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SEARCHING FOR THE SOCIAL IN THE BRAIN

THE EMERGENCE OF SOCIAL NEUROSCIENCE

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Table of Content

Table of Images

Figures 1-5: produced by Markus Christen and already published in Matusall, Svenja, Ina Kaufmann and Markus Christen (2011): 'The Emergence of Social Neuroscience as an Academic Discipline.' Cacioppo, John and Jean Decety (eds.): *The Oxford Handbook of Social Neuroscience*. Oxford: Oxford University Press: 9-27.

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Abstract

The present study *Searching for the Social in the Brain. The Emergence of Social Neuroscience* is an ethnographic-historical investigation of the newly emerging research field social neuroscience, a research endeavour at the boundary between social psychology and cognitive neuroscience. The study's aim is threefold. First, it attempts to describe this new field of research, its origin, actors and themes. Second, it explores the notion of social prevailing in this field, its historical and epistemological roots as well as its role in social neuroscientific research. Third, it situates social neuroscience's interest in pro-social behaviour in a broader discourse generating a new notion of human nature, which bases on empathy, cooperation and altruism.

The study begins with an attempt to define the field itself (Chapter 2). It is only an attempt because the field of social neuroscience is still in the making, thus it is fluid in terms of disciplinary boundaries, general themes and epistemology. These issues are subject to internal debates and it is not yet clear where the discussion will lead to in the future. For this study, I limited the analysis to those calling themselves social neuroscientists or social cognitive neuroscientists, thus excluding other scientists being driven by similar research questions but framing their research differently. The rationale behind this limitation is twofold. A very practical reason is that it would be very difficult to draw the line and define what does belong to social neuroscience and what does not. The second rationale that this study aims to examine how a possible new research field emerges and what role the given label and the conflicts about the proper name play in this process.

Chapter 3 examines the role of experimental design, methods and technologies. Understanding the machines and technologies of scientific research is crucial for understanding experimental culture and experimental systems of the research field investigated. The chapter provides an introduction to experimental methods of both psychology and psychology-based neurosciences, discusses implications of technology on the objects studied, and concludes with a sketch of a debate vexing the field in early 2009.

Chapter 4 asks about social neuroscience's notion of social. What do researchers imply when looking for the social in the brain? A genealogy of social neuroscience's notion of the social shows that its roots lie in the US-based individualistic approach to social psychology of the 1920s as well as in the defence of the free individual of the West against the oppressing collectivism of the East in the early decades of the Cold War. The

chapter proceeds by discussing various forms of "social" present in social neuroscience experimentation, in its epistemology, in its hypotheses tested, and in experimental settings.

In chapter 5, the narrative of the social brain is traced back in the history of the brain sciences. The interdependencies between discourses in brain sciences and society during the last two hundred years are explored, but the focus is on the discourses at the time social neuroscience emerged and thus on the intellectual climate preparing the grounds for a new research field to emerge.

Chapter 6 takes the question of the social in the brain a step further and asks what the consequences are for a notion of human nature that is both driving this research and informed by it. Moreover, it contemplates how this may relate to recent changes in other spheres of Western culture. The driving question behind this chapter is a puzzle: why does at a time when individualism seems to be one of the highest values of Western culture, a notion of human nature arise which focuses on the empathic, altruistic and cooperative aspects of human acting, thinking and feeling? And how does an evolutionary narrative focusing on these aspects differ from an evolutionary narrative leading to the selfish, rational concept of Homo economicus?

The study concludes with a coda taking a look at what happens when locating a culturally determined category in the brain by taking the well-studied example of gender brain research.

Zusammenfassung

Die vorliegende Arbeit ist eine ethnographisch-historische Untersuchung der sozialen Neurowissenschaft, einem im Entstehen begriffenen Forschungsfeld im Bereich zwischen Sozialpsychologie und kognitiver Neurowissenschaft. Die Arbeit verfolgt drei Ziele: erstens wird das neue Forschungsfeld der sozialen Neurowissenschaft beschrieben: historischen Wurzeln, Hauptakteure und Forschungsfelder. Zweitens wird der im Forschungsfeld vorherrschende Begriff des Sozialen historisch und epistemologisch untersucht. Dabei geht es sowohl um die Herkunft des Konzepts als auch um seine praktische Relevanz in Experimenten der sozialen Neurowissenschaft. Drittens wird das Interesse der sozialen Neurowissenschaft an prosozialem Verhalten in einem grösseren Diskurs über ein neues Menschenbild verortet, das auf Empathie, Kooperation und Altruismus basiert.

Die Untersuchung beginnt mit dem Versuch einer Definition des Forschungsfeldes (Kapitel 2). Dies kann zu diesem Zeitpunkt nur ein Versuch sein, da das Feld noch im Entstehen begriffen und in Bezug auf disziplinäre Grenzen, Themen und Epistemologie noch nicht gefestigt ist. Diese Aspekte sind noch Gegenstand interner Aushandlungen mit offenem Ausgang.

Kapitel 3 untersucht die Rolle von Experimentaldesign, Methoden und Technologien innerhalb der sozialen Neurowissenschaft. Instrumente und Technologien sind von grundlegender Bedeutung für das Verständnis des untersuchten Forschungsfeldes, da sie die Perspektive auf den Forschungsgegenstand (mit)bestimmen. In diesem Kapitel werden die experimentellen Grundlagen von psychologischer Forschung und von psychologisch orientierter Hirnforschung vorgestellt und der Einfluss der jeweiligen Methoden auf die Untersuchung des Forschungsgegenstandes diskutiert. Das Kapitel schliesst mit mit einer Anekdote über einen Methodenstreit, der das Forschungsfeld 2009 beschäftigte.

Der Begriff des Sozialen in der sozialen Neurowissenschaft ist Gegenstand von Kapitel 4. Eine Genealogie des Begriffs zeigt, dass dessen Wurzeln in der individual-psychologischen Sozialpsychologie liegen, die wiederum seit den den 1920er Jahren in den USA vorherrschend ist. Ausserdem spielen in der Bildung des Begriffs ideologische Kämpfe um die Überlegenheit der westlichen individualistischen Kultur und Auseinandersetzung mit Faschismus und Kommunismus eine wichtige Rolle. Im zweiten Teil des Kapitels werden die verschiedenen Formen, die das Soziale in sozialneurowissenschaftlicher Forschung annimmt, diskutiert. Dabei wird vor allem

untersucht, welche Formen des Sozialen explizit erforscht werden und welche implizit in der Forschung mitschwingen.

In Kapitel 5 wird das Narrativ des sozialen Gehirns in der Geschichte der Hirnforschung verortet. Dabei werden die Wechselwirkungen zwischen Diskursen innerhalb der Hirnforschung und anderen gesellschaftlichen Bereichen während der letzten zweihundert Jahre beleuchtet, aber der Schwerpunkt liegt auf Diskursen seit den 1990er Jahren, dem Zeitraum, in dem soziale Neurowissenschaften entstehen. Diese Diskurse bereiten den Nährboden, auf dem dieses Forschungsfeld entstand.

Das sechste Kapitel geht einen Schritt weiter und verortet die Diskurse innerhalb der sozialen Neurowissenschaft in einer grösseren Debatte über ein neues Menschenbild, das auf Empathie, Kooperation und Altruismus basiert und verbindet diese mit Veränderungen des Begriff des Sozialen in westlichen Gesellschaften.

Die Untersuchung schliesst mit einer Coda, in der am Beispiel der Geschlechter-Gehirnforschung die Frage diskutiert wird, was passiert, wenn eine kulturell und sozial bestimmte Kategorie im Gehirn lokalisiert wird.

1. Introduction

> "I witnessed a breakup yesterday in the middle of MIT's vast Infinite Corridor (...). Something (...) had clearly pushed the girl overboard. Her boyfriend had fallen dramatically to his knees and as he wept heartfelt apologies for some crime or another, the girl stood with crossed arms, trying not to look at him. Then, as I passed, the angry young woman knelt and slapped him hard and loud across his face just before storming off down the Corridor. I don't know what happened between those two, but I felt bad for the guy. Seeing him cry so openly in public hurt me, in a small way (...).
> This, I believe, is empathy (though, as I've recently discovered, scientists can't seem to agree on their own definition). We've all 'felt' for someone else, whether that person is a stranger getting slapped in public or a close friend suffering through the loss of a pet. The empathy we experience can feel as real as if the pain were our own.
> But empathy is failing on a pretty mass scale. It fails between Christians and Muslims. It fails between Israelis and Palestinians. Between Democrats and Republicans. Between Red Sox and Yankees fans. When it comes to conflict groups, empathy largely goes offline.
> Because of this failure to empathize, MIT Saxelab neuroscientist Emile Bruneau has set his sights on not only locating empathy in the brain via controversial fMRI scans; he also hopes to find a way to quantify empathy" (Bjoran 2011).

> "Teens are notoriously self-conscious. Now brain-imaging experiments are revealing how this adolescent predilection might be the result of changes in brain anatomy linked with the self, and the findings may hint at how the sense of self develops in the brain.
> One way we build a sense of self is by reflecting on how others perceive us, a concept psychologists have dubbed 'the looking-glass self.' To see how teenagers reacted to what other people thought of them, researchers asked adolescent girls ages 10 to 18 to imagine a variety of scenarios involving onlookers that were designed to evoke social emotions such as guilt or embarrassment (...). Cognitive neuroscientist Sarah-Jayne Blakemore of University College London and her colleagues found that when compared with scenarios describing basic emotions that did not involve the opinions of others, such as fear and disgust, girls who thought about onlookers' opinions engaged a brain region known as the dorsal medial prefrontal cortex (MPFC) more during social emotional scenarios than adult women did. (...)
> It makes evolutionary sense for teenagers to be highly concerned about what others think, Blakemore suggests. Adolescence requires becoming more independent because one's parents might not be around much longer. Teens have to start relying more on what peers think 'and develop a more socially constructed sense of self,' Blakemore says" (Choi 2009).

These quotations from opening passages of an article and a blog entry in *Scientific American Mind* are examples for how a recent research endeavour engaged in studying sociality is presented to the interested lay audience. They show that this research has very much to do with our everyday life and understanding ourselves but can also contribute to a better understanding of human nature in general. The first quotation draws from small relationship drama to conflicts on a global scale. Both forms if conflict are linked to empathy, a concept with roots in aesthetics which is now a subject of research in cognitive psychology and neuroscience. As is implied in the example, in

these disciplines empathy is a potentially quantifiable feature of feeling with others which is located in the brain. While in some cases it sets in automatically, in other cases it is absent, causing more or less problems, depending on whether baseball or global conflicts are concerned. The second quotation covers another important aspect of sociality, the question of how a sense of self is entangled with interactions with others, causing social emotions and the activation of specific areas in the brain. It also stresses the role certain aspects of contemporary humans' behaviour may have had in the species' evolution. They both cover a newly emerging research field linking sociality with neuroscience.

Media coverage such as those above drew my attention to this research field combining concepts such as empathy or sense of self with terms like brain scanner, amygdala or evolution. Yet, the fascination was mixed with confusion, a confusion about the question how it was possible to look for the social within the brain. Wasn't the social something happening between people who are members of complex social structures, subject to power relations and institutional constraints rather than something happening within a brain and measurable with a brain scanner, a machine reminding me of science fiction movies? I began thinking about these questions and soon this field of research appeared to me a reasonable subject for a case study for investigating the questions: what do contemporary neurosciences tell us about who we are and why are people interested in hearing it? This new field of research had my interest and let me embark on a journey exploring the field and particularly the question of what happens to the social when it is located in the brain?

Social neuroscience, as this field calls itself, is a newly emerging research field investigating the interactions between brain and environment. The field is a kaleidoscope of diverse approaches and disciplines, united in the aim to find neural substrates of social interaction. It is involved in research on a wide range of issues such as aggression, autism, education, emotions, face perception, lifelong learning, love, meditation, neuroenhancement, purchase behaviour, trust, xenophobia, and a lot more. On all these topics scientists hope to achieve deeper knowledge through the application of neuroscience.

The term "social neuroscience" was first coined by social psychologists Gary Berntson and John Cacioppo in 1992. But it took another decade before a research field with research groups, professorships, university courses, textbooks, conferences, societies, and journals emerged. For several reasons this emerging research field is an interesting

subject to study from a science studies point of view: It claims to bridge the gap between 'nature' and 'culture' and is an example for a new type of interdisciplinary research. However, social neuroscience is a research field that has yet to establish itself. Hence, the link between society and science might be more obvious than in more established disciplines. A second aspect is the notion of a learning adult brain, which is an indicator for a paradigm shift within neuroscience – from the notion of a fixed brain towards the idea of a flexible brain; and this flexible brain fits into the neo-liberal paradigm of self-management. Last but not least, the emergence of social neuroscience raises the epistemological question what 'social' or 'society' means in social neurosciences.

This study investigates emergence and epistemology of social neuroscience by combining methods and approaches from science and technology studies with a historical perspective, arguing that social neuroscience's approach to sociality is individual-centred while at the same time rooting in a collectivist narrative of human evolution. The integration of science and technology studies and history of science allows an analysis of the present which includes a genealogy of concepts and practices. Doing so, it can be shown that social neuroscience incorporates an individualistic notion of the social originating in American social psychology and combines it with a narrative of human evolution focusing on the necessity to evolve social skills to survive in social groups. Combining these two narratives of individualism and pro-social behaviour, social neuroscience produces a new notion of the social that is at the same time individual-centred and bigger than the individual. It is individual-centred because it is located in the brain, and bigger than the individual because it is part of the species' evolutionary history, a feature serving the species' survival.

1.1 All These Things Being Social

The present study is a contribution to an analysis of the "social" in the early 21st century. I set out aiming to investigate how social neuroscience could investigate "the social" with the tools of neuroscience, assuming that it was more or less clear what this "social" was – an attribute referring to a given group of people, their actions, beliefs, structures, power relations, artefacts and so on. It seemed obvious that this catategory should be investigated by sociology and other social sciences looking at the whole rather than the pieces. However, this reference point was lost in the course of the research process. In the course of research, the notion of the "social" shifted from being

a category of analysis into being a subject of investigation itself because it was no longer clear what the social actually was. Thus, rather than asking *how* it is possible to find the social in synapses and neurotransmitters, the question of this study is *what kind* of social is found in the brain.

What 'social' is and what 'social' means has been under debate within the social sciences throughout their 150 years of existence. Yet, as John Greenwood observes in the introduction to a volume on different perspectives of the social, this debate has been centring around the questions of what counts as a social entity and what are the proper means of investigation while the question what it actually means for an object, event or structure to be social has been avoided in most cases. Most theorists, he implies, have provided their definition of what constitutes the social em passim while developing their social theory, but they have rarely been explicit about the constitutive factors of the social (Greenwood 1997: 1-3). The list of phenomena having been defined to be social in the course of the history of the social sciences is rather long and diverse as he points out by giving a random collection of those phenomena:

> "states, families, armies, religious organizations, literary societies, mobs, street brawls, people chatting on a street corner, the Roman Catholic Church, the Renaissance, insect communication, dominance hierarchies among primates, language, financial instruments, and traffic flow in a city" (ibid.: 3).

This list shows that speaking about 'the social' is by no means as self-evident as its frequent usage suggests. Yet, a common narrative in the history of the social sciences is that the social emerged as a distinct sphere in the 19th century. In *Reassembling the Social* (2007), Bruno Latour presents the following observation: In classical social sciences, 'social' has been a distinct domain that was different from other domains of reality, such as law, science, politics, biology, or economics. Once defined, this domain could help to explain the properties of other domains – the 'social aspects' of these domains.[1] The default assumption was that non-social activities are located in a 'social context' and that they cannot be fully understood without understanding this context or the social dimension of any given activity. Society, therefore, is the container in which everything else takes place and 'social' is the glue that holds everything together (ibid.: 5). Latour argues that this notion is out-of-date, (social) realities have changed: rather than describing a certain sphere or a distinct class of things, the term 'social'

[1] In a radical perspective, these domains (or at least their meaningfulness) were imagined to be socially constructed – Berger/Luckmann 1966, for a critical discussion of the inflationary usage of 'social construction' see Hacking 1999.

relates to a certain form of associating and assembling various factors (ibid.: 7). Latour's strong refusal of social as an analytic category may serve as an example for a general tendency in contemporary social sciences to reconsider the explanatory power of the categories *society* and *social* for comprehending shared realities of the late 20th and early 21st century.

For the assemblage of human nature, the social brain and emerging new life sciences this transformation is crucial. The social world is no longer the abstract sphere, the force that stands in opposition to the individual; today, each individual herself is capable of being social by natural make-up. Consequently, with sociality being an internalised, biological category, society itself becomes a biological category, a product of human nature. Two discourses are at work here: the discourse about the relationship between society and individual and the discourse about the nature of human sociality. Both have changed significantly since the wake of modernity; sometimes their paths met and then they went along for a while before separating again. In the second half of the 20th century, after the Second World War and the Shoah, the biological and the social were strictly separated realms, not least because National Socialism's abuse of this kind of research for racist politics and mass murder (Hagner 2008). To distance itself from this kind of science, biology kept away from studying human sociality. This slowly began to change in the 1970s, when an umbrella term for approaches of studying sociality in the animal kingdom was created and the field of sociobiology emerged, trying to translate former research on animal sociality to humans. The emergence of sociobiology (Wilson 1975) can be seen as a starting point for a new attempt of thinking 'social' and 'biology' together. But it was only in the 1990s, that the investigation of biological foundations of human behaviour again became widely accepted – this time in the form of genetics.

But also in the humanities, 'social' is by no means an unambiguous category and its meaning has changed over the centuries. In *The Human Condition*, Hannah Arendt clarifies that in Ancient Rome *society's* etymological root *societas* had a clearly defined meaning: an association formed for a certain purpose, be it to rule over others or be it to commit a crime. Only later it became possible to think of "being social" as a part of human nature. She stresses that the concept of *societas* describes a fundamental difference between Latin and Greek philosophy: Plato and Aristotle knew too that humans could not live outside a community of others. But the same was true for animals and hence this dependence was a constraint imposed by biological necessities being the same for all organic life forms. This natural life was located in the *oikos*, the household.

Free men had a second life, *bios politikos*, its sphere was the *polis* (Arendt 2001: 34-5). The distinction between the private and the public along the lines of *oikos* and *polis* has persisted for several millennia. Only with the modern era, Arendt argues, a third sphere emerged: the social sphere, which found its political form in the national state. With the emergence of this sphere the clear distinction between the public and the private blurred as needs, activities, and forms of organisation of the oikos came into the light of the publicly political sphere without becoming part of the polis (ibid.: 39). With this new sphere emerging, the meaning of the terms *public* and *private* and of the spheres they described, transformed. The private was now connected with a form of intimacy which has not hitherto been known and which stands in an unprecedented opposition to the social. Since the naissance of society, i.e. since household and housekeeping became part of the public sphere, this realm showed a tendency of expansion and overgrowing the public and the private sphere. This expansion has accelerated over the course of the last three centuries and the reason for this is exactly the fact that with the emergence of society former private processes came into the public sphere and became a matter of public concern (ibid.: 57-8). Writing in the United States of the 1950s, Arendt argues that in the mass society the social has expanded to the extent that it includes and controls each of its parts equally; there is no outside of society anymore (ibid.: 52).

Up to that point, society was perceived as an entity standing in opposition to the individual, but this began to change with the political movements of the 1960s and 1970s and the incipient economic crises of the 1970s. All pillars of modernity were challenged: democracy (that is ruled by incompetent bureaucrats), technology (more dangerous than beneficial), science (far from being disinterested, it is subject to political interests), social market economy (dependent on external factors such as oil) (Wagner 2001: 81). Slowly beginning in the 70s but coming fully into bloom only after the fall of the Berlin Wall, a notion of society came into existence that was individual-centred. The relationship between individual and society was now discussed from a perspective that claimed that individual freedom would lead to collective wellbeing. “Paternalising” institutions of the welfare state were perceived as obstructing individual freedom. These institutions as well as other public sectors and property of the commons had to be freed from state interference and integrated into the free market. Only competition could guarantee both individual freedom and economic success. Now individuals were hold responsible for their own success and wellbeing, including areas of welfare, education and health care (Harvey 2005: 65).

In the course of this evolution, the focus on the subjects of governance changes: the population of earlier decades is now conceived as consisting of distinct individuals. Each of these individuals is located in several diverse and overlapping networks of personal concern and investment. With this new notion of networks as the organising form of living together the meaning of 'the social' shifted as is represented in the rise of notions of 'community' in political debates (Miller/Rose 2008: 87-8). The notion of community as "lost authenticity and common belonging" (ibid.: 89) was first formed as a critique of the remote bureaucracy and controlling power of 'society', and as a tool to empower the subjects of the systems imposed by society to identify their needs, to strengthen their own identity and culture. This notion was deeply rooted in the locality of these communities. Within a short time, however, as Rose argues "what began as a language of resistance and critique was transformed (...) into an expert discourse and a professional vocation" (ibid.). These new communities are not tied to a certain place; rather they root in the various relations an individual is a part of. However, we have – sometimes more, sometimes less – to be made aware of our belonging to a certain community: *we* as inhabitants of village x, as women, as carriers of the gene y, as people suffering from social phobia, as members of the ethnic group z (ibid.: 90-2).

As other notions of the social before it, the contemporary concept of the social consisting of networks and communities requires a distinct notion of the self. Individual identity becomes much stronger than social identity, due to often changing social groups, mobility between places and identities and multiple memberships in various networks and communities. Anthropologist Paul Rabinow coined the term biosociality to describe how new identities and communities are based on shared genetic characteristics such as proneness to certain diseases (Rabinow 1999). Others, most prominently philosopher Jean Baudrillard (1978) have declared that the social is dead, if it ever existed at all. Sociologist Stephan Lessenich, on the other hand, suggests that the social rather than being dead has transformed into the neosocial; a state in which individuals are responsible for maintaining the social good by adjusting their own behaviour towards this end (e.g. Lessenich 2011).

I argue that social neuroscience contributes to creating a version of human nature which constitutes a human being that is able to move in these new social structures of networks and communities, a human being that is cooperative and altruistic.

Like other research fields concerned with (human) sociality, social neuroscience has its own notions of the social, which is seen as a stable and static entity that can be treated

as one parameter among many in investigating human nature. In its enterprise of stressing the pro-social aspects of human nature, social neuroscience can be interpreted as taking part in a revival of intersubjectivity and emotion, not only taking place in biology (particularly in the work of primatologists such as Sarah Blaffer Hrdy, Michael Tomasello or Frans de Waal) but also in the humanities, for instance in history and philosophy.[2]

1.2 All These Things Being Neuro

Besides contributing to a debate about contemporary concepts of the social, this study also aims to contribute to an understanding of contemporary neurosciences. In recent years neurosciences have gained public attention and interest, not least as a planned effect of the so called "Decade of the Brain" in the 1990s (Jones/Mendell 1999). Technological developments allowed for introducing new methods and tools both in research and in clinical practice. This did not only change research and clinical practice but changed how the brain itself was understood. The impact of imaging technologies such as positron emission tomography (PET) and functional magnet resonance tomography (fMRI) has been subject to science studies since they were employed in scientific research and clinical practice in the 1990s (Hagner 1996, Dumit 2004, Cohn 2008a, 2008b, Burri 2008, Joyce 2008).

New neuro-pharmaceuticals also contributed to a new understanding of the brain, the person and the self. Sociologist Nikolas Rose (2003) coined the term "neurochemical selves" to describe this shift in notions of brain and personhood towards a concept of the person dependent on chemical composures and chemical reactions in the brain; a concept of the person that can be modulated by the intake of chemical substances, sold as Prozac, Ritalin, or Zoloft. In the course of that shift, certain states of the mind that were formerly defined as psychological disorders with uncertain origin such as depression, hyperactivity, schizophrenia or autism are now located in the brain and its neurotransmitters, which are either over- or underproductive (Lakoff 2005, Nadesan 2005, Matusall 2006, Martin 2007). Other terms such as 'brainhood' (Vidal 2009) or 'cerebral subject' (Ortega 2009) were coined to grasp these seemingly new notions of personhood implied by the increasingly popular brain sciences. However, a glance into the history of the brain sciences reveals that the attempt to locate the person in the brain

[2] The Max Plank Institute for Human Development in Berlin, for instance, has an entire department dedicated to the history of emotions.

is much older than that. Historian of science Michael Hagner (2001) shows that for more than a century, brain anatomists understood the person in terms of the brain. For instance Oskar Vogt, the founder of the Kaiser-Wilhelm-Institute for Brain Sciences in Berlin, defined human beings as brain animals and, more generally, Hagner maintains that research in and public discourse about modern brain research since its emergence around 1800 generated the figure of 'Homo cerebralis', the cerebral human (2000). He understands the brain as an epistemic object whose history is interwoven with the emergence of modern brain research and that is both a natural and a cultural object (Hagner 2007). The concept of the brain as an epistemic object helps making sense of the present popularity the brain enjoys by exploring its entanglements with its history, popular discourses, hopes, and fears.

In recent years, several studies contributed stones to the mosaic of the contemporary brain. In the last one and a half years alone, three edited volumes on social and cultural aspects of the new brain sciences were published (Ortega/Vidal 2011, Pickersgill/van Keulen 2011, Choudhury/Slaby 2012a). The latter is the result of an interdisciplinary cooperation between neuroscientists, philosophers, cultural anthropologists and historians being engaged in a debate about a critical neuroscience and contributing

> "diverse strands of inquiry that help to understand how particular intellectual, economic, and political conditions hold in place current views of the brain, and how these models of the brain and neurocentric practices may in turn produce ontological impacts in society" (Choudhury/Slaby 2012b).

Noteworthy about this project is the interdisciplinary approach – it is not a critical examination of neuroscience's impact on other areas of social and cultural life from the outside but from within, from neuroscientists reflecting the impact of their own work joined in this endeavour by scholars from the humanities and social sciences. Similar cooperative projects, crossing the borders of the various academic cultures can be seen in the *European Neuroscience and Society Network*, an ESF-funded forum for multidisciplinary engagement between neuro- and social sciences as well as in the *European Life Sciences, Mind Sciences, and Humanities Platform*, an initiative of the Volkswagen foundation, bringing together young researchers from cognitive sciences, neurosciences, social sciences, and humanities.

Besides general considerations on how the new neurosciences may influence notions of self and personhood, also the expansion of neurosciences to subjects formerly more or less uncontestedly belonging into the realm of the humanities or social sciences gained the interest from social scientists. In addition to social neuroscience, the subject of this

study, several new ‘neuro-terms’ have emerged over the last years, claiming to define new subfields. Be that neuropedagogy, neuroeconomics, neuromarketing, neuro-philosophy, neuroaesthetics, or neurohistory. These new neuro-subfields are partly the consequence of the attention everything related to the neurosciences is currently getting and the implied idea that neurosciences may be able to solve puzzles about all areas of human behaviour and culture (Chodhury/Slaby 2012b: 2). Yet, it is questionable whether their emergence would have been possible without a crucial shift in thinking about the human brain and particularly the adult brain. For the most part in the history of the brain sciences it had been common sense among neuroscientists and consequently psychologists, educators and the informed public that the human brain, while having a rather long period of maturation, is finished at one point around twenty years of age and all changes happening after that are only changes of decline (Rees 2010a: 154). In the early years of the 21st century, a formerly dissident theory of possible adult neurogenesis, the creation of new neurons in the adult brain, became accepted in the mainstream of neuroscientific research practice and epistemology. The new concept soon became popular under the easier to remember term of plasticity, stressing that the adult brain is still able to form new neuronal connections and is thus able, for instance, to learn new languages, to adopt to changed environments, or to cope with brain injuries (ibid.: 157, see also Rubin 2009). This new notion of a flexible brain is crucial for conceptualising a brain that not only interacts with its environment and with others but is also influenced by these interactions.

Social neuroscience, one of the new neuro-subdisciplines, and the epistemic object of the social brain have not yet been subject to much reflective investigation. Anthropologist of science Allan Young works on the history of the social brain, empathy and empathic cruelty (Young 2011, 2012). With Markus Christen and Ina Maria Kaufmann, I contributed the first overview of the field of social neuroscience and its history (Matusall et al. 2011). The first attempt to take up social neuroscience’s invitation for an interdisciplinary approach to understanding sociality was done by social psychologist John Cromby (2007). Yet, he sees more obstacles than benefits in cooperating as long as social neuroscience does not refrain from defining the grounds on which a cooperation can take place. In a case study, ethnographer of science Simon Cohn (2008a) reflects on how the social emotion pleasure is studied in a PET experiment. The present study provides the first ethnographic-historical analysis of social neuroscience as a field in the making.

1.3 Engaging with a Field in the Making

Because social neuroscience is so young a subject and not much literature about it exists, a third aim of this study was to generate empirical material about this research field, aiming to understand how knowledge is generated and what kind of factors influences that process. To this end I designed two projects, a quantitative and a qualitative study. For the quantitative project, focusing on discipline-building processes in social neurosciences and neuroeconomics, Markus Christen, Ina Maria Kaufmann and I analysed the dynamics within these emerging research fields in terms of key persons and their relations, publications and their impact, and formation of journals and scientific institutions. We analysed whether these factors indicate a fast evolving process of discipline-building or rather express a mere "hype" in applying neuro-scientific methods (in particular imaging) to complex psychological and social phenomena. Moreover, we identified basic questions and topics of social neurosciences (Matusall et al. 2011 and chapter 2). The aim of this quantitative study was to get an overview of the structure of the field; yet it cannot say much about the kind of knowledge being produced. For this purpose I conducted an ethnographic study in a social neuroscience laboratory to examine how knowledge about the social and the brain is produced and to explore which factors – from technological possibilities and constraints over coincidences to newspaper articles – influence research practice and epistemology.

Since the seminal studies of Bruno Latour and Steve Woolgar (1979), Karin Knorr-Cetina (1981), Michael Lynch (1985) et al. ethnography is an integral part of science studies. While these early studies were mostly interested in the modes and factors of knowledge production within a specific discipline or even a single laboratory, in the 1980s and particularly the 1990s, a second generation of ethnographers of science began to investigate the cultural foundations of scientific research and knowledge production. Rooting in cultural anthropology, these researchers aimed at "anthropologizing the West" (Rabinow 1996). One line of research employed Michel Foucault's critical analysis of the productive power in life and human sciences, most prominently Paul Rabinow with his project of an anthropology of reason (Rabinow 1996). At least as influential were approaches coming from a feminist critique of male-centred scientific practice and epistemology (e.g. Franklin 1997, Haraway 1989, Martin 1994, Rapp 1999, Strahern 1992). This perspective on science as a cultural practice deeply embedded in social and cultural norms and beliefs is fruitful for studying the entanglements between

different loci of knowledge production and belief systems. In her key note address at the 1994 meeting of the *Society for the Social Studies of Science*, cultural anthropologist Emily Martin addresses the question what cultural anthropology can contribute to science studies and points out that

> "ethnographic research suggests that the strict, fixed borders between the citadel of science and the 'untutored' public do not hold up to scrutiny. The walls of the citadel are porous and leaky. Action and initiative go in both directions. It is less 'science in action' than 'knowledge in action' in a multitude of contexts, both scientific and non-scientific. (…) I am claiming that both 'science' and 'society' are produced inside the heterogeneous matrix of culture (…). Culture, meaning fundamental understandings and practices involving such terms as the person, action, time, space, work, value, agency, and so on, is produced by a far wider range of processes than those deployed by experts producing science" (Martin 1998: 30).

Understanding science as a part of culture means to go outside the citadel of science and try to find out how knowledge production within may be linked to events and processes in the world outside its walls (ibid.: 31). Moreover, she stresses, anthropological research is not looking for a thing that is existing somewhere out there in the world but "understanding the processes by which things, persons, concepts, and events become invested with meaning" (ibid.: 36).

While the present study clearly focuses on the side of knowledge production within the field of social neuroscience, it also makes inferences to discourses in other areas of scientific and social knowledge production, is informed by the cultural-anthropological perspective of science as a site of cultural knowledge production and is located in the project of contributing to understanding the culture we are living in.

Methods that can be employed in ethnographic research are as diverse as the objects under investigation. For this study I conducted a multi-site participant observation and expert interviews.[3] A content analysis of programmatic review articles and textbook introductions prepared the way into the field.

The field of social neuroscience was easily accessible. I even could gain necessary course credit for my doctorate studies by enrolling in social neuroscience classes at the University of Zurich. Attending these classes allowed me to get insight into the formal training necessary for being a part of the research community. Moreover, I had the chance of participating in several experiments, both inside and outside an fMRI scanner. Being an experimental subject was an important part of my fieldwork, because it shed light not only on the perspective of those generating knowledge but also on the

[3] For an overview of these methods see Flick et al. 2010.

perspective of those serving as the most important resource for knowledge production. I also attended talks and a conference on social and affective neuroscience, providing an impression of the culture of debate and academic exchange within the field.

The core part of my field work was a six-month internship in a social neuroscience laboratory at a leading US-university. During my internship, I took part in lab meetings, lectures, familiarised myself with experimental computer software, helped developing and conducting experiments, and volunteered as a study subject. I joined my colleagues for lectures, job talks and departmental meetings but also engaged with them socially, going for lunch, drinks, to the movies or to parties, was invited to their homes, and met their friends for picnics in the park. During these six months, I was a part of the lab and had to be there 9-5 like everybody else, yet at the same time I was an outsider, which became evident in those cases cases when I could not follow their debates about statistical thresholds or when every now and then one of my colleagues remarked something about what I should or should not take notes of. Obviously, this special role of being simultaneously an insider and an outsider impacted the empirical material that I collected during my fieldwork, which consists of personal field notes, written after returning to my apartment from the lab or other events. After returning from the field, the field notes were coded for recurring themes and subjects, an index consisting of these coded subjects was created, allowing structured access to the material.

The internship provided an insider perspective into the field, which made it possible to ask the questions I asked. This perspective is subjective; had I done an internship in another lab, the perspective on the field and the questions I asked in the interviews might have been different ones. Thus, rather than consciously choosing a research perspective, my research perspective is determined by the experiences during the fieldwork. Yet, it is more than a micro-level case study because the field notes served as a starting point for more general considerations about the practices and epistemologies of social neuroscience. They provided an entrance into the bigger field of social neuroscience and they are integrated into the final study to support, or sometimes just to illustrate, more general observations.

After three months of the internship I began to contact leading social neuroscientists in the US to arrange appointments for interviews. These interviews, conducted in April and May 2009, followed the method of semi-structured expert-interviews (Hopf 2010). They followed a guideline with open questions about their personal way into social neuroscience, their education and research, and their estimation of the field while

leaving enough space for the interviewees to bring in their own perspective. The interviews lasted between one and two hours; they were recorded and afterwards transcribed. Like the field notes, the transcripts were coded for recurring topics and subjects and then indexed.

It is inherent to an ethnographic study that the author's voice and her entanglement in the research process matter – at least as much as in other research. Thus my voice is visible throughout the study by being presented in the first person singular.

The participants in my ethnographic work, both those I encountered during my field work and the social neuroscientists I interviewed are granted anonymity. Persons I am referring to are distinguished by capital letters, the places relevant for my field work are also marked by capital letters and referred to as "The Lab", "The Conference", "The University", "The Hospital", etc.

1.4 Structure of the Study

This study begins with an attempt to define the field itself (Chapter 2). It is only an attempt because the field of social neuroscience is still in the making, thus it is fluid in terms of disciplinary boundaries, general themes and epistemology. These issues are subject to internal debates and it is not yet clear where the discussion will lead to in the future. For this study, I limited the analysis to those calling themselves social neuroscientists or social cognitive neuroscientists, thus excluding other scientists being driven by similar research questions but framing their research differently. The rationale behind this limitation is twofold. A very practical reason is that it would be very difficult to draw the line and define what does belong to social neuroscience in a broader sense and what does not. The second rationale that this study aims to examine how a possible new research field emerges and what role the given label and the conflicts about the proper name play in this process.

Chapter 3 examines the role of experimental design, methods and technologies. Understanding the machines and technologies of scientific research is crucial for understanding experimental culture and experimental systems of the research field investigated. The chapter provides an introduction to experimental methods of both psychology and psychology-based neurosciences, discusses implications of technology on the objects studied, and concludes with a sketch of a debate vexing the field in early 2009.

Chapter 4 asks about social neuroscience's notion of social. What do researchers imply when looking for the social in the brain? A genealogy of social neuroscience's notion of the social shows that its roots lie in the US-based individualistic approach to social psychology of the 1920s as well as in the defence of the free individual of the West against the oppressing collectivism of the East in the early decades of the Cold War. The chapter proceeds by discussing various forms of "social" present in social neuroscience experimentation, in its epistemology, in its hypotheses tested, and in experimental settings.

In chapter 5, the narrative of the social brain is traced back in the history of the brain sciences. The interdependencies between discourses in brain sciences and society during the last two hundred years are explored, but the focus is on the discourses at the time social neuroscience emerged and thus on the intellectual climate preparing the grounds for a new research field to emerge.

Chapter 6 takes the question of the social in the brain a step further and asks what the consequences are for a notion of human nature that is both driving this research and informed by it. Moreover, it contemplates how this may relate to recent changes in other spheres of Western culture. The driving question behind this chapter is a puzzle: why does at a time when individualism seems to be one of the highest values of Western culture, a notion of human nature arise which focuses on the empathic, altruistic and cooperative aspects of human acting, thinking and feeling? And how does an evolutionary narrative focusing on these aspects differ from an evolutionary narrative leading to the selfish, rational concept of Homo economicus?

The study concludes with a coda taking a look at what happens when locating a culturally determined category in the brain by taking the well-studied example of gender brain research.

2. What is Social Neuroscience? A Sketch of a Discipline in the Making

> „When you go to an academic conference you expect to see some geeks, gravitas and graying professors giving lectures. But the people who showed up at the Social and Affective Neuroscience Society's conference in Lower Manhattan last weekend were so damned young, hip and attractive. The leading figures at this conference were in their 30s, and most of the work was done by people in their 20s. When you spoke with them, you felt yourself near the beginning of something long and important. (…) All of these studies are baby steps in a long conversation, and young academics are properly circumspect about drawing broad conclusions. But eventually their work could give us a clearer picture of what we mean by fuzzy words like 'culture.' It could also fill a hole in our understanding of ourselves. Economists, political scientists and policy makers treat humans as ultrarational creatures because they can't define and systematize the emotions. This work is getting us closer to that. (…) The hard sciences are interpenetrating the social sciences. This isn't dehumanizing. It shines attention on the things poets have traditionally cared about: the power of human attachments. It may even help policy wonks someday see people as they really are" (Brooks 2009).

