diplomatic skills (Harris et al. 2008) are necessary, although it is difficult to know what these are.

My analysis concurs with authors who emphasise that interdisciplinarity requires individuals' self-awareness, reflexivity, ongoing negotiation and diplomatic skills (Buanes and Jentoft 2009; Oughton and Bracken 2009; Petts et al. 2008; Romm 1998). I suggest that reflexivity and negotiation could be stimulated by paying attention to the ideological dilemmas I identified. When is openness to other disciplines being too extensive? When is one's core disciplinary identity in risk? When is one missing others' interests? When is one putting too much emphasis on one's own interests? When is one missing other perspectives? When should one be tolerant? What are the limits of such disciplinary tolerance? When are efforts not paying off? Yet, it should be taken into account that other ideological dilemmas could be encountered. It would be arrogant to say that I identified all the possible dilemmas that can exist, drawing on an analysis of a limited number of interviews. A convenient starting point would be to consider that the ideological dilemmas an individual encounters are common to his or her collaborators. This might create some initial common ground to start arguing and thinking about how to overcome such dilemmas.

Dilemmas may not be entirely solved, and therefore interdisciplinary expertise as I present it here may not be fully reached. In such case it might just exist as a 'promise' which 'render[s] "alive" the expectations of interdisciplinary collaboration', as Brosnan and Michael (2014:680) recently argued in reference to the leader of a translational neuroscience research group. As a

'promise' interactional expertise could be taken as an aim, as something to look for and work for.

Summing up, my research contributes to studies of interdisciplinarity and studies of expertise by pointing out that biographical talk, states of mind, narratives of skills-possession and collaboration development are not neutral descriptions of reality but are retrospectively constructed for specific interactional and rhetorical purposes. Moreover, analysts of interdisciplinarity shall consider that what they intend to find, namely interdisciplinary 'success', may only be partial, and they should be aware of the dilemmas and contradictions their research participants might be facing, but which probably are partly ignored and partly denied. The role of the analyst should include, as Billig et al. (1988) suggest, identifying those contradictions and making them more obvious.

9.5 Avenues for future research and practice

This thesis can be concluded by presenting potential areas of future research. The most adequate place to start is addressing the limitations presented earlier. Thus, I could explore in my data variation in accounts of male and female interviewees, and I could also pay attention to the finer details of the conversational turn-taking. Moreover, the interviews for this thesis were carried out in a time of tension and uncertainty about the REF results. It would be valuable to explore if my interviewees would construct themselves similarly or differently if they were interviewed a second time, now that the REF results are out, and what they make of recent claims about the presumed high scores of interdisciplinary research in impact case studies (Northam 2015; Hill, 2015)

In order to extend the study to a broader sample, I could interview researchers with stronger disciplinary commitments and trajectories. They may come up with interesting narratives too, probably about the heterogeneity of their own disciplines (Schaffer 2013), and it would be interesting to explore if they face similar or different dilemmas. Also, since this study focused on a particular country and in a particular historical time, it would be valuable to explore how (inter)disciplinary researchers understand and construct themselves in other national contexts, including countries with less developed research structures. Furthermore, it would be interesting to explore how agendas of argumentation about (inter)disciplinarity have changed across time, focusing in other decades by analysing written biographical accounts of scientists and intellectuals, as Daston and Galison (2007) have done, but also across collaborative projects' lifetime. Besides these suggestions one could gather data from naturally occurring interaction.

Recently, social scientists engaged in collaboration with natural scientists, specifically in neuroscience and synthetic biology, have suggested that collaboration across disciplines can be taken as 'experimental entanglements' (Fitzgerald and Callard 2015; Fitzgerald et al. 2014) or as a research method (Calvert 2013) in itself. Social scientists entangled in collaborative experiments could also draw on the ideological dilemmas I identified and search for other ones, and these could be used to shape such experiments, reflecting and encouraging discussion. Calvert notes that while in synthetic biology collaborators from the natural and social sciences may have different objectives, they can think of co-developing 'lower-scale, more pragmatic objectives, such as getting a grant or running a Masters programme'

(2013:191). This seems to be a good way to overcome the dilemma of individualism and collectivism I described. She continues, 'in pursuing these pragmatic objectives together we will inevitably provoke each other to *think* in new ways' (p. 191, my emphasis), and I would suggest, following Billig, to *argue* in new ways, because arguing and thinking are strongly connected (Billig 1996). Thus, these collaborative engagements could be enhanced by drawing on the dilemmas I identified to foster discussion and reflexivity, and new forms of inter- and any form of cross- disciplinary expertise could be aimed for.