This account of the 2009 *Social and Affective Neuroscience Conference* was given one of the keynote speakers, New York Times columnist David Brooks. Brooks, who is completey embracing social neuroscience research, mentions four important points about how social neuroscientists like to see themselves: first, social neuroscience is young, hip and sexy; second, social neuroscience helps to understand ourselves properly; third, social neuroscience provides a profound and scientifically sound basis for social sciences and social policy; and fourth, social neuroscientists are very careful about their conclusions (and that distinguishes them from the always dreaded "bad science").

This chapter aims to define social neuroscience, the subject of this study. Yet, because social neuroscience is a research field not yet stable, its definition depends on the perspective taken. Roughly speaking, two groups of researchers that may belong to the field can be distinguished: those calling themselves social neuroscientists and those doing research on similar questions and subjects without considering themselves to be part of a distinct discipline or research field. This broader group is sometimes included into the field by self-identified social neuroscientists, perhaps to make the field seem larger but certainly to establish a research tradition as broad as possible. From the outside, it is not always clear where the boundaries are and who indeed call themselves social neuroscientists and who does not. In this chapter I will focus on the self-identified social neuroscientists, the actors creating a new field of research. This is due to a reason both of pragmatic and conceptual nature. The broader field of research somehow related

to the social brain is difficult to define. Each decision to include or exclude a researcher or school is arbitrary to some extent and perhaps against the self-definition of the researcher. By limiting the sample to self-identified social neuroscientists, it is possible to focus on the main actors, those who are eager to establish a new academic discipline, a new identity and a research programme. Doing so, the strongest programmatic voices are included in the sample.

Even talking about social neuroscience in the narrow sense of only including self-identified social neuroscientists is not easy. It is a young research field still in the process of defining itself, dealing with questions about the proper name, who and what will once belong to it, what topics shall be tackled by it, and what its relationship to neighbouring disciplines will be. But yet there are some indicators that social neuroscience is on its way to becoming an independent field of research: top US universities recently created chairs for social neuroscience – for instance Harvard, Princeton, Chicago or UCLA – two journals were launched and two societies founded, both holding annual conferences.

2.1 Field or Discipline?

Research groups, chairs, journals, societies, or conferences are indicators for a movement towards institutionalisation and formalisation of a research endeavour into a stable discipline. Yet, as will become clear in the course of this chapter, social neuroscience is still in a process of defining itself and it is by no means clear where this process is heading. Hence it is difficult to determine what social neuroscience actually is. Is it an emerging and forming discipline? Is it a truly interdisciplinary endeavour? Is it a new form of knowledge production?[4] Is it just a marketing strategy or media hype of smart social psychologists jumping on the bandwagon of neuroscience? These and more questions may be risen in regard to this new field of research. Moreover, the emergence of social neuroscience itself is an example for changing dynamics in the academic field. Three factors are crucial in this process: First, contemporary information technology enables faster communication between researchers interested in similar questions as well as the founding of journals and social organisation of scientists. Second, increased competition for financial resources as well as for academic positions calls for creating

[4] For a history of modern disciplines as communication systems see Stichweh 1992. For a discussion of the transformation towards inter- and transdisciplinary modes of research see Gibbons et al. 1994 and Nowotny et al. 2001, but also Fuller 2000).

specialised research niches which can attract both funding and job opportunities. Third, the same competition for resources creates a necessity to promote the significance of specialised research to a broader audience. These factors lead to an increased volatility within the academic sphere, including an increased number of research fields proclaiming themselves to be disciplines, some of them only to disappear into insignificance after a while (Nowotny et al. 2001).

Thus, I will speak of social neuroscience as a research field which is more open and less defined and institutionalised than a discipline, allowing for more volatility. This choice of term indicates that it is not yet decided whether social neuroscience will become an independent discipline, a sub-discipline of social psychology or of cognitive neuroscience, whether it might replace social psychology, or whether it will disappear, its approaches partly becoming integrated in mainstream social psychology. The term "discipline" itself can be seen as a rhetorical tool used by the protagonists of the field to justify their existence and to give it the appearance of an established and academically recognised endeavour.

For a theoretical approach towards the field of social neuroscience, I suggest to speak of an avant-garde with an uncertain future or – in the terminology of sociologist of science Ludwik Fleck – of the esoteric circle of a thought collective. Fleck defines a thought collective as a functional term, not equivalent with a distinct group or class. Rather, a thought collective comes into existence whenever two or more people exchange thoughts. These unstable and coincidental aggregations produce specific atmospheres which do not exist independently from the specific constellation of people. These volatile thought collectives can transform into more stable ones, manifesting themselves in specific organised social groups. If such a group exists for a longer period of time, it can develop a distinct thought style, typical and only existing in that group (Fleck 1935[1980]: 135). These more stable thought collectives have some distinct characteristics: most importantly a certain insularity of form and content, but sometimes also certain customs or a specific language. Novices have to be introduced into the subject matter as well as into the customs of a thought collective (ibid.: 136).

Thought collectives consist of several circles: at its centre stands an esoteric circle, consisting of those being most actively engaged in knowledge generation and conforming the thought style. This esoteric circle is surrounded by various exoteric circles to which the knowledge of the esoteric circle is communicated while their members do not actively take part in the generation of new knowledge (ibid: 138-9).

The esoteric circle of each stable thought collective forms a certain thought style rendering some problems thinkable while others remain in the realms of the un-thinkable, unimportant or meaningless. A thought style in this terminology is a frame enabling a scientist to perceive what she is working with. Fleck defines it as follows:

> "We can therefore define thought style [as readiness for] direct perception, with corresponding mental and objective assimilation of what has been so perceived" (Fleck 1935[1979]: 99).
>
> "It is a definite constraint on thought, and even more; it is the entirety of intellectual preparedness or readiness for one particular way of seeing and acting and no other. The dependence of any scientific fact upon thought style is therefore evident" (ibid.: 64).

Thought styles can change over time, either within a thought collective or leading to a new one. New thought styles first emerge in the form of a resistance to previous ways of perceiving a certain object or a worldview, which Fleck calls a thought restraint. While at first chaotic and preliminary, a resistance might transform into a new thought restraint and thus become the lens through which the given object or the world is perceived (Fleck 1935[1980]: 124). However, changes in thought styles cannot be explained by looking at a collective alone. Other factors such as social, economical or political circumstances have to be taken into consideration as well because they are intertwined with the scientific knowledge (ibid.: 83).

The emergence of social neuroscience can be read as a change in thought style. A common narrative of social neuroscientists is that the investigation of the social brain was neglected by scientists who were studying either social behaviour or cognitive abilities or the brain. Their own attempt of thinking these aspects together was at first neither accepted in cognitive neuroscience nor in social psychology. Thus, they had to fight against the thought constraint of either discipline and in that process, not only a new way of thinking unfolded but an entire new thought collective. While chapter 5 argues that social neuroscientists were not the first doing this, their narrative seems to be strong enough to establish a new esoteric circle, which is actively engaged in generating a new way of thinking about the social brain. This esoteric circle is an avant-garde, proclaiming a new way of thinking about both the nature of the brain and the nature of social behaviour. However, whether anyone will follow this avant-garde in the long run has to remain open at this point.

To provide a more concise description of the emergence and development of a research field calling itself social neuroscience, a quantitative and a qualitative analysis of publications associated with the field will follow. A quantitative, bibliometric analysis –

a joint project with Markus Christen and Ina Maria Kaufman of the University of Zurich (cf. Matusall et al. 2011) – was conducted in 2009 with the aim to determine when an increased interest into investigating the interrelations of social phenomena and the brain emerged. It sheds some light on the question about when research in social behaviour was combined with neuroscienctific tools and when this integrative approach generated published results. The subsequent qualitative analysis of programmatic papers, review articles and introductions to handbooks, reveals how the field was conceptualised within the research traditions of social psychology and biopsychology on the one hand and cognitive psychology on the other hand.

2.2 Bibliometric Analysis of the Field 1990 - 2009

If the growth of the annual fraction of neuroscientific publications using a terminology referring to the social world such as 'social' or 'culture' relative to the whole body of neuroscientific publication is a first proxy for the scientific dynamic of the field, a steady and remarkable increase arising in the early 1990s can be detected (Figure 1.a.). This indicates a growing interest in the 'social brain' in contemporary neuroscience and I take this observation together with the qualitative analysis of social neuroscience publications as evidence for the hypothesis that social neuroscience as an academic discipline emerged in the 1990s and stabilised in the 2000s. While the following chapters investigate epistemological preconditions and the epistemic culture in which social neuroscience emerged, in the current section bibliometric data are discussed, representing the emergence and development of social neuroscience between 1990 and 2009 as well as its roots and impact.

Before presenting the results of the bibliometric study, a brief overview of the methods shall be given.[5] For conducting the analysis, the search sets 'neuro'[6] and 'social'[7] had to be established. Basing on a qualitative analysis of twenty social neuroscience review papers, books and high impact papers (including neuroeconomics), a social neuroscience vocabulary has been established. 57 expressions and word stems referring to topics (for instance empathy, aggression) or methodologies (for instance ultimatum game, TMS, fMRI) were identified. In a next step, expressions appearing very often or

[5] For a detailed description of the methodology see the appendix in Matusall et al. 2011.

[6] Search expressions in the set 'neuro' were: neuro* OR neural OR brain* OR amygdala OR cerebellum OR cortical OR cortex OR hippocampus (= NEURO) (Matusall et al. 2011: 23)

[7] Search expressions for the set 'social' were: NEURO AND (social* OR socio* OR cultura* OR emotion* OR econom*) (= SOCIAL) (ibid.: 24).

very rarely within the sets 'neuro' and 'social' were excluded (twelve expressions). Finally, the remaining 45 expressions were first analysed according to annual and general frequency and then clustered in three categories: category one consists of expressions showing an increase between 1990 and 1999 (21 expressions), category two includes expressions showing an increase between 2000 and 2009 (14 expressions), and category three comprises expressions whose frequency did not increase significantly within the last two decades (ten expressions).

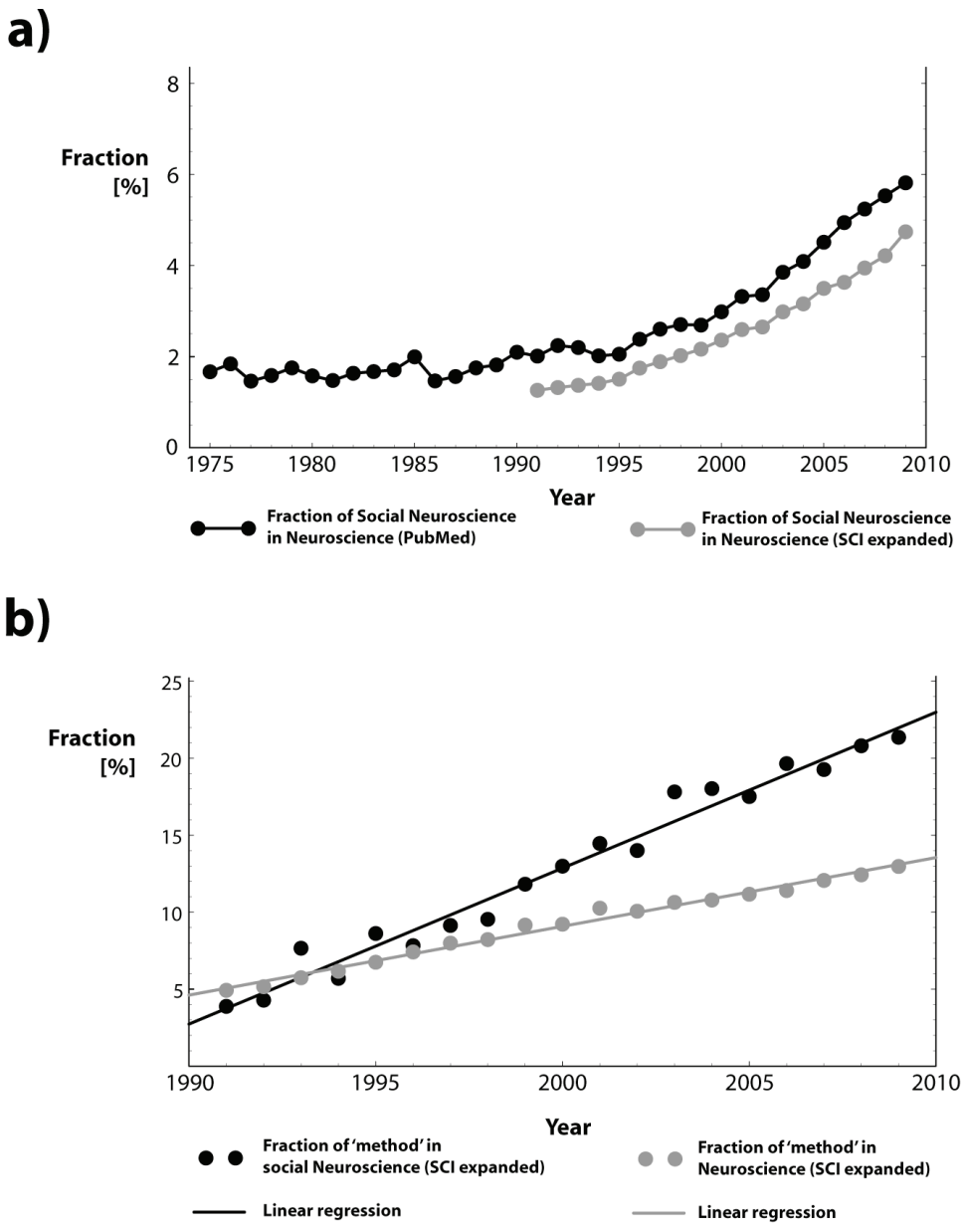

Figure 1: Publication Dynamics of Social Neuroscience
a) Growth of social neuroscience papers relative to neuroscience papers measured in two different publication databases: A steady increase is identifiable beginning in the mid-1990s. b) Growth of 'methodology papers' within social neuroscience compared to neuroscience in general (only measured based on SCI expanded). The slope of the linear approximation in former is 2.27 times larger than in latter, indicating an increased importance of non-invasive imaging methodologies for social neuroscience compared to neuroscience in general.

The first and the second category provide the basis for identifying a list of the hundred most cited papers for the decades 1990-1999 and 2000-2009 (in the following Top-100-1990s and top-100-2000s). Papers without a single reference to neuroscience, papers without a reference to human behaviour and papers dealing with mental disorders were excluded from these lists, resulting in a set of papers focusing on neuroscientific explanations of normal human social behaviour. The basis for excluding animal and patient studies is the hypothesis that social neuroscience can be distinguished from neuropsychology, psychiatry or neurology by its strong interest in normal social behaviour.

The lists of top-100 cited papers again served as the basis for determining the dominant journals of the field. Dominant journals are defined as those in which the top-100-papers are published – the more papers of the top-100-list published, the more important the journal for the respective decade. These data served as the basis for an impact analysis (Christen 2008), which will be discussed below. An impact analysis allows determining the impact of publications on a given data set, in the present case different academic disciplines.

It has to be mentioned that the following bibliometric analysis has some limitations for understanding social neuroscience. First, the search for the top-100-papers has been limited to the SCI expanded database.[8] Due to this constraint, the focus is on contributions with a (neuro-)scientific origin as defined by ISI, neglecting papers from journals classified as belonging to social sciences and humanities. This choice was made intentionally in order to assess the impact of social neuroscience papers with a 'scientific' publication origin. Second, although the ISI database is rather large, a well-known selection bias for English language distorts in particular the appreciation of social neuroscience papers in humanities where language diversity is higher. Furthermore, citations in monographs – an important publication category in humanities – are not captured. The method thus probably underestimates the impact of social neuroscience papers in social science and humanities. A third limitation is that this method cannot access the kind of appreciation. We can only observe that a paper was cited but cannot estimate the context in which it was mentioned and whether it was cited affirmatively or critically. Notwithstanding these constraints, the bibliometric analysis provides a first overview of the emergence and development of the field since it draws a picture of a developing interest in studying the social via the brain. It shows in which

[8] The science citation index (SCI) database was entered via Web of Knowledge.

period of time and in which areas of research it became first possible and then relevant to think ‘social’ and ‘brain’ together.

2.2.1 Pioneers

The bibliometric analysis of the top-100-papers in the 1990s reveals that a large majority of these papers has been published in the late 1990s and originates from North America (mainly from the United States) and the United Kingdom (Figure 2). These data indicates that social neuroscience can be identified as a scientific discipline emerging in the Anglo-Saxon academic culture in the second half of the 1990s.

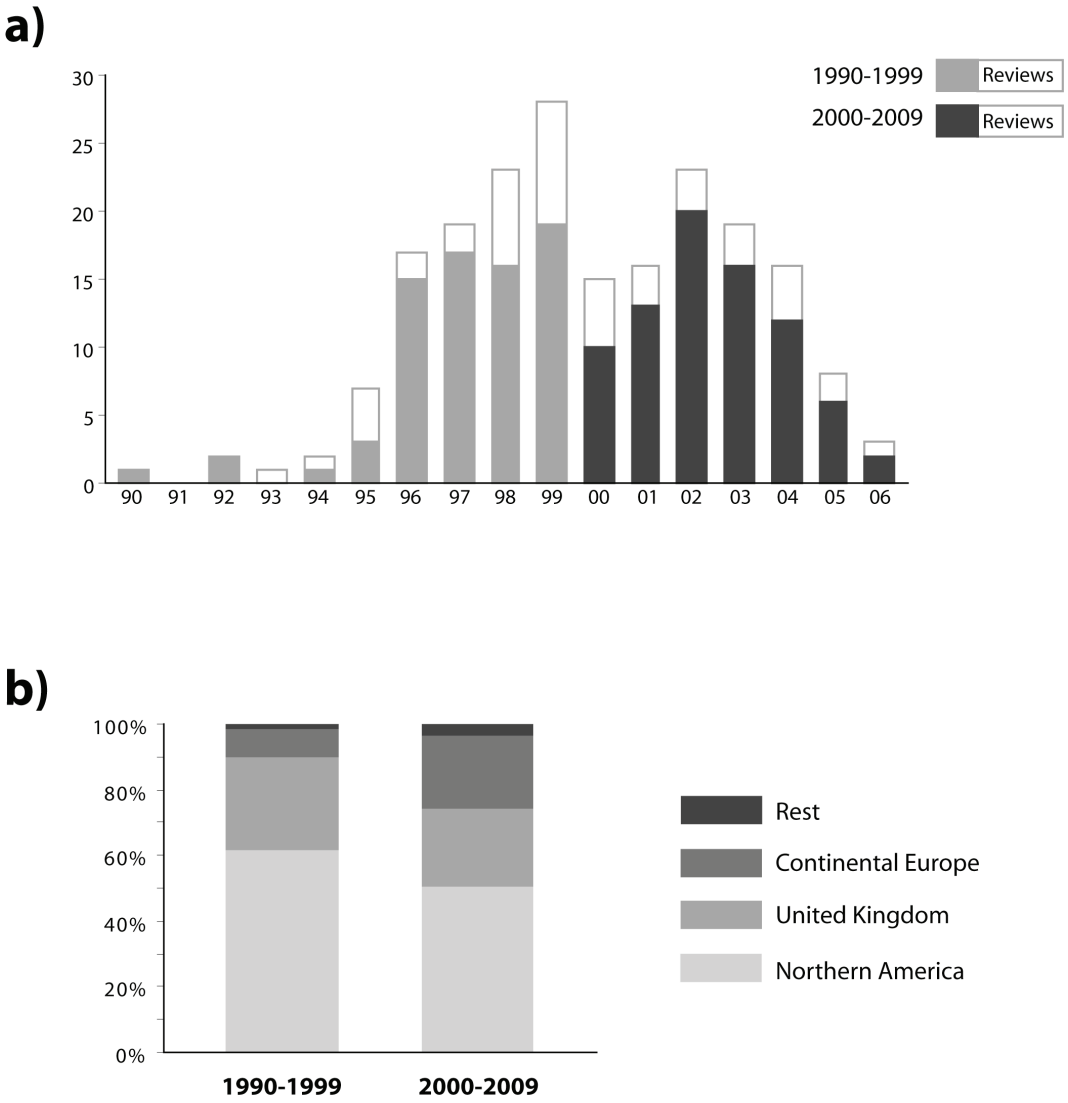

Figure 2: Top-100-Papers in terms of citation of the decades 1990-1999 and 2000-2009
a) The distribution of the total 200 mostly cited papers in social neuroscience of the decades 1990-1999 and 2000-2009 clusters around 1996-2004: 87.5% of all papers were published in these years. 23 (first decade) resp. 29 (second decade) publications are classified as ‘review papers’. b) The geographic origin of the top-100-papers of the first decade is more centered in the Anglo-Saxon academic culture (89.7%) compared to the second decade (74.3%).

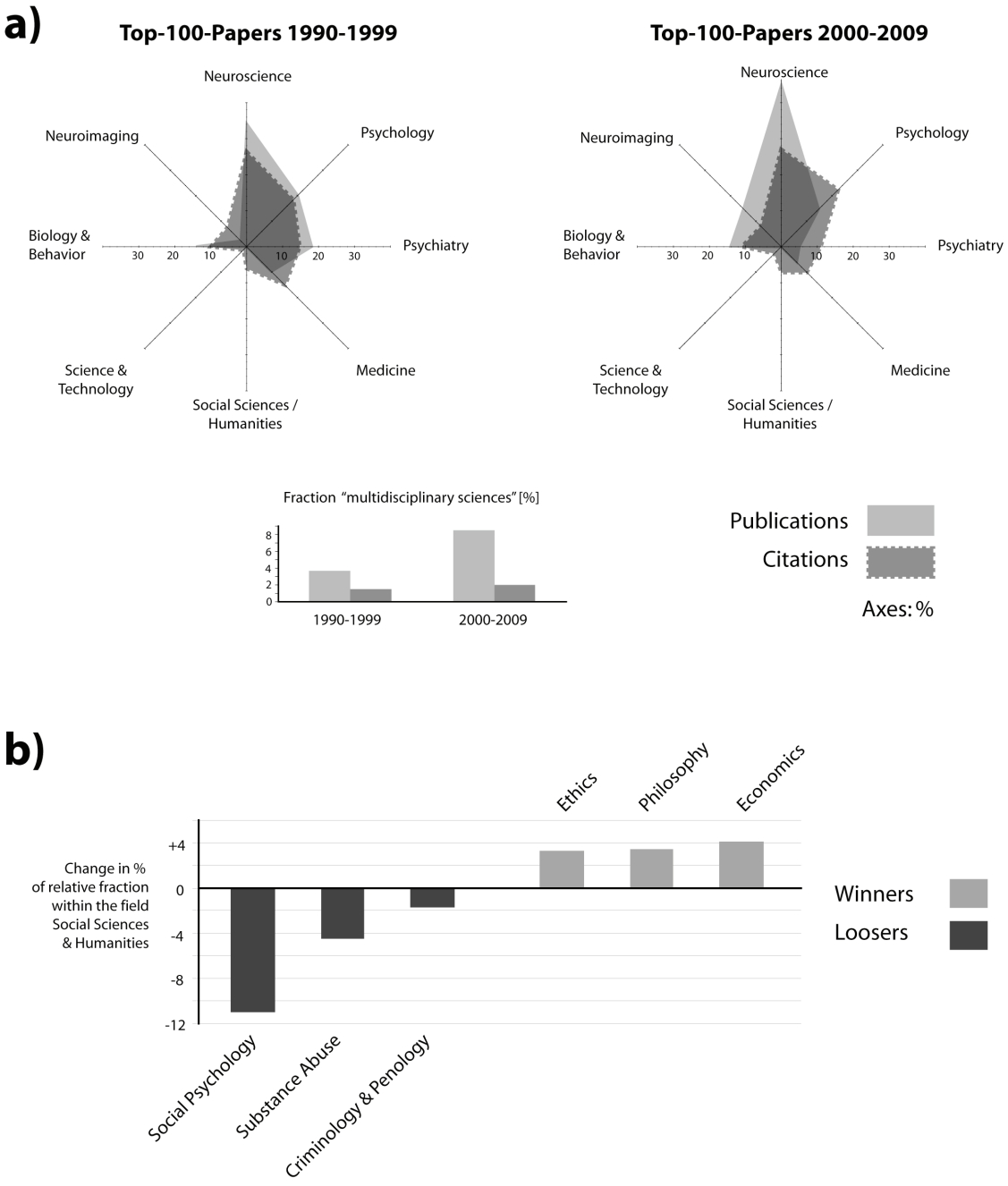

Figure 3: Impact Analysis for Top-100-Papers of the decades 1990-1999 and 2000-2009
a) The top-100-papers in social neuroscience of the second decade have a different impact profile than those of the first decade and show a larger net-transfer to other disciplinary clusters: 27.9% compared to 17.6%. This is partly explained by the larger fraction of papers from the second decade published in interdisciplinary journals. b) Top-3 winning and losing subject areas forming the cluster 'social sciences and humanities' when comparing the appreciation of social neuroscience papers of the 1990s and the 2000s. The papers gained interest in core-fields of social science and humanities, namely economics, philosophy and ethics.

By performing an impact analysis, we identified the disciplinary origins and disciplinary appreciations of these papers within eight disciplinary clusters, namely neuroscience, neuroimaging, biology and behaviour, psychology, psychiatry, medicine, social sciences and humanities, science, and technology. The analysis reveals two interesting aspects. First, psychiatry is an important discipline for social neuroscience in

the 1990s. Several factors indicate this relationship: the analysis of disciplinary origins suggests that besides 'neuroscience', also 'psychology' and 'psychiatry' are important disciplinary origins (these three clusters include 73% of all entries, Figure 3). Moreover, psychiatric journals such as *Biological Psychiatry, American Journal of Psychiatry, Neuropsychologia, Psychiatry Research - Neuroimaging* belong to the dominant journals of that decade (Figure 3). When looking at the distribution of the papers between the dominant journals (Figure 4), the relevance of psychiatry as a field for publishing and thus promoting the emergence of the field is striking. Lastly, the subject categories 'social psychology' and (to a lesser extent) 'substance abuse' and 'criminology and penology' are of considerably greater importance in the 1990s than later. This, too, indicates that questions related to psychiatric issues and deviant behaviour were rather important in the 1990s.

The second interesting insight regards the impact of the analysed papers. The analysis shows that early social neuroscience research had a comparably low transfer to other disciplinary clusters. The overlap of the distributions 'publications' and 'citations' along the eight axes for the papers emerging from the first decade is considerably larger compared to those published in the second decade. Generally speaking, papers are cited in the fields in which they have been published. An interesting exception is that publications are surprisingly often cited in the 'neuroimaging' cluster, a fact suggesting that the early papers may also have had some effect on developing imaging methodologies (Matusall et al. 2011: 19-20).

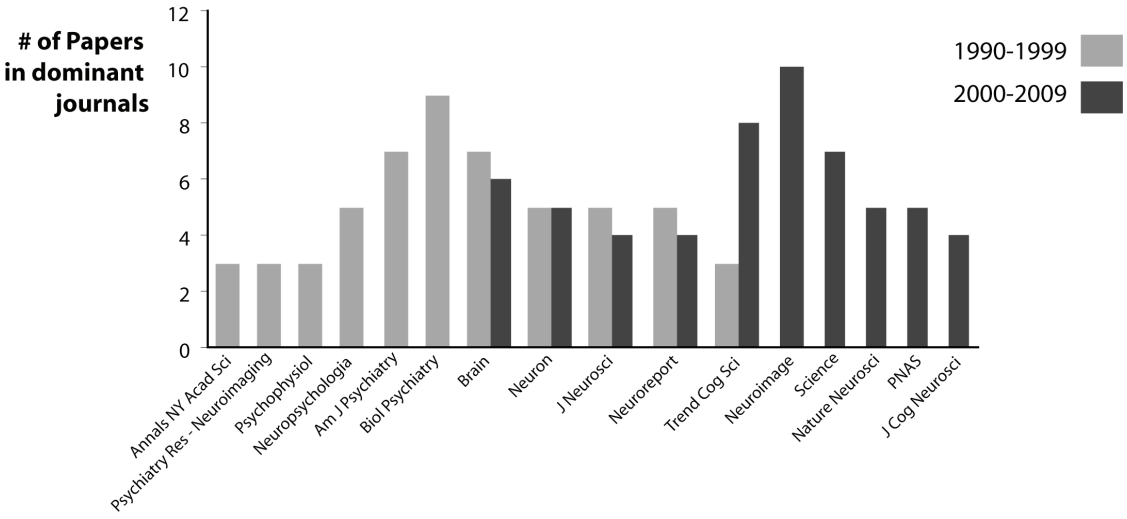

Figure 4: Dominant journals for Top-100-Papers of the decades 1990-1999 and 2000-2009
Top-100-papers of the second decade are to a large degree published in other journals than those of the first decade. 55 (first decade) resp. 58 papers appeared in these dominant journals. Remind that the chart only includes those papers that define the category 'dominant journal', i.e. one cannot conclude that for example no top-100-paper of the first decade was published in Science.

2.2.2 Getting Organised

In the decade 2000 to 2009, social neuroscience obtained various attributes of a discipline: People started using the term to describe their own work, psychology departments created positions for social neuroscience and in the middle of the decade, two journals using this label were launched (*Social Neuroscience*, first issue: March 2006; and *Social Cognitive and Affective Neuroscience*, first issue: June 2006).
Researchers previously working rather isolated on issues such stereotyping, empathy, emotion processing, or mentalising now began to meet. They first met in a coincidental manner before becoming more organised, meeting for workshops and pre-conferences of meetings of both the Society for Personality and Social Psychology and the Cognitive Neuroscience Society. The first conference using the term 'social cognitive neuroscience' took place in Los Angeles in 2001. In 2004, the conference "Social Neuroscience: People Thinking About People" accompanied the inauguration of the *Center for Cognitive and Social Neuroscience* at the University of Chicago. Since 2007, the Social and Affective Neuroscience Conference has taken place annually. This conference is organised by the Social and Affective Neuroscience Society, which was founded in 2008 (www.socialcogneuro.org). In 2010, a second society, the Society for Social Neuroscience, was founded (www.s4sn.org).

Using our approach for identifying the top-100-papers published between 2000 and 2009, some changes regarding origin and impact of these papers compared to the 1990s can be detected. With respect to their geographical origin, the dominance of North America and the United Kingdom is less pronounced, although still clearly present (Figure 2). The transfer between the disciplinary clusters, however, is considerably more significant than it had been in the 1990s (Figure 3a): almost two-thirds of the papers were published in the clusters 'neuroscience' or 'neuroimaging', while the distribution of citations is much more diverse than it was in the preceding decade. They show increased appreciation by psychology, psychiatry, medicine and, to a lesser extent, in social sciences and humanities. The number of papers which appeared in multidisciplinary journals such as *Science* and *Nature* doubled, a fact partly explaining the increased cross-disciplinary transfer. Finally, also the characteristics of the dominant journals in the data set changed: while psychiatric journals are no longer among the dominant journals in the 2000s, the growing importance of imaging methodologies is emphasised by the fact that 10 of the top-100-papers were published in *NeuroImage*.

In the disciplinary cluster ‘social sciences and humanities’ social neuroscience papers were most cited within the subject categories ‘economics’, ‘philosophy’ and ‘ethics’. Thus, although the general impact within this cluster did not increase much compared to the 1990s (from 6.0% to 7.3%), social neuroscience obtained more appreciation in disciplines that are closer to the core of social sciences and humanities compared to the 1990s when research fields dealing with deviance such as criminology and substance abuse were dominant within the cluster. However, one has to take into account that this quantitative analysis cannot disclose whether cited papers were discussed positively or critically.

2.2.3 Analysis of Topic Clusters

As a final step of our bibliometric study, we broadened our impact analysis to four subjects falling into the thematic range of social neuroscience, which received a comparable large number of citations (Figure 5). These subject categories are 1. moral issues (moral decision making, moral emotions etc.), 2. psychopathy and sociopathy, 3. empathy and 4. trust, cooperation and punishment (which are defined as attributes of social interactions).

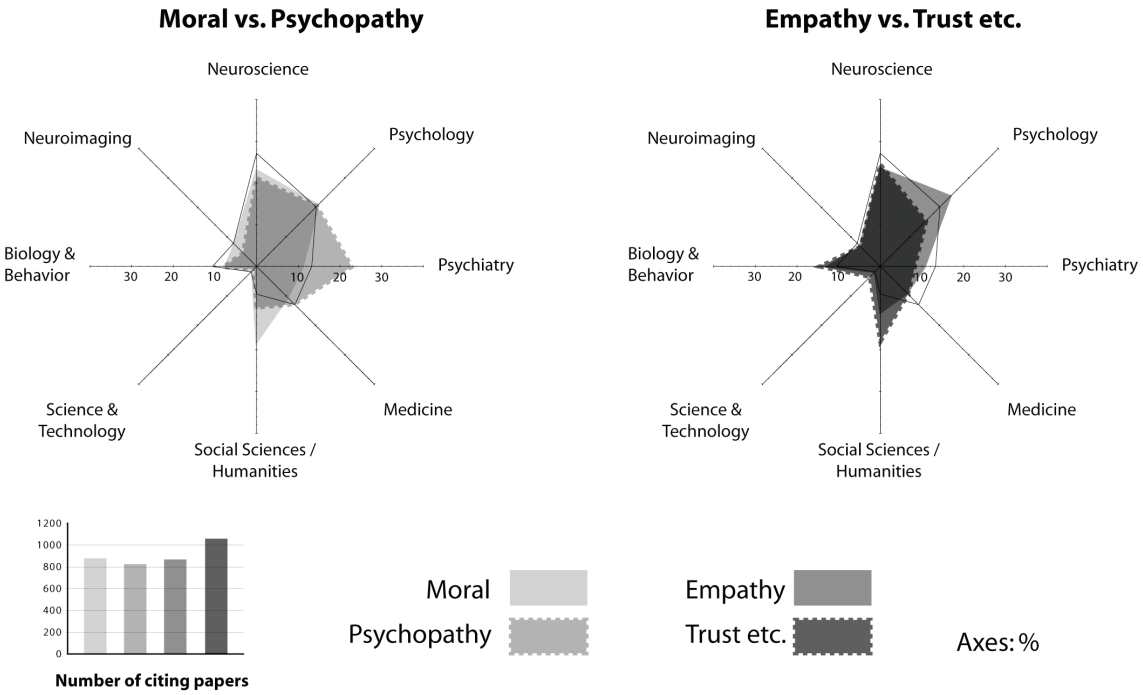

Figure 5: Impact analysis for selected topics of social neuroscience
Impact analysis for four selected topics ‘moral’, ‘psychopathy/sociopathy’, ‘empathy’ and ‘trust, cooperation, punishment’ that gained a similar total number of citing papers. The black line in the graph indicates the total number of citations of all 200 papers along the eight disciplinary clusters.

Their impact was calculated separately and compared to the mean impact of all 200 papers along the eight axes (black line). Regarding the first two issues, papers on psychopathy and sociopathy had the highest impact within psychiatry, whereas moral issues had the highest impact in social sciences and humanities – in fact, these papers had the strongest impact within this cluster in general. Regarding the second subject pair, papers on empathy were mainly cited within psychology, whereas papers of the group trust-cooperation-punishment had a highest appreciation within social sciences and humanities. This indicates that social neuroscience's relevance for social sciences and humanities is bigger in topics traditionally tackled by disciplines in that cluster, while psychiatric and psychological topics appear to be less relevant for the social sciences – and vice versa.

In summary, the quantitative impact analysis of the most often cited papers characterising the formation (1990s) and establishing (2000s) phases of social neuroscience reveals the following: First, the disciplinary basis of social neuroscience narrowed over time. While being comparably strongly rooted in neuroscience, psychology and psychiatry (73% of all entries) in the 1990s, neuroscience and neuroimaging became the dominant clusters (~60%) for publications in the 2000s. Second, the interest in 'anormal' social being (e.g. psychopaths), which was dominant in the 1990s, shifted to an interest in issues of 'normal' social behaviour without losing interest in psychopathologies, something I will come back to in chapter 6. Third, although the impact in the disciplinary cluster 'social sciences and humanities' is not very large in general, social neuroscience results gained more attention in core disciplines of this cluster in the second decade analysed.

2.3 The Invention of Social Neuroscience

This quantitative analysis showed general trends leading to the emergence of social neuroscience. It revealed parent disciplines as well as those on which the emerging field had some impact. The most important point the analysis revealed was that the general trend in thinking about the social brain is a shift from an interest in deviance or anomaly to investigating what is assumed to be the normal set-up of human social behaviour. This is underscored by the fact that the growth mainly took place in the area of studying normal, healthy subjects; an incident leading to the hypothesis that it was mainly research related to social psychology that was responsible for the overall growth.

While the quantitative analysis allows to determine general trends in interests in the social brain, to understand how an independent research field "social neuroscience" within an increased interest in the social brain emerged, a qualitative approach is necessary. In this section, an analysis of interviews with leading social neuroscientists as well as programmatic papers serves as the basis for reconstructing the history of the field.

2.3.1 Founding Narratives

In the beginning of my interviews I asked about academic background of my interview partners. They all told me about their time in graduate school – all were trained in either social psychology or cognitive neuroscience – and how they felt a discomfort about doing social psychology or biological psychology alone without being able to investigate questions about sociality interdisciplinary. A second common narrative in the interviews was a discomfort about one-sided methods that were insufficient for dealing with questions about social cognition. One interviewee explained

> "as I was working on my questions, I kept running into roadblocks, methodological and even theoretical roadblocks" (social neuroscientist B).

As the common story goes, this discomfort with strong disciplinary boundaries lead to combining psychophysical methods such as EEG, and later fMRI, with questions about mentalising, prejudices, and empathy. The three senior academics in the sample (who received their graduate training in the 1970s and 1980s) in particular stressed the difficulties in pursuing their interest of combining biopsychology or psychophysics with social psychology in their graduate or postdoctoral research. Advisors, colleagues, advisory boards, peer reviewers, and funding bodies had to be convinced that it was a research endeavour worthy of support. In contrast, the younger generation, who got its training in the 1990s, felt that it was about time to integrate research from social psychology and cognitive neuroscience.

> "And when I got to graduate school, I realised within about the first two months that I wasn't really interested in studying memory. I quite literally had a dream where I woke up and thought I have to study emotion and social behaviour and is anybody doing that? You know, I mean in the context of the brain?"

social neuroscientist C told me right in the beginning of the interview. While a dream is quite a strong image for the genius researcher having an inspiration, all younger interviewees indicate that there was something "in the air" to try this, to see what would

happen when adding tools of cognitive neuroscience to classic social psychology questions.

All social neuroscientists I interviewed stressed the fact that pioneering work has taken place before the name "social neuroscience" came into existence. The group of cognitive neuroscientists around Chris and Uta Frith at University College London were mentioned by many interviewees as influential for the research field; as were neuropsychiatrist Antonio Damasio, neuroscientist Joseph LeDoux or psychobiologist Jaak Panksepp. The Frith group is particularly influential in the research on higher mental functions such as mentalising (cf. Frith/Frith 2003) and subsequently in the area of theory of mind and autism research (cf. Baron-Cohen et al. 1985). The other three mentioned scientists were influential on the field of neuroscience of emotions. Damasio is a clinical neuropsychiatrist who first suggested an integrative approach towards cognition and emotion (see chapter 5; Damasio 1994). Panksepp coined the term "affective neuroscience" in his endeavour to investigate the neuronal foundations of emotions (Panksepp 1998). LeDoux conducted influential research on the role of the amygdala in fear processing and subsequently suggested a theory of the emotional brain by integrating the cognitive brain with the limbic system, an evolutionarily old structure associated with emotion processing (LeDoux 2000). While the Friths and Damasio work with a patient population, Panksepp and LeDoux are mainly working with animals. Before the development of non-invasive and relatively high resolving imaging technology such as PET and fMRI, these – together with post-mortem studies – were the standard procedures for of investigating the correlation between brain and behaviour (see chapter 3).

These researchers investigated aspects of the social brain – the way we engage with each other – already in the 1980s and 1980s, at a time when this approach was generally neglected in neuroscience and psychology. However, I do not classify them as early social neuroscientists since they remained members of their original discipline and did not attempt to found a new research field. Here I follow sociologist of science Joseph Ben-David, who suggests that three conditions must be fulfilled for a scientific identity of a newly founded field: first, a person has to do empirical work on the subject matter of the given field; second, they must not have any other disciplinary identity and third, they have to be a member of a group rather than being an isolated individual (Ben-David 1991: 53). The mentioned researchers do not fulfil the second criterion since they all have their own disciplinary identity. They do not identify themselves as social

neuroscientists even though they conduct research that could retrospectively be identified as social neuroscience. In the terms of Ben-David, they classify as forerunners (ibid.: 54).

Not only neuroscientists have been influential for the emergence of this new research field. Some of my interview partners also mentioned primatology and particularly Michael Tomasello as important sources for social neuroscience. Tomasello studies communication and cooperation in primates and infants (cf. Tomasello 1999; Tomasello 2009) and is thus crucial for social neuroscience's argument for evolutionary foundations of cooperative behaviour. Interestingly however, his dual inheritance approach of explaining human social behaviour by a co-evolution of nature and culture – or "cumulative cultural evolution" (Tomasello 1999: 6-7) – is but rarely discussed in social neuroscience. While social neuroscience's evolutionary narratives stress adaptive advantage of pro-social behaviour and take into consideration the interactions between individual and (social) environment, they neglect the impact the various aspects of social life may have on human nature. A possible reason for this might be the focus on reproduction as driving force behind evolution and thereby minimising the impact of other aspects of life, such as culture.

Moreover, the importance of social psychologists who started looking for subconscious patterns, such as the famous study by Fritz Heider and Marianne Simmel (1944), describing that research subjects attributed mental states to animated geometric objects, was mentioned.

Whilst the importance of these predecessors was recognised by my interview partners, the importance of having a distinct field of research has been stressed by most. This is not surprising when taking into account that all of them hold university positions for social neuroscience. Social Neuroscientist C, again in quite strong images, stresses the value of having a name for what one is doing. He argues

> "it's sort of like planting a flag and giving people something to rally around, it's like, you know, having a country rather than we all just live in these settlements, it's like, we're this nation of people that have a shared identity and common goals and so on and it gives people something to look towards to and organise themselves in terms of. And I think, that's useful, in the end, though, it's all about the topics you study and there are people who say: I'm a cognitive neuroscientist who does stuff I would say is social cognitive neuroscience. You know, people who'd say: I'm an affective neuroscientist who does stuff I'd say is social cognitive neuroscience. And maybe vice versa. So, in the end these labels don't matter a whole hell of a lot but in the short term they provide a lot of impetus to an interest in an area. They can catalyse something and make something happen that feels new and interesting to people."

Only one social neuroscientist I talked to, said he did not believe something like social neuroscience exists. While he is aware that his opinion is a minority position, he makes quite a strong point by explaining:

> "If I do memory research and I happen to use fMRI or Alzheimer's disease or EEG (as a method, S.M.), I don't call myself a mnemonic neuroscientist, right? I'm just a cognitive neuroscientist who studies memory (…). That is, I'm a psychologist who uses cognitive neuroscience techniques to study social questions, right? And so, just like I wouldn't call myself a linguistic neuroscientist because I happen to use imaging to study language, it feels awkward to me to call myself a *social* neuroscientist if I just am a cognitive psychologist who studies social questions using imaging, right? (...) I mean I was mostly not a huge fan of having separate journals, even though I think they're doing a fantastic job now – because I think we should insist that we're just like, we're on par with all the other cognitive neuroscientists studying memory or attention or language or what have you. But others don't see it this way" (Social Neuroscientist A).

Despite this dissident position he uses the term 'social neuroscience' in the name of his lab at an Ivy League university, implying that he identifies with that group, and ends his explanation with the one sentence definition of social neuroscience which I had asked for:

> "So, in my view, what social neuroscience is, is basically the use of techniques of cognitive neuroscience, i.e. imaging or patients or EEG to study questions about social cognition. And social cognition means all the processes I bring to bear to understand what you're like as a person, how to interact with you, predict what you're gonna do etc" (ibid.).

This was a question I asked in all my interviews with the aim of getting concise brief definitions, which I would be able to compare. Like probably every academic being asked to give a brief to the point description of what they were doing, my interview partners found this task rather difficult after having talked about their academic biography, their research interests and their favourite research at some length. However, the following four answers show the spectrum in which social neuroscience research is conceptualised.

Social neuroscientist E is very enthusiastic about the field and is the only interviewee offering a one-sentence-definition without being directly asked for it. He asserts that his definition of social neuroscience was broader than others perhaps would construe it. He explains that

> "we're a social species, we're one of many social species. Social species, by definition, create emergent structures and organisations that extend beyond the individual organism. What are the hormonal, genetic and neural mechanisms underlying that and what are the specific functions of those? How do we express our sociality and what're the evolutionary principles governing it?" (Social Neuroscientist E).

Social neuroscientist B focused on the social processes and gave the following definition:

> "The simplest way would be to say social neuroscience is the study of social processes and social behaviour as it relates to the brain and physiological mechanisms" (Social Neuroscientist B).

However, he is very careful in stressing that he does not understand his definition as the only correct one. Others, he said, might have a different perspective, for instance focusing much more on the neurobiological mechanisms and how they relate to the social, which is what social neuroscientist F did:

> "The scientific investigation of the neurobiological processes that underpin social interaction" (Social Neuroscientist F).

While all coming to the question of bodily mechanisms and their relation to social processes, these answers reveal the plurality of approaches within the field of social neuroscience: social neuroscientist E takes a strong stance in the evolutionary paradigm: since Homo sapiens is a social species, it has to have the biological prerequisites for creating and moving in structures bigger than the single organism. By framing his research in an evolutionary setting, his perspective is much broader than the individual in the sense that the people he studies are representatives of one social species among many. He wants to understand how social species in general and Homo sapiens in particular organise their sociality biologically. Social neuroscientist B's perspective on the social is comparatively narrower. For him, social processes and behaviours are in the centre of attention. While from this quote it is not possible to tell what social processes are, it can be assumed that they are something in which other people are involved and social behaviours are what people do with or towards other people. He is interested in how these processes and behaviours are related to physiological mechanisms but his focus is on the social level, as becomes clear in his afterthought that others might focus more on the brain and neuronal mechanisms. Social neuroscientist F turns the question around and asks for the neurobiological underpinnings of social processes, thus focusing rather on what happens in the brain than what happens in the social sphere. Social neuroscientist A now stresses the cognitive side of social. In this perspective, social is a mode of cognition and thus focusing on processes within the individual.

The first and the last approach stand for two different research traditions within the young research field of social neuroscience, the former coming from biophysiological psychology, also having some roots in ethology, and the latter coming from cognitive

psychology. The other definitions show that approaches in social neuroscience are not either black or white – different shades of grey are possible and many different approaches are integrated into this new field.

These voices of leading social neuroscientists are indicators for trends within the research field, but of course they are singular voices. However, these voices serve as an introduction into the field of social neuroscience, revealing programmes and intentions of the field's protagonists, focusing on establishing a strong identity with the project.

Good sources for programmatic propositions are introductions to handbooks and review papers, in which the state-of-the-art of a research field is summarised. Over the last two decades, programmatic review papers introduced and evaluated the project of social neurosciences. Going more into detail and looking into these papers, an intriguing circumstance reveals itself: Social neuroscience was invented twice. Once in the early 1990s, having strong roots in biopsychology, and a second time in the early 2000s, now with strong roots in cognitive psychology. The different disciplinary backgrounds became visible in the slightly different terms used for introducing the research endeavour: the former was introduced under the name 'social neuroscience' (Cacioppo/Berntson 1992) while the latter was introduced as 'social cognitive neuroscience' (Ochsner/Lieberman 2001). The two journals and societies in the field are linked to either of these research branches: The journal *Social Neuroscience* and the Society for Social Neuroscience are associated with the biopsychology line of research while the *Journal for Social Cognitive and Affective Neuroscience* and the Social and Affective Neuroscience Society are linked to the cognitive psychology line of research.

2.3.2 Invention of Social Neuroscience 1: Biopsychology Tradition

The term "social neuroscience" was first coined in 1992 by two psychologists, who later came to identify themselves as social neuroscientists, John Cacioppo and Gary Berntson,[9] at that time faculty members of Ohio State University's psychology department. It was in the early years of the "decade of the brain", which had been proclaimed by US president George Bush senior in 1990 to raise awareness of the benefits coming from brain research and to enhance research in brain related diseases

[9] John Cacioppo got his graduate training in psychology at Ohio State University where he received a PhD in social psychology in 1977. At Ohio, Cacioppo met Gary Bernston, a psychobiologist who received his PhD from the University of Minnesota in 1971 before joining Ohio State's faculty in the psychology department in 1973. Both shared an interest in bringing together the social and the biological and were the driving forces behind developing the concept of social neuroscience after twenty years of research in biopsychology and social psychology, implementing biopsychological methodology (cf. Cacioppo n.d.; Berntson n.d.).

and disorders. While not automatically implying extra funding for the neurosciences, the decade of the brain stimulated new research initiatives and visibility for the neurosciences (Jones/Mendell 1999: 739). It is likely that this publicity had an impact on how neuroscience was perceived in other disciplines and might have triggered thoughts about integrating neuroscientific research into the own research. And, besides the increased publicity of the neurosciences, the hope of more funding might also have played a role.

In their paper on social psychology's contribution to the decade of the brain, Cacioppo and Berntson stress the importance both of the decade of the brain for all cognitive, behavioural and social sciences and of social psychology for understanding the brain which is an

> "interacting component of the developing or aging individual who is a mere actor in the lager theatres of life" (Cacioppo/Berntson 1992: 1020).

This larger theatre is of a social nature and while the brain is an essential component of social beings, the nature of brain, behaviour and society is too complex to be reduced merely to neural processes. Theories of social behaviour require the consideration of both social and biological levels of organisation. Hence, they argue, social psychology is a "fundamental although sometimes unacknowledged complement to the neurosciences" (ibid.).

For understanding the interdependence of (neuro-)physiological, psychological and social components of social behaviour, psychological disorders as well as organic diseases such as AIDS, they propose a "Doctrine of Multilevel Analysis." This doctrine postulates that understanding psychological phenomena requires a "multilevel integrative analysis", i.e. the integration of knowledge and theories about the elements on each structural level and on the relational features of these elements *across* the levels. This multilevel analysis should follow the principles of multiple determinism (one event may have multiple causes on different levels), non-additive determinism (the whole may be different from the sum of its parts) and reciprocal determinism (mutual influences between factors on different levels) to take into account the complexities of the phenomena studied. As a result of their previous discussion, Cacioppo and Berntson develop the project of social neuroscience as cooperation between neurosciences and social psychology. Both should benefit from this cooperation, which aims to avoid the pitfalls of reductionism and to develop a more general psychological theory (ibid.: 1026-7). They conclude with the hope that

> "the decade of the brain is more likely to be a gateway to a new millennium of the mind if we recognize that the brain is a single, pivotal component of an undeniably social species and if we recognize that the nature of the brain, behavior, and society is, in Bevan's (1991) words, orderly in its complexity rather than lawful in its simplicity" (ibid.: 1027).

In this early paper, the term 'social neuroscience' is still followed by a question mark (ibid.: 1025), but in the following years the project got more shape. Ten years after that first reference to a possible research endeavour called social neuroscience, Cacioppo, by now professor at the psychology department at the University of Chicago, reviewed what had happened under that name in the decade since. He observed that both the social sciences (i.e. social psychology) and the neurosciences contributed to the emergence of social neuroscience. Social sciences benefited from including neuro-scientific methods and principles for drawing inferences about social and psychological processes in various fields: the complexity of mechanisms underlying social behaviour, empirical tests of conflicting theories of social behaviour, better understanding of mental and physical diseases as well as of physiological processes, and

> "conceptualizations of social phenomena ranging from attachment, morality, and social prejudices to social cognition and decision making" (Cacioppo 2002: 821).

For Cacioppo, the single most important factor within the neurosciences contributing to the emergence of social neuroscience was the development of non-invasive brain imaging technologies. These technologies enable the investigation of social processes such as face recognition, social categorisation, attributional processing and reasoning, moral reasoning, and theory of mind (ibid.). Notwithstanding the impressive insights gained by imaging technologies, Cacioppo warns against too strong a reliance on these technologies, which still hold significant limitations. He stresses that insights in the cognitive and the social sciences also depend on cellular and molecular research.

> "It is important therefore," he emphasises, "that advances within the neurosciences favouring the emergence of a social neuroscience perspective run deeper than brain imaging techniques" (ibid.).

Despite his caution against imaging, he is optimistic that the technological and methodological developments lead towards analyses integrating biological and social levels of organisation (ibid.: 826). A year later, Cacioppo, Berntson and colleagues published a caution against too strong embracing fMRI technology by social psychology in a paper they called *Just Because You're Imaging the Brain Doesn't Mean You Can Stop Using Your Head*. In this paper they maintain that fMRI does not yield

any unambiguous results. They contend that it is not enough for a neuroimaging study to show that aspects of social cognition, emotion and behaviour correspond to changes in brain activity, because "what scientific theory would predict otherwise!" (Cacioppo et al. 2003: 652). Current methodologies in brain imaging and particularly in data analysis often imply straightforward results that appear to be linear and additive. However, this perspective ignores important questions about how small differences in tasks may activate completely different brain regions and networks. On the technical level, they emphasise that the interpretation of fMRI images "depends fundamentally on the conditions that produced the images in the first place" (ibid.: 659). Despite all critique, they are optimistic that collaboration between neuroscientists and social scientists opens possibilities for obtaining a deeper understanding of human social cognition, emotion and behaviour if "the most important tool in the scientist's armamentarium – the capacity for reasoning, analysis, and syntheses" is also included into the set of technologies and methodologies (ibid.).

In the almost two decades since Cacioppo and Berntson first suggested a new research focus of social neuroscience, they have been very active both in conducting research and in marketing this kind of research as something new and distinct from older approaches to social behaviour and the brain. Consequently, in 2010, Cacioppo, Berntson and Decety argued in a special issue of *Social Cognition* on social neuroscience that

> "social neuroscience can be viewed as a single, overarching paradigm in which to investigate human behavior and biology, and to investigate where we as a species fit within the broader biological context" (Cacioppo/Berntson/Decety 2010: 676).

They argue that social neuroscience is independent of social psychology and make a strong claim for social neuroscience being an independent field of research within the behavioural sciences (ibid.: 680), with own subareas such as

> "social cognitive neuroscience, social affective neuroscience, cultural neuroscience, computational social neuroscience, social developmental neuroscience, and comparative social neuroscience" (ibid.: 682-3.).

This 2010 definition is interesting for several reasons. First, it stresses the evolutionary paradigm of social neuroscience for locating people as representatives of Homo sapiens among other social species. Second, it confidently presents social neuroscience as an independent field of research, which, while having parent disciplines, is not part of these disciplines any more. Partly, this speaks for the success of the endeavour. But it is also a political move to mark one's territory by defining it as a discipline of its own. The

third interesting point is that by integrating other approaches of thinking about the social and the brain, the claim for defining the broad field is articulated.

2.3.3 Invention of Social Neuroscience 2: Cognitive Tradition

This brings us to the second time social neuroscience has been invented. Almost a decade after the term "social neuroscience" was coined by Cacioppo and Berntson, Kevin Ochsner and Matthew Lieberman (2001) introduce a research endeavour, which they call "social cognitive neuroscience". Ochsner and Lieberman got their graduate training in psychology at Harvard University, where they met in graduate school. While Ochsner was trained in cognitive psychology, Lieberman was trained in social psychology. They realised that they both had a discomfort with the constraints of their respective sub-disciplines and thus became interested in collaboration after being introduced by their doctoral advisors (personal communication). In their programmatic paper they define their research endeavour as follows:

> "The name social cognitive neuroscience denotes both the interdisciplinary nature of the field and its emphasis on integrating data from multiple levels of analysis, ranging from the experience and behavior of motivated individuals in personally relevant contexts (the social level) to the information-processing mechanisms that give rise to these phenomena (cognitive level) to the brain systems that instantiate these processes (the neural level)" (Ochsner/Lieberman 2001: 719).

They stress that looking for the social in the brain does neither mean to define a social module nor a mere mapping of brain correlates of social and emotional phenomena. Rather, a true integrative approach aims at understanding the links between the different levels, "whatever those links turn out to be" (ibid.: 729).

The concept of integrating knowledge from different levels sounds familiar, since this demand was also at the core of Cacioppo and Berntson's proposal for social neuroscience. However, Ochsner and Lieberman's emphasis is on the cognitive level, because social psychology and cognitive neuroscience both are concerned with describing psychological processes in terms of information processing. Hence at this level, it is relatively easy to communicate and to mutually enrich research designs and knowledge (ibid.: 719). Moreover, rather than speaking of a biological level, which may include genes, hormones and evolutionary history, they suggest investigating the neural level, which seems to be less integrative. In a later review paper, Lieberman defines social neuroscience as a research field that combines tools from cognitive neuroscience with questions and theories from social sciences (e.g. social psychology, economics or political science) to detect biological correlates of social processes. This could provide

mutual information of social neuroscience and social psychology (Lieberman 2007: 260-1). In this review the strong reliance on cognitive neuroscience becomes part of the research program, enabling "interdisciplinary cross-fertilisation" (ibid.: 279) and generating new theories about the nature of social processes.

Thus, compared to the former proposal of Cacioppo and Berntson, Ochsner and Lieberman have a narrower view of the field, also by setting their focus on *human* social behaviour – a specification that is reflected by their term 'social cognitive neuroscience', which would be only one of many branches of social neuroscience defined according to Cacioppo and Berntson. In his historical overview of social cognitive neuroscience, Ochsner (2007: 43) argues himself that this research field is focusing on human social cognition, while social neuroscience integrated approaches link social variables to psychophysiological, endocrine and immunological parameters in humans and in animals. In that paper, Ochsner discusses why it was necessary to create a new interdisciplinary subfield when others dealing with similar questions already existed. He maintains that researchers coming from a cognitive tradition could neither identify with social neuroscience (SN), investigating psychophysical processes, (neuro-) endocrine and subcortical brain systems involved in social phenomena nor with affective neuroscience (AN), investigating cortical and subcortical bases of basic emotions as well as affective disorders (ibid.). Social cognitive neuroscience

> "appealed to researchers who (1) were interested in using cognitive neuroscience methods to study a wide array of socioemotional phenomena, (2) wanted to use this combined methodology to elucidate the information processing level of analysis, and (3) did not identify with the types of research questions and content areas previously associated with related fields such as SN, AN, and CN (cognitive neuroscience, S.M.)" (ibid.).

The twofold invention of social neuroscience can be interpreted as a simultaneous yet independent discontent of researchers of two research traditions resulting in the same conclusion: the own tools and methods are no longer sufficient for answering their questions. The first invention comes from the tradition of biopsychology, which is mainly interested in evolutionary, genetic, physiological and developmental mechanisms underlying behaviour of humans and animals (Wickens 2009: 3). From that perspective, investigating cognitive processes in the human brain is only one among many tools of studying the correlation between brain and social behaviour. Other aspects such as genetics, hormones or other chemical processes are at least as relevant for understanding social behaviour. The strong evolutionary perspective on human social behaviour allows for embracing animal studies in understanding human

behaviour and opens the scope for a broad definition of social neuroscience, integrating a plurality of approaches on the different levels Cacioppo defines. In this approach, the main focus lies on understanding the biological and the main method is imaging as has been discussed above. Thus, it remains open whether the rhetoric of plurality will also reflect research practice in the future. The protagonists of this branch of social neuroscience attempted to bring together biological and social aspects of human psychology at a time when these areas of research were strictly separated. They stress that it had been difficult to bring together biopsychology and social psychology against the established habits and beliefs in the respective disciplines, as this passage of my interview with Social Neuroscientist E shows:

> "I put bio and social together in my dissertation but there was this abyss that the linkages were not natural and one thing that graduate training did was that it meant if I would bring a bio perspective I had to be better, because I was facing an antagonistic audience. I had to be more rigorous, with more evidence than if I didn't bring the bio to bear (…). And similarly, to the bio group, the social was not believable, it was not central to basic development, we *knew* that basic development and social evolved later (…). We could deal with those after we understand basic development, structure and processes, that was the notion in the bio side."

The same was true for the integration of cognitive psychology into social psychology. However, at the time when social neuroscience was invented the second time, the integration of cognitive psychology in social psychology was already an accepted way of studying the individual's engagement with the social world (Fiske/Taylor 1984). Cognitive psychology had an internal and an external trigger. A critique of behaviourism, which did not allow for studying innate states, since these as non-observable, accounted for an internal trigger, most notably in Noam Chomsky's criticism of behaviourist research in language. The external trigger was the emergence of information technology and computer sciences in the 1950s (ibid.: 7, see also Greenwood 2009: 543-4). The notion of information processing was adopted into psychology to describe what happens between the intake of information (or stimulus) and a reaction to that stimulus. Moreover, cognitive psychology is interested in question of information storage, interpretation and modification (Greenwood 2009: 542). Susan Fiske and Shelly Taylor, who presented the first handbook on social cognition in the early 1980s, stress that the difference between cognition in experimental psychology and cognition in social psychology is that the former is mainly interested in inanimate and abstract objects while the latter is mainly interested in social experience (Fiske/Taylor 1984: 16).

While the different disciplinary origins might be a part of the answer to the question why social neuroscience had been invented twice, it remains to be explained why both endeavours try to establish a new research field independently from each other, establishing separate journals and societies hosting separate conferences, while being fully aware of each other and working on very related questions. A possible way of dealing with this observation is using Pierre Bourdieu's concept of different disciplinary habitus within the scientific field. Differing trainings (between subfields but also between universities), values and approaches of disciplines shape the way their members see not only their subject of study but also how they approach the world. Moreover, since initiation into a discipline and thus the incorporation of a disciplinary habitus is strongly connected to scientific training, which again changes over time, differences between generations also influence the diversity of habitus (Bourdieu 2004: 42). Yet, not only diverging habitus, which shape a disciplinary approach to research subjects and the world in general, are important for understanding the strong opposition between the protagonists of the two different lines of research but also the question of distribution of capital within the academic field. In a Bourdieuian sense, capital does not merely consist of the economic resources a discipline, lab or single researcher possesses but also of symbolic capital. He argues:

> "Scientific capital functions as a symbolic capital of recognition that is primarily, sometimes exclusively, valid within the limits of the field (although it can be converted into other kinds of capital, economic capital in particular)" (ibid.: 55).

He stresses that originality of contributions into the disciplinary field is crucial for obtaining high symbolic capital, institutionalised for instance in publications in high ranking peer-reviewed journals. Both, the differing disciplinary habitus and the struggle for symbolic capital might explain the fierce insistence of being the inventors of this new research field. It is connected to thinking along certain lines in conceptualising the world and to the declaration to be the first to combine social psychology with neurosciences. Both groups claim to be the inventors, discoverers or founders of this new discipline, all titles accumulating academic capital.

An additional reason may be found in a struggle over academic territory. Sociologist Joseph Ben-David observed that new disciplines often emerge when academic positions in an existing discipline become scarce and the young generation has to look for alternatives if they want to pursue an academic career. Creating a new discipline with

jobs and founding options, as well as possibilities to distinguish themselves as pioneers in a new field (Ben-David /Zloczower 1962[1991]) may serve this purpose.

These sociological interpretations help to comprehend the strong advocacy of the two camps for their own version of social neuroscience, including organisational features such as journals and conferences supporting them. However, it is important to stress that these claims of self-proclaimed inventors of the field constitute two poles in a continuum, or ideal types in a Weberian sense. In practice, no organised, clear cut camps exist, both knowledge and members of research groups circulate. Many researchers publish in both of the two journals,[10] even the protagonists of both camps publish in the journals founded by the respective other camp (cf. for instance Berntson et al. 2007; Burklund et al. 2007).

For understanding certain dynamics within the field (for instance the existence of two journals, two societies or two annual conferences), it is important to acknowledge that these two camps exist and their existence is part of the history of the field. Yet for the present study as for the actual research practice in social neuroscience, the shades of gray in-between these camps are as important. It appears that most researchers are quite content with doing research in the field defined by both Cacioppo/Berntson and Ochsner/Lieberman. Often, both terms – social neuroscience and social cognitive neuroscience – are used synonymously and interchangeably. While the founders of the two research traditions are quite strict in pointing out the differences between their approaches, many other researchers in the field use terms and concepts from both "camps". For instance, a recent essay collection on social neuroscience bears the title *Social Neuroscience. Toward Understanding the Underpinnings of the Social Mind* but it refers to social cognitive neuroscience in its introduction (Todorov/Fiske/Prentice 2011: xi). Thus, these two programmes, biopsychological social neuroscience and cognitive social cognitive neuroscience, can be seen as the two ends of a spectrum, which from here on will be called social neuroscience, to simplify matters.

To add some shades of grey to the picture of social neuroscience, some further definitions shall be presented. These are taken from programmatic publications, aiming

[10] A bibliometric analysis of the two journals *Social Neuroscience* and *Social Cognitive and Affective Neuroscience* (SCAN) reveals that between 2006 and summer 2010, 32 out of 56 main authors publishing more than one paper, publish in both journals. Those publishing in only one, tend to publish rather in *SCAN* (15 authors) than in *Social Neuroscience* (nine authors).

to define the subject. In the editorial of the launching issue of *Social Neuroscience* – one of the two journals of the field – it is stated:

> "social neuroscience may be broadly defined as the exploration of the neurological underpinnings of the processes traditionally examined by, but not limited to, social psychology" (Decety & Keenan 2006: 1).

In this statement, the editors clarify their disciplinary counterpart while indicating an openness concerning the research traditions that deal with "the social". In an early social neuroscience essay collection, Eddy Harmon-Jones and Piotr Winkielman (2007: 4) define social neuroscience as

> "an integrative field that examines how nervous (...), endocrine and immune systems are involved in socio-cultural processes. Social neuroscience is nondualist in its view of humans, yet it is also nonreductionistic and emphasizes the importance of understanding how the brain and body influence social processes as well as how social processes influence the brain and body. In other words, socialneuroscience is a comprehensive attempt to understand mechanisms that underlie social behavior by combining biological and social approaches."

In 2005, a workshop supported by National Institute of Mental Health brought together a group of researchers in order to discuss the scope and the future of social neuroscience (Cacioppo et al. 2007). With John Cacioppo and Kevin Ochsner a representative of each camp was present at the meeting. In the resulting paper, an epistemic frame in which social neuroscience should operate, was outlined. A basic assumption that was identified,

> "is that all human social behaviour is implemented biologically" (ibid.: 101).

Yet, the group stressed that research on the biological level alone is not enough to explain any form of human behaviour. It has to be supplemented by research on the psychological and social level; as has been seen earlier, both camps stress the importance of different levels of investigation. As a tool of analysis they suggest

> "constitutive reductionism, a systematic approach to investigating the parts to better understand the whole" (ibid.).

In constitutive reductionism, the whole is as important as the parts and a special focus is put on the interrelations between the whole and its parts. Thus, social neuroscience should also aim to find the "bridging principles" between the organisational levels used to describe and explain social behaviour. In the workshop, the following topics have been identified as "most active areas of research" within social neuroscience: brain-imaging studies in normal children and adults; animal models of social behaviour;

studies of stroke patients; imaging studies of psychiatric patients; and research on social determinants of peripheral neural, neuroendocrine, and immunological processes. Studies in these fields should give insight for instance into developmental processes, psychopathologies, the roles of hormones and of social contexts on social behaviour, group processes, and the evolution of the social brain.

The first student's textbook dedicated to social neuroscience draws a strong connection of social neuroscience to social psychology by translating Gordon Allport's classic definition of social psychology into social neuroscience:

> "an attempt to understand and explain, using the methods and theories of neuroscience, how the thoughts, feelings, and behaviours of individuals are influenced by the actual, imagined, or implied presence of others" (Ward 2012: 4).

The relationship between social psychology and social neuroscience is the topic of chapter 4. At this point it is sufficient to note the broad definition of social neuroscience as integrating the neurosciences into studying the impacts others have on an individual. It leaves a wide space for research to fit in – and it has to do so in the introduction to a textbook integrating many different perspectives on the social brain without being dedicated to one of the founding fathers in particular.

Ralph Adolphs, a former student of Antonio Damasio and now social neuroscientist at the California Institute of Technology, interprets social neuroscience as a synonym for the neurobiology of social behaviour, which enables him to integrate an evolutionary perspective into his definition of the field. This perspective, he argues can shed light on clinical problems such as social impairments as a result of mental illness or brain lesion. This is particularly pressing, because some defects of social cognition, such as autism or social phobia, currently appear to increase and because the modern social world is very different from the one in which the brain evolved. Thus, the question remains, whether and to which extent, the brain is maladapted to the contemporary social world (Adolphs 2010: 755). This statement indicates that clinical application is still important in social neuroscience. Adolphs also warns his fellow social neuroscientists not to lose their roots over the success the field is enjoying. It is and remains important to collaborate with other disciplines that are concerned with social behaviour, be it neurobiology, primatology or social psychology and many others (ibid.: 764).

The discussed approaches and definitions of social neuroscience can be seen as the most prominent in the process of establishing social neuroscience as a research field of its own. However, similar research on similar questions has been done without creating a

new name. Most importantly this is the research on higher mental processes by the groups around Uta Frith and Chris Frith at UCL, research in theory of mind by Uta Frith's former PhD student Simon Baron-Cohen in Cambridge, and research in emotions in the brain, most famously done by Antonio Damasio with patients and by Joseph LeDoux with rats. Also, research in mirror neurons emerged at the same time as the voices for an independent research field called social neuroscience. Most of these scientists are classified as forerunners but it is important to note that at least Uta and Chris Frith joined the team and contribute to the social neuroscience literature. For instance, in 2010, they chaired a special review series on social neuroscience in *Neuron* (Frith/Frith 2010a).

After reviewing these programmatic papers, it remains still open whether social neuroscience will indeed reciprocally investigate behaviour, interactions, and structures on the one hand and biological structures and functions on the other hand or whether it will set its priorities on the "biological" side and take neural, hormonal and genetic aspects as pivot points for its investigations. Research questions are indeed manifold as are the perspectives on the relevance of the various research tools, ranging from neuroimaging to research in non-human animals. These perspectives and subsequently chosen methods have also an impact on the understanding of the term 'social' and the willingness to integrate an evolutionary perspective when understanding social behaviour that goes along with enlarging the focus on other social species – in particular other primates. David Amodio, in his paper on the relevance of social neuroscience for social psychology summarises this quite nicely:

> "Social neuroscience means different things to different people. To a social psychologist, it refers to an interdisciplinary research approach that integrates theories and methods of neuroscience (and other biological fields) to address social psychological questions. To a cognitive neuroscientist, it often refers to research on the neural substrates of social processes, such as social emotions and person perception, with a focus on understanding neural function. To an animal behaviorist, it may represent research on the neural and hormonal mechanisms associated with basic social behaviors, such as dominance and affiliation. Broadly speaking, social neuroscience refers to an integrative approach that can be applied to any scientific question concerning social processes and the brain" (Amodio 2010: 697).

Thus, while the founding stories of social neurosciences can be traced back to different research traditions, the field unfolding is rather diverse, tackling a plethora of research questions, to which I am coming now.

2.3.4 Topics of Social Neuroscience

The brief overview of definitions demonstrates that social neuroscience has a potential for including a large number of research topics, which can be classified along three classes of levels of analysis: the social, the cognitive and the biological as defined by Ochsner and Lieberman (2001). In each class, many levels of organisations can be distinguished, yet the question which levels are present, which are relevant and what are the bridging principles between them, is a major scientific challenge for social neuroscience. While separating levels may be helpful for identifying from which level a specific question originates, it has to be kept in mind that social neuroscience's aim is to integrate all levels to get a broader and deeper understanding of social phenomena. In the following, I present only a selection of research topics on the various levels proposed in the literature.

First, on the social level, Todorov et al. (2004) claim the existence of a "core social motive" that belongs to a social group. From this motive, the cognitive motives 'understanding' and 'controlling' as well as the affective motives 'self-enhancing' and 'trusting' emerge (ibid.: 78). Another important research topic is the individual or a group of individuals being in a social world (Lieberman 2007). It is claimed that individuals aim to create a "coherent" social world, requiring the coordination of activities with those around us, the use of feedback from others to understand ourselves, and the development of self-theories and attitudes towards social groups (ibid.: 270-1). Thus, several research topics are identified in order to understand interpersonal relationships – one of the main concerns of social neuroscience.

Second, on the cognitive level, social neuroscience is concerned with social perception and cognition, which require the ability to "understand others" and to "understand oneself". The research frame of understanding others includes: theory of mind, empathy, cheating and bargaining, fairness and justice. The research frame of understanding oneself includes recognising oneself (through the lens of others), reflecting on oneself, self-knowledge and self-concept. Other research topics on the cognitive level are self-regulation (intentional and unintentional, emotion processing, motivation, attitudes, stereotypes and prejudices (for overviews see e.g. Liebermann 2007, Todorov et al. 2004, Blakemore et al. 2004).

Third, research on the biological level includes a variety of different topics. On the neural level, it tackles the identification of core processing (automatic vs. controlled; internally-focused vs. externally focused; Lieberman 2007, 261), the relations and

interactions of different brain regions (e.g. prefrontal cortex and amygdala), the structure of brain regions, the localisation of brain activities related to social behaviour, or the impact of mirror neurons. Research on the genetic level may be particularly helpful for understanding psychiatric disorders. On the neuroendocrinological level, the influence of hormones on social behaviour but also the influence of social context on hormone production is investigated (Cacioppo et al 2007, 104-106).
These programmatic outlines of possible research topics get an empirical confirmation by analysing the abstracts and keywords of papers published in the two journals of the field as well as the abstracts of talks and posters at the 2009 Social and Affective Neuroscience Conference.

A bibliometric analysis of all papers published in the two journals of the field, *Social Cognitive and Affective Neuroscience* and *Social Neuroscience (SCAN)*,[11] between 2006 and summer 2010 reveals that of 345 papers in total 133 papers (38,5%) fit into the cluster "self-other relations and interactions," including, among other things, mentalising and theory of mind, empathy, cooperation and trust, morality, social cognition and cultural practices. 59 (18%) fit into the cluster "ingroup/outgroup," consisting of ingroup/outgroup distinctions, cultural differences, exclusion, stereotypes, distinctions basing on race or gender. 21 papers (6,5%) tackle questions about motivation and decision making. 26 papers (8%) take into consideration the social context of the phenomena studied or have social phenomena such as socioeconomic status as a topic. 72 papers (22%) deal with the self. Since one paper can belong to more than one subject group, percentages cannot be simply added together, but nevertheless the numbers show that a big part of the papers is concerned with higher mental states necessary for dealing with other people or for living in a social world.
The 97 papers (29%) dealing with core processing (face and body processing, gaze, motor perception, language, memory, attention and impulse control) are also interested in the social dimensions of the brain's processing capacities. 69 papers (21%) are concerned with emotion perception and processing, indicating another important issue in social neuroscience. 26 papers deal with neurobiology and neurochemistry. This indicates that core processes are an important subject of research, yet they are so mainly on a superficial level in brain terms, because research seems to be interested in the functions rather than the structures and origins. This is also reflected in the choice of

[11] Both were founded in 2006; 345 papers were published between 2006 and summer 2010.

methodology. Leaving out review papers, 61 percent of the published papers used imaging technology – mostly fMRI but also PET and EEG. 18 percent used psychophysical methods and eight percent behavioural methods. Animal and anatomical studies are each represented with four percent, three percent of the papers present genetics and less than one percent studied hormones. Thus, it can be concluded that despite all rhetoric about integrating all levels of analysis from the cellular to the social, the vast majority of research is conducted on the cognitive level that is accessible by brain imaging technology and psychophysical methods.

As a side note, the question on national distribution of published papers is worth reporting, since here a difference between the two journals becomes evident. While in both periodicals, US American constitute a majority, in *Social Neuroscience*, they have only a relative majority (40%) but in *SCAN*, they constitute an absolute majority (57%). The share of Anglophone countries is with 19, respectively 18% almost even, a big difference can be detected in the share of European (without Britain) and Asian papers: European contributions constitute 32, and Asian ones 9 percent in *Social Neuroscience*, but only 21, respectively 5 percent in *SCAN*. These differences in the national contribution indicate that the research community represented in *Social Neuroscience* is broader and more diverse, since more national research contexts are included.