Last but not least, this research has focused on the self and on how it is constructed socially, discursively and in relation to others. Those engaged in the practice of interdisciplinarity may see value in the fact that they can re-position and re-construct their self and their understanding of others by seeing and taking the other side of the argument. The specialist may gain from being aware that he or she might risk being narrow-minded, short-sighted, or even intolerant of other approaches; and from seeing that the non-single discipline expert may also be struggling for recognition. The 'jack of all trades' can see that disciplines and specialist fields are inherently diverse, and that they might gain from searching for heterogeneity in 'closer places'. Individuals engaged in the promotion of interdisciplinarity at the departmental, university or national level, may gain from seeing that those engaged in interdisciplinarity face risks and dilemmas which may at times be solved, but which might reappear in new situations. Therefore, as any individual, and particularly when they are designing new policies, they should be aware of what could be hiding on the other side of their arguments, what constrains could their policies be imposing

and how much room they let for researchers to move away from their dilemmas.

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Appendix 1. Transcription notation

–	Self-repair
: , :: , :::	Extension of the previous sound
(.)	Short untimed pause
[…]	Section of transcript omitted (from the same account)
[C:]	Interviewer expression
CAPITALS	Speaker emphasis
Italics	Pseudonym or omitted information. If a field or discipline is not in italics, it is the original answer of the interviewee
(laughs)	Laughter from the speaker
[*Later during the interview*]	Discussion of same topic later during the interview, not part of the same account

Appendix 2. Email to participants

Dear ,

My name is Carlos Cuevas, I am doing a PhD in Science and Technology Studies focusing on <u>thoughts and experiences about interdisciplinary research</u>. I would like to invite you to participate in my project as an interviewee. Interviews will last around <u>40 to 70 minutes.</u>

If you agree to participate we can arrange for a place and time to carry out the interview. I am happy to go to your office if that makes it easier for you. My schedule on February and March is free besides Thursdays between 11am and 2pm.

I would like to record interviews digitally but the recorder can be switched off at any time and I can just take notes, if you prefer. Names can be omitted to achieve anonymity and confidentiality, again, if you prefer. My study complies with the School of Sociology and Social Policy's ethics guidelines and procedures.

If you have any query about my study please do not hesitate in contacting me or my supervisors, whose contact details are below.

Best wishes,

Carlos

Supervisors:

Professor Brigitte Nerlich

e-mail: brigitte.nerlich@nottingham.ac.uk

Professor Alison Pilnick

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School of Sociology and Social Policy

University of Nottingham

Appendix 3. Info sheet for participants

The discursive construction of interdisciplinarity: visions of mind, self and institutions

Dear Staff member,

My name is Carlos Cuevas, I am a Ph.D. researcher in Science and Technology Studies at the Institute for Science and Society, University of Nottingham.

In my research I focus on the different views, thoughts, experiences and expectations of interdisciplinary research. In particular, I will analyse how these are built up in discourse and how they differ among different interviewees, including natural scientists, social scientists and policy makers.

I would like to invite you to participate in my research as an interviewee. Interviews will last between 40 and 70 minutes and will be carried out in any site of your preference. Interviews will be recorded and transcribed, but interviewees' name and details will be kept anonymous.

This research has been obtained permission from the Ethics committee of the School of Sociology and Social Policy. Please contact me if you need further information.

Feel free to speak as in a normal conversation!

Sincerely,

Carlos Cuevas
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Appendix 4. The dilemmas of interdisciplinarity

Interdisciplinarity is a crucial concept in contemporary scientific research and in research and innovation strategies across the world, for universities and for national and international organisations. Interdisciplinarity can be briefly defined as any interaction between different disciplines. It has been popular since the last century and it has received vast amounts of support ever since because it is meant to address complex "real world" problems and to foster innovation. Yet, engaging in interdisciplinary research has always been intellectually and professionally problematic. Why? This brief essay intends to provide some answers to this question by presenting the key findings of a PhD research project in a research area called science and technology studies.