Posters and papers presented at the 2009 *Social and Affective Neuroscience Conference* give a similar picture: out of 120 studies presented, eleven investigated core processes in the brain and nine motivation. 39 of the presentations were related to emotions, either about what individual emotions are, how they are processed in the brain, or how they can be regulated. 26 of the studies dealt with self-other relations such as mentalising or empathy, but also attractiveness and self-esteem. 27 of the contributions presented work on social interactions or ingroup/outgroup relations. Interestingly, only six of the studies explicitly mentioned the relevance of context for understanding neural processes related to social interactions in their abstracts.[12] In regards to methods, a similar picture is revealed: 68 posters presented imaging studies and 13 used psychophysical methods, these constituting the majority of used methodology. In terms of national representation the papers and posters show a similar distribution to the journal *SCAN*[13], whose editor in chief Matthew Lieberman was also part of the organising committee of the conference.

[12] However, that question was discussed in many of the talks.

[13] US: 55%, anglophone countries: 13; Europe: 23%; Asia 8%; Latin America 1%.

The analysis of journal and conference abstracts shows some common grounds. Many of the above mentioned topics fall into the realm of classic social psychological research interests, namely ingroup/outgroup distinction, prejudices and biases. Interesting, however, is the focus on emotion, empathy and altruism. This is a new perspective, an aspect that had been neglected by psychological research over the last decades. In the era of behaviourist and cognitive psychology, these issues were only investigated by outsiders, in mainstream psychology and neuroscience they were marginalised (cf. Bajai 2010). Recently, pro-social behaviour became increasingly a subject of investigation, not only in social neuroscience but also in other behavioural sciences such as primatology and anthropology (particularly in the works of Frans de Waal and Michael Tomasello). It is interesting to note that not only in the sciences but also in the humanities, intersubjectivity and emotion have been experiencing an revival in the recent years (cf. for instance Greco/Stenner 2008, Illouz 2008, Ratcliffe 2008, Zaboura 2009) – a shift particularly noteworthy because it is not merely a reaction to or criticism of the cognitive sciences and their focus on rationality, but rather the attempt to integrate irrationality into the cognitive paradigm. The mind can only be explained with referring to emotion and to other minds.

The analysis shows another important point. As already indicated by the bibliometric analysis of social brain sciences between 1990 and 2009, social neuroscience research in this decade is predominantly interested in normal social behaviour, in everyday situations, the interactions between the individual and their social environment and in the role of emotions in these interactions. This is interesting because psychological and neuroscience research traditionally was interested in the deviant, in what is not normal, from which the normal could be inferred (cf. Canguilhem 1991). While social neuroscience is still interested in pathologies, mainly autism and psychopathy, the main focus is on studying normal, healthy subjects.[14] This shift was made possible by the development of non-invasive imaging technologies enabling to study the normal and healthy brain instead of having to infer from post-mortem studies or studies with brain lesioned patients. Moreover, the integration of social psychology experiments into neuroscience shifted the epistemological perspective towards everyday social interactions.

[14] How these normal subjects are defined will be discussed in chapter 4.

2.4 Conclusion

The emergence of social neuroscience has to be interpreted in the context of a quickly changing academic field, in which interdisciplinary research becomes, if not required, at least demanded. Moreover, the growing pressure on funding and job opportunities increases the attractiveness of postulating new research fields and oneself as their inventor, since this might improve the own chances for securing resources. Yet, it is too early to determine whether social neuroscience will indeed establish itself as an independent discipline or whether it will rather become a methodological approach to conduct social psychological research.

However, what can be observed presently is that with the twofold invention of social neuroscience, the "social" found its way into neuroscience and is thus one example of neuroscience's adoption of questions traditionally subject to the humanities and social sciences. How this adoption shapes a specific notion of 'social' is subject to the succeeding chapters of this study.

3. Technologies and Experimental Design in Social Neuroscience

> "(Brain mapping's) working methods and ideas are as bizarre and counterintuitive as some of the most extreme human practices and cosmologies described by anthropologists. Brain mappers turn individual persons into experimental subjects and put them into narrow tunnels. They expose them to strange stimuli and bombard them with invisible rays and forces. Finally, they claim that this can reveal the true, objective nature of the workings, not only of their subject's minds, but of everybody's minds" (Roepstorff 2004: 1106).

3.1 Introduction

In the last chapter, I introduced the subject of this study, social neuroscience and outlined the emergence and development of this field of research. This chapter is concerned with the modes of knowledge production within the field. One of the traditional beliefs within the sciences, most thoroughly scrutinised by history of science and science and technology studies, is the belief that scientific facts are natural entities that are out in the world waiting to be discovered by the scientist. On the contrary, as studies both in the history of science and in science and technology studies have shown, and scientists themselves are willing to admit, the production of scientific knowledge depends to no small degree on technology and practices, the instruments employed and the parameters chosen, the materiality both of the subject of research and the laboratory setting, the communication between scientists, and also on chance (see for instance Fleck 1979, Rheinberger 2001, Latour/Woolgar 1979, Lynch 1985; Pickering 1995).

For the present subject, social neuroscience, this means that it is important to consider the practices, materialities and technologies of its research as part of the system of social neuroscience's knowledge production and to examine in how far they limit the space of possibilities for research questions and answers that potentially can be found.

What follows is a description and discussion of the practices and technologies used in social neuroscience, constituting the experimental system of knowledge production in this field. A bibliometric analysis of all papers published in *Social Neuroscience* and *Social and Affective Cognitive Neuroscience* between 2006 and 2010 revealed that 54% of the papers used fMRI technology.[15] Including other imaging technologies such as PET, the share is even 59%. This shows that brain imaging technologies dominate the field. However, it also shows that other methodologies, for instance behavioural experiments or traditional biopsychological methods, make up about 40% of the

[15] Excluding reviews and method discussions.

publications in the two journals of the field. Yet, imaging technologies are not only the most important technology for knowledge production in social neuroscience but also for transfer of knowledge in the public sphere. As will be discussed later in this chapter, the "magnetic appeal" (Joyce 2008) of neuroimages is a significant factor in neuroscience's current popularity in media and public discourse. Due to the relevance of imaging technologies both in knowledge generation and knowledge transfer, I will focus on this technology when discussing social neuroscience experiments.

While crucial differences exist between classic behavioural psychology experiments and fMRI experiments, the general logic of social neuroscience, imaging or other, bases on the principles of experimental design in psychology. Both need to develop methods and technologies to transform the subjective experience of experimental subjects in an experimental situation into intersubjective, quantifiable and falsifiable knowledge. Thus, this chapter starts with an introduction into the experimental method in psychology before discussing methodological and epistemological aspects of social neuroscience experimentation.

3.2 Basic Principles in Experimental Psychology

3.2.1 The Experimental Subject

The distinctiveness of psychological experiments, i.e. what distinguishes them from experiments in natural sciences, is the attribution of data to a human data source. Cognitive Neuroscientist Chris Frith and anthropologist Andreas Roepstorff stress that

> "(t)he nature of this source has as much to do with the kind of knowledge claim made in the experimental report as have the other two factors (reduction of complexity and fixed structure of experimentation, S.M.)" (Frith/Roepstorff 2004: 336).

No neuroscientific or psychological experiment can take place without one crucial element: the experimental subject. However, this requirement often clashes with the general aim of psychological and neuroscientific experiments, the generation of universal and ahistorical knowledge about human beings. It clashes because the resources for these experiments are specific subjects located in historically specific situations. Already early on in the history of experimental psychology, rhetorical devices were developed for coping with this paradox. Historian of psychology Kurt Danziger observes that

> "(i)t became customary to emphasize the experimental identity of human data sources at the expense of their ordinary personal and social identity" (Danziger 1990: 99).

Experimental results were not attributed to historical individuals but to the experimental roles taken by these individuals. Yet to make a convincing point that psychological experiments are more than ordinary social situations, that they are able to generate knowledge that is also valid and relevant outside this situation, special features of this experimental situation had to be determined. These special features could be the special nature of the participants, their activity or the circumstances of the experiment (Danziger 1990: 89). Consequently Danziger emphasises the rhetorical aspect of describing a valid psychological experiment:

> "The claim that the outcome of the experimental interaction is not to be taken as a historically unique product but as a 'finding' of potentially universal validity depends as much on a special way of describing and constituting the human data source as it does on other features of the experimental situation" (ibid.: 90).

According to Danziger, despite all rhetorical effort, the claims of universality were, with a few exceptions, not empirically grounded. The rhetoric of the experimental report was fundamental for creating the illusion of experiments as "the manifestation of abstract transpersonal and transhistorical processes" (ibid.: 100).

In the early days of experimental psychology, often fellow psychologists acted as participants in experiments. This served two purposes: first, it was required that participants make careful self-observations about physiological responses during the experiment. Thus, they had to be familiar with the experimental situation as well as with the general aim of psychological experimentation. Second, their social status as academics served as a guarantee for validity and reliability of their observations and thus of the experiment (ibid.: 1990: 91).

Soon psychology widened its scope of methods and other forms of experimentation emerged using large samples of non-expert experimental subjects. One of these forms is a kind of psychological census taking. These censuses were descriptive studies investigating mental phenomena as isolated and countable entities rather than as processes embedded in a historical context. Experimental subjects reporting mental phenomena were perceived as some sort of neutral medium through which these universal phenomena could be studied. Since in this case the credibility of the data sources was not guaranteed by the expert status of the subjects, the need for justifying the mode of knowledge production was even more salient than for experiments employing scientists as subjects. Yet, these experiments also had an important advantage to earlier designs because they resembled quantitative natural history in the

way they counted the mental entities. The resemblance to natural sciences served an important cause in establishing the experimental psychology's status as an empirical science (ibid.: 92).

3.2.2 Experimental Groups

Research in experimental psychology follows the positivist ideal of falsifying or verifying hypotheses. As will be shown in the next chapter, the choice of this paradigm results from experimental psychology's aspiration of gaining acceptance as a "hard science". Two of the earliest subjects of psychological investigation were consciousness and perception, which experimental psychologists tried to find a measure for since the 19th century. These research interests as well as the special properties of humans as objects of investigation – defined for example as agency, reaction to the experiment, potential of cheating – and assumptions about the nature of these phenomena shaped the experimental design and methodologies of psychological research. For instance, in Wilhelm Wundt's psychological laboratory, founded in 1882 and the first of its kind, consciousness was studied by measuring physiological reactions to psychological stimuli (Danziger 1990: 24).

While in these early psychological experiments individual perception and cognition were in the main focus and general inferences were made from experiments with individual participants, in the early decades of the 20th century research in groups became predominant (ibid.: 81). It can be roughly distinguished between two types of collective subjects in psychological experiments: so-called 'natural' groups and artificial groups. Natural groups represent the organisation of social life outside the laboratory. For instance, school children or army recruits. These natural groups were not created by the experimenter but taken from the social realities they were living in. The purpose of research in natural groups was to get more specific information about attributes of categories that were accepted as given and part of the social world. For instance the examination of certain psychological attributes in children of a specific age had social significance for a school system ordered by age groups. Thus, psychology's task in studying natural groups was to produce knowledge about properties of groups of people. This changed when artificial groups were introduced into psychological research. The earliest examples of experiments creating artificial groups were those in which results were averaged over a group mean. Danziger points out that the artificial creation of a group mean signifies an important conceptual change, since an average is not an attribute of any individual research subject but the attribute of an imagined collective.

However, the only thing the members of such collectives have in common is that they all take part in the same experiment. In contrast to natural groups, artificial groups do not represent categories valid outside the laboratory setting, they are defined by laboratory practice and only make sense on the basic assumption of a hypothetical population free of unique characteristics, which can be subjected to the same experimental procedures (ibid.: 84-5). Danziger claims that

> "it is difficult to overemphasize the potential importance of this shift for psychology as a discipline. It points the way to a science that supplies its own categories for classifying people and is not dependent on the unreflected categories of everyday life" (ibid.: 85).

Moreover, it opened the possibilities for constructing psychological categories and implementing them in the social order, for instance by categorising children or military recruits by intelligence quotient.

Two kinds of artificial groups can be distinguished: those created for the purpose of testing responses to modified factors and those created for the purpose of testing what was assumed to be stable traits such as intelligence or personality. For understanding social neuroscience's experimental design, the former are more relevant, as will become clear later this chapter. Danziger identifies two sub-categories of this first kind of artificial groups: in the first category, several individuals are subjected to the same (experimental) conditions and their reactions are then pooled together. Doing so, artificial groups are created. In the second condition, the newly emerging control-group design, study participants are artificially separated in experimental and control group. With the emergence of this paradigm, the differences between the groups are of major interest (ibid.: 86-87).

3.2.3 Experimental Design

Another important historical aspect for framing experimentation in social neuroscience is the development of methods for conducting and analysing experiments that are perceived to be context free. The introduction of statistical instruments was crucial for this development. Danziger stresses that statistics were soon to be reified and taken as the basis of validity.

> "Given the prevailing tendency to reify statistical artifacts, and therefore to confuse statistical with psychological reality, it was quite natural for statistical significance testing to be employed as a basis for decisions about the validity of *psychological* hypotheses" (ibid.: 154, original emphasis).

While experimental design and the methodologies employed have changed over time, this brief historical excursus was important for showing the roots of contemporary designs in experimental psychology. Basic principles of investigating physiological reactions to psychological stimuli and the usage of artificial experimental groups as well as the notion of theory-free methods are still guiding principles for experimental (social) psychology.

The textbook definition of psychological experiments states that their purpose is to test hypotheses. Hypotheses in psychological research are based on the model that factor x causes event y. Thus, a study has to by designed in which the effect of x on y can be tested. However, as social psychologists Alexander Haslam and Craig McGarty point out, the aim of a psychological experiment is not only to measure a given variable but to manipulate variables and to measure the effect of this manipulation. To this end, a situation has to be created in which it is ensured that the only differences between different conditions are those tested for. They state:

> "The basic scientific logic of the social psychological experiment is that it attempts to reduce the range of possible explanations for some difference between experimental conditions to just two possibilities: (a) the effect of some combination of the experimental factors and (b) chance" (Haslam/McGarty 2004: 239).

Besides the hypotheses that are tested for, four other factors are crucial for conducting a valid experiment: representativeness, randomisation, control group, and replicability.

The sample for any given experiment has to be representative. This means two things: it has to have a certain size and it has to be representative in terms of the dimensions of the population that is relevant for testing the hypotheses (ibid.: 248-9).

Participants are randomly assigned to one of two or more experimental conditions. By randomisation, behavioural biases between groups should be reduced or even removed, since every participant has the same chance of belonging to either of these conditions. Thus, randomisation serves as a sample equalizer between the conditions because any difference within the sample (unique characteristics of study participants such as personality or mental and physical states at the time of testing) is distributed among all groups. Within each experimental setting, a control group has to be defined. While the general experimental experience is held constant and the same for all participants, the only difference between the experimental and the control group is that the variable which is tested for is not present in the control group. For data analysis, the differences between the tested conditions are important. To test the hypothesis that factor x is crucial for phenomenon y, at least one control condition is required in which x does not

occur. In data analysis, the results of these two conditions are compared. If the difference is statistically significant, the experiment supported the original hypothesis (Dunn 2009: 77-8). However, because no psychological experiment can achieve one hundred percent certainty whether chance was ruled out, experiments gain reliability and robustness if results can be replicated in other experiments following the same design (Haslam/McGarthy 2004: 240).

While the stated rules for experiments are taken from social psychology textbooks, they are basically the same for imaging experiments. However, there is one crucial difference between imaging and behavioural experiments: most imaging experiments integrate the two conditions, the experimental and the control condition in the stimuli presented to each and every subject. This entails other conceptual problems but the aim remains the same: to rule out any differences between experimental and control condition that are not part of the experiment. And with that remark it is time to have a closer look at experiments in social neuroscience.

3.3 Experiments in Social Neuroscience

In the opening scene of the short film "The Science of Love" (Draganosky 2005) Sydney, an evolutionary anthropologist, verifies her fiancé's love for her by examining his brain scans: "the brain scans are collaborating your claim: you are truly and madly in love." Shortly after, she has to defend her research in front of her faculty. Ileana, the chair of the department openly shows her rejection of integrating neurobiological methods into anthropological research. During the presentation of neuronal correlations of love, the positions clash and Ileana leaves the room. The following scene shows a quarrel in Ileana's office about the fundamental question what biology or culture, respectively, can contribute to explaining human behaviour. After that, we see well-dressed people at a cocktail party with cables sticking from their heads. Sydney explains that she invented this "EEG mixer" to "simulate as natural an environment as possible while still being able to measure neuronal activity" to identify the part of the brain that controls lust. The cocktail party serves as an experimental design by bringing people together who never saw each other before and who hence could only feel physical attraction but not love for each other. She employs herself as her fist study subject, explaining that a particular area in her brain should light up yellow when she looks at her fiancé whom she loves. However, nothing happens and Sydney crawls under the

table to check the cables and connections. When she comes up, she sees Ileana and the desired effect becomes visible on the screen, showing her something she did not even know herself: she is in love with Ileana.

This parody hints at two crucial points of neuroscientific research: from the inside perspective the salient question is how to find the most realistic design for a scientific study that will yield clear enough results for processing in post-experimental data analysis. From the outside perspective, the question is what can and what cannot be explained by mapping higher mental states onto neuronal activity – and can brain imaging reveal truths about inner states unknown even to the person whose brain is under examination?

The remainder of this chapter discusses foremost the first question of research design in social neuroscience and particularly in fMRI experiments. The focus on imaging has three reasons. First, its proper usage and analysis is debated in the field, second, the majority of social neuroscience research employs imaging technologies and third, these studies get the highest attention from the media and are thus present in public discourse (see Weisberg et al. 2008, Vul et al. 2009).

Sociologist of science and cognitive scientist Morana Alac defines fMRI research as follows:

> "The defining mark of the fMRI culture is its interest in the anatomical specialization of brain regions for processing of different types of information. To create 'brain maps' fMRI researchers project measures of cognitive behaviour on the spatial representations of the human brain" (Alac 2008: 487).

In this section, the basic principles of fMRI technology are presented and epistemological reflections on this technology discussed. This is followed by brief considerations on brain mapping, before the actual requirements for fMRI experiments are discussed.

3.3.1 Basic Principles of fMRI

Functional brain imaging bases on the general assumption that it is possible to map mental functions onto neuronal activity in anatomical brain structures. This supposition about the relationship between mind and brain is integrated into the technology itself.

Functional magnetic resonance imaging (fMRI) was developed in the early 1990s and has since become the most important technology for functional brain imaging. It also has more or less replaced positron emission tomography (PET) as a tool for functional

brain imaging. fMRI has two advantages compared to PET as neuroscientist Marcus Raichle points out: while PET could only be used for research, fMRI can also be used in clinical practice because it can measure brain activation in a single individual rather than calculating activation averages from several brains. It bases on anatomical magnetic resonance imaging (MRI), a technology using the specific behaviour of hydrogen nuclei in strong magnetic fields. fMRI technology became popular in medical imaging because it is non-invasive, free of any radiation, unlike other imaging technologies such as traditional x-ray, computer tomography (CT) or PET and produces more detailed and clearer images than older imaging technologies (Raichle 2000: 60). While MRI images anatomy, functional MRI measures function via changes in blood flow in different brain regions. The idea behind this is that activated brain regions need more oxygen than resting brain regions (like activated muscles need more oxygen than resting muscles) and that thus blood oxygen concentration in these regions is stronger than in resting regions. This is measured via BOLD signals. BOLD stands for "blood oxygenation level dependent" and the BOLD signal measures changes in the oxygenation of haemoglobin. Fully saturated haemoglobin behaves differently in magnetic terms than haemoglobin which is not fully saturated with oxygen molecules. Oxyhaemoglobin causes a stronger magnetic signal than deoxyhaemoglobin and, accordingly, areas with higher concentrations of oxyhaemoglobin cause stronger BOLD signals (Amaro/Barker 2006: 221). However, BOLD signals are not straightforward measurements since they are also influenced by cerebral blood flow and volume.[16]

Taking advantage of magnetic properties of cerebral blood flow, fMRI experiments collect the BOLD signals while a person in the scanner is performing a given cognitive task. A complete BOLD image of the brain is generated every 2-3 seconds and digitally calculated in so-called voxels (volume picture elements) (ibid.: 222). A voxel is a value in three-dimensional Cartesian space. These data are later analysed statistically and mapped onto anatomical brains, either anatomical MRI scans of the same subject or average brains from neuroimaging atlases.[17] The most basic analysis is the subtraction method: once a region of interest is defined, the voxels of that area in a resting state are subtracted from the voxels in the assumed activated state and thus indicate whether a significant difference exists. If this is the case, it is assumed that this region plays a role in the task investigated (ibid: 223).

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[16] For a detailed history of MRI see Joyce 2008 and for a detailed history of PET as another functional imaging technology see Dumit 2004.

[17] For a history of these atlases see Beaulieu 2001.

3.3.2 Epistemological Reflections on fMRI Imaging

Before discussing the application of fMRI in brain mapping, i.e. the attempt to find correlations from mental functions to neural activity, a short epistemological reflection of image production is necessary. Images generated by fMRI machines and software are not as straight forward as they may appear at first glance. Far from being representations of the active brain, these images are the results of statistical analyses of quantitatively generated data basing on the working hypothesis that active brain areas use more oxygen than resting areas (Schinzel 2006: 196). They differ fundamentally from images produced with a camera lens in that they are quantitative data transformed into anatomical and functional images by both human and technical intervention (Joyce 2008: 25). The images are products of conventions, preferences of practitioners, technological constraints and their solution. Sociologist of science Kelly Joyce points out that in the early days of MRI[18] technology, the numerical data output was considered to be at least as important as the images generated among the scientists and technologists developing this technology. Moreover, the appearance of the images was subject to interdisciplinary discussions. The developers of MRI technology had little if any experience with anatomical images and being children of their time, they often chose vibrant colours for image generation, resembling the art of Andy Warhol or Roy Lichtenstein (ibid.: 35). This, however, did not work out for radiologists who were trained in reading x-rays and hence used to black and white pictures. They could not read the multicolour images of early MRI scans and they were not interested in numbers. Pop art MRI images were not intelligible for medical practitioners whose requirements shaped the way the data processing was becoming to be designed (ibid.: 38-41).

This brief glance in the history of MRI data design shows the contingency of the way the data are represented. For the information contained, it does not matter whether it comes in numbers, pop art or black and white images. These visualisations of MRI data are the result of negotiations about representations rather than depictions of the anatomical and active brain. Perhaps for that reason, researchers are reluctant in estimating the value of visual representations for their research as Joseph Dumit and Anne Beaulieu experienced in their anthropological fieldwork (Beaulieu 2002: 56 and Dumit 2004: 93-95).

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[18] When first developed in the 1970s, the technology was called nuclear magnetic resonance (NMR). Joyce points out that not least as a reaction to anti-nuclear movements, ‘nuclear’ was dropped in the 1980s (Joyce 2008: 41-2).

Compared to classical MRI, in functional MRI images a further component in image generation is added: not only has the representation of the anatomical data to be negotiated but also the representation of the functional data. These data are represented in colourful blobs, with yellow and red blobs usually connoting activation and blue usually connoting inactivity. Hagner points out that this choice plays with colour-psychological components of perception, since yellow and red are associated with warmth whereas green and blue are associated with cold. These connotations suggest much stronger contrasts than actually measured (Hagner 2008: 48). The calculations underlying fMRI images are, as computer scientist Britta Schinzel points out, extremely complex and it "is not in the least possible to sight the assimilated data by hand" (2006: 193). Thus, the interpretation has to rely on technology, on the hard- and software. These machines generate images which suggest that they reveal not only the anatomy of the living body but also functional processes within that body. Joyce emphasises that in contemporary discourses about objectivity and truth, machines have a privileged position since they are connoted with neutrality.[19] They get their neutral position from the assumption that they are able to generate knowledge free from human intervention as Joyce maintains:

> "Culturally positioned as free of human intervention, technologies – especially expensive and complicated ones – are understood as crucial to the production of rigorous knowledge" (Joyce 2008: 76).

However, generating (f)MRI images is a process of construction, of deciding what to include and what to exclude as 'noise', how many and how thick the slices are chosen for generating an image. All these parameters influence the end product and are subject to heated debates within the imaging community (Vul et al. 2009, Diener 2009). For fMRI scanning, freely available software packages allow a semiautomatic computation of massive amounts of data and thus for rapidly separating raw data in significant "blobs" of activation and non-significant activation below the statistical threshold (Roepstorff 2004: 1108). While in this case the decision-making process is partly delegated to the software, still parameters have to be chosen by the researchers and are thus subject to their evaluation. In social neuroscience laboratories this is called to "play with the data", as one social neuroscientist suggested in a neuroimaging course I attended.

[19] On the role of machines in the production of objectivity see also Daston/Galison 2007, particularly chapters 6 and 7.

MRI technologists told Joyce during her fieldwork how easy it was to include or exclude lesions in scanned organs or to generate something not physically present in the scanned body. She concludes:

> "The technologists' knowledge of how they manipulate image content demonstrates how MRI scans do not provide a transparent 'window' into the inner body but instead *produce* the body" (Joyce 2008: 63).[20]

Particularly problematic in this regard are artefacts, forms or shapes appearing in the image that are effects of the technology. These artefacts are a particularly strong reminder of the fact that technology generates rather than discovers knowledge about the inner body (ibid., see also Lynch 1985). Yet, eliminating these artefacts, as Britta Schinzel argues, requires knowing what belongs to the picture and what does not. Also all other post-scan adjustments of the images require a preceding idea about what the image should look like (Schinzel 2006: 194).

What is discussed above shows that the (f)MRI images are far from being neutral representations of the natural body. Rather they are the product of sociotechnical relations, the constraints of hard- and software, historical developments and negotiations between developers and applicants of the technology.

Not only the production of images is embedded in sociotechnological context, also interpretation and use of these images are highly dependent on these contexts. Sociologist of science Ludwik Fleck emphasises that novices of a discipline first and foremost have to learn how to see. The training of perception always follows the thought style prevailing in a discipline. In this process, the student learns to read an intelligible object out of manifold impressions: some details have to be mentally added while others are ignored. The choice of what to add and what to ignore does not happen consciously but follows from the conventions or the thought style of a discipline (Fleck 1935[1983]: 68).

Radiologists and others using images generated by (f)MRI technology thus first have to learn to read them: what is noise and what is relevant? How to compare different individual brains? Which images should be included in publications? These and more questions have to be dealt with in the process of an imaging experiment. In her ethnographic study of two imaging laboratories, Alac observes how the process of learning how to read the images is embedded in social interactions, negotiations

[20] Similar observations regarding ultrasound can be found in Duden 1991 and Cartwright 1995.

between involved researchers and the use of various computer programs. Moreover, she points out, analogous to Fleck, that seeing

> "is tied to actions that arise out of experiences with the manipulation of objects and everyday practical dealings" (Alac 2008: 504).

On the other hand, she also points out that these visualisations enable the researchers to cope with huge amounts of abstract data and thus to make sense of them (ibid.).
Most social neuroscience papers use images. However, they are often more illustrative than part of the argument, since the basis for argumentation in social neuroscience is the statistical analysis of the data. While relying on a visual technology and employing images for emphasising the argument (and perhaps in the process of data analysis as a visual aid to cope with the data as Alac suggests), for social neuroscience researchers, the numbers are more important than the images. Images are, however, important in an earlier stage of the research process to define regions of interest in which neuronal activation is assumed. Anatomical scans serve as the basis on which the functional data makes sense.

Images are important for another reason. They have "magnetic appeal." This title of Joyce's (2008) study suggests that (f)MRI images are not innocent. As Weisberg et al. (2008) have shown, psychological arguments are estimated to be more convincing, if a neuroscientific explanation is included, even if a reference to the brain does not add any relevant information. Moreover, psychologists David McCabe and Alan Castel showed in behavioural experiments with psychology undergraduates (i.e. people becoming experts in the field) that neuroscientific data were granted more credibility if a brain image, in which activity is presented, was included – no matter whether the neuroscientific data was entirely made up or had actually some empirical grounds (McCabe/Castel 2008: 349). Since in their study brain images generated also more credibility than activation maps depicting the same data, they conclude that

> "the present results lend support to the notion that part of the scientific credibility of brain imaging as a research technique lies in the images themselves" (ibid.).

Like the scientists Dumit and Beaulieu interviewed, social neuroscientists are rather sceptical about the brain hype induced by the images, as my interviews revealed. Social neuroscientist D experience in presenting her research to lay audience is supporting Weisberg et al.'s and McCabe and Castel's observation about the credibility associated with images of the brain:

> "if I tell people what I do and I say, I did a survey or I did an experiment with sophomores in the lab, people are polite. If I say I did a brain imaging study that looks at the same thing I totally get their attention. And they think it's science and they think it's real. And, you know, if you give a talk and you put up a brain imaging slide, I mean, it depends on the audience, but for the public it's like, oh, wow, this is real science and it must be true. So, you know, and I keep trying to make the point to the public that just because you can show a brain image of it doesn't mean it's hard wired, doesn't mean it's inevitable, doesn't mean it's not malleable, so the culture makes a difference" (social neuroscientist D).

All but one of my interviewees stressed that images are over-interpreted by "the public" or "the media". But notwithstanding their criticism of how the media treats the brain images, it is them who produce these images, which then start a life of their own outside the laboratory and these images are part of (social) neuroscience's recent success[21]. Hagner suggests to read brain images as brands. Like the name of a certain soft drink evokes that this specific drink tastes better than others, brain images work like a logo helping to sell certain scientific research. He argues that brain images have high scientific authority because they have been present in the media for several years and because they serve as an emblem for credibility (Hagner: 2008a: 46-48). Elsewhere he argues that brain images are an indicator for a new kind of anthropology, which merely produces superficial structures. In contrast to deep investigations of the human mind such as psychoanalysis, neuroimaging can only produce superficial knowledge because that it is only able to represent neuronal activations. These activations do not have any meaning per se, nor have their connotations with mental activities. Distinguishing neuroimages that are correlated with specific activities from those correlated with other mental activities, is not determined by technology or produced by machines but depends on active interpretations by the researchers. What should be gained from such interpretations is subject to social and cultural negotiations about the question what meaning information from the brain should have (Hagner 2006: 190-1).
While MRI images suggest to objectively represent the brain, the discussion in this section has shown that far from being objective displays of the anatomical and functional brain, they are the products of sociotechnological negotiations and constrains. This entanglement with sociotechnological contexts determines the knowledge production of fMRI technology, which finds its form in brain mapping.

Mapping is the process of connecting the functional data to the anatomical data. The aim of this endeavour is to identify cerebral regions connected with specific functions

[21] For detailed discussion see Dumit 2004, particularly chapter 5.

such as memory, attention, fear, or empathy. This attempt to localise mental function is as old as modern brain sciences themselves, which emerged around 1800 with Franz Joseph Gall and the phrenologists who determined an area on the cortex for every human character trait (see Hagner 2000; Cooter 1984). Later in the 19th century, neuroanatomists attempted to localise centres for motor sensory, speech and other functions in post-mortem brains or lesioned patients (Hagner 2000). In the mid-20th century, Wilder Penfield used electric stimulation during brain surgery in epileptic patients for mapping specific functions such as speech, spatial cognition or body awareness to certain brain areas (Harrington 1987). Studying injured or post-mortem brains were the only ways to investigate human brains before the emergence of non-invasive imaging technologies.

The crucial feature distinguishing contemporary mapping projects from older attempts is that imaging technologies seem to allow to map cognitive functions on the brain in real-time in healthy individuals. But how does this work? First it is hypothesised that certain brain areas are involved in any given cognitive task. Then, an imaging experiment employing this task is developed and conducted. In a last step, the data from the experiment are analysed to see whether the hypothesised regions are in fact activated during that task. However, some methodological problems arise (see also Vul et al. 2009a): one problem concerns the question how much activation is sufficient to be statistically relevant. How big does the measured difference in the BOLD signal have to be in order to show a reliable effect? And how are the chosen statistical thresholds justified? The second question is linked to the question of slice thickness. How thick are the slices analysed, i.e. how many voxels do they include and how precise is the image's resolution? Both questions will be discussed more detailed in the next section.

On the epistemological level, the concept of mapping bears at least two problems, one that some social and cognitive neuroscientists seem to be aware of and one that is intrinsic to social neuroscience's concept of human nature and is not reflected on in methodological debates.

The first problem, the one discussed within the imaging community, relates to the question whether or not brain mapping reveals the truth about how brain and mind work. Two opposing opinions about mapping function to anatomy exist in the cognitive neuroscience community: one school claims that certain regions are responsible for specific functions, thus they identify for instance face areas, fear areas or motor areas. The other school claims that cognitive functions are distributed in networks and that a

given area can have different functions, depending on the task (for a discussion, see e.g. Bunzl et al. 2010). These two schools have different answers to the question how the brain and consequently the mind work – or vice versa – but what is relevant here is that both share the notion that cognitive functions can be mapped to brain structure. Brain mapper Russell Poldrack observes that

> "neuroimaging studies rely upon a theory about the structure of the mind that specifies the component operations that comprise mental function" (Poldrack 2010: 753).

He calls this theory 'cognitive ontology' and stresses that it is just that – a theory. As long as this theory is at least to some extend related to what he calls 'true ontology' (ibid.: 754), imaging will reveal some function-to-structure mappings, but this does not necessarily mean that the cognitive ontology is entirely correct (that for instance the connections between cause and effect are precisely stated). He observes that contemporary neuroimaging literature suggests that selective mapping of function to structure "is currently impossible to find" (ibid.) and proposes three reasons for that. First, the underlying cognitive ontology might simply be wrong, i.e. the theories about how mind and brain work do not reflect the actual processes in the brain. Second, it could be the case that while the cognitive ontology is correct, experiments so far have failed to isolate the correct processes, i.e. the hypotheses about the connections between specific tasks and processes are wrong. Third, it might not be possible at all to map functions to structures since the underlying processes might be widely distributed across networks (ibid.: 755). These different options show that brain mappers are not yet quite sure or at least do not yet agree among themselves what the actual aim of their research is, what they are actually looking for. Nonetheless, in their research they seem to find something that enables them to draw hypotheses about how brain and mind work and how they interact.

The second epistemological problem refers to the question of nature or nurture. Experiments in social neuroscience aim to map social processes to the brain. An early and much cited experiment showed that the amygdala was more activated when participants viewed black faces as compared to when they saw white faces (Phelps et al. 2000). Since the amygdala was associated with emotions and particularly with fear, the authors drew the conclusion that racial attitudes have a biological substrate. This is a particularly strong example for the attempt to map environmental and learning impacts on life experience on brain structures (Beaulieu 2003: 561-2). It is particularly strong

because of its political connotations. Even if not intended, the message taken from the study was that fear of black people may be hard-wired in the brain. Another popular study, however, shows how the spatial memory of taxi drivers has also a biological substrate without anyone saying that this difference is hard-wired. Rather it is seen as an evidence for the brain's plasticity and the impact of learning (ibid.: 562-3). What is important in discussing these studies is that both the alleged fear of black faces and the spatial memory of taxi drivers are only valid parameters for neuroimaging when translated into activation in the brain. That does not mean, as Beaulieu contends, that only nature counts. Rather,

> "(b)iologization of mind in brain mapping takes the social or the environment rather seriously. It renders it as a feature of a map" (Beaulieu 2003: 563)

and thus in biological terms. While behavioural experiments investigated the mind in time, imaging experiments study the brain in space (ibid.: 564-5). This marks a conceptual shift in the perception of human behaviour and in the relation of the biological and the social: suddenly, the social world can be perceived as biology in so far as it can be translated into neural activation.

As this discussion has shown, brain mapping is a practice that includes many assumptions about the relationship of mind and brain – a relationship that is supposed to be tested for by this practice. Study design and data interpretation depend on the paradigm the researcher follows: does she believe in a locational or a functional mode of brain organisation?

Following these general reflections on imaging technology and brain mapping, the next section will provide an overview of task design in neuroimaging research. The basic principles of experimental design in psychology do also apply to psychological neuroimaging studies. However, the most crucial difference between behavioural and neuroimaging experimentation is that in the latter, both experimental and control condition are investigated in the same subject.[22] Moreover, the design has to be adapted to the requirements of the technology (Dumit 2004: 59).

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[22] This applies to research in normal, healthy subjects. Neuroimaging research in mental or physical pathologies does employ different groups of participants: a control group of healthy participants without neurological and psychiatric disorders and participants diagnosed with the disorder in question. The notion of normality is, however, problematic in medical settings (Canguilhem 1991) and thus in neuropsychiatry and neurology. In defining the normal brain, seemingly self-evident criteria are in fact contingent and are embedded in cultural conceptions of what human beings should do and be. Screening questionnaires, which are designed for excluding non-normal subjects from experimental samples, manifest what is considered to be a normal person. Dumit (2004: 61-2) points

3.4 Task Design

Following the tradition of cognitive psychology, the guiding principle of much neuroimaging research is that all complex mental functions can be reduced to simpler, basic functions. Thus, the aim of a task in neuroimaging is to identify, isolate and test the basic functions. Since these are tested within a single individual, the main problem is to control for all other variables that are not tested for. For instance, in a study of word recognising, factors such as size, brightness, rate and speed of presenting them, the language as well as literacy, learning and attention effects, and task interpretation of the participant might each and all influence the neural activation and thus have to be controlled. However, the most important assumption of all imaging experiments is that behaviour (that can be tested by experiments) can be directly linked to specific brain states (Dumit 2004: 64-8).

The way this linkage is hypothesised depends on the research paradigm. Poldrack speaks of three different strategies, the 'where strategy', the 'what strategy' and the 'fractionation' strategy'. The 'where strategy' was the earliest strategy in imaging research. As is suggested by the term, the aim was to locate specific mental and neuronal processes in specific brain areas and was repeatedly criticised as neo-phrenology. The 'what strategy,' succeeding the 'where strategy' (without entirely replacing it) is rather looking for the function(s) of specific brain areas. Thus, rather than looking for the locus of a specific function, the emphasis is on the question what functions a specific brain area might have. The 'fractionation strategy' assumes that a given process is performed by more than one brain region (Poldrack 2010: 755). The strategy chosen as theoretical foundation of the research determines the selection of design elements used to create the experimental design.

But how does a typical design of an fMRI experiment look like? Amaro and Barker explain that the foundation of any fMRI experiment is the intervention in the brain – for instance a cognitive task – and subsequent observation of the system's response via the BOLD signal (Amaro/Barker 2006: 222). This definition resonates with the basic principle of psychological research to define dependent and independent variables. The authors emphasise that the first step is to decide as precise as possible what the purpose

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out how much effort is put into defining the normal, non-pathological subject. Early imaging studies even looked for "super-normals", ideal types free from symptoms of neurological or psychological pathologies. In order to define the normal subject, it has to be determined what might influence how the brain works. Categories such as gender, age, race, and handedness are commonly assumed to influence brain structure and function. However, these are categories set by the historical, cultural and social conventions in which the scientists live and think.

of the experiment is and whether imaging is the proper tool for investigating a certain research question. Once this is determined, a hypothesis has to be developed, "ideally with a neuroanatomical basis" (ibid.: 223). The kind of hypothesis will decide what kind of research design is used. The design is composed of three strategies, the comparison strategy, the stimulus presentation strategy, and the image acquisition strategy. For each of these strategies, different options exist.

The very basic comparison strategy is the 'subtraction method.' By this method, images generated during a control condition are subtracted from images generated during an active condition. The subtraction method bases on the assumption that these two conditions are similar enough to be cognitively added. While Amaro and Barker claim that more often than not this is an invalid assumption (ibid.: 222), they admit that it nonetheless can produce useful information as well as robust results. A subtraction design requires at least two conditions and the data analysis would include BOLD signal differences in all regions involved in the task. Other comparison strategies have been developed in the last two decades. The 'factorial method' compares two different components both separately and in interaction with each other. This method has to assume that the BOLD signal of the two components and the interaction between them is linear; otherwise other influences could not be excluded. In the parametric method, the difficulty of a specific cognitive task is increased during the experiment. The hypothesis underlying this method is that the increase in difficulty is connected with an increase in BOLD signal. The 'conjunction analysis' is interested in commonalities between conditions rather than differences and examines common patterns of BOLD signals in different conditions. These four methods as well as combinations between them are the basis for fMRI experimentation (ibid.: 223-4).

Once a comparison strategy is chosen, a strategy for presenting stimuli has to be selected. The easiest and oldest stimulus presentation strategy is the 'block design.' In block designs, stimuli of the same condition are presented sequentially for a period between 20 and 60 seconds, with at least two conditions alternating; one of them is defined as the control condition. This design produces robust results, statistical reliance and high BOLD signal changes. Yet, as Amaro and Barker point out, it has been criticised on a neuropsychological basis and on the ground of the many implied assumptions underlying this design. An alternative to the block design is the 'event-related' design. Event-related designs take advantage of the high temporal solution of fMRI scans and allow faster changes of stimuli. Moreover, they are more flexible than

block designs, can take into account individual differences during tasks, allow for more randomisation, variation in time of stimulus presentation, and are thus less predictable for participants. The advantage of event-related designs is that they are able to detect temporal variations in BOLD signal changes. 'Mixed designs' are taking advantage of the robustness of block designs and of the flexibility of event-related designs. They enable the researcher to investigate the role of a certain node or network in specific tasks. However, they are stonger based on assumptions about how the brain might work than other designs and thus incorporating hypothesis into their design. An alternative to the presented designs, which all require the participant to actively engage, is to let the participant do nothing and measure the differences in BOLD signal related to 'spontaneous activity' while watching stimuli or in resting state (ibid.: 224-5).

Another important descision in designing an imaging experiment is the choice of the image acquisition technique. Generally, two factors are crucial for image acquisition and have to be balanced: temporal and spatial resolution. The more precise the temporal resolution or sampling rate, the less precise the spatial resolution (voxel size) and vice versa. High temporal resolution is achieved using fast repetitions, i.e. high number of whole brain scans in a given time period. However, this means that less slices are collected and that thus the spatial resolution is lower. High spatial resolution is achieved using small voxel size, which generates a more precise representation of the brain tissue. However, it also has negative impact on the signal-to-noise ratio since it is less sensitive to the BOLD signal changes. While generating a more precise representation of brain tissue, it takes more time to generate a whole brain scan and thus is less sensitive to fast changes over time (225-7).

Once generated, images have to be analysed. Which image analysis strategy is chosen is defined by the experimental hypothesis. Several laboratories have developed specific software packages for data analysis matching their specific needs (Alac 2008: 485). During my own ethnographic work, I observed that these software packages travel with scientists from lab to lab. Someone doing her PhD in a lab using certain data analysis software is likely to take it with her when founding her own lab. Despite the number of different software packages, some general steps of data analysis can be identified. In a first step, data are preprocessed, i.e. prepared for later analysis. The preprocessing includes correction for head movement as well as spatial and temporal filtering and reordering the acquired data. The most important purpose of data preprocessing is to remove "noise", signals that are not related to the task, to avoid artefacts. Then, the

BOLD signal changes are modelled to form the basis of statistical evaluations, depending on the original hypothesis. This data processing produces an "activation map" of a single brain; statistically calculated activations are usually represented in colours. These are the images we know. This "first level analysis" often is followed by a "second level analysis", in which the data of several individual brains are processed in group statistic to determine common or typical patterns in the neural activation in the investigated task (Amaro/Barker: 228-9).

The research questions and hypotheses determine which of the different strategies in each of the four components is chosen for any imaging experiment. However, the choice of the strategy already implies assumptions about the relation between cognitive task, neuronal function and brain anatomy. Moreover, the choice of strategies is highly constrained by the limitations of technology. fMRI machines and the software making the data available and accessible to social neuroscientists and other imagers without training in fMRI radiology are black boxes beyond the control of the scientist. fMRI is such a highly specialised technology, with so many specialists working together, that each of them is only an expert for her own area: the physicists understands the physics of fMRI, the radiologist knows how to produce and read the images, the statistician is the expert for developing instruments for data analysis, and the psychologist knows how to relate the measured activation to function or behaviour. However, none of them is able to understand the entire technology. Thus, they have to rely on the options offered by each specialist for reading the information generated in their respective areas. These options are often offered anonymously in computer software.

Roepstorff and Frith add yet another dimension to the question of task design. They argue that while most experimental designs assume that participants will simply follow the script set by the experimenter, this is in fact rarely the case. Rather, the development of a script and its interpretation by participants are embedded in more complex environments outside the lab (Roepstorff/Frith 2004: 197). The generation of an experimental design is embedded in the standards and expectations of the scientific community in which they want to publish the study. It has to relate to the shared knowledge of the community both for getting ideas for script generation and for producing intelligible knowledge that can be handled by fellow scientists. Moreover, as Roepstorff and Jackson (2002) argue, while it is agreed upon in the cognitive neuroscience community that subjective data such as self report and introspection are crucial for making sense of imaging data, such data are neither collected systematically

nor reported in publications (ibid.: 333). They stress that this information is crucial because participants in any experiment are subject to personal experiences, moods, and other subjective factors and the experimenter cannot assume that each participant understands the script in the same way or follows the instructions completely. Collecting subjective data would give participants a chance to describe the role they actually played in the experiment (ibid.: 336). The next chapter will go into more detail on this issue of imaging experiments as social situations.

Before concluding this chapter, I present an anecdote about an incident on which feelings ran high in social neuroscience in early 2009, caused by a paper criticising lacking causation in statistical correlations. Among other things, this anecdote shows that disputes about proper methods and technologies are still hot in this new field of research, indicating that it has not yet reached the status of "normal science" (Kuhn 1962) but is rather in a test stage.

3.5 The Voodoo Affair

Beginning in late December 2008, several internet blogs dedicated to critically follow recent developments in psychology and the neurosciences,[23] reported about a paper which was soon to be published in *Perspectives on Psychological Sciences* but was available already online. The blogs found praising words, *mindhacks* for instance spoke of "a bombshell of a paper" (Mindhacks 2008), and news spread fast.

3.5.1 The Paper

The paper the bloggers got excited about was titled *Voodoo Correlations in Social Neuroscience* (Vul et al. 2008) and caused much attention, agitation and anger among those identifying as social neuroscientists. The core message of the paper was that social neuroscience produced correlations between measures of individual differences regarding personality, emotion and social behaviour on the one hand and fMRI measures of brain activity on the other hand that were "extremely high" (ibid.: 2). These correlations define the probability that a certain activation of the brain can indeed be linked to mental states such as emotions or social behaviour. While the reliability for scales measuring personality and emotionality lies between .7 and .8 and for fMRI measures probably not greater than .7, the authors found correlations well above .9 in

[23] Mindhacks, n.d. [reported 29.12.2008-29.04.2009], Neurocritic, n.d. [reported 31.12.2008-08.04.2009], Neuroanthropology, n.d. [reported 31.01.2008-06.05.2009]; all retrieved 13.01.2012.

social neuroscience papers (ibid.: 3-5).[24] This observation caused the authors to conduct a meta-analysis of social neuroscience research by sending a survey to the authors of 54 papers identified as belonging to that field. Basing on the 51 responses they received, they concluded that the selection of voxels for analysis was biased in 54% of the papers. Only those voxels showing a significant correlation with behavioural measures (i.e. exceeding a certain statistical threshold) were selected for data analysis (ibid.: 10). The problem of this non-independent selection of voxels is that they are not reliable, since they can even produce results out of pure noise or show correlations by chance. Vul et al. emphasise that

> "(t)he problem is exacerbated in the case of the 38% of our respondents who reported the correlation of the *peak voxel* (the voxel with the highest observed correlation) rather than the average of all voxels in the brain" (ibid.: 13).

Moreover, they could demonstrate that studies performing non-independent correlations showed higher correlations than those using independent correlations (ibid.). Thus, they

> "are led to conclude that a disturbingly large, and quite prominent, segment of social neuroscience research is using seriously defective research methods and producing a profusion of numbers that should not be believed" (ibid.: 22).

However, a re-analysis of the results is possible and should be performed using independent correlations; so the authors

> "urge investigators whose results have been questioned here to perform such analyses and to correct the record by publishing errata that provide valid numbers" (ibid.).

In the appendix, they listed all papers they examined and whether they performed independent or non-independent analyses or whether they did not respond to the survey (ibid.: 26-29). Vul et al. claimed to have choosen social neuroscience as the site of investigation because it was this research field in which the phenomenon first came to their attention. However, they stress, this would not mean that other neuroimaging research would look any better if analysed the same way (ibid.: 3).[25]

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[24] 0 = no correlation, 1 = full correlation.

[25] Ed Vul and his doctoral advisor Nancy Kanwisher published a contribution with similar impetus in a recent volume on brain mapping. While they speak about cognitive neuroscience in general, they again point out social neuroscience as an example for bad practice (Vul/Kanwisher 2010: 80). This indicates that they might indeed aim a pointed attack at this field as some assume.

3.5.2 Reactions

This paper – soon to be called the "Voodoo Paper" – sparked quite a heated debate among social neuroscientist. The first time it was mentioned during my field work was in mid-January 2009, when a candidate for a job position at the Department discussed with graduate students. He mentioned the paper after I had introduced myself and my ethnographic project and suggested that kind of research the paper would be very interesting. This remark started lively discussion about data interpretation. The job candidate implied that the paper was a necessary wake-up call, not only for social neuroscience but for the imaging community in general. Nevertheless, it was calling for a reply since leading figures in the field had been attacked. While most people I had spoken to, agreed that critical evaluation of research was necessary, they criticised the way it was done. The chosen title was too sensationalistic and picking on social neuroscience was regarded to be quite unfair.

When I asked Social Neuroscientist A about his opinion of the paper – about half a year after it first appeared on the internet, he first asked back what I took away from it.

> "Interviewer: When I first read it, I didn't understand much because it was all about statistics but what I basically took away from it was that they claim that there are papers in social neuroscience with correlations that are much higher than it's possible to get with the methods they use and so that they make too strong claims with what they do. So, that's what I took away from it. And then I just sat there and observed that everybody got panicked and angry. But I mean that was like only for a few weeks and now nobody talks about it anymore, so that's at least my observation.
>
> Social neuroscientist A: The paper is very interesting because, so that is a sociological sort of question or observation. It is interesting for at least three reasons. One, it is sort of like a Rorschach in that every time I ask people what they took away from it, people give me different answers. So there's very little consensus among most people about what the point was in the first place. So, because my take what the point was is very different from yours for instance. Two, I was kind of shocked by the sheer number of people who were outside the field who had gotten very excited about the paper. So, there was a conference in February in Tampa, that was social psychologists, and that was the thing that many people wanted to talk about, even though maybe about 10% had actually read it. So, that's kind of interesting, like why were people so quick to get interested and almost gleeful about this paper. And then I think the third one is, the group at MIT, well the authors of the paper made a calculated decision to make as flashy a point as they possibly could by saying things, by calling it Voodoo and making fairly ad hominem attacks on people. So, those three things don't feel like that's the way that science – that's not the kind of science that I would like to see happening.
> Having said that I think that the authors do have a very good point, that's extremely minor. And the extremely minor point that they're making is that if you find a correlation between a behavioural measure and some brain data and you've done all the necessary corrections, then the correlation really exists because you define the region in appropriate ways. But what's not ok is to report what the strength of the correlation is. So, people define that region, let's say interior cingulate and it's correlated with how much pain you are in and everybody acknowledges that there is

> really a correlation in the ACC in how much pain you report you're being in but we don't know what the number is. We don't know if it's .6 or .7 or .8 or .9 'cause you can get bigger or smaller numbers depending on exactly how you set your thresholds. So, that's it. Basically, if people just went to their papers and crossed out the line that said what the actual number is, then everything would be ok. So, it hasn't change anything about the interpretation of any of the data that exist. All of these data are completely appropriate, people are reporting that there is a correlation and there really is a correlation. We just don't know if it is .8 or .7 or .6." (Social Neuroscientist A).

This response very much summarises the reactions I heard in my interviews and also in lunch and party conversations I had with the social neuroscientists in the Lab in early 2009. The general agreement seemed to be that it was important to expound the problems of data interpretation in imaging research and to caution researchers to be more careful in thinking about thresholds and correlations. Yet, the style in which this was done irritated many people and lessened their appreciation for the point the authors made. They saw social neuroscience's reputation damaged by being singled out of the bigger imaging community. What is interesting about this particular interview excerpt is the mix in the argumentation between social constructivist and positivist reasoning. My interview partner argues in a social constructivist matter in regard to the way bad science is conducted and communicated and in regard to the choice of thresholds, which is apparently arbitrary and should thus not be published. In arguing for a correlation between pain and a specific brain region, the anterior cingulate cortex, he takes a positive stance, which leads to the assumption that he strongly believes in the factual truth of the data generated ("there is really a correlation in the ACC"), notwithstanding the fact that the production of the data itself relies on prior assumption about what to measure.

3.5.3 Published Papers and Comments

The anger within the field of social neuroscience was so strong that eventually the title of the paper was changed into "Puzzlingly High Correlations in fMRI Studies of Emotion, Personality, and Social Cognition" (Vul et al. 2009a) and instead of speaking about "the field of social neuroscience (or social cognitive neuroscience, as it is also sometimes referred to)" (Vul et al. 2008: 2) the published version refers to "Functional magnetic resonance imaging (fMRI) studies of emotion, personality, and social cognition" (Vul et al. 2009a). Moreover, they got one more response, which they grouped into the independent articles[26], and added one paper into their analysis[27], which

[26] Phelps et al. 2001.

[27] Sareen et al. 2007.

is part of the group non-independent articles. They also recalculated their data regarding independent versus non-independent correlations of the articles analysed (see differences in figure 5 between Vul et al. 2008 and Vul et al. 2009a). The larger number of high correlations (bigger than .8) is a result of including paper number 55 (Vul et al. 2009a: 281, fig. 5); for the rest of the papers, a small trend towards smaller correlations can be observed.

Moreover, the paper was published with six commentaries. In fact, this was the editor's original plan, as he stated in the introduction to the Vul et al. paper and the responding comments (Diener 2009: 272). He emphasised that much of the heated and sometimes counterproductive debate was due to the fact that the paper was discussed without the context which he had intended for it, and he expressed the hope that the set of articles and commentaries together will encourage ongoing discussions, which in turn will help to improve the methods of neuroimaging (ibid.: 273). Three commentaries (Lazar 2009, Lindquist/Gelman 2009 and Nichols/Poline 2009) added a statistical perspective to the debate. All three of them appreciate the debate initiated by the Vul et al. paper and expressed the hope that it leads to improving statistical methods within imaging studies, particularly in what Vul et al. call the non-independence problem (Lazar 2009: 308), and in the interpretation of statistical correlations (Lindquist/Gelman 2009: 311). Thomas Nichols and Jean-Baptist Poline argue that Vul et al. make two major points in their paper: the multiple testing problem and the fact that most published imaging papers have confusing or incomplete methods sections. However, they stress that these problems are already discussed in the imaging community and the "alarmist rhetoric" of the original paper does not help having a constructive debate about the statistical measures in imaging (Nichols/Poline 2009: 292). Tal Yarkoni (2009: 295) adds that statistical power is impaired by small sample sizes in neuroimaging studies, since in small samples individual differences (within-subject effects) are probably stronger than commonalities across brains (between-subject effects). Lisa Feldman Barrett (2009) reminds the community that over the course of the history of psychology attempts to infer from physical parameters to mental states have always started out having difficulties, because it had to be found out what was signal and what was noise in the physical data collected, and what the data can actually tell (ibid.: 314-5). The angriest commentary was by Matthew Lieberman, Elliot Berkman and Tor Wager. Even though the title was changed, in their perspective the paper "is a pointed attack on social neuroscience" (Lieberman et al. 2009: 299). They claim that they are not aware of any

researcher who performs the two-step analysis resulting in the non-independence that Vul et al. identify as the core problem. Rather, they use single-step analyses for identifying regions showing a non-zero effect, which is all they aim for (ibid.: 300). Moreover, they contend that Vul et al.'s claim of "impossibly high" correlations in social neuroscience is based on "on a rough estimate of reliability that is then generalized across a range of measures" (ibid.: 305). However, the reliability of fMRI has not yet been assessed for social neuroscience studies and even if such an assessment should reveal an average reliability of about .74, this would not mean that higher correlations were by default too high, since an average cannot say anything about a maximum correlation (ibid.).[28] Perhaps it is not so surprising that these authors voice the strongest criticism. Not only are they the only commentators defining themselves as social neuroscientists, one of them (Lieberman) was co-author of one of the three studies singled out as examples for generating "puzzlingly high" correlations by Vul et al. (2009: 275).

In a reply to all commentaries, Vul et al. explain some points from their original paper in more detail, but generally refute all criticism from the commentaries, particularly those from Lieberman et al. and Nichols and Poline. They conclude by remarking that the commentaries had been helpful in reminding the field that the problem of non-independence is neither new nor limited to (social) neuroscience and imaging studies. In fact, they admit, it is a rather old problem, since the first paper they are aware of discussing these issues was published already in 1950. Psychologist Edwart Cureton (1950) stressed in that paper that by using the same data for selecting items and assessing validity, he got high measures of validity. But those, he stated, were simply "baloney" (Vul et al. 2009b: 323). By concluding in this way, they emphasise their original critique rather strongly.

By the time the paper was formally published with commentaries, half a year after its emergence on the internet, the debate had already disappeared from the virtual front pages of science blogs and the minds of most social neuroscientists as had the original paper from the internet.[29]

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[28] Another reply was published on the Internet (Jabbi et al. 2009) in which the authors reject the charge of negligent data analysis and criticise Vul et al. for misleading and flawed data analysis themselves.

[29] Yet, as outgoing editor, Ed Diener reflected on the debate two years later in November 2010 with a special section on neuroimaging. However, none of the original authors and commentators contributed to that section, which was more of a general debate about the advantages and dangers of neuroimaging as a tool in psychology.

3.5.4 Voodoo Affair and Culture of Scientific Debate

The "Voodoo Affair" shows several important points: first, new media, Web 2.0 and particularly the "bloggosphere" influence discussions within the scientific community. The paper was first distributed via private blogs and the science blog of Newsweek author Sharon Begley (Begley 2009). Lieberman et al. and Jabbi et al. first posted their comments as responses to blog entries discussing the paper (in ibid). This is a new quality in scientific discussions. It is faster and perhaps less reflected than traditional debates via journals. If a reply to a controversial paper has to be submitted and the editor decides whether it gets printed in the next issue, the debate takes more time but authors may think more about what to write and how to argue than they do in a comment posted under a blog entry. In a web 2.0 culture, the debate is also more distributed over the various blogs discussing the paper, which makes it more difficult to follow. Moreover, different people may know different pieces of the debate. Neuroscientist Daniel Margulies points out that this form of debate via blogs was so new that participants acted and reacted in unconventional ways, for instance by posting preliminary rebuttals as blog comments. Accusations of improper science and improper proceeding were fast at hand. Some refused to openly debate the matter via public blogs and insisted on an exchange in peer-reviewed journals, thus implying that proper science has to be discussed within a community of experts rather than in an auditorium in which lay people can intervene (Margulies 2012: 278-9). Yet, the distribution over blogs can also democratise the debate because more people have the chance to actively engage in it. In the voodoo affair the internet played a crucial role. Without the blogs, the paper and the debate would have received much less attention, both inside and outside the field of social neuroscience.

Second, it shows that within the imaging community, and in this case social neuroscience, a certain amount of disagreement exists about how proper research is done. Since social neuroscience is a research field without clear boundaries, it is not quite clear whether the attack came from within or from the outside. Depending on whom you ask, you will get different answers. Piotr Winkielman, one of the paper's co-authors, edited one of the first textbooks bearing the title *Social Neuroscience* (Harmon-Jones/Winkielman 2008). But as discussed in the last chapter, in the book's editorial, he and Eddie Harmon-Jones define social neuroscience much broader than for instance Ochsner and Lieberman (2001). Moreover, on his official website he states that he is interested in social cognition and mentions "techniques from social neuroscience" in an

array of methods he uses for his research. Is he a proper social neuroscientist then? And who is it to decide? His colleague from San Diego, Christine Harris also works in the field of social cognition. Harold Pashler is a psychologist working on memory and learning,[30] thus a bit further away from social neuroscience, and the main author Edward Vul, a statistician working on human cognition, did his graduate training in the lab of Nancy Kanwisher at MIT. Kanwisher is a strong proponent for domain specificity and modularity of the human brain (see e.g. Kanwisher 2010), which brings her into opposition to many researchers working in the field of social neuroscience (Adolphs 2010: 760).[31]

Third, fMRI is a rather young technology that produces fascinating images, which contribute to the media attention the neurosciences currently get. Vul et al. are not the first ones reminding the imaging community that proper data analysis is crucial in the use of this methodology. The already mentioned paper by Cacioppo et al. *Just Because You're Imaging the Brain Doesn't Mean You Can Stop Using Your Head* (Cacioppo et al. 2003) stresses the point that fMRI research cannot not yield any unambiguous results. Interestingly, Vul et al. do not mention this earlier paper criticising unreflected imaging practices from within the field of social neuroscience. Other critical voices are for instance Weisberg et al. 2008 or Logothetis 2008, both warning against over-interpretation of fMRI data.

That the question of interpreting data is a hot topic in the imaging communitiy shows another incitent. Just when social neuroscience's collective temper had cooled down a bit, the so-called 'salmon study' caused some amused attention. It had a similar, but less moralistic impetus than the voodoo paper.

At the Human Brain Mapping Conference 2009, a poster was presented bearing the title "Neural Correlates of Interspecies Perspectives Taking in the Post-mortem Atlantic Salmon: An Argument for Multiple Comparisons Correction". In 2005, the authors had scanned a dead salmon among an array of other objects to develop fMRI protocols. A few years later, the poster's main author Craig Bennet analysed the data while discussing the multiple comparisons problem (errors occurring when testing several

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[30] Cf. their faculty profiles (Harris, n.d.; Pashler, n.d.; Winkielman, n.d.).

[31] The theory of domain specificity assumes that the brain is divided into various modules, each responsible for a specific array of tasks, such as face recognition, language, motor perception etc. In this perspective, social neuroscience's task is to identify the modules responsible for social cognition. The opposite view is that the brain has no specialised modules for social and non-social cognition but that the function of a specific brain region depends on the information processed (Ward 2012: 5-7). The notion of modularity will be discussed in more detail in chapter 5.

variables at the same time). He wanted to see how many false positives he would get in his analysis. The false positives he did find were located in the dead fish's brain.

> "A cluster of three significant voxels were arranged together right along the midline of the salmon's brain. If they would have been anywhere else the salmon would have been just a curious anecdote, but now we had a *story"*

he writes in his blog (Prefrontal 2009a). Together with one of his PhD advisors he decided to present the data at the mentioned conference. They designed the poster as if it was a proper study, explaining experimental design, tasks and methods. The salmon's task was described as follows:

> "The salmon was shown a series of photographs depicting human individuals in social situations with a specified emotional valence. The salmon was asked to determine what emotion the individual in the photo must have been experiencing" (Prefrontal 2009b).

They got positive statistical correlations between the tasks and brain activation. Hence, they conclude that the standard statistical thresholds and minimum cluster sizes they used were not sufficient and that multiple comparisons correction should become common practice in analysing fMRI data (ibid.).[32]

Voodoo affair and salmon anecdote highlight a crucial point in social neuroscience and more general in psychological experiments using imaging technologies: experimental design, methods and data analysis are most crucial for generating reliable data in (imaging) studies. For instance, it is not sufficient simply to take an experimental design that was developed for behavioural experiments and use it in the scanner, since the conditions in an fMRI scanner are different from those in a behavioural laboratory.

3.6 Conclusion

This chapter introduced the various elements of social neuroscience's experimentation: the components of the experimental design, imaging technologies, the role of the primary data source, the experimental subject as well as the epistemological entanglements and implications. Research questions and results in social neuroscience are limited by the technologies employed as well as the practices common in social neuroscience, for instance in selecting research participants and employing certain designs and methods for data analysis.

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[32] For a more general critique of the "seductive allures" of neuroimaging see Weisberg et al. 2008.

It has been shown that functional imaging technologies do not simply depict the mind at work (Hagner 2006). Rather, they are a product of social, technological and practical contingencies and have to be located in the historical, cultural and social context of their emergence. Instead of unambiguous results they yield data highly dependent on interpretation. Moreover, the production of imaging data is determined by hard- and software in such a high degree and subject to many specialised procedures that it is not possible for the social neuroscientist experimenter to fully understand the process of data generation. The scanner is like a black box which is fed by information sources (the participant and the experimental design) and produces data which can then be interpreted by other black boxes, the statistics programs. Both the scanner and the statistics programs depend on highly complicated parameters and formulas, which are not comprehensible by anyone not highly specialised in fMRI radiology or neuro-statistics. Thus, the researcher gives away much of her agency to machines and software and has to trust them. However, as Anne Beaulieu (2001) points out, this also increases the assumed objectivity and hence scientific credibility of the data generated as human intervention is minimised.

Social neuroscience research is not only determined by technology and software but also by the methods chosen for data generation and analysis. Quantitative experimental design and data analysis, the choice of how to translate a research question into an experimental task and the selection of study participants all contribute to the framework in which knowledge is produced and at the same time are the products of both scientific and cultural imaginations about how to investigate the social in the brain. It shapes the way in which knowledge can be thought and conceptualised and renders what is thinkable.

While what is discussed above is true for other endeavours in cognitive neuroscience using fMRI or other imaging technologies, one more component is crucial in the present case: the term ‘social’, which is obviously quite prominent in this field of research. Social neuroscience’s experimental system both is determined by a certain notion of the social and determines it. The genealogy of this notion of the social and its implementation in social neuroscience is the topic of the next chapter.

4. Social in Social Neuroscience. History, Research Practice and Epistemology

In the last two chapters, the research field of social neuroscience, its emergence and development as well as its research practice were introduced and epistemological consequences of experimental design and particularly imaging technology were discussed. Now it is time to get deeper into the subject matter of the notion of social underlying this research. As indicated in the introduction, more than one concept of social have existed over the course of the history of the social sciences and remain to do so in the various disciplines engaged in studying intersubjective interactions. Thus, the aim of this chapter is to provide some answers to the question what a social neuroscientist may mean when saying the little word 'social'.

Social Neuroscientist D, who was originally trained in social psychology, explained to me how she first became interested in that subject and subsequently in social neuroscience. Her primary interest in stereotypes had led her to the more general interest in studying how we perceive other people. Interesting in the present context is the way in which she speaks about this entity 'the other person':

> "A person is such a *complex stimulus*, you know it's really kind of an amazing stimulus, you know, and the idea that we think we know another person and another person's mind, I mean that's kind of a miracle, right? (...) I mean, when you think about the evidence that you have, you know, the evidence is complicated and messy and noisy and somehow we form this coherent impressions and go away, confident that we actually most of the time know something about the person. So, I think, that's fascinating, you know that we do that and it's important*, because it's the basis of all social interaction*" (Social Neuroscientist D, emphasis added).

The focus of attention in my interviewee's concept of the social is on the individual and how she perceives other people. In this perspective, social interactions are rooted in the individual. Other people are stimuli – complex, even miraculous stimuli indeed, but stimuli nonetheless, external impulses triggering a reaction within the individual. The other social neuroscientists I interviewed, too, revealed this perspective in their definitions of social neuroscience: they all defined social neuroscience as a science studying the neurobiological mechanisms and processes underlying social behaviour, be it neuronal, genetic, or hormonal. This perspective on sociality is only possible on the basis of an individualistic understanding of the social: the point of reference is not a given group in interaction but a modus of processing external stimuli within the individual organism. The reference to stimuli instantaneously evokes associations of

behaviourist psychology and it will be shown that the historical roots of social neuroscience's notion of 'social' are in fact intertwined with behaviourism.

An individual-centred notion of 'social' is not new. It has been prevalent in experimental social psychology since the 1920s. Thus, this chapter starts with a history of the 'social' in social psychology before concepts of 'social' in contemporary social neuroscience will be discussed in two dimensions: in experimental design and conduct and in the epistemology guiding social neuroscienctific experimentation.

4.1 'Social' in the History of Social Psychology

As has been discussed in the introduction, 'social' and 'society' as relevant categories for understanding human nature came into use at a time when certain problems emerged that could not be explained by categories hitherto existing. These terms do not merely describe the external world, rather, they are productive agents framing the way we think about our being in the world, about our relation to other human beings as well as to the external world. By rendering certain problems as 'social question', 'deviance', or 'individual versus society', these problems are framed in a specific epistemic mind-set, which has explanatory and defining power at a given time and place as Nikolas Rose argues:

> "within a limited geographical and temporal field, it (the term *social*, S.M.) set the terms for the way in which human intellectual, political and moral authorities, in certain places and contexts, thought and acted upon their collective experience" (Miller/Rose 2008: 86).

The 'limited geographical and temporal field,' in which the category 'social' emerged as an epistemic mind-set in the sense Rose suggests, is the post-revolutionary Europe of the early 19th century. The category 'social' as a force standing in opposition to the individual emerged after the French Revolution and became increasingly important for rendering the pressing problems of the day in the course of the 19th century, as many authors argue consistently (see e.g. Arendt 1958 [2001]; Baudrillard 1978; Latour 2007; Miller/Rose 2008; Rose 1989; Wagner 2001; Williams 1976). It provided the basis for dealing with the new problems resulting from industrialisation and urbanisation by establishing a concept and a language to define and comprehend them. Two aspects of 'social' in the 19th century are particularly important for early social psychology: notions of society as a supra-individual organism that has evolved over time and the notion of self-organisation of societies.

19th century European social thinkers saw a strong link between the individual, the societies they were living in, and the history that shaped these societies. A common assumption of the various approaches emerging in the course of the 19th century is their notion of a collective entity which is distinct from the individual and which cannot be studied via individual minds.[33] This will be briefly exemplified by four eminent figures of social and/or psychological thought: Herbert Spencer in Britain, Gustave Le Bon and Emile Durkheim in France, and Wilhelm Wundt in Germany.

Herbert Spencer (1885), like others before him, understood society as a superorganism, i.e. an organism consisting of individual parts but being more than the sum of these parts. He introduced the concept of evolution into reasoning about society, arguing that all kinds of organism are subject to the guiding principle of adaptation to changing circumstances. For him, a strong analogy between individual and social organisms exists, since both are subject to adaptation and higher-order laws such as growth, structure and differentiation (Jahoda 2007: 90-3). Also in one of the most famous works in early social psychology, Gustave Le Bon's *Psychologie des foules* (1895), an idea of superorganism is present in the notion of the crowd. However, Le Bon's concept of a superorganism is quite different from Spencer's. Being influenced by studies in hypnotism, he assumes that individuals lose their own will when entering a crowd and merge into one mental unity, being less intelligent and less rational than the individuals are before and after being part of a crowd (Jahoda 2007: 107).

Emile Durkheim and Wilhelm Wundt advocated the notion of a collective mind shaping social beliefs, ideas, actions, norms, and customs. Both saw little room for individual psychology in explaining these social phenomena. Durkheim argued that they were social facts that could only be explained by preceding social phenomena and not in the individual mind. Moreover, a social phenomenon always has to be investigated in regard to its social purpose (Durkheim 1901[1984]: 193). Studying social phenomena by the means of psychology would be like studying biological phenomena by the means of physics and chemistry alone. He maintained that it is not possible to fully understand a group by only studying its members (ibid.: 188). Wundt's approach is somewhat more confusing since on the one hand he argues that individual psychology is more fundamental than what he calls *Völkerpsychologie* and on the other hand sees them as

[33] For a detailed overview over the emergence of social psychology in Europe see Jahoda 2007, particularly part II. I will follow Jahoda's history of early social psychology closely to provide a contrast to later forms of social psychology emerging in the United States. Since the latter are the main interest of this section, the description of early European social psychology has to remain sketchy.

equally important parts of one unity. Social phenomena such as customs are rooted in social interactions both past and present and cannot be studied by experiments. Wundt stresses that comparative studies such as historical and ethnological accounts are necessary for understanding phenomena of the collective mind (Jahoda 2007: 127).

These four thinkers, in all their differences, represent the dominant thought style regarding the social in late 19th century Europe, which was also guiding early social psychology. While they had diverging opinions on the question which role individual psychology may play in understanding human nature, they all perceived the social as an entity not reducible to its individual members and which thus could not be studied though individual psychology.

However, already in the late nineteenth century, diverging positions about the role of psychology respectively social sciences in explaining social phenomena existed. For instance, British-American psychologist William McDougall, author of one of the earliest books bearing the title *Social Psychology*, brought neo-Darwinian and Spencerian notions into social psychology. In his influential book *An Introduction to Social Psychology* (McDougall 1908) he posits the view that psychology is the foundation of all social sciences since it provides insight into the instincts and motivations of the individual's mind, which shape and influence the social world.

Other social psychologists, however, had different views on the areas of responsibility and task division between the disciplines of social sciences. For instance, Charles Ellwood, an American sociologist and criminologist of the interwar years, pleaded in his doctoral dissertation for a social psychology as a necessary supplement to sociology; while sociology studies the objective or physical aspects of social life, social psychology is concerned with the subjective or psychological aspects of social life. He stresses that there is no hierarchical order between these concepts but that "both are parts of a philosophic whole" (Ellwood 1901: 3).

Despite all conceptual differences, it was a shared assumption among early social psychologists that social psychological phenomena were grounded in the membership of social groups.[34] These phenomena were considered to be different from phenomena grounded in the individual, which were generated independently from a social group (e.g. genetically or by non-social learning). Consequently, they reasoned that the subject matter of social psychology was qualitatively different from that of individual

[34] The terminology was not always consistent, also "collectives" or "communities" were common terms for describing this form of aggregations of people.

psychology (Greenwood 2000: 444). Social forms of cognition, emotion and behaviour were distinguished from individual forms of cognition, emotion and behaviour. While the first were perceived as basing on the assumption that other members of any given social group would perceive, feel or behave similarly in similar situations, the latter were perceived as forms of cognition, emotion and behaviour independent of the represented cognition, emotion and behaviour of that social group. Thus, 'social' was understood as a certain kind of cognition, emotion or behaviour (being shared by others) and could be directed towards any kind of object (Greenwood 2004a: 19-20).

It is important to note that early social psychologists distinguished social from interpersonal behaviour: a behaviour towards another person was not per se considered to be a social behaviour – it was only regarded as such if it represented a behaviour common among members of a given social group. For instance, aggressive behaviour towards another person was perceived as an interpersonal behaviour that could be either individual or social, depending on the motivation: individual if caused for instance by individual frustration or social if caused by shared beliefs in appropriate behaviour. On the other hand, social behaviour did not necessarily have to be interpersonal behaviour, it could also be directed towards non-social objects such as trees as objects of worship or similar communal purposes. The crucial criterion was whether the motivation was social or individual. In these early concepts, 'social' was a mode of engaging with the external world, independent of the object. For cognition, emotion and behaviour to be social, they had to be grounded in the shared beliefs of a social group (ibid.: 21). Danziger (2000: 338) points out that this notion of 'social' was closely connected to concepts of morality and religion; and thus with institutionalised (political or economical) power.

4.1.1 American Social Psychology During the Interwar Years

In the first decades of the 20th century, the sociological and the psychological approaches to social psychology became increasingly separated. Danziger (1997) shows that in the 1920s an individualistic approach to psychological social psychology became predominant. This was most obvious in the seminal book *Social Psychology* by Floyd Allport[35] (1924). The introductory chapter of his book bears the title *Social Psychology*

[35] Allport is often described as one of the "founding figures" of social psychology. In the late 1920s, he founded the first PhD program in social psychology at Syracuse University (Samelson 2000: 502). For intellectual influences on Allport's Social Psychology see Parkovnick 2000.

as a Science of Individual Behavior and Consciousness (ibid.: 1) and he defines the subject as follows:

> "Social psychology is the science which studies the behavior of the individual in so far as his behavior stimulates other individuals, or is itself a reaction to their behavior; and which describes the consciousness of the individual in so far as it is a consciousness of social objects and social relations" (ibid.: 12).

Psychology in general is interested in behaviour, which Allport defines in the tradition of behaviourism "as the interplay of stimulation and reaction between the individual and his environment" (ibid.: 3). Social psychology, now, is interested in the social segment of the environment – "that is, between the individual and his fellows" (ibid.). Allport suggests that the significance of behaviour caused by social stimuli is the same as that caused by non-social stimuli – its purpose is to correct a "biological maladjustment" or the satisfaction of needs (ibid.: 3-4). Social behaviour in this perspective is not defined by the motivation causing the behaviour as in older definitions but by the stimuli triggering it, i.e. other people. Moreover, it is driven by an internal, biological urge to better adapt to the external world, a perspective quite different from the theories hold by the previous generation of social psychologists.