Between November 2012 and September 2013, 27 researchers and research planning personnel from a large British university were interviewed about their careers and their experiences carrying out and implementing interdisciplinary research. They were also asked about what they think it takes to be a good interdisciplinary researcher and collaborator. The interviewees included young and senior researchers, from interdisciplinary areas within and across the natural and the social sciences, engineering, arts and humanities; and high-level university administrators. The interviews were fully recorded and transcribed, and the transcripts were analysed paying careful attention to how interviewees put arguments together, drawing on personal experiences, common sense and common ways of reasoning.

The analysis revealed different ways of talking about interdisciplinarity, used even by the same person, and identified overarching patterns of argumentation in the interviewees' talk. These different ways of talking were at times contradictory and made the interviewees face, in particular, four dilemmas. This sort of dilemmas can be understood as **struggles to fit "*the ideal*" and "*the practical*: at times our thoughts are pushed and pulled in opposite directions because we might somewhat disagree with that we praise for, and somewhat agree with that we criticise.** These dilemmas are briefly explained below (the names are given here just for easy reference, but they can be called otherwise).

1. The dilemma of openness (or flexibility) and rigour. This is the typical "breath-vs-depth" debate. Individuals involved in interdisciplinary research may find it challenging that they need to "open up" to other disciplines, to understand them and use them, and to learn other disciplinary jargon. But while doing so, they may also risk the rigour with which they should engage with their own discipline, or they could be criticised of doing so. To put it bluntly, if one is "too open", one is not seen as an expert; however, if disciplinary rigour and specialist expertise is protected too much, one can be criticised as being "narrow-minded". Too much focus on openness poses risks to the ideal of disciplinary rigour, and too much focus on disciplinary rigour poses risks to the ideal of openness. Dealing with this dilemma is difficult as defining what is relevant and

part of a discipline often requires, itself, negotiation.

2. The dilemma of individualism and collectivism. In our contemporary societies we are expected to look out for our own interests and do what we are passionate about. However, we also know that too much of this individualist push might result in being regarded as selfish, and that some degree of collectivism – looking for the interests of a broader group – is expected. When collaborating with people from other disciplines, researchers may run the risk, on the one hand, of doing work that doesn't have an intrinsic appeal to them, or which is not regarded as valuable for their own discipline or for their careers; while, on the other hand, being overprotective of one's own interests and being reluctant to deviate from these is not a good move if the goal is interdisciplinary collaboration.

3. The dilemma of disciplinary tolerance and expert prejudice. Interdisciplinary research requires individuals to be tolerant of other disciplines and of other ways of working and producing knowledge. That is to say, different traditions have to be equally valued. However, at times our tolerance is limited by our own ways of doing things, and our commitment to the criteria of our own research areas make us prejudiced. Escaping from that prejudice is difficult and it might even be present when we believe we are being tolerant. The more we try to justify our reservations towards other methodologies, theories, and philosophies, the more prejudiced we sound; thus there seem to be hidden

limitations to our claims of tolerance and equality.

4. The dilemma of effort and reward. Interdisciplinary work is difficult, it will always be. It is difficult to learn the language of other disciplines; it is difficult to know what is relevant and what is not; and it is difficult to keep track of the developments of two or more different areas. People invest a huge amount of effort in keeping all interdisciplinary balls in the air, so to speak, and yet that effort may not be recognised by their disciplinary peers and by their department. However, making rewards your priority may not get you too far, and you might alienate people when you become known for always expecting something in return for your efforts.

Where does this take us? If these dilemmas sound familiar or resonate with your own experiences, this means that they are widely spread and that they cannot easily be solved. However, this also means that they can be called by a common name, which may be useful for talking about them. This may in turn be useful to discuss about how to mitigate these dilemmas and to reflect on how these have (or could have) been overcome in the past. These dilemmas might be a common concern shared by many potential collaborators, and thus there might be common-ground to talk about them and to design projects in a way that suits different people's interests and careers. This may sound complex and problematic, but it would be more problematic to pretend that these dilemmas do not exist.