In the first chapters of his book, Allport discusses the social aspects of the individual in a hierarchical order: first the physiological basis of human behaviour in general (the nervous system), followed by a discussion of the fundamental activities (both inherited and learned) of starting and withdrawing, rejecting, struggling, hunger reactions, sensitive zone reactions, and sex reactions. The next chapter tackles feeling and emotion and the last two chapters of the first part deal with personality and the measurement of personality. Also the second part, in which Allport discusses social behaviour, is structured hierarchically. First, the nature and development of social behaviour are discussed, followed by two chapters about social stimulation (first language and gesture, followed facial and bodily expression). The succeeding three chapters discuss the response to social stimulation in its elementary forms, in the group and in the crowd. The last three chapters deal with social attitudes and social consciousness, social adjustments and social behaviour in relation to society. The structure of the book acknowledges a general dissimilarity between social behaviour and its physiological bases: complex matters such as 'social behaviour' in relation to societies ground on more basic issues such as the physiological basis of human behaviour and it can be explained by looking at all the gradual accumulation of complexity in the phenomena in-between (cf. Allport's chapters 3-14). Moreover, he stresses that the individual must

be seen as a product of social interaction as well as a (potential) factor in social interaction (ibid.: 13). Thus, it cannot completely be reduced to its less complex parts. Nonetheless, at its core, his approach is a reductionistic one. The social can be explained in terms of the individual as becomes clear in the title of the introductory chapter *Social Psychology as a Science of Individual Behavior and Consciousness*.

Allport postulates a strict division of labour: while the study of social behaviour of individuals is the subject matter of social psychology, the study of groups is the subject matter of sociology. Psychological data provides "explanatory principles" for sociological interpretations of groups. Psychology is interested in causes while sociology is interested in effects (ibid.: 11).

He strongly opposes older collectivist notions and warns against the "group fallacy" that comes in various shapes and, by focusing on a mystical supraindividual "group mind", diverts the attention from the locus of cause and effect, i.e. the "behavior mechanism of the individual." He believes that "the groups will be found to take care of themselves," if psychologists would just study individuals in group situations (ibid.: 9).

Greenwood suggests that the rejection of the traditional notion of 'social' was an expression of the rejection of holistic concepts (such as the group mind) developed by – mostly European – sociologists of the late 19th century. The notion of group minds or group behaviour differing from individual minds or behaviour was perceived as metaphysically dubious or was even associated with forms of subservience required by communist or fascist states (Greenwood 2004a: 23-4). Consequently, in this line of thought, any theory about socially engaged psychological states was perceived as a threat to the principles of autonomy and rationality, i.e. the foundations of the human condition that rooted in laissez-faire liberalism. Floyd Allport, his brother Gordon Allport, and other social psychologists arguing along the same lines proclaim to have liberated social psychology from seemingly unscientific speculations about behaviour rooted in social groups and thus prepared the ground for employing tools of individual psychology in social psychological research. In their view, this brought social psychology closer to the standards of positive science (ibid: 23).

The concept of an individualistic social psychology corresponded to a more general trend in reasoning about the state, society, the public and other formations of aggregated human beings. The notion of 'social' as promoted by Allport was closely interwoven with several developments in North American culture and society, for instance, a growing consumer culture and emerging marketing research, debates about collectivist,

i.e. totalitarian ideology versus democratic freedom, and an expanding social administration with its need for knowing the population it is supposed to administer (Danziger 1997: 149). This entanglement will be discussed later on in this section.

4.1.2 Attitudes

In this individualistic paradigm of social psychology, attitudes became the most important concept of experimental research. In their study about rural Polish populations in Europe and America, sociologists William Thomas and Florian Znaniecki (1918) first defined social psychology as the science of attitudes. They understood attitudes as the link between social values and individual actions. In attitudes, the individual's conscious life was manifested and could be measured. They lead to potential actions, depending on specific situations. Attitudes were developed in relation to bigger entities such as race, nationality, religious or social groups. While adopting the concept, Allport and succeeding social psychologists, considered attitudes to be strictly individual attributes and thus erased the collectivist notion behind the original notion. If two individuals held similar attitudes, this resulted from similar learning experiences; any notions of collectivity or 'group mind' were treated as 'fiction'. Consequently, Allport's theory left no space for the concept of social attitudes defined as being shared among a social group that was held by the previous generation (Danziger 1997: 144). In this new perspective, social attitudes were attitudes directed towards social objects, i.e. other people. Danziger points out that different definitions of 'attitude' are closely connected to different concepts of 'social': while in psychological literature, attitudes were 'social' if they referred to (individual) reactions to social stimuli, in the perspective of many sociologists – and older social psychologists – this definition misses the essential character of 'social' since they thought 'social' as referring to interactions and collaborations (ibid.: 146).

With the growing influence of individualistic concepts, the focus of social psychology's investigation shifted from the kind of perception towards the kind of object that was perceived. The centre of attention was now the individual who was confronted with different kinds of stimuli, with social stimuli being one kind among others. This approach made it possible to reconceptualise the research in social attitudes in terms of stimuli: does the perception and processing of social stimuli differ from the perception of other kinds of stimuli? The success of the individualistic notion of social attitudes was closely intertwined with the development of methods and techniques for measuring attitudes and thus generating information for social policies. These social policies were

increasingly requested by state agencies in the New Deal era (ibid.: 150). Rose (1998: 121-5) observes that the interest in attitudes arose from the question of how to influence individuals by education and legislation. The concept provided a good basis for developing social technologies and social planning by policy makers because not only it rendered attitudes as measurable entities, but also allowed for measuring the effect of any social and legal programmes aiming at engineering these attitudes. Not only individuals but human sociality became calculable in scales, charts and diagrams.[36]

4.1.3 Quantification

Besides occupying topics such as attitudes, the development of new methodologies was crucial for establishing social psychology as an independent discipline. These methodologies focused on scientific experimentation and quantification. This is an important shift since, as Danziger (2000: 332-3) points out, methodology is never ontologically neutral. On the contrary, a strong link exists between preconceptions about the object studied (e.g. social reality) and the trust in specific methods for investigating this object. In regard to social psychology, he argues that for making any social object accessible for scientific experimentation, it was necessary to redefine that object in a quantifiable manner and to abolish the concept of social as inter- or supraindividual that is hard to define or to measure in numbers. Hence, debates about experimental methods in mid-20th-century's social psychology can be read as discourses about the identity of social psychology as an autonomous subdiscipline of psychology in delineation from other psychological subdisciplines, from sociological social psychology, and from everyday social knowledge (MacMartin/Winston 2000: 351).

As has been shown, Floyd Allport was a proponent of that redefinition of the social. For him, only individuals were real, whilst institutions, culture etc. only existed in social behaviours and attitudes of the individual and could not be studied outside the individual mind. In his view, the social is observable in the distinction between social and non-social behaviour of individuals, i.e. the individual's response to social stimuli ("the reactions to language, gestures, and other movements of our fellow men", Danziger 2000: 333) in contrast to non-social stimuli ("such as plants, minerals, tools, and inclement weather", ibid.). Danziger points out that in this concept not even cultural artefacts ("tools") are regarded to be of non-social origin (ibid.). This concept of the

[36] And they became invisible psychological concepts rather than visible bodily postures (Rose 1998: 123).

social turns the old notion of the social as a supra-individual entity upside down. While the social thinkers of the 19th century argued that the social could not be studied via the individual mind, Allport claimed that it could *only* be studied via the individual mind.

Allport's individualistic notion of the social as an attribute of the individual opened the space for quantifying methods and laboratory experimentation. Danziger (1997: 146) observes that the focus on technologies helped to create a common basis for social psychological research. As long as the methodology provided data, theoretical debates about what was actually measured were less important. Social psychology developed into an experimental rather than a theoretical science.

These technologies for measuring attitudes helped social psychology on its way towards a more general recognition both within psychology and in the world of policy making, as their development went hand in hand with realising the useful potential of social psychology's research for social administration and policy making.

Rather than contemplating about human nature in the ivory tower of academia, social psychology provided data necessary for implementing policies of the New Deal such as Social Security, or measuring effects of interventions, for instance via education. It was argued that the control of human conduct depends on developing exact descriptive methods of measuring it in the same way the control of nature was facilitated by tools of measurement. Measuring social attitudes, so it was argued, would help developing effective programmes for changing wrong into right attitudes (ibid.: 147). American policy making in the early 20th century believed in governing the various aspects of social life by dispassionate management and administration. For establishing such an administration, a scientific analysis of problems and potential solutions was required. Social psychology's newly developed tools for measuring attitudes matched this need. These tools promised to bring to the surface the population's attitudes toward any subject of governmental interest (Rose 1989: 126-7). A first application of social psychology's methods for social administration was accomplished by a committee appointed by US president Herbert Hoover to investigate social trends in the United States. This committee did not only present demographic reports and surveys about health, education and public administration but also reports about changes in social attitudes, for instance on topics such as prohibition, religion, labour relation or foreign policy (President's Research Committee on Social Trends 1933). Other issues subject to social psychological investigation were delinquency, immigration or racism (Danziger 1997: 142). The proximity of social psychological research tools and the instruments of

market research and opinion polling increased the administrative interest in these techniques. Measuring attitudes, via verbalised opinions, generated more transparent information about what 'masses' thought about certain issues. Early, mainly European, social psychologists considered collectives, defined as crowds or masses, as irrational, emotional entities. The most famous account was Le Bon's crowd psychology (1895), arguing that individuals in a group showed special characteristics they did not show when being alone. Crowds were feared for their irrationality and had to be tamed. The introduction of polling techniques in social psychology research made these opaque crowds scientifically accessible for the first time. The new quantitative methods made it possible to study these aggregations inductively via measuring individuals' attitudes; their opinions were valid and valuable parts of a functioning democracy (Rose 1998: 128). Researchers of public opinion, most prominently George Gallup, even promised to predict election outcomes. This was only possible because public opinion, like other aspects of social attitudes, was perceived to be the sum of individual opinions that could be calculated from aggregated individual opinions. These applications of social psychology research in policy making and administration were important elements in justifying its existence as an independent discipline (ibid.).

But social psychology's applicability did not stop at policy making. It also provided scientific evidence supporting a Western individualist culture, basing on a notion of an independent individual, actively engaging with her environment (Danziger 1997: 157-8). Since its emergence, American social psychology was closely interwoven with defending this culture against more collectivist ideologies. This is particularly visible in Floyd's brother Gordon Allport's retrospective account on the development of American social psychology in the light of rising Communism and Fascism:

> "A special challenge fell to social psychology. The question was asked: How is it possible to preserve the value of freedom and individual rights under the conditions of mounting strain and regimentation? Can science help provide an answer? This challenging question led to a burst of creative effort that added much to our understanding of the phenomena of leadership, public opinion, rumor, propaganda, prejudice, attitude change, morale, communication, decision-making, race celations and conflicts of value" (Allport 1954: 2).

This quotation shows social psychology's entanglement with the social, political and cultural discourses of the time of its emergence and its ideological function in defending Western individualism. How this was implemented in research practice will be discussed below. Before doing so, it is important to have a glance at the methods that

were developed for studying the social because the methods used reflect the epistemological assumptions guiding research.

4.1.4 Experimental Method

Psychological experimentations in the first half of the 20th century were "limited to exploring *effects that were local, proximal, short term, and decomposable*" (Danziger 2000: 334, original emphasis). These experiments could only investigate what was present in the laboratory. Danziger's example is the study of visual perception. Changes in visual perception could only be studied as long as they were responses to stimuli presented in the laboratory. Effects of urbanisation on the visual environment outside the laboratory were outside the range of experimental exploration since they were neither local nor proximal nor short term. Moreover, complex phenomena had to be decomposed in elements that could be studied in the isolation of the laboratory (ibid.).

Allport believed that this form of experimentation also provided an appropriate methodological foundation for the scientific social psychology he wished to establish.[37] The introduction of this experimental design into social psychology was only possible because he was radically breaking with traditional conceptions of the social, which were basing on effects that were non-local, distal, long-term, and experimental non-decomposable, for instance international markets, political structures or historical changes in symbolic life (ibid.). Two general features became prominent in this new social psychology: the primate of a individualistic approach towards collective life, which allowed exploration by the means of laboratory experiments and a shift in the mode of understanding social phenomena. Whilst the previous generation looked for the roots of social phenomena in morality and religion, as well as in institutionalised power relations, now the focus was on the interpersonal level, on social influence between individuals (which also was easier to investigate with experimental tools) (ibid.: 338).

With this shifting notion of what constitutes the social, a certain notion of the group came along. Despite the rejection of 'group minds' and other collectivist notions of human interactions, groups remained to be an important tool in social psychological experimentation. Now, however, they were artificially created entities controlled by the experimental design. The individuals of a group served as social stimuli to each other.

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[37] Samelson, however, questions that Allport's emphasis on experimentation was as strong as is claimed by Danziger, Greenwood and others. Moreover, he argues that Allport himself did not carry out experiments in the modern sense of the word (elaborate methodology etc.) (Samelson 2000: 502). But what is important here is that his programme was read as a strong claim for an individual and experimental social psychology that was implemented by succeeding generations.

This class of stimuli was conceptually the same as that of other experimental psychologists, with the exception that they consisted of other people instead of visual figures, abstract tones etc (Danziger 2000: 336-7). Defining groups in this manner made it possible to deny any effect of extra-experimental social influence on individual behaviour in experimental situations. In this concept, group memberships outside the laboratory did not play any role in social psychological experimentation. Social influence was only relevant as interpersonal influence between the individuals in a given experiment (Greenwood 2004a: 25-6).

Another important step in the transformation of the social was the introduction of statistical methods. In its course, Danziger argues, "actual social groups were gradually replaced by hypothetical groups that had a purely statistical reality" (Danziger 2000: 344). By randomly assigning individuals to different experimental groups, it was implicitly assumed that they had incorporated the factors of the social world (such as interpersonal relations, history etc.) and could access them independently of other people. While in opinion research the sample was carefully created according to categories, such as the social statuses of real life populations, this was not a concern for social psychologists. They used the tools of opinion research for investigating what was lying under the surface of the opinions studied, namely universal attributes of statistical, i.e. hypothetical populations. These statistical populations were not constrained by the study subjects' lives outside the laboratory, or so the argument went (ibid.: 345).

Danziger points out that statistical approaches only work for populations but not for social formations that are shaped by inter-individual or even inter-group relations such as kinship groups, economic or administrative organisations. But since most experimental populations consisted of a more or less homogenous group – namely US college students – this did not cause problems in experimental practice, because the individuals studied shared the same socioeconomic background as well as the experience of college live. Yet, it is important to note that a certain ontological basis was required for predicting social behaviour of randomly assigned groups: the notion of "an anomic state in which isolated individuals without historical ties drift from one brief encounter to another" (ibid.).

It is not possible to separate the development of new methods and technologies in social psychology from the described transformation in the perception of 'social' from a feature of the shared world of several individuals into an internal capacity of individuals. The new notion of 'social' prepared the ground for developing quantifying

techniques, which again contributed to shaping the individualistic concept of social as an attribute of individuals. The administrative and political need for data was an important external catalyst for establishing social psychology as an experimental scientific discipline.

4.1.5 World War II and Post-war Developments

While social psychology had worked hard to prove its relevance for policy making and administration during the inter-war years, it was not before the Second World War that social psychology got a significant practical application. Investigating military morale or the effect of propaganda provided opportunities for applying the new quantitative techniques on a large scale. Social psychology could prove its value for predicting the public mind, measuring the impact of media and propaganda, or by studying attitudes of soldiers as well as the morale of the own population and the enemy. By doing so, the young research field could justify its existence as a discipline of its own.[38] Also in the post-war years, the field could benefit from the public support it got during the war and establish a scientific social psychology, independent of other psychological subdisciplines and sociology (Jahoda 2007: 138).

The Second World War was important for social psychology in two more regards: first, the emigration of many leading European intellectuals to North America had an impact on all branches of intellectual life that cannot be underestimated. In the late nineteenth century, Europe and particularly Germany had been a favourite learning destination for aspiring American psychologists. The outbreak of the First World War had made it politically impossible for Americans to continue their studies in Germany and the connection between German and American intellectuals had not been mended in the inter-war years. But with the outbreak of the Second World War, North American academia got in even closer touch with concepts discussed in continental Europe in the interwar years because intellectuals forced to leave Europe became members of American universities. As a result of the anti-intellectual and anti-Semitic climate and the political events preceding the war, social psychology had become more or less nonexistent in Europe, since many of its exponents went into exile – often to the United

[38] Shortly after the War, an edition in four volumes on social psychology during the war was published by the Social Science Research Council (1949-1950). An entire volume is dedicated to the methods of measurement and prediction (Stouffer et al. 1950), while the other three volumes are centering around the objects of investigation (vols. 1 and 2 on soldiers and vol. 3 on mass communication).

States – or were murdered by the Nazi regime. In consequence, social psychology during and after the war was predominantly an American project (ibid.: 138-9).
The second impact that the Second World War had on the development of American social psychology was that Fascism and Stalinism posed questions about why people would get actively involved in pogroms and genocide or blindly follow authoritarian leaders. What had already begun in the inter-war period as a scientific support for individualist culture became more pressing once the United States entered the war. Arising from the same socio-political context, proving the superiority of democracy became an important project (Cartwright 1979: 84-6). Social psychology's role in defending democracy against Fascist and Communist ideologies was of growing importance. Here, social psychology had a dual task: on the one hand, social psychological experiments provided the scientific basis of democratic values (cf. Lewin's experiments on leadership climates, e.g. Lewin et al. 1939). On the other hand, it provided the tools for translating the principles of democracy and freedom from the realm of ethics to the domain of science. It developed a vocabulary for understanding the problems endangering democracy and provided possible solutions for these dangers complying with the standards of (experimental) science and the values of democracy (Rose 1998: 118-9). This project remained salient in social psychology during the Cold War when individualism and freedom as the ideology of the West stood in fierce opposition to Communist ideology of the East.

During and shortly after the Second World War, attempts were made to bring psychological and sociological social psychology back together (Cartwright 1979: 91), not least by European exiles who brought their own thought tradition of theory-led qualitative research (Danziger 1997: 155). In this period, holistic notions about groups had a short interlude in experimental social psychology by the integration of Gestalt psychology – particularly through Kurt Lewin's influence (Patnoe 1988). In the post war years, however, the social was redefined in terms of the interpersonal while affiliation to social groups was neglected. The qualitative approach of European exiles was only integrated insofar it was compatible with the quantitative, behaviourist experimental design developed in American social psychology in the inter-war years. Thus, the notion of social psychology as a branch of individual psychology was reaffirmed in the post-war years (Greenwood 2004a: 27).
The famous big experiments of the 1950s, 1960s and early 1970s, such as the Milgram Experiment (Milgram 1963), the Stanford Prison Experiment (Haney et al. 1973), or

Muzafer Sherif's experiments on conformity (e.g. Sherif et al. [1954]1961), all focused on the individual in a given social environment, on their norms, attitudes and self-concept. Although groups were crucial in the theories underlying these experiments, the perspective was unidirectional rather than reciprocal. The interest was merely in the effects the (social) environment imposes on the individual, not on how the individual might influence or shape her environment (for a critique see Cartwright 1979).

In the post-war decades, the quantitative experimental design was refined along the methodological focus on interactions between individuals.[39] Researchers developed strategies for eliminating or at least controlling any effect and variable not being part of the current study. This, Greenwood argues, also eliminated all characteristics of real life situations that are grounded in group-membership. The methodological and conceptual rigidity in social psychology experimentation also restrained the ways in which sociality could be conceptualised; it was reduced to the form of interindividual relations that could be tested in the laboratory. Methodological rigidity was a driving force in social psychology's establishment and acceptance as an experimental science (Greenwood 2004b: 224-30). Yet, this did not remain uncontested for a long time. In the 1970s, critique arose regarding the asocial and artificial nature of social psychology experimentation as well as the lack of theory in generating hypotheses (Greenwood 2004b: 231; see also McGuire 1973; Cartwright 1979).

Many social psychologists saw this problem solved when the social cognition paradigm emerged in the late 1970s. This paradigm understood 'social' as the kind of cognition that is concerned with other persons or groups, but again this concept put the individual at the centre of attention, merely replacing Allport's focus on behaviour with a focus on cognition. In this approach, the social remains a unidirectional factor in deciphering certain elements of the external world. It is both a feature of the object perceived (other people as individuals and not as members of a social group) and a feature of deciphering certain classes of objects as compared to other objects, such as trees or tables (Greenwood 2004b: 239-41). As has been demonstrated in the second chapter, the social cognition paradigm marks an important step towards social neuroscience. It integrated concepts of cognitive psychology into social psychology and in this course causing a shift in the focus of attention towards investigating how (social) information is

[39] For a more detailed history of American social psychology after the Second World War see Greenwood 2004b and for a more detailed on the international post-war history of social psychology see Moscovici and Marková 2007.

represented in the brain. Applying more psychophysical methods in social psychology provided seemingly more reliable data than mere self-reports.

Despite this shift towards cognition, contemporary psychological social psychology operates with concepts and methodologies once developed by the protagonists of individual social psychology. For instance, in a current introductory textbook for students, Susan Fiske (2009), who belongs to the social cognition tradition, still refers to Gordon Allport's definition of behaviourist social psychology:

> "Social Psychology is all about people influencing other people. Social psychology is the scientific attempt to explain how the thoughts, feelings, and behaviors of individuals are influenced by the actual, imagined, or implied presence of other human beings" (ibid. 4).

She explains that social psychology's subject matter is the individual, while groups or institutions belong into the field of sociology. Scientific explanations of human beings operate on different levels of analysis, from micro to macrolevels. Social psychology is located somewhere in the middle, she argues, bordering both sociology and other psychological subdisciplines, such as developmental or cognitive psychology. On the bottom of her list, i.e. at the most basic level, is neuroscience, investigating the nervous system and looking for neuronal responses. As discussed earlier, this notion of different levels of organisation has been predominant in the course of social psychology's history and is equally so in contemporary social neuroscience. The conceptual relationship between social neuroscience and social psychology becomes particularly evident in the introductory chapter to the first student's text book on social neuroscience, where Allport's definition of social psychology is adapted to a "working definition" (see chapter 3).

4.1.6 Summary: The Social as an Quantifiable Entity

For establishing social psychology as a branch of individual psychology, a transformation in the concept of 'social' was a necessary prerequisite. The shift from understanding 'social' as a mode of perception to conceiving it to be an attribute of the object perceived first opened up the possibility of studying intra-individual processes rather than supra-individual or collective entities. While early, European, social psychology distinguished itself from individual psychology by investigating how real or imagined social collectives influenced individuals' cognition, emotion and behaviour, American social psychology emerging in the 1920 understood itself as a branch of individual psychology, investigating whether and how the perception and processing of social

stimuli was different from the perception and processing of non-social stimuli. The site of investigation now was the single individual, a fact that provided the basis for introducing the experimental method into social psychology, which again was a pivotal factor in establishing social psychology as a scientific discipline, i.e. a discipline generating 'objective' and falsifiable knowledge about the external world. However, in order to apply an experimental approach, social psychologists had to frame their objects of investigation quantifiable and thus statistically measurable. Hence, they had to redefine 'the social' as a quality of countable entities rather than connecting it with concepts of morality and religion, or with institutionalised power as earlier social psychologists had done. The individualist approach to social psychology is deeply rooted in the American culture of individualism and consumerism and generated scientific support for the superiority of this culture by showing that the group is nothing more than the sum of its members and that the social can be investigated by studying individuals. Information generated by social psychology research was soon applied by policy makers and administrators in order to better understand social problems and to develop tools for solving them.

In the individualist perspective of American social psychology, 'social' is both an attribute of a certain class of stimuli and an internal capacity for deciphering these stimuli. While this perspective on the social is the same in the behaviourist and the cognitive paradigm of social psychology, the epistemic approach differed in the two paradigms. Behaviourist social psychologists were interested in observable behaviour, in visible or audible reactions to a given stimulus. Cognitive social psychologists, on the other hand, investigated how social stimuli were perceived and processed in the brain and whether this differed from the perception and processing of non-social stimuli (Greenwood 2004b: 239-40).

This section's aim was to trace the notion of 'social' in the history of social psychology as well as to sketch the historical context of its genesis and development. The underlying hypothesis was that social psychology's concept of the social is crucial for understanding social neuroscience's concept of the social, which stands in the thought tradition of experimental social psychology. Evidence for this hypothesis will be provided in the remainder of this chapter. A rather obvious continuation lies in social neuroscience's scope and locus of investigation. It is looking in individuals' brains and thus has an individualistic scope on the social, being more interested in processing of

social stimuli in the brain than in social structures or power relations. Its notion of the social is unidimensional rather than reciprocal, it is interested in how the brain represents and responds to social stimuli. Thus, it stands in the individualist tradition of American social psychology, applying its concepts and approaches to a new object of investigation: processes in the brain. And like its predecessor, social neuroscience, too, promises to generate knowledge important for social administration.
The following section investigates the 'social' in experimental design and conduct as well as the epistemology guiding social neuroscience research.

4.2 'Social' in Social Neuroscience Imaging Experiments

"Do you want to get pictures of your brain?" an advertisement asked that was looking for volunteers for an fMRI study investigating empathy. Since I was interested in how it actually felt to take part in an fMRI experiment, I answered. A few days after I indicated my interest, I got a phone call confirming my participation and asking some questions about my state of health, my medication and drug use, whether I was pregnant, whether I had any piercing or tattoos and whether I was left- or right-handed. Apparently I passed the screening and was informed that the experiment would take place on two consecutive days and that in addition to the promised brain scans I would receive some money for my participation (in fact quite a lot for a chronically poor PhD student). Finally I was told to come to the imaging unit at the hospital at the agreed time and date. Hospitals always intimidate me and that added to my nervousness while I was trying to find my way to the imaging unit on the hospital's basement. I was greeted by a PhD student whom I knew vaguely from a class in social neuroscience I was taking that term. She led me to a room with two computers, explained the risks related with MRI scans and asked me to fill in some questionnaires and a consent form at one of the machines. After I finished, she asked again some questions about my health and explained the experiment. I was told that before doing the "real" experiment in the scanner I should practice at the computer. While I was doing that trial, another person entered the room and was introduced as my partner in the experiment. She was also asked to fill in the questionnaires and forms while I was led to the changing room, where I had to change into a hospital costume to make sure that I did not have any metal at my body. On the way to the scanner the PhD student in charge of the experiment asked me whether I had been in an MRI scanner before and I said that I had been, although only with my legs and that I remembered the noise as being rather unpleasant.

She reassured me that it was not too bad and that I would get protection against the noise. When we entered the control room, I was introduced to the second experimenter took off my shoes and entered the dimly lit scanning room. I was asked to lie down on the scanner's trolley, my head was put into position and fixed with cushions, I got ear plugs and headphones, was covered with a blanket, a panic button was placed into my right hand, the experimenter touched my cheek, and then I was moved into the machine. As soon as I entered the dark tube, I was asked via a built-in intercom whether everything was all right and I was reminded to keep still and how the experiment would proceed. Then the scanner began to produce loud noises and the experiment began: via a small overhead screen I was presented images of animals or objects while my left hand, which was outside the tube, was touched with corresponding items, e.g. I was shown an image of a kitten and was touched with something fluffy or I saw snails and felt something slimy. After each stimulus I was asked to rate the pleasantness of the sensation on a scale from -4 to +4. In a second cycle I was asked to rate the same stimuli for the other person I had briefly met in the computer room. When the second cycle was over, I was told that it would get even a bit louder because they would take the anatomical scan. The whole procedure took about one hour.
The next day, the experiment was slightly varied: I was shown two images (one for me and one for the other person) while being touched with an item corresponding the image for me. In the first cycle I was supposed to rate the feelings of the other person and in the second cycle to rate my own feelings. In the end I was asked to state my emotions evoked by each of the presented object. When the experiment was over, I got the money and was promised to get the scans of my brain soon.

Regarding the search for social neuroscience's concept of 'social', this anecdote is interesting because it provides many hints at how complex and messy the project of locating the 'social' on the micro-level of neuronal activation is. Allowedly, the experimental design included a greater degree of complexity than most designs by involving another person rather than a photo or a stick figure on the screen. By meeting the other person I was probably supposed to rate the stimuli for someone I knew. And the stimuli themselves were more complex than the average by adding haptic components to the visual stimuli. But yet, even though the situation was complex, it was not complex in a real-world sense: I did not know that other woman with whom I never exchanged more than those courtesies being said when meeting a stranger and whose face I couldn't even remember while lying in the scanner. Hence, I could not rate the

stimuli as if I knew her. Consequently, I had two options, either to rate them exactly like I would do for myself or to rate them according to an assumed common sense (kittens are cute and maggots are disgusting).

This experiment was about empathy (could I tell how another person would feel?) – but it could have been about any other phenomenon social neuroscience is interested in since the mechanisms of abstraction and disembedded investigation of neural processes is generally the same. The experimental design rendered empathy as a psychological process within the individual's brain, independent of the circumstances in which it occurs. The question I had to answer in the experiment was not: "how would Susan feel if she petted a kitten at her grandmother's farm?" but: "how would an average female of your age feel if confronted with stimulus x?" or: "what is the common sense notion about sensation y?"
Interpersonal relationships, the conditions in which an event is taking place, intentions of the involved actors, time and place – all these factors of the social world are left out in an experimental design focusing on the individual in the scanner and on what happens in her brain when confronted with a combination of visual and haptic sensations. "Empathy" is reduced to a change of blood flow that is interpreted as a reaction to standardised stimuli. In this kind of studies, 'social' is reduced to a capacity within a single organism, more specifically a capability of the brain to process information about the external world. Consequently, an event or interaction is only relevant for social neuroscientific research if it shows in the brain. For showing in the brain, an event has to cause a neural activation that can be traced by imaging technologies.

My episode in the scanner also shows that the experimental process includes forms of social interaction that are not part of the experimental design. Lying in the scanner, I was suddenly confused about what my task actually was: should I rate the actual sensation I experienced at my hand or how it would feel if I was touched by the object I saw on the screen (which was sometimes only similar but not exactly the same). I felt that I could not ask the experimenters while the scanner was running since the only means of communication I had was the panic button and it did not feel appropriate to stop the entire experiment to clarify this minor element of my task. Hence, I had to come up with a solution myself and decided to rate the visual rather than the haptic stimulus but still, this was difficult because for many objects the context was crucial for

the question whether I would like the touch or not. Above all, I got confused about the whole issue of rating the pleasantness for the other person. After all, I did not know her, so how should I know whether she was allergic to cats or whether she was in fact fond of spiders? And sometimes it depends on one's mood whether one likes the touch of something. It made me feel uncomfortable that I was not entirely sure about what to do because I wanted to be a good participant, i.e. providing good data and I felt that this was impeded by my confusions. Of course, I could have asked after the first scanning session, but as soon as I came out of the scanner it felt rather stupid to worry about minor questions like that.

Besides these thoughts directly related to the experiment, I was thinking about a lot of other things while lying in the tube – for instance events the images reminded me of, a song that came into my mind or how I would spend the afternoon. Especially on the second day, when the cycles were longer and more repetitive, I often found myself thinking about things completely unrelated to the experiment. The most prevailing thoughts, however, were those about my role in the experiment, the machine and the technology: I was wondering whether the experimenters could see that I did not pay full attention and particularly whether they could see what I was thinking or whether they could tell if I cheated. And perhaps I moved too much to provide good data?

The following four points can be derived from the episode and will be discussed in the remainder of this and the next section:

- The experimental situation is at the same time an unsocial and a social situation. While the participant is isolated in the scanner and a research object generating data, she is also entangled in complex social relations. The interaction between experimenter(s) and participant(s) is a vital feature for performing an experiment; however, it is neglected in interpreting results or even designing the experiment itself.
- The social is reduced to a psychological process within the individual brain for which the context is only relevant as an additional parameter or stimulus but not meaningful in itself. This means that the social is logically relocated inside the body and identified as a mere effect of biological processes.
- Whatever the situation: relevant is only what shows in the brain insofar as it is quantifiable and statistically measurable. A subjectively experienced feeling such as

empathy has to be transformed into an objective category and a material entity to get any meaningful information from neuroscientific (or psychological) experiments.

- On the epistemological level, several questions have to be risen: what are the problems of designing an experiment aiming to mirror complex real-world situations in a way that it produces results which can be processed by statistical tools? How is complexity dealt with? What does this tell us about an implied notion of how the social world is organised?

These four points resonate with the individualistic concept of the social prevalent in American social psychology. The social is perceived as an entity that can be investigated in experiments yielding to quantitative data. It is a capacity of individual's brains necessary for decoding the external world. What gets lost in this concept of the social is an everyday notion of meaningful interaction between individuals, which is not reducible to data. However, this form of social interaction is crucial for designing and performing experiments as will be discussed below.

4.2.1 The Scanning Process

If only looking at the level of experimental design and actual investigation in imaging studies, social neuroscientists face the problem that their means for studying social interaction are rather un-social in the vernacular sense of the word: the experimental subject is lying in the tube alone.

As discussed in the last chapter, experiments have to be designed in such a way that they can be conducted with the tools of cognitive neuroscience, i.e. with fMRI scanners producing data to be processed by statistical software. The introductory anecdote to this section illustrated that fMRI scanners provide a rather unsocial environment. The participant is alone in a narrow and sterile tube, having been instructed not to move during the scanning session (see Image 1). For protection against the scanner's extreme noise, she is provided with earplugs and earmuffs/headphones, a condition further isolating her from the external world. In terms of visual stimuli, the external world is brought into the scanner only by a small overhead mirror via which information is projected (usually screen presentations connected to a data generating computer program). Sometimes an eye tracker is integrated, allowing the experimenter to track the participant's eye movements and subsequently to identify regions of interest on the screen and in the presented stimuli. Communication with the external world is theoretically possible via a built-in microphone and the "panic button", but in practice

communication usually only takes place in the framework of the experiment (e.g. via rating scales, making decisions in a game etc.). Participants are encouraged not to talk because this would cause head movements which again would influence the quality of the data production.

The impression of a meaningful context has to be simulated by the stimuli presented or by (real or fake) interaction with people outside the scanner, e.g. via virtual games or seeing them (via the mirror) in the same room. Thus, the objective of mapping socially meaningful events or interactions on the brain meets a research reality in which the participant is isolated and socially meaningful situations have to be artificially produced or at least simulated. It is an extreme example of the laboratory situation that had been introduced into social psychology in the post-war period. If looking at the whole scanning situation, however, a different picture with regard to the social nature of the experiment unfolds. This will be discussed along three axes: the interaction between the experimenter and the participant, participant's perspective and the criteria for recruiting.

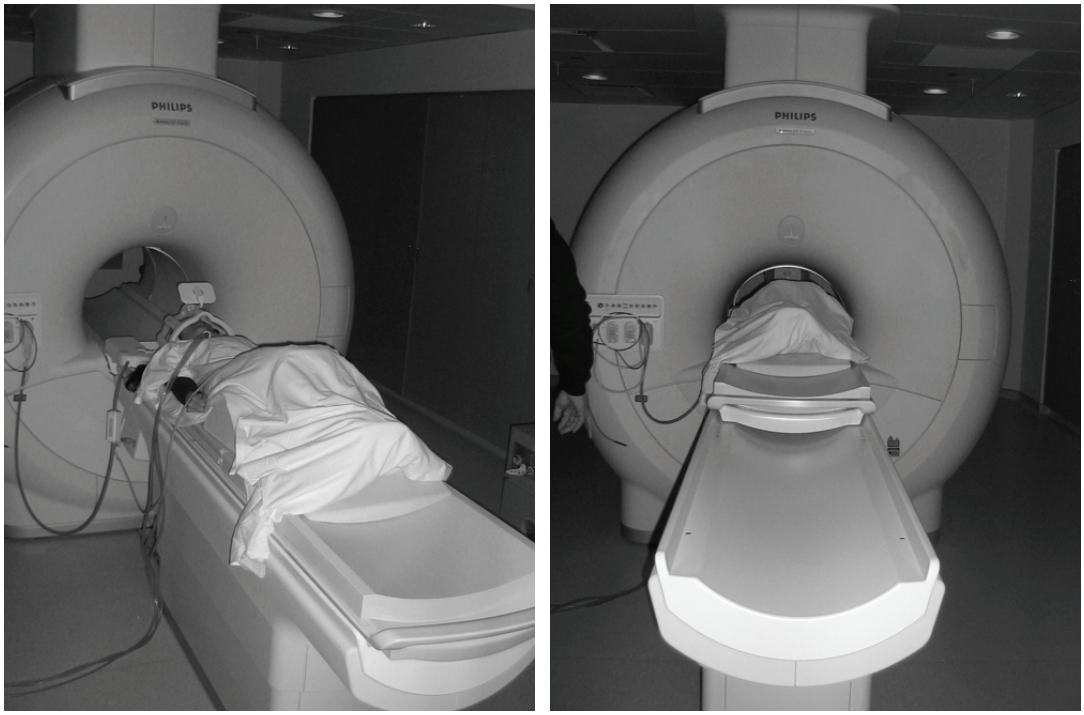

Image 1: subject on trolley and in scanner

4.2.2 Interaction between Experimenter and Participant

Before the experiment begins, the participant is 'trained', i.e. she is informed about what to expect and what to do during the experiment. Cohn observes that this training does not simply prepare the participants in terms of letting them know what is going to happen, but also in terms of telling them what to feel and think during the experiment

and to develop a sense of cooperation, an attitude crucial for any psychological experiment (2008a: 155). In preparation of the experiment, the researcher has to engage with the participant, reassuring her and doing everything to make her comfortable. Often experimenters share their own experiences of participating in imaging studies, for instance recounting how once they themselves have even fallen asleep in the scanner – this was repeatedly told in the study I observed. Because the situation in the scanner is isolating and intimidating, careful preparation and guidance are important since a relaxed participant is more likely to provide good results.

At the Brain Imaging Center at the University, a mock scanner provides the opportunity to prepare participants for the real scan. A mock scanner is a model including the essential parts of the scanner that might intimidate participants: the trolley and the narrow, dark tube and the (tape-recorded) noise. In this mock scanner, participants can practice their performance before doing the "real" experiment. For scanning children, the researchers invented a story about astronauts flying a space shuttle and decorated the room accordingly with space posters and glow-in-the-dark stars. The children were told that the noise was an important indicator showing that the space shuttle worked well. Before entering the real scanner, participants (both children and adults) could choose a DVD among a collection of nature and space documentaries, which then was played while they were brought into the scanner and during the anatomical scan, preceding the actual experiment.

Before the experiment, a relationship between participant and researcher is established. This relationship is important for the experiment's success because it ensures that the participant is comfortable and willing to engage in the experiment. Without the active (and "correct") participation of the participant in the scanner, it is not possible to generate good data, i.e. data significant enough to find differences between activation and resting state (cf. Cohn 2008a: 157).

Cohn (2008b: 96) stresses the importance of this initial (or preparatory) encounter between researcher and participant for establishing an intimate relationship between these two parties of the experiment. Because researchers are usually aware of the stressful and frightening experience of lying in the scanner, they put great effort into making the participant feel as comfortable as possible and overcoming their vulnerability. In doing so, Cohn notices, they often shift from professional into personalised relationships and thereby strengthen the participant's sense of connectedness with the researcher. He even documents lasting friendships arising from

these encounters. These observations demonstrate how intense and intimate the pre-experimental encounters between researcher and participant can be. At this stage of the experimental process, an empathic and personal relationship with the subject is of professional importance for generating good data.

During the scanning session, the participant in the scanner is only present mediated by technology while the technology itself is immediately present in the control room and hence may be more present in the experimenter's mind (see also Burri 2008).

Image 2: control room during the scanning process

Image 2 shows the experimenter and the Imaging Center's staff during the scanning process. The MRI technologist (left) monitors the technological details of the scanning process; on his screen he has the anatomical brain scan in three axes. The experimenter (middle) is in charge of running the study. In addition to managing the computer on which the experiment is running, she also takes care of the participant in the scanner by communicating via an intercom installed at the desk. The physicist (right) is supervising the eye tracker. The scanner room is behind the dark window. The situation in the scanner can be supervised on the closed circuit TV (CCTV) screen in the right corner. Sociologist of science Regula Valerie Burri (2008) observed in her field work in MRI units that imaging units look everywhere the same and that sometimes only the language spoken reminded her of in which country or city she was (ibid.: 146). Thus, imaging units are at the same time the concrete places in which experiments take part and representatives of globally standardised spaces, independent of the concrete location.

The researcher communicates with the participant in the scanner throughout the entire experiment, even though this communication is minimised. The participant is informed about the next steps in the experiment and she is reassured in her performance, for instance she is told that she is "doing really great" and asked whether everything is fine. While the participant is talked to via intercom, she is asked to avoid talking herself because this would change her head's position, which again would interfere with the scan's accurateness. In case a response is required, non-verbal signs are agreed on before the participant is entering the scanner.

The importance of this kind of communication became evident during one scanning session when something went wrong: in the middle of the experiment the computer program coordinating the screen presentation and data collection suddenly went out of sync with the scanner. The experimenter cancelled and restarted the session but it still did not work. The cancelling and restarting procedure was repeated several times without success and the experimenter was too occupied with the technical problems to think of the girl in the scanner. After some time, the Head of the Lab, who had stayed in the scanning room, came out and exclaimed angrily that it took too much time, that the girl was becoming impatient, and that it was important to talk to her because she did not know what was happening, which would make her nervous. They agreed to try it one more time and told the girl that she was still doing very well but that they had a small computer issue to solve. Finally they started the program manually – this time it worked and the experiment could continue. After the experiment, the girl was particularly praised for her performance. Everybody was evidently relieved that the experiment was over.

This episode shows how important it is for the experimenter to interact with the participant in the scanner, but also how difficult this can be as soon as something is not working according to plan. The researcher is aware that she has a special responsibility for the well-being of the person in the scanner – particularly if it is a child – but at the same time she is occupied with her experiment in which the participant is only one parameter among others. Moreover, the incident shows that even though the well-being of the participant in the scanner is a major concern and topic of permanent discussion, the experimental process is too complex in its social and technological aspects to guarantee a good handling of all components in the case something unexpected happens.

While researchers spend a lot of time thinking about how to make the situation comfortable for the participants, this is a level of 'social' that is neither reflected in the

experimental design nor in the data processing. It is part of the environment in which the experiment takes place, but not part of the experiment itself. For the participant, however, it is closely interwoven with the entire experiment, since for her the experiment starts at the time she enters the site and ends when she leaves; everything happening between these events is part of the experiment from her perspective.

Moreover, interaction during the scan is mediated by technology, i.e. by seeing the participant's brain and eye movements on the screen, talking to her via intercom and watching her via CCTV. A physical and technological distance (Burri 2008: 158) is established as soon as the experimenter moves from the scanner room to the control room to start and monitor the experiment. The intimate relationship that had been established in the training process now becomes a professional and technical relationship. The participant becomes a parameter of the experiment, one of many factors important for generating data. By becoming a parameter of the experiment, subjectivity has to be removed or at least to be controlled. Thus, the intimate relationship between experimenter and participant that had been important for putting the participant into the right mindset for taking part in the experiment now had to be cut off, since this would contradict the principle of disinterestedness of science (see also Cohn 2008b).

If the scan is running smoothly, the people in the control room have time for a chat as the monitoring of the scan does not require full time attention. In the study I observed, researchers and staff were talking about the participant, about previous scans, and about the small things of life. When parents are present, conversation often revolved around the study in general, about seeing the child's brain on the monitor,[40] and about the child herself. In a way, the participant, whilst lying in the scanner, is both present and absent in the control room (see also Cohn 2008a: 156).

4.2.3 Participants' Perspective

During the scan, the interaction between experimenter and participant is unbalanced: while for the people in the control room the participant becomes one parameter among many, the experimenter is constantly present on the participant's mind. The participant, in turn, is permanently aware of the fact that she is taking part in an experiment.

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[40] However, the MRI technologist maintained that he never explains the details of the anatomical scan to parents. The danger was too great that people rely on what he says and that he might be hold accountable or even get sued if he says anything that is proved wrong later. For the same reason, the head of the lab strongly opposes to give anatomical scans to subjects. These ethical questions did come up once in a while during my research.

Cohn (2008a: 152-3) makes two important observations regarding the participant's perspective in imaging experiments: first, participants want to be "good participants", they want to comply with the experiment's requirements and the experimenter's expectations. In short, they want to be helpful by participating in what they are told is very important research. The researcher and the demands of the experiment are on the participant's mind during the entire experiment. Cohn's second observation is that the participant can never forget that she is taking part in an experiment. Lying alone in that narrow tube, surrounded by loud, unfamiliar noise, and watching social stimuli can be quite a surreal experience which will never be anything close to a natural situation. Moreover, she might ask herself whether she in fact is doing well enough to provide good data.

For both observations I found evidence in my own fieldwork. While the participant in the scanner is one among many possible objects of thought and communication for the people in the control room, these people are very present on the participant's mind. These are the people who are watching and judging her performance in the scanner in a way neither known nor accessible to her. She simply cannot know what is happening in the control room where 'they' can see her brain on the monitor, her eye movements on the eye tracker and who decide what she is going to see in the scanner. Thus, her thoughts circulate around those people. After the experiment, many participants expressed confusion about whether they acted correctly and what the experimenter thought about their performance. For the participant's own evaluation of her performance the pre-scan training and the stories told by the experimenter are important. The experimenter's intention is to make the participant comfortable enough during the scan so she would not back out during the experiment. While it might be noisy and perhaps even a bit scary to lie in the scanner, so a common story goes, one gets used to it very soon. While these stories are meant to be reassuring, the experimenter might in fact increase the awareness of experiencing an uncomfortable situation by referring to their own uneasiness in the scanner.[41] Moreover, by emphasising the importance to keep still, this demand, too, becomes a central requirement preoccupying the participant's mind. The PhD student in charge of the study I observed told me that she once scanned a six year old boy who tried so hard not to move that his back was wet of sweat when he came out of the scanner.

[41] One participant, a psychiatrist herself and thus a professional, told me after the scan that she was even more nervous after she heard the stories of the experimenter.

While for the experimenter any scan is just one part of a bigger study, for the participant it is a single and stressful event. In a short period of time she has to adjust to an uncomfortable and unfamiliar setting to an extent that she is able to productively take part in an experiment. Moreover, she needs to find out the codes of behaviour appropriate for that situation. By agreeing to take part in a study, the participant consents to subordinate herself under the experimental designs and to act in accordance with the rules of the design. How to do that she has to find out by doing.
What I have discussed for the interaction between experimenter and participant is also true for the participant's experience in the experiment: while experimenters think and talk a lot about how to make the scanning situation as comfortable as possible for the participant and take quite some time to prepare her for the scanning process, the participant's perspective is not reflected on in experimental designs. Rather, it is a question of how well a person is complying with the experiment's demands and what can be done to improve this. It belongs to the experiment's environment, to the noise that has to be reduced to get good data.

Another important issue is that the participant might wonder what the experiment *really* is about. Particularly adult participants, who are mostly recruited from a university population, might be prone to asking that question. For instance, one psychology graduate student who participated in the Imaging Study claimed the scanning situation, like most situations in psychological experiments, was not very realistic. Thus, she wondered, what the results could tell for real life situations. We discussed the matter of complexity and realistic scenarios with the experimenter in charge and she admitted that the artificiality of experimental situations was a general problem of psychology. But she stressed that it was important to have baselines and controls to get reliable results and, since the artificiality was the same for all stimuli, this would not interfere with the results. This debate about the artificiality of stimuli in psychological and social neuroscience experiments shows quite well that the notion of social as an entity studied in experimentation differs from everyday notions of social. Its complexity has to be reduced and divided into different aspects that can be investigated separately.
However, while the experimenters were painfully thinking about how to improve the experimental design as well as the situation for the participants, feedback on the study itself was not regarded to be useful. In both, the study I took part in designing and in the Imaging Study I observed, friends of lab members took part and commented on the design. While the experimenters listened to them, either they themselves or the head of

the lab decided afterwards that their feedback was not relevant for designing experiments.

In the study in which I was involved designing, the PhD student in charge rejected the participants' feedback on the ground that it was subjective information. She needed the volunteers for testing but not for commenting the design. Whether the design made sense or not was a question of the quality of the data produced. Thus, analysing the data produced by the testing software (what options were chosen, reaction time) was more informative than asking people what they thought about the presented stimuli and whether the task made sense to them.

In regard to the Imaging Study, the head of the Lab generally remarked that it was not a good idea to ask participants for feedback because they do not know the bigger story of which the current experiment is only a part. Again, it is implied that the data generated by technology can tell more about whether an experimental paradigm works or not.

Yet, another lab member who was designing a study asked her fellow lab members as well as other graduate students in the department to give feedback on her stimuli. In that case, participants' feedback was in fact relevant and appreciated because it was important to know how people interpreted the stimuli and whether that matched the intentions of the study. At the stage of designing the stimuli, which are then included in an experiment, feedback seems to be more important.

Generally, it is important that participants feel comfortable in the artificial situation of an experiment but what they think about the actual experimental design is not relevant for the current study or for improving the design as long as good data are produced. As soon as they enter the experimental situation, they are part of the data production machine and not part of the discursive circle designing experiments for testing hypotheses (see also Joyce 2008: 78).

4.2.4 Recruitment of Participants

The recruitment of participants is another social factor in the research process. At North American universities, participants are usually recruited among college student populations as long as the study does not require a specific target group. Psychology majors who can gain course credit or some pocket money by participating in studies provide an abundant resource of experimental subjects. This produces a bias in the sample towards young people around age twenty belonging to a well-educated, white middle-class. Usually, this is not a problem for conducting a study. From the experimenter's perspective, it might even be good to have a homogeneous sample since

that allows correlating differences in brain activation with the actual task rather than with intra-sample differences. Moreover, as was once argued in a Lab Meeting, a student sample might be better for studying cognitive traits since these are particularly trained at universities. Hence, student samples would generate stronger results.

The Imaging Study I observed worked with two groups of participants: Children and adults. The children were recruited from the families of the Head of the Lab's acquaintances and his children's schoolmates. When he recruited a child with a Muslim background, he joked that the sample was now less biased because until then all children came from Jewish families. While this joke suggests some awareness about biased samples – even though religious affiliation may be a weak bias – this theoretical awareness has no consequences for creating samples. All children came from families of high socioeconomic background – in most cases at least one parent was working in higher education, a fact the experimenter reflected on, but only in informal conversations, not in the study itself. The adult sample was recruited among the lab members' friends. In creating this sample, the original aim was to find people who did not work in the psychology department because it was suspected that their knowledge might influence the study.[42] However, in the end fellow psychology graduate students had to be recruited because the circle of friends of the lab members did not include enough non-psychologists.

The informal reflections about the socioeconomic background of the sample indicate also certain awareness of the artificiality in creating samples. At one point in time the issue of biased samples was even discussed in the Lab Meeting. A PhD student working on a study about racial biases reported that not enough African Americans volunteered to take part in her experiments. After considering to exclude the group from the study entirely, she found another solution: she could use the University's business school's testing centre downtown where enough African Americans could be recruited. This report prompted the head of the lab to reflect more generally on biased samples and the ensuing difficulties to say anything about "human nature" on the grounds of small and biased samples. He explained that he started thinking about that problem after one of his papers was rejected by several high profile medical journals because the sample was too small and not complying the scientific standard of randomisation. Interestingly, the issue only became a matter of debate when the common practice of recruiting

[42] Cohn heard the same argument in London (Cohn 2008b: 97).

undergraduates caused problems and ceased to be discussed as soon as a solution for the methodological problem was found.

Despite the (limited) awareness of biased samples, the Lab as well as other social neuroscientists continue the psychological practice of using small, easy to recruit samples. However, this research practice has been criticised from within psychology repeatedly. For instance, already 25 years ago, David O. Sears, social psychologist at UCLA, presented a content analysis showing that social psychology research since the 1960s was drawn from "college student subjects tested in the academic laboratory with academiclike materials." (1986: 515) His suspicion is that relying on such a narrow data set

> "may have unwittingly led us to a portrait of human nature that describes rather accurately the behavior of American college students in an academic context but distorts human social behavior more generally" (ibid.).

He contrasts this approach with social psychology studies of the post-war years when researchers went into the field to study adults in "their natural habitat" (ibid.: 519) rather than the laboratory. He observes a concomitance of the shift from field into laboratory research and a change in the theoretical explanations from behaviourist and psychodynamic explanations of human behaviour towards cognitive approaches towards human behaviour (ibid.: 525).

Twenty years later, P. J. Henry revisits the problem of student samples and representativeness. In his meta-analysis, he shows that the percentage of studies published in high profile social psychology journals using mere student samples even increased since Sears' study, now ranging over ninety percent (Henry 2008: 52).[43] To test the effect of this biased practice in regard to prejudice research, he conducted a comparative study between campus populations and the general public. His findings are that the university sample was generally more open-minded towards minorities, less racist and more open towards affirmative action programmes. He argues that this reflects the liberal and egalitarian culture of academia, which he describes as "a major bastion of liberalism in America" (ibid.: 59). With its culture of political correctness, greater access to other ethnic as well as to political groups, and a liberal curriculum it constitutes a unique environment encouraging certain liberal attitudes. Basing on these findings, Henry identifies two major epistemological threats to psychological research: first, student samples can affect theoretical conclusions when they are generalised to universal truths.

[43] This, of course, is a point in case for Sears' argument that the shift towards cognitive appoaches in social psychology amplified the tendency of using university populations as samples.

While phenomena might occur in a university context, they do not necessarily do so in a broader setting (ibid.: 59-61.). Second, using student samples can affect the research topics and research questions because it influences the way social psychologists look at the world. As Sears before him, he speculates that the strong bias towards university samples might limit the topics studied in two ways, either to topics that are relevant to the academic community or to topics that "are most conveniently studied with students" (ibid.: 64).

While Henry identifies problems in the high rate of student samples in social psychology research, his criticism is based on the culture of the institution – focusing on the more than average liberal climate at US universities – rather than socioeconomic factors. He argues that the liberal culture at universities is so strong it would basically influence anyone exposed to it but he does not reflect the socioeconomic background of those people who do attend these universities. The universities used in his sample charge tuition fees between 13'000 and 40'000 dollars per annum, are all rated "more selective" or "most selective"[44] in the US News National Universities Ranking in 2010 (US News 2010a) and four out of five are private institutions. All of them are located in the metropolitan area of Chicago. These criteria already exclude a large part of the population, which is never exposed to the liberal climate dominating these universities. His lacking sensitivity for socioeconomic influences of the sample composures becomes evident when he points out that the ratio of African Americans in the university sample (10.2%) differs significantly from the ratio of African Americans in the general sample (29.1%) (Henry 2008: 55), without even asking about possible reasons for this uneven distribution. In his argument, the problem is merely one of uneven racial composure of the different samples.

Another line of critique of psychology's tendency towards generalising on the basis of biased samples is voiced with regard to the concentration of US American samples. This issue was already raised by Dorwin Cartwright in his 1979 paper and more recently, psychologist Jeffrey Arnett (2008) points out that US American psychological research claims that its findings about the nature of social, emotional and cognitive functions apply to human beings in general because they constitute universals of human nature. At the same time, however, their samples' scope is mostly limited to what is easily available to them, i.e. people living in the United States and thus neglecting about 95%

[44] Categories are "most selective," "more selective," "selective," "less selective," or "least selective," (US News 2010b).

of the world's population. A content analysis of leading (US) psychology journals revealed that about 73% percent of the authors are based in the United States and 68% of the samples are located there. Taking a global perspective, he shows that in these journals 99% of the authors and 96% of the samples are located in industrialised countries,[45] constituting 12% of the world's population (ibid.: 605-608).

Yet, as Joseph Henrich provocatively points out,

> "people from Western, educated, industrialized, rich and democratic (WEIRD) societies – and particularly American undergraduates – are some of the most psychologically unusual people on Earth" (Henrich et al. 2010: 29).

Thus, it is problematic to generalise findings from samples of US American students to something as universal as 'human nature.' By extrapolating from studies designed by researchers thinking about Western societies and using Western samples they infer that the Western way of organising life is the norm.[46]

Arnett speculates that psychological research could proceed in that way because it was more interested in core processes and principles than in the living conditions of the people studied. This resulted from the dominance of the scientific paradigm and the experimental method in mainstream US psychology. In laboratory experimentation, so it is assumed, external variables could be controlled and were thus irrelevant. He argues that despite the emergence of cultural psychology within the last ten years, the prevailing assumption in psychology still is

> "that people anywhere can be taken to represent people everywhere and that the cultural context of their lives can be safely ignored" (Arnett 2008: 610).

This trend got even stronger in recent years with the growing importance of cognitive science, neuroscience and behavioural genetics within psychology, all of which are disciplines looking for (biological) universals rather than cultural contexts (ibid.).

These examples show that a debate about the quality of samples and the possibility to infer universal claims from one's research does exist in psychology. However, Henrich's and Arnett's papers are not cited very often according to *Web of Science*,[47] thus the question remains open how strong the debate about sample biases is within psychology (and social neuroscience). The fact that the head of the lab asked whether there are

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[45] North America, Europe, Australia, New Zealand and Israel.

[46] This argument is embedded in the broader discourse of postcolonial studies, strengthening non-Western perspectives in all areas of academia. For an overview see e.g. Ghandi 1998 or Young 2003.

[47] Information retrieved December 2010.

discussions about the topic and that nobody from the group could name a paper indicates that these reflections are in fact not part of the mainstream psychology curriculum. Nevertheless, it is important to mention that at least the issue of cultural diversity is beginning to be discussed in social neuroscience and a new neuro-subfield called cultural neuroscience is emerging. The journal *Social Cognitive and Affective Neuroscience*, for instance, published a special issue on the cultural neuroscience in 2010, and in 2009 a handbook on cultural neuroscience was published (Chiao 2009). Yet, the notion of culture underlying research in neuronal substrates of cultural differences has to be as much situated in its cultural-historical context as this study attempts to do with social neuroscience's notion of the social, because what 'culture' and 'cultural difference' mean is by no means clear as debates in cultural anthropology show (Cliffort/Marcus 1986, Rees 2010a). A genealogy of different concepts of culture in anthropology and their integration or neglect in cultural neuroscience would help to situate this research field in these debates.[48] However, this analysis is beyond the scope of this study.

4.2.5 Additional Information

While some information is crucial for publishing studies, namely age, gender and race of the participants, sometimes handedness, other is not. This implies the assumption that some categories (e.g. gender, race, or whether one is right- or left-handed) are more important for understanding differences in how participants respond to tasks than others (e.g. education, income, or which political party one supports). Take any randomly chosen paper and you will find that the first categories are an integral part of virtually every study, while the latter are only mentioned if they are directly relevant for the actual research question. In social neuroscience's quest for human nature this also means that some categories are defined to be more at the core of human nature than others and thus probably more biological and less cultural, more determining and less prone to external influences, because they can be correlated to brain structure or activation. The choice of categories for social psychology and social neuroscience experiments defines what is relevant for data analysis and what is not. These choices follow conventions and reproduce common sense notions. Because gender is a category for data analysis and income is not, gender differences are manifested as objective and natural by psychological and neuroscientific studies while differences in income are not.

[48] For a recent contribution to the debate from the perspective of biological anthropology, see Marks 2009.

Data on social factors collected outside the scanner are treated as static entities providing the basis for creating static statistical groups (based on ethnicity, gender, age, or education). These data are collected regardless of their relevance for the experiment and used to analyse the imaging data along conventional criteria of psychology. The presentation of this "demographic information" in research papers has almost the character of a ritual but it rarely contributes to a better understanding of the results. By integrating these categories into data analysis, they are established as more or less natural distinctions manifested in the brain (men are different from women, African Americans are different from Caucasians, left handers are different from right handers). Since if these are categories of analysis, they must show distinct activation patters in the brain. And, by showing distinct activation patterns, the differences are inscribed in the biological make-up of members of these categories (cf. Kaiser et al. 2009: 54).

While the above-mentioned demographic information is not relevant for interpretation, other information certainly is. Questionnaires assessing character or personality traits, certain emotional skills or attitudes as well as subjective ratings of the presented stimuli are necessary for making sense of the data. While some debates I observed in the Lab indicated an awareness of the tension between the need to consider participants' intentions and strategies on the one hand and the paradigm of objectivity on the other, the predominant view was that data generated by the scanner was more reliable than self-reports and that, in the interpretation of results, subjective accounts should be ruled out as far as possible. The object of investigation is dissociated from those parts of its context that do not belong to the experiment and thus cannot be controlled in the experimental design. They are part of the "noise" that has to be eliminated when processing the data. Complex motivations and intentions of the participants volunteering for the study are not taken into account in the process of data analysis (cf. Star 1983: 222-3). As soon as they enter the imaging centre, volunteers become a 'resource' in the production process of fMRI images (Joyce 2008: 78).

From what has been discussed in this section, it becomes clear that the scanning process is far from being a sterile experimental setting. Intimate relationships between the main actors (experimenter and participant) are crucial for the experiment to work. However, from the experimenter's perspective, once the experiment begins the participant is reduced to being a part of the experiment, while from the participant's perspective the experimenter is consciously present during the whole process. Cohn observes that

> "[w]e can see a reiteration in this of the paradox that in order to make objective claims about the function of a particular part of the brain during an experiment it is actually necessary to engage with the subjectivities both of the scientist and of the volunteers." (Cohn 2008b: 99).

This bundle of interpersonal relations and interactions is not included into the processing and evaluation of the generated data; rather it is, as Cohn argues, "extracted as artificial noise" (ibid.: 99). Some social neuroscientists are becoming aware that neglecting the social context of the research process is problematic (Roepstorff et al. 2009), but usually it is argued that these factors are the same in all conditions tested and can hence be ignored. Treating interpersonal relationships that are not part of the experimental design as noise is a result of the dominance of the experimental paradigm in social neuroscience but also of the focus on biological substrates, which are assumed to be the same in all human beings. Taking an anthropological stance, Andreas Roepstorff gives a short, to-the-point account of how subjective experiences are transformed into objective findings about how the mind works:

> "Brain mappers turn individual persons into experimental subjects and put them into narrow tunnels. They expose them to strange stimuli and bombard them with invisible rays and forces. Finally, they claim that this can reveal the true, objective nature of the workings, not only of their subjects' minds but of everybody's mind. This redraws the boundary between nature and culture by showing humans to be very much like animals (...) and yet also to be very unique with highly particular and specific abilities like mind-reading, cheating and feeling empathy" (Roepstorff 2004: 1106).

4.3 Critical Reflections on Social Neuroscience Experimentation

Social neuroscience investigates the social by using quantifying methods, which has some implications for how the social is perceived. This section discusses the implications social neuroscience's research methods have for their subject of interest, namely the relationship between the social and the brain. The focus lies on methodological constraints for investigating the social by discussing three issues, the exclusion of historical, cultural and social factors from experimentation, the reduction of complexity and methodological reductionism.

4.3.1 Exclusion of Historical, Cultural and Social Factors

As discussed in the previous section, social neuroscience has to deal with several complex factors of social interactions that are not reflected in experimental designs or in conclusions and theories derived from research.

Another conceptual problem emerges from the fact that experiments can only take into account what is actually present and empirically measurable in a given laboratory setting. Any parameter not immediately present or traceable cannot be studied in this kind of experiment. This is particularly true for the personal life-history and the habitus of the participant as well as all for kinds of motivations and intentions deriving from life-history and habitus. Generally speaking, while it is possible to investigate neuronal correlates of attitudes or emotions in a specific situation, social neuroscience cannot say anything about *why* a person holds a specific attitude or what she associates with a specific stimulus triggering the emotion studied. In other words, the social investigated by social neuroscience is necessarily context-free because it has to be an event that can be controlled. For being controllable, the social has to be a clearly defined entity without any links to the world outside the experimental design. Real-world social interactions, attitudes or emotions, however, are never context-free and always have links to other events and experiences that are related to other people, times and places.

Social psychologist John Cromby (2007: 163) points out that this experimental limitation reflects a more general epistemological implication of social neuroscience research: by measuring biological and social variables with the same tools, both are treated as parameters side by side in one experiment. In consequence, qualitative differences between social and biological factors in acting, thinking and feeling are ignored. By treating them as if they were of the same kind, it is disregarded that 'social', unlike 'biological', is always connoted with meaning. Moreover, social factors are often seen as mere causal forces or inputs which can be controlled and measured in experiments (ibid.: 159). In actual research practice, social variables such as socioeconomic status – if collected at all[49] – are dealt with as more or less static, fixed or uniform parameters which can be measured in scales and to which imaging data can be correlated. Obviously, this technological limitation determines the kind of questions that can be posed in the first place. As has been shown in the first section of this chapter, this approach has a long tradition in social psychology as an experimental science and has been a by-product of social psychology's transformation into a quantitative science.
I argue that Cromby's criticism of how the social is treated in social neuroscience research is correct, but that it addresses only one part of the story. The point that has to be added is the following: In the imaging experiment itself, social variables cannot be

[49] The demographic questionnaires used in the lab are very short and contain questions about ethnicity, gender, age, education, and handedness, see above.

taken into account at all. fMRI studies measure differences in blood flow in brain areas that are related to neural activity, which again is mapped to certain stimuli in the data analysis. From this perspective, social variables only appear viable if they can be traced down to biological processes causing cause differences in blood flow within specific areas of the brain. This narrows down the scope of studying the social by looking for changes in the organic substance, which then have to be reconnected with the events originally causing them. And, as Cromby argues himself, any kind of associations with people, objects, past or present events in the world outside the imaging centre that might be triggered by the stimuli have no space in the analysis of imaging studies. The process of mapping or correlating, however, is far from unambiguous; these are statistical correlations such as that when watching stimuli of category A, brain area x is more activated while when watching stimuli of category B, brain area y is more activated (see Chapter 3). Imaging studies cannot give any information about causalities. Hence, "why-questions", a type of questions important for understanding complex phenomena of the social world, cannot be asked in imaging studies.

4.3.2 Ill-structured to Well-structured Problems

This is not a sole problem for social neuroscience methodology, but rather of the scientific method in general. "Scientific work involves the representation of chaos in an orderly fashion," sociologist of science Susan Leigh Star observes in her study on simplification in scientific work (Star 1983: 205). This implies drawing boundaries and excluding certain objects and questions from scientific investigation because otherwise scientists would lose themselves "in endless contingencies" (ibid.: 206). She argues that in the process of scientific research 'ill-structured' problems are broken into pieces, which are then treated as if they were 'well-structured.' This creation of 'well-structured' problems, however, involves ignoring complexities such as "uncertainties in the environment, subjects' reaction, unforeseen interaction effects." (ibid.: 207). Components of any experiment have to be "simple enough to be managed", and learning how to manage complications and complexity is an essential part of scientific work and training. By the transformation from 'ill-structured' to 'well-structured' problems in combination with deleting descriptions of this process in presentations of scientific research, the histories of knowledge production get lost and scientific results become reified as scientific facts (ibid.).

Star's observation also applies to social neuroscience experimental research. This branch of research engages with one of the most chaotic phenomena: (human) social

interaction. Social neuroscience's initial problems are very 'ill-structured' indeed: they are real-world problems that do not yield any particular answers, have many connotations, layers, implications, and usually history and future. For investigating these messy 'ill-structured' problems with the tools of social neuroscience, they have to be transformed into 'well-structured' ones. For this purpose, complex and messy real-world problems have to be divided into several sub-problems, some of which can then be investigated by social neuroscience (e.g. neural activations or hormonal changes during a decision making process) while others have to be ignored. This segmentation is not the result of any individual researcher's conscious decisions, but rather a consequence of looking at real-world problems from a (social) neuroscientific perspective, i.e. being interested in neuronal processes during social events. And, as shown above, the segmentation of social phenomena in quantifiable entities has been part of social psychology's thought style since the 1920s and is thus part of the discipline's self-understanding, which is handed on to each new generation of students and eventually incorporated in their research practice.

Investigating problems in such small pieces, however, entails the risk of losing the perspective on the broader picture and taking the small piece for the whole problem (ibid.: 223-4). The experimental design in social neuroscience research requires rendering the research interest in a narrow, quantitative and reductionist fashion. This does not necessarily imply a reduction of complexity in the stimuli or situations presented (some studies for example work with baseball game situations, feature films or election campaigns) but in the questions asked and/or the brain regions investigated.

However, the segmentation of one big 'ill-structured' problem into many smaller 'well-structured problems' is not simply a practical question of how to put a research question into practice but a matter of how to think about a problem, how to conceptualise the object of investigation. To conceptualise complex issues such as voters' emotional reactions to election outcomes or empathy with members of an 'out-group' in a way that they can be investigated by generating quantitative data involves a reductionist approach to real-world phenomena. The underlying assumption is that a complex phenomenon can be split up into several problems and thus is not more than the sum of its parts. This notion is fundamentally different from a hermeneutic approach towards complex phenomena dominant in humanities and non-quantifying social sciences.

4.3.3 Reductionism

In explaining their approach to studying (human) social behaviour, social neuroscientists pay credit to the problem of complexity by drawing on the concept of different levels of organisation (Cacioppo/Berntson 1992) and different levels of analysis (Ochsner/Lieberman 2001). As a "Doctrine of Multilevel Analysis", Cacioppo and Berntson (1992) outline some programmatic principles for understanding mental and behavioural phenomena and their underlying (neuro-)biological processes. They maintain that, although the brain is the essential component of all social beings, the nature of brain, behaviour and society is too complex to be reduced completely to neural processes. Moreover, they stress that theories of social behaviour have to consider both social and biological levels of organisation. They exemplify this necessity with behavioural genetics, drug abuse, and cancer research and demonstrate that a "multilevel integrative analysis" indeed helps to understand complex phenomena such as drug abuse in all their facets. A multilevel analysis aims to integrate knowledge and theories gained both about the elements on each structural level (by its associated discipline) and on the relational features of these elements across levels. This approach should help avoiding the pitfalls of reductionism – an aspect emphasised again in their 2005 textbook, where they suggest that "the broader the collaboration between different disciplines, the better the understanding of mind and behavior" might be (Cacioppo/Berntson 2005: xiii).

Social neuroscience's notion of levels is more complex than traditional theories of levels in positivist science, because they do allow for inter-level relations; this makes influences of higher on lower levels thinkable. Neurobiologist Steven Rose argues that each of these levels has its own language for describing any given phenomenon and that rather than reducing the language of, say, biology to that of physics, it would be more appropriate to translate the one into the other and thus accept them as equal (Rose 2005: 94). However, since social neuroscience does not take into account debates from non-quantifying social sciences and humanities – disciplines not speaking the same language, not even one that can be transformed into numbers – it does not really integrate knowledge across all levels. Knowledge from other disciplines can only be integrated if it is compatible to the language of quantifying sciences.

This is not a sole problem of social neuroscience. Steven Rose points out that reductionism as methodology enables scientists "to generate seemingly linear chains of

cause and effect" (ibid.: 77). Reductionism has been a powerful method over the last centuries because it helped to gain deep insights into the way the universe works and also simply because it seems to work most of the times. However, Rose, who faced problems of reductionism in his own research practice, emphasises that, as soon as it is forgotten that it is only one of many possible methodological tool for understanding complex problems and not a true-to-life picture of how the world really is, it might turn into ideology (ibid.: 78-80).

Sociologist of science Martyn Pickersgill (2009) investigates the notions of "biology" and "environment" in research and clinical practice of neurological psychiatry. Even though he does not come across the concept of levels in his study, his findings have interesting implications for interpreting social neuroscience's concept of levels. He demonstrates that, even though human life sciences such as genetics, epigenetics or neuroscience may work with reductionist categories on an epistemological level – for instance by reducing the causality of psychiatric disorders to genes or neurotransmitters in their research, in their clinical practice, their assumptions are often far from reductionist. Concepts of 'environment' are important in many of these disciplines, covering a multitude of aspects from cellular environment to socio-economic status, all of which may be responsible for a psychiatric disorder to manifest. These concepts may be crude, particularly when compared to concepts of the social world as they are discussed in the social sciences but they indicate that at least some level of causality by factors "outside the material limits of the body" is admitted (ibid.: 46). However, in his analysis of interviews with neuroscientists he can also show that this discrepancy between epistemological reductionism and practical recognition of the complexity of real-world phenomena is not resolved in the research process (ibid.: 57-8). As exemplified in Cacioppo and Berntson's 'multilevel doctrine', social neuroscientists like the neuropsychiatrists in Pickersgill's study do assume that their research contributes to developing a broader picture of sociality, but – again as stated by said neuropsychiatrists – at the level of research, real-world phenomena cannot be captured in their complexity. Here again, an unclear stance between a practical recognition of complexity and an epistemological reductionism can be observed. Sociologist Robert Dingwall et al. (2003: 635) identify a "philosophical realism" prevalent in biology at the core of this problem. This realism is unsustainable when working on matters that the social sciences are concerned with:

> "The problem with the biological explanation of crime is that it attempts to cross from one kind of object to another without recognizing the need to confront the epistemological challenges that arise in the process" (ibid.).

The simplistic view of "environment" prevalent in social neuroscience may hence be the result of a category mistake inasmuch as the appropriate ways of understanding certain phenomena are confused in crossing from one level of analysis to another.

4.4 Conclusion

In this chapter I have shown that social neuroscience's notion of the social as a capacity of individual brains stands in the tradition of experimental social psychology. While early, European social psychologists saw a strong relationship between individual and society, the latter was merely understood as a stimulus on the individual in experimental social psychology that emerged in the United States of the 1920s and 1930s. The individualistic notion of the social is a product of an interaction between economical and political factors, such as marketing and policy making, ideological factors such as individualistic culture versus collectivist organisations of society as well as democracy versus Fascism, and methodological constraints imposed by quantitative methods and statistics. Social neuroscience's notion of the social is a consequent continuation of this individualistic concept. As in experimental social psychology, the social in social neuroscience is a quality of the objects perceived. The ability to process these stimuli is a capacity of the individual's brain. This notion is fundamentally different from the notions of qualitative social in social sciences and humanities.

I have also shown that in social neuroscience's research practice various aspects of social interactions and cultural assumptions are necessary for designing and conducting experiments. However, these aspects are not part of the data analysis and they have to be eliminated as noise, as my ethnographic fieldwork revealed.

The individualistic notion of the social, as discussed in this chapter, is only half of the story. In social neuroscience it is joined by an evolutionary narrative of adaptiveness of pro-social behaviour. In chapter 6, it will be discussed how a new norm of socially acting individuals is created and how the focus on neural capacities of sociality coincide with a time when responsibility for social cohesion is de-centralised by the principle of subsidiarity. Before coming to that, a genealogy of the social in the brain sciences shall be outlined in the following chapter.

5. How Does the Social Get Into the Brain? – Historical Perspectives

5.1 The Social and the Brain in the History of Brain Science

In the preface to an essay volume on social neuroscience, John Cacioppo and Gary Berntson observe the following about the relationship between biological and social sciences over the course of the 20th century:

> "To simplify the study of the mind, neuroscientists in the past century tended to ignore or hold constant social influences, while cognitive and social scientists tended to ignore the biological constraints on and mechanisms through which cognition, affect, and conation are expressed. As conceived by the neurosciences, the architects of development and behaviour were anatomical structures and genetic strings sculpted by the forces of evolution operating over millennia and encapsulated within living cells far from the reach of social influences; the brain was an analytical information-processing machine. Information attributable to the social world, the reasoning often went, was best considered later, if and when the need arose; social factors were thought to have minimal implications for basic development, structure, or processes of the brain or mind, and thus to be essentially irrelevant. But even if social factors proved relevant, considering them may render the study of the human mind and behaviour too complicated to sustain scientific progress.
> The century's two world wars, Great Depression, and widespread civil injustices made it amply clear, however, that social and cultural forces were too important to await the full explication of cellular and molecular mechanisms.
> As the twenty-first century dawns, there is a recognition that much of the groundwork for multidisciplinary scientific collaborations has been laid by the giants of the preceding three centuries. Neuroscientists, cognitive scientists, and social scientists are placing less emphasis on the arbitrary division between the social and the biological sciences and are moving beyond simplifying assumptions toward developing more comprehensive theories of mind, brain, biology, and behavior. Through the efforts of such individuals (…) the broad multidisciplinary perspective of social neuroscience has emerged" (Cacioppo/Berntson 2004: vii-ix).

This passage is a classical trope of a founding story. The authors are defined as founding figures of social neuroscience and belong to the more integrative camp, emphasising an evolutionary approach to the social brain. In this passage they claim that for more than one century, neuroscience on the one hand and cognitive and social sciences on the other hand were working in oblivion or at least ignorance of each other's work and findings. Finally, some smart people – the would-be social neuroscientists – realised the potentials of collaboration across the cultural divide between natural and social sciences and thus contributed to the emergence of social neuroscience. From this brief historical overview it does not become clear what happened before the twentieth century, yet the statement in the last paragraph, that the groundwork for collaboration has been laid over the course of the last three centuries, lets us assume that the "giants" have done the

basic research within their own disciplines, allowing their heirs to stand on solid grounds while reaching out to other disciplines. This interpretation leads to the assumption that in the dark ages before the last century, no cooperation between the disciplines took place – this is insofar correct as neither psychology nor sociology are older than about a century and thus could not collaborate with each other nor with brain sciences (which are about 200 years old).

Compelling as Cacioppo and Berntson's story might be, the history of the relationship between the social and the brain is more complex, as is the history of the brain sciences, which is the topic of this chapter. Over the course of the history of debating what human nature is and which role the brain plays in it, the pendulum has swung in either direction of nature and culture, and cross-disciplinary discourse as well as controversy have not been infrequent. The debate was not only, as the authors imply, on the question of how social factors were influencing the brain, but also vice versa: by studying the brain, it was not only supposed to generate knowledge about social behaviour but also to base social policy on that knowledge. And even in the decades between 1920 and 1990 in which psychology and cognitive science have been dominated first by behaviourism and then cybernetics, some researchers were working on more holistic concepts of the brain in the world, most famously German-American neuropsychologist Kurt Goldstein, who developed a holistic notion of brain and organism, basing on Gestalt theory (Goldstein 1934, see Harrington 1996: 152-3). Interestingly, these were clinical neurologists, working on brain lesions affecting social behaviour. In the broader realm of biological sciences, sociobiology took the task of developing a "modern synthesis" (Wilson 1975) as a general science of human (social) behaviour. Moreover, some social scientists have been more open to evolutionary thinking than the quoted passage leads to assume. None less than Hebert Spencer, a founding figure of both sociology and psychology, has not only been influenced by the brain science of his time, phrenology, but also developed a theory of evolution, applicable to the inorganic, the biological life as well as social life.[50]

The aim of this chapter is a genealogy of notions of the social in brain research. It is the attempt to contextualise the epistemic object "social brain" in the history of the brain sciences, focusing on two aspects in its history: localisation theories and theories of evolution. These two topics are particularly relevant for social neuroscience in their

[50] On the influence of evolutionary concepts on the social sciences in the course of the 20th century see for instance Hofstatter 1955 and Dietz et al. 1990.

attempts to map certain functions to brain areas or neural circuits and in their quest for evolutionary explanations of sociality.

Since the emergence of modern brain research around 1800, the relationship between brain, behaviour and the social world has been discussed time and again. This became possible by a conceptual shift concerning the understanding of body and soul. Until then, for about 150 years, this Cartesian dualism and the notion of the brain as the organ of the soul have been the dominant paradigm in reasoning about the brain. René Descartes famously postulated a strict dualism between body and soul which he perceived as independent yet interacting entities. While bodies are divisible and mortal, souls are indivisible and immortal. In this concept, the locus of interaction between body and soul was the brain, or more precisely the pineal gland, which was – according to Descartes – the only cerebral structure existing only once in the entire brain and not, like all other brain structures, once in each hemisphere. This singularity served as a clear indicator that it had to be the seat of the soul, which also only existed once (Harrington 1987: 6-7).

5.2 Studying the Scull

5.2.1 Gall's Organologie

It was the Viennese anatomist Franz Joseph Gall who first famously challenged the hierarchical organisation of brain and body and established a new significance of the brain as the originator and elicitor of the various expressions of human nature (Hagner 2001: 543). Two aspects of his doctrine are of particular importance here. First, all capacities and behaviours were connected to a material basis in the brain and were thus comparable with each other. Gall defined 27 organs or faculties, each being responsible for a certain capacity, ranging from organs for reproduction and parental love over organs for vanity, criminality or murder to organs for musicality, religion or metaphysics (van Wyhe 2004: 213). In this *Organologie*, as he soon called his theory, everything from reason to the most animalistic drive had a material seat in the brain and thus it was possible to discuss altruism and insanity on the same materialistic level. Second, Gall was the first who connected cerebral development with personal development. At least in his later work this link was clearly a one-way street: behaviour is rooted in nature, i.e. in the brain, and thus the development and justification of social norms should base on brain research. Brain research in consequence was understood as the leading science for explaining human nature (Hagner 2000: 104).

Since Gall believed that the shape of the cortex was imprinted in bulges in the scull, he could test his theory with living subjects by palpating their heads. Thus, while being a theory of the brain, organology's object of study was the skull. For this being possible, some premises had to be fulfilled, as historian of science Roger Cooter points out. He identifies five of these premises on which Gall's organology bases: 1.) the brain is the organ of the mind, 2.) the brain is an aggregate of several mental organs, 3.) these organs can be located topographically and are responsible for specific functions, 4.) if other factors are constant, the relative size of one organ as compared to others is an indicator for this organ's power, 5.) since the skull takes the shape of the brain during infancy, craniological measurements of the skull provide insights about the brain's organisation (i.e. the size of the different organs) (Cooter 1984: 3).

While in Gall's theory the brain was not structured in terms of centre and periphery (pineal gland and the rest, as in Cartesian notions of the brain as organ of the soul), another hierarchical order is operating in his localisation doctrine. Cognitive and analytical faculties were located in the frontal cortex while emotions and drives were located in the back. Thus he was, as both Cooter and Hagner stress, the first to treat mental phenomena and the passions as functions of the brain, which had to be investigated by the means of neurophysiology and neuroanatomy (Cooter 1984: 3; Hagner 2000: 104). Following this assumed division of labour between the different regions, Gall's classification system was not as simple as associating small brains with low mental capacities and large brains with high mental capacities. Rather, in his theory, the various faculties of brain and mind could have different sizes, thus the composure of the faculties (as seen in the shape of the skull) is crucial (Hagner 2007: 58).

Hagner emphasises that this doctrine of inscribing mental qualities into the cortex was not only the advent of modern brain research but also the foundation of modern concepts of human nature. Gall's doctrine was both individualising and somatising human abilities and capacities. Concepts that were previously considered to be immaterial such as soul, personality or freedom of will were now reduced to products of the various organs (Hagner 2007: 58-9).

This shift made it in principle possible to relate brain functions to human behaviour and its social consequences such as criminality, immorality, or gender and racial differences. By this shift the brain gained importance but paid the price of losing value: while all aspects of human nature could now be located in the brain, also those aspects of human nature that were formerly located far away from the organ of the soul were new a part of

the brain. Thus, lower instincts, drives and affects were located rather closely to intellectual and moral faculties. The brain was no longer the exclusive seat of the noblest faculties of human nature (Hagner 2000: 128).

5.2.2 British Phrenology

While Gall and his *Organologie* were soon discredited on scientific and political grounds,[51] his doctrine remained popular throughout the 19th century, particularly in Great Britain; both as popular science and as a basis for social reform movements (Hagner 2001: 543). It was his assistant Johann Gaspar Spurzheim, who introduced Gall's doctrine to the British audience. Spurzheim left Gall after some serious quarrels in 1814 and travelled to Britain where he began a lecture series on Gall's doctrine. However, he did so with his own modifications, most notably he increased the number of cerebral faculties from 27 to 33 (van Wyhe 2004: 27-30).

In his lectures and publications, Spurzheim claimed to aim at nothing less than understanding human nature which, according to him, was still a mystery by and large. The reasons for it still being a mystery were firstly that human beings were treated as being separate from nature, which Spurzheim claimed to be wrong and that, secondly, so many different doctrines about human nature existed that it was not easy to know which one was correct. The mystery of human nature could only be solved by relying on nature and the sciences, the only way of getting to the true nature of humankind. His system, Spurzheim claims, was the science of human nature finding the answer to long-pressing questions about human nature, morality and the mind (ibid.: 31).

In Britain, and particularly in Edinburgh, phrenology, as it was soon called, was highly successful and promised its proponents fame and wealth. Historian of science John van Wyhe observes that the cultural climate in post-Napoleonic-Wars Britain was much more receptive for this doctrine than the romantic German culture of the same period (ibid.: 23). Cooter argues that the reason for Gall's doctrine's success in Britain was that for the first time the mysteries of the mind were studied in terms of medicine and science, uniting in its notion of the mind neurology and biology of adaptation. Thus,

[51] The implied materialism of Gall's doctrine caused him considerable problems in getting his theory accepted in the academic community and in political terms, since it was viewed to be anti-clerical, republican and more generally against the ruling order (Hagner 2000: 105). The problem of materialism was the following: in the Cartesian tradition, mind proved God since it was sentient rather than simply animated by collision of particles. Now the mind was reduced to a mere function of the brain, it was no longer immaterial and thus no longer a proof of God, and in last consequence questioning the existence of God (Cooter 1984: 5). Even though Gall tried to protect his doctrine from this logic, it was perceived as materialistic and God-denying by others (Hagner 2000: 105).

highly metaphysical concepts of the mind were transformed into organic entities understandable also by the more practically minded (Cooter 1984: 32).

Moreover, he points out, phrenology helped to establish the newly emerging industrial age as a natural order of society:

> "(P)hrenology naturalized the emergent structures and relations of industrial capitalism by casting them into the descriptive and explanatory language of mental organization and mental function. Thereby those structures and relations came to seem 'as ourselves,' or as corresponding with the known 'facts' about the innate nature of man, while deviations from them began to appear as pathological. Here, in fact, were the roots of what would come to be known as functionalist social theory; and it should come as no surprise that the seminal theorists of functionalism all owed large debts to phrenology" (ibid.: 113).

Phrenological concepts of faculties provided sufficient tools for speaking about human behaviour in a scientific manner and thus phrenology was an important force in naturalising the human condition. As van Wyhe points out:

> "An organ or faculty sought fulfilment of its function, and proper function led to morally correct action. If an organ was diseased or congenitally enlarged, it would go beyond the proper limits of its natural functions, and evil and vice would ensue." (van Wyhe 2004: 60).

It seemed, phrenology was a timely theory, emerging exactly at a time, when a naturalistic explanation of human abilities and their pathologies became useful in establishing a new social order in which not descent but ability were supposed to be key to social success.

5.2.3 George Combe and the Constitution of Man

According to both Cooter and van Wyhe, the most important book in the history of popularising phrenology in Britain was *The Constituion of Man Considered in Relation to External Objects* by Edinburgh phrenologist George Combe (1828).[52] This bestseller was advocating the application of phrenology to self-conduct and attempted to establish a science of morality. According to Combe, the best way to happiness was to maximise one's intellectual and moral faculties and to suppress the animal desires as much as possible (Cooter 1984: 122). Yet, it is important to take into account that despite its author's role as a leading phrenologist, *Constitution of Man* was not a book merely dedicated to phrenology. Rather, Combe differentiated between the natural laws as the

[52] Interestingly, it was this book basing advises for self-conduct on state of the art brain science which was the most influential book arguing for non-static nature before Robert Chambers and Charles Darwin (van Wyhe 2004: 117).

knowledge he was aiming at and phrenology as the tool for gaining that knowledge (van Wyhe 2004: 110).

The book's basic argument was that if humankind was to follow what he calls "natural laws", everybody would live a happier and healthier life in a happier and healthier world, progressing to ever more perfection or as van Wyhe puts it:

> "Combe portrayed a world in which the natural laws were wisely designed by a benevolent (albeit deistic) creator to function in perfect harmony with the mind and the body of Man" (ibid.).

Combe is not explicit about what nature in fact is but van Whye's summary of the definitions of nature scattered through the book is the following: Nature is the work of God and is evolving and progressing by following natural laws from the simple and crude to the more highly organised and civilised over time. He found evidence for his claim in fossils as well as in comparing the current state of the civilised world to older ages. It could also be found in the emergence and development of science, morals and government (ibid.: 116). Not only nature, also Man (sic!) was progressing. Like the former he progresses from primitive to most civilised and since phrenology showed evidence that intellectual and moral faculties were uniquely human, these had to rule and to govern the inferior faculties. Yet, if an individual failed to do so, it was their own fault if they had a bad standing in life or were living in poverty since they were not living in accordance with Nature.

Combe defined three natural laws governing the constitution of man: the physical, the organic and the intellectual. These three laws corresponded with three classes of faculties: the animal, the moral and the intellectual. A sub-group of the intellectual laws were the social laws, which were basically synonymous with a concept of division of labour between the different social classes. The poor were – in good Malthusian manner – accused of violating these laws by multiplying in too big numbers and thus producing a bigger labour force than needed and than could be fed (ibid.: 119-123).

While he stressed that the natural laws were absolute he still reminded his readers not to break them and thus Combe's book was more than a description of natural laws, it was a manual of how to improve oneself by training the moral and intellectual faculties: encourage morality and avoid selfishness. While it may seem difficult to combine a deterministic concept such as phrenology with technologies for self-improvement, Combe argued that while character was formed by nature to some extent, it was always possible to improve it or to neglect it. Cerebral faculties had to be trained like muscles

and education was key to this. Consequently he was an advocate of free juvenile education (ibid.: 181).

Combe's attempt of locating human nature in the brain was perhaps the most read but by no means the only or even the first one. Rather, it was an integral part of Gall's organology and later phrenology. In phrenology, all human capacities had material locations in the brain and they could be improved by training, at least as long as no malfunctions lead to deviant behaviour. Since the brain was the seat of human nature, social rules and norms should base on knowledge generated by brain science. Locating social capacities, i.e. capacities necessary for interacting with others, in the organic make-up of individuals' brains and making it their responsibility to enhance these capacities seems to be quite coherent with our understanding of the individual but it was rather revolutionary in early 19th century. However, it matched the general attitude of emerging industrial capitalism and ensuing rise of the individual. The general intellectual climate of the time favoured theories emphasising the individual and thus scientists supporting such theories. Hence, advocating phrenology was not always a merely scientific enterprise. Many British phrenologists were non-established scientists and pursued this science not only for the sake of explaining human nature but also for improving their own social and monetary position. Combe's advocacy of technologies of the self and the notion of one's own responsibility of well-being not only reflected his background in Scottish Calvinism (Cooter 1984: 104) but also was a promising recipe for personal progress and justification of success in a static social order.

It would be easy to consider phrenology as a highly successful, yet fundamentally wrong theory in the history of the brain sciences. More fruitful, however, is it to look for patterns in establishing a certain notion of human nature as the only true knowledge. Van Whye compares the fixed belief system of phrenology and contemporary evolutionary biology and sociobiology. They are similar, he argues, in their naturalistic approach to human behaviour, beliefs in inborn tendencies, links between brain capacities and nature, as well as their thinking in faculties or modules. Moreover, the criticism raised against evolutionary psychology is more or less the same that had been raised against phrenology: being false, pretending to be something it is not, and being dangerous. But the most important similarity is on an epistemological level: evolutionary psychology, like phrenology, is accused to make too broad claims on too weak empirical grounds and claiming too much authority on explaining the relations

between Man and Nature (van Wyhe 2004: 205). This comparison between 19th century's and 20th century's projects of locating human nature literally in the organic dispositions of the individual shows a certain fondness of looking for explanations of the world how it looks like or the world how it should look like in nature. The losing explanatory power of religion in defining human nature is thus replaced by materialistic and individualistic definitions of who we are and why we are. However, this nature is always mediated through culture and the historical time and place in which such theories are developed (see chapter 6).

5.2.4 Phrenology's Influence on the Human Sciences

Gall's doctrine, mediated and transformed into phrenological science, popular science and applied science was also influential in the early years of two new human sciences, psychology and sociology, most notably in Britain and France. Cooter stresses that Gall's notion of brain functions and the necessity to investigate them by empirical studies both of humans in society and of species in nature is the basis of functionalist reasoning in sociology and psychology in the late 19th and early 20th century (Cooter 1984: 3). Leading theorists of early sociology and psychology included into their theories an organismic metaphor, which should become the ruling paradigm in sociology, social anthropology and psychology (Cooter 1984: 113). Thus, even though phrenology was soon discredited as false and unscientific, it has enduringly influenced our understanding of the social world in terms of how we conceptualise it and in terms of what language we use for describing it.

Out of this group of early sociologists and psychologists Herbert Spencer and his theory of evolution are of particular importance for the genealogy of the social in the brain. Starting as a social reformer, being critical of the state of society he finds in Victorian Britain, Spencer sketches an ideal society, which bases on altruism, amity, cooperation. He argues that industrialisation is the driving force behind growing social cohesion and peace. Yet, he believes that not only external circumstances have to change, also human nature itself. Here, Spencer has a Lamarckian notion of evolution since he assumes that traits such as altruism might become part of human nature by several generations living in peaceful and cooperative societies. In this process, the circumstances would shape human nature (Perrin 1976: 1344). The starting point for his deliberations were embryonal theories of transmutation of species, i.e. the theory that embryonal development of all species begins in the same form (in homogeneity) and only in later

developmental stages become more diverse, with the specific characteristics of the different species (Bowler 1975: 106).

Spencer's theory of evolution bases on the assumption that every part of the universe constantly changes since matter and motion are constantly redistributed. If the process of redistribution is predominantly one of integrating matter and dissipating movement, it is a process of evolution. In the process of evolution, things evolve to ever more heterogeneous and more complex states. The end point of evolution is an equilibrium, which in organic bodies means death. Once this point is reached, a process of dissolution begins, unravelling the state of equilibration (Offer 2010: 137-8).

> "Evolution is an integration of matter and concomitant dissipation of motion; during which the matter passes from a relatively indefinite, incoherent homogeneity to a relative definite, coherent heterogeneity; and during which the retained motion undergoes a parallel transformation" (Spencer 1900: 367, quoted in Offer 2010: 138).

Spencer's evolutionary theory about the development of cosmos, world, human mind, and everything in-between leads to the brain sciences in the second half of the 19th century, in which evolutionary perspectives become increasingly important.

5.3 Localisation Theories in Late 19th Century

From the middle of the 19th century onwards phrenology became increasingly insignificant and discredited, since its claims were scientifically untenable. One factor in this development was the increasing focus on the experimental paradigm in physiology, which refuted the whole notion of localisation (Hagner 2000: 271). Only in the second half of the 19th century, anatomical, clinical and physiological studies of the cortex emerged which provided satisfying insights into its functioning. With this research into cortical functions, an important shift took place, the shift from studying the skull and making inferences about the brain to studying the brain itself, cortical convolutions, size and weight (Hagner 2004: 121). In the course of that shift, brain research was going beneath the skull. Another shift took place in locating faculties or abilities in the brain. Gall and the phrenologists conceptualised a hierarchical organisation with drives being located in the back and higher cognitive faculties in the frontal parts of the brain. Now the faculties and abilities were increasingly considered to be located in one of the two hemispheres. Whether the left or the right hemisphere was considered to be the superior changed over time, yet what did not change was the

assumption that the superior hemisphere was most developed in male representatives of what was considered to be the superior race, i.e. Europeans (cf. Harrington 1987).

Hagner points out factors helping the localisation paradigm to become the valid explanation of the brain after 1860. These factors were mainly the localisation of motor and sensory functions, and particularly the identification of centres for speech as uniquely human. While the outspoken goal of establishing a comprehensive human science was never fully achieved, the localisation paradigm was prominent enough to establish the brain as a sort of an ideal organ, now liberated of all phrenological suspicions.

> "The brain became the scene of battles between higher intentions and lower drives, moral reason and selfish craving for pleasure, possible higher development and unavoidable degeneration. The cortex, as the youngest (in an evolutionary sense), most complex and 'finest' part of the brain here played a starring role: containing both earl and pariah, it produced both geniuses and criminals; it made culture possible, and it squandered culture. It was thus crucial to establish research on the cortex in order to improve culture and man as a whole" (Hagner 2001: 543).

One important line in the history of the social brain is a theory of two kinds of cortical nerve fibres that was presented by another Viennese anatomist, Theodor Meynert, in the 1860s. Meynert distinguished between two kinds of nerve fibres, which he called projection and association fibres, respectively. He argued that while the former transported sensual impressions from sense organs to the cortex, the latter were responsible for linking perceptions and concepts. Moreover, the latter were producing thought, consciousness and intelligence by frequent and intense repetition of a certain association. By constant use and training, these fibres form personality and the self. The development towards personality and the self begins within the so-called 'primary ego,' which is helpless and only capable of feeling pain, hunger, warmth, and joy of movement. Over time and with continuous activity of the brain, gradually a secondary ego manifests itself. Beginning with perceiving the outer world, it continues to mature

> "culminating with the feeling for other people and responsibility towards society and state. The primary ego is selfish, the secondary ego 'is associated with the ideas of mutuality, reciprocity, brotherhood.'" (ibid.: 544).

The notion of primary and secondary egos bases on evolutionary thinking: the primary ego is located in evolutionarily older structures which are controlled by the secondary ego, located in the evolutionarily younger structures of the cortex. In this brain theory, mental and brain diseases were important since they could mean two things: either the secondary ego never properly developed or the cortex could not fulfil its control

function any more. In both cases, the secondary ego's inhibitory and controlling power was disrupted and thus the hierarchical order was distorted, leading into chaos (ibid.: 544-5).

Meynert compared this hierarchical organisation of civilised cortical structures governing the primitive parts of the brain with the Habsburg Empire, which was controlled by its capital, Vienna. Notwithstanding the political analogies, Hagner stresses that Meynert did not pursue a political programme with his brain theory. Rather, by associating his understanding of the brain structures with his political and philosophical world-view, he introduced a specific anthropomorphic and sociomorphic vocabulary into brain science, linking the social and the brain on a metaphorical level. However, his successors, such as Paul Flechsig, August Forel or Oskar Vogt, were explicitly engaged in proclaiming programmes of rather diverse political camps and used their research for this end (ibid.: 546).

Paul Flechsig, a psychiatrist working at Leipzig University, added a social-Darwinian component to the discussion by proclaiming a conflict between primitive physiological and higher moral parts of the brain. As a psychiatrist, he was mainly interested in phenomena such as alcoholism, madness or criminality, which he identified as indicators for a crisis of civilisation. He saw a cure for these ailments in a moral physiology as well as in establishing a proper culture, which for him meant an authoritarian social order (ibid.: 547).

Oskar Vogt, who was briefly working in Flechsig's laboratory and would later become the founder of the Kaiser Wilhelm Institute for Brain Research in Berlin, postulated an alliance between brain anatomy and psychology, since none of these alone were able to fully understand the nature of the normal and pathological states of psychic life (ibid.: 550). In the research he conducted with his wife Cécile Vogt, the cortex was not organised hierarchically in inhibiting cortex and controlled subcortical structures. In their theory, neither strict distinctions between rationality and emotion, between higher and lower drives nor hierarchical connections between cortical and subcortical structures exist.

> "(T)he entire cerebral cortex was a differentiated organ in which elements were linked to one another to form complexes. This was simultaneously an issue of both anatomic and political world-view differences (to earlier anatoms such as Meynert or Flechsig, S.M.)." (ibid.: 552).

While Flechsig had projected his monarchist and anti-modernistic world-view onto the brain structure he examined, the Vogts understood the brain as

> "a conglomerate of numerous centers, equal in stature in terms of their function. They wanted to locate psychologically measured abilities, characteristics, and talents of a person in the brain itself, and in doing so, create a cerebral characterology" (ibid.).

The Vogts were supporters of social democracy, furthering ideas of improving humankind for living in a democratic world order and they perceived the political turmoil after the First World War as an opportunity for creating a new society. This new society was supposed to pave the way for scientific rationality to leave the laboratory, enter society and thus overcome mysticism, out-of-date morality and traditional beliefs. If the newly founded Weimar Republic was to advance the most possible happiness for its citizens, it had to recognise the "natural laws of collective life", encourage "their social realisation and inhibit contrary tendencies" (ibid.: 555).

Not only Vogt's notions of natural laws of the social are important for the genealogy of the social brain, also his approach towards the different disciplines investigating the brain. After some severe attacks on neuroanatomy, claiming that this discipline was not able to provide bases for understanding human psychology, in 1900 he claimed that neither anatomy nor psychology alone would be able to explain human psychic life in its normal and pathological states, and planned to equip his own Neurological Central Ward with both a neuroanatomy and a psychology division. Yet a little later, in 1902, he proclaimed anatomy the leading discipline in investigating human psychic life. Hagner argues that these fast shifts in Vogt's positions towards the different brain sciences have several reasons, mainly rooting in inter-disciplinary politics and technological developments. By returning to anatomy as leading discipline of neurobiology and neuropsychology, he – like his mentor Auguste Forel – defended the social and cultural significance of the brain and thus took an effort for securing social and scientific authority of brain researchers. A second reason was the development of a new technology, allowing for generating a structural and anatomical picture of the entire cortex of a single brain. This cytoarchitectonics, which the Vogts developed together with Korbinian Brodmann, gave rise to the hope of associating each mental process to a material element. This technique promised to come close to that old hope of localisationists to be able to differentiate multiple functional areas of the cortex (ibid.: 551-2). The Vogt's scientific project was closely associated with a political and cultural project, namely developing a "cerebral characterology". Like others before them, they claimed that

> "cultural and social development of man can be traced back to the formation and function of the brain, and accordingly, that brain research forms the center point 'around which all other sciences have to group themselves'" (ibid.: 553).

But Vogt does not stop at claiming the position of brain sciences as the fundament for all human sciences. He goes even further by claiming a function of the brain sciences for social and cultural diagnostics. They are able, so he argues, to work towards eliminating social problems by predicting and intervening and thus he was advocating not only brain hygiene, but also racial hygiene, planned breeding and eugenics for developing the society of the future – which was state-of-the-art across the political spectrum (ibid.: 553-4). Consequently, the Vogts established genetics as an integral part of their brain science project at the Kaiser Wilhelm Institute (ibid.: 557).

This review of German and Austrian neuroanatomy of the second half of the 19th century and the early 20th century shows that the localisationist narrative of the brain and the social consisted of two parts: First, the political order is used metaphorically for speaking about brain organisation and different political orientations, and subsequent metaphors led to different interpretations about how the brain is in fact structured: is it a hierarchical structure in which "higher", more moral parts are controlling "lower", morally less developed parts? Is a centre controlling the periphery? Or is the brain organised in a "democratic" way without one centre ruling over the others? In the cases of Meynert on the one and Vogt on the other side, it becomes visible how political world-view can influence research practice. Second, it was believed that social grievances as well as deviant behaviour would have negative effects on the brain's health. Neuropsychiatric research was mainly interested in phenomena such as alcoholism or "degeneration", phenomena which were social in nature and lead to psychiatric diseases. Moreover, like Gall, neuroanatomists were claiming a strong relevance of their work for social reform. For instance, Flechsig was arguing for a moral physiology and scientific pedagogy basing on anatomy, pathology and chemistry (Hagner 2001: 547).[53] Vogt, on the other hand, saw an eugenic program of cultivating brains – according to the insights of brain science – as the basis for improving society and the entire world (ibid.: 557).

[53] The idea of a pedagogy basing on neuroscientific findings gained new attention with the emerging neuroimaging technologies a century later (e.g. Singer 2003; for a critical discussion see Becker 2006).

5.4 Evolutionary neurology: Hughlings Jackson and von Monakow

While the late 19th century was dominated by attempts of localising mental functions in the brain, non-localisationist theories were also present and gained attention as the examples of British neurologist John Hughlings Jackson and Swiss neuroanatomist Constantin von Monakow show.

In his famous Croonian Lectures *On Evolution And Dissolution Of The Nervous System* (1884), John Hughlings Jackson, a founding figure of British neurology, develops a theory of evolutionary development of the nervous system. The nervous system consists of different parts, hierarchically ordered by their evolutionary age. The oldest parts are at the bottom of the hierarchy and are inhibited and controlled by evolutionarily younger centres. Jackson's neurological theory bases on Spencer's notion of evolution as becomes evident in his theory of the nervous system. He understands the evolution of the nervous system as a progress from the least to the most complex, from the most to the least organised and from the least to the most modifiable. Thus, the oldest centres are the most organised, least complex and modifiable, while the youngest centres are the least organised yet most complex and modifiable. In accordance with Spencer, he stresses that the older centres are associated with automatisms and reflex behaviour and the younger centres with higher functions such as learning and memory (Smith 1982: 247-8). In this equation of evolutionarily older parts with lower functions and evolutionarily younger parts with higher functions, a hierarchy between different aspects of human nature is in place.

According to Jackson, the human nervous system consists of centres at three levels. The lowest centres represent limited parts of the body, the middle represent a bundle of these representations and they do coordinate information from different body regions. The highest centres finally do represent the entire body as well as bundling information from the middle centres. However, many higher centres exist and thus they should not be equated with the entire cortex. Rather, as neuroscientist Chris Smith points out,

> "each if the numerous highest centres represents the entire organism, and each represents the entire organism in a somewhat different way from all the other highest centres" (ibid.: 251).

However, as a neurologist, Jackson is mainly interested in questions of mal- or dysfunctioning higher centres. Here another Spencerian concept is helpful: the notion of dissolution as the counter movement to evolution. Dissolution is the reverse process of evolution, a process of taking to pieces, going from the most complex to the least

complex and the least organised to the most organised and for Jackson, neurological disease is just that: a process of dissolution (ibid.: 249). When a layer is destroyed by dissolution, the underlying layer is revealed and its formerly unconscious centres gain consciousness. What is classified as a mental illness represents what is now the fittest state of the affected individual (ibid.: 252-3). Since these layers represent evolutionary strata, mental illnesses provide a window in the species' past (Young 2012: 165).

While Jackson's theory is not directly linked to narratives of the social brain, it is important in two respects, in its definition of the evolutionary structure of the brain and in linking certain psychiatric conditions to evolutionary stages of the species. This notion will be taken up later by sociobiology, evolutionary psychology and partly social neuroscience (ibid.). It also informed the brain theory of Constantin von Monakow, neuroanatomist in Zurich, who was another proponent of anti-localisationist theories of brain organisation (Harrington 1999: 81).

Like other brain scientists before him, Monakow developed his brain theory from his clinical practice. A core concept of his theory was something he called diaschisis or clinical shock and it was an attempt to explain the fact that patients could recover from permanent brain damage. Monakow argued that classical localisationists ignored the fact that a local lesion put not only the affected area into a state of shock but the entire brain. This shock would often vanish in the process of recovery. Thus, he claimed that the brain was more dynamic than commonly assumed, that it could change and adapt to changed circumstances. Diaschisis and recovery followed evolutionary patterns: phylogenetically, skills were acquired over evolutionary time and the most advanced skills were evolutionary the youngest. Since he believed that ontogeny follows phylogeny, he argued that these skills were also acquired last in life (ibid.: 79-80). Moreover, they were the ones first to vanish in the case of a brain lesion. Thus, for treating a patient, the neurologist did not only have to know the site of damage but must also relate to the evolutionary level of the affected function. This meant that the symptoms of brain lesions were far from being meaningless. Rather, they followed a logic rooted in evolutionary and life history, since "(t)he mind, in both health and disease, was a process that evolved and unfolded in *time*" (ibid.: 80, original emphasis).

Like Jackson, Monakow maintained that the different levels of the brain might provide a sort of an archaeological record of the species' evolutionary history. He believed that the youngest levels were the most vulnerable ones, which would in cases of crisis break down first (ibid.: 82).

For Monakow, his scientific work and his world-views went hand in hand very clearly. For instance, during his research he became a strict follower of the temperance movement and understood – like other psychiatrists and neurologists in his time, most prominently his Zurich colleague Auguste Forel (Ernst/Walser 2006: 138-9) – alcoholism as a sign of degeneration. Moreover, as many other intellectuals, he was shocked by the outbreak of the First World War. For him, the war was nothing less than the descent of humankind to a lover level of evolution. In his theory, not only brains could be in a state of diaschisis but also individuals and even entire cultures. Yet, like a brain could recover from a clinical shock, Monakow hoped that also societies could recover from that lower evolutionary state (ibid.: 87). Thus, for Monakow thinking about the brain and thinking about the world worked along the same lines. This is quite understandable if one takes into account a Spencerian notion of evolution of progressing to ever more complex and advanced stages, be it in biology or in society since everything was just part of a bigger whole and thus worked according to the same principles.[54]

While the concept of diaschisis is important in terms of neuropathology and also for a history of notions of brain plasticity, for the genealogy of the social brain, a second concept is perhaps even more important: the horme. Monakow defines the horme as a vital energy guiding the development of an organism which is equipped with a memory of everything the species had learned and experienced in the process of evolution. This memory is transformed into automatic, instinctive behaviour, which is the reason why he also called it the "primal mother of instinct" (Monakow/Mourgue 1928, quoted in Harrington 1999: 89). Moreover, he describes it as the driving force in the creative process of evolution (ibid.: 90). The horme is an ethical drive striving for perfection, both of the individual and the entire world and is located in each and every cell of an organism. It serves the most important and noble life interests, is the basis for other feelings and interests serving to achieve these interests and is the primary reason why the central nervous system evolved: because it needs a central government. The horme is both a psychologically felt emotion and physiologically substrate of endocrine glands (Monakow 1927[1950]: 255). In this horme, Monakow saw the solution for the perils of

[54] Spencer's long time secretary Agnes Pariss started to work for Monakow after being his patient and continued to be his personal assistant for more than 30 years (Harrington 1999: 77-8). Thus it is likely that some direct transfer of knowledge took place in this working relationship.

his time. If human beings would learn to follow their higher instincts they would automatically live in health and harmony (Harrington 1999: 94).

> "Through his biology, Monakow told a moralizing story in which the individual, guided by the biological wisdom of the horme, moved from an initial preoccupation with self and survival to an identification with something beyond self. Often this process of identification began with a focus on family and the narrow community, but the nature of things was for consciousness to expand and recognize its relationship to increasingly larger entities, up to the species, the organic world and finally the cosmos" (ibid.)

Harrington's analysis of Monakow's brain theory suggests not only a striking similarity to Jacksonian notions of brain evolution but also to theories of brain anatomists such as Meynert, who also argued for a movement of identification with entities bigger than the individual in the course of brain development, as has been discussed above. While Monakow developed his theory of the brain about a century after Combe's phrenological account of the brain in the world and in clear distinction to phrenological and other localisationist brain theories, some striking similarities between these theories exist. Not only is a common line of argumentation in all of these theories that higher or more evolved parts of the brain control lower, less evolved parts. Phrenologists like Crombe, localisationists like Meynert or Vogt and anti-localisationists like Jackson and Monakow alike stress that the brain itself strives to ever more perfection and self-actualisation. By doing so, it will aim at goods beyond the individual organism, eventually identifying itself with the entire world or even the entire cosmos. Far from being simply an organ of a monadic individual, the brain seeks to become a part of a bigger entity and to overcome the selfishness of lower stages of evolution. This process is governed by natural laws, or the horme in Monakow's terminology, connecting the individual with the social world. The idea of a natural striving towards sociality as a human capacity is pivotal in these concepts of human nature and the brain. Underlying the various theories of striving towards perfection is a Spencerian concept of goal directed evolution. Yet, while this striving is a natural given, not everybody follows it. This is in part explained by the various concepts of degeneration or dissolution of higher brain structures, giving way for lower structures to take over. But even if no degeneration or dissolution takes place, the brain does not automatically follow its natural destiny of striving towards ever more self-perfection, morality and transcendence, identifying with the greater goods of a greater entity (humanity, the world, the cosmos), because every individual has to actively work for reaching this goal. It is the individual's responsibility to reach these goals by taking care of oneself

and behaving morally. Not taking care of oneself and behaving immoral will lead to degeneration from this high stage of human evolution as will mental illness (whether caused by immorality or not).[55]

Theories of evolution – Darwinian and non-Darwinian – were central to 19th and early 20th century's concepts of the brain and the social. Not only was the general belief that the different parts of the brain evolved over time, with the older parts being more similar to animal brains while the younger parts being more uniquely human. Rather, this notion was associated with an hierarchical organisation: the younger, more evolved parts such as intellectual capacities or morality were in control while the older parts such as drives and emotions were subordinated. This hierarchical order reflects a division of labour between different parts of the body that goes back to antiquity. Yet, while in older theories different functions were located in different organs – reason in the brain, passions in the heart, drives in the liver – now every function was located in the brain. The hierarchy between functions is maintained by evolutionary arguments.

The 19th and early 20th century's discourse of the social brain was dominated by ideas of perfection: the thriving towards an improved brain and a greater good and later on by social Darwinist notions of eugenic selection of good and healthy brains. By defining a healthy, social brain, neuroanatomists and psychiatrists also defined the pathological, asocial brain, which could be the result of deranged genes or of unhealthy environmental factors. Special attention was paid to certain classes of asocial brains, such as the criminal brain. The Italian physician Cesare Lombroso proposed that inborn criminals stand on an evolutionarily lower stage than civilised men, showing not only behaviours of what were esteemed to be lower races, savages, or even animals but also their physical features. This claim formed the basis of criminal anthropology, aiming at an anthropological determination of a personality type defined as the inborn criminal. The means of this endeavour were to determine physiognomic and anatomical differences between criminal and law abiding individuals. In the tradition of phrenology, size of the skull as well as cranial differences played a crucial role in this concept but were by no means the only parameters, others were for instance skin colour, relatively long arms or certain wrinkles. Once inborn criminals were identified, so

[55] In Foucaultian terminology, these early brain researchers were suggesting technologies of the self "which permit individuals to effect by their own means or with the help of others a certain number of operations on their own bodies and souls, thoughts, conduct and way of being, so as to transform themselves in order to attain a certain state of happiness, wisdom, perfection, or immortality" (Foucault 1988: 18).

Lombroso's argumentation, they could be harshly punished and childhood screening for these traits would prepare teachers to look out for certain children. (Gould 1997: 152-166).

This genealogy of the social brain in the history of modern brain science has aimed to show that the 'social' and the 'brain' were engaged in a complex relationship long before 'social neuroscience' emerged in today's understanding. In this genealogy, it was not always possible to distinguish the emotional from the social brain, since these were overlapping concepts – and remain so in contemporary social neuroscience. For the present project of exploring the roots of social neuroscience's concept of the social, the social aspects of emotions and their epistemological relationship to the brain are of particular importance.[56] While this genealogy showed some versions of the social brain as it was conceptualised in the course of its history, it is important to distinguish between the 'social brain' as an epistemic object – whose history is interwoven with the emergence of modern brain research and that is both a natural and a cultural object (Hagner 2007) – and 'social neuroscience' as an attempt to understand the mutual development and interplay of social and neuronal entities. While its emergence may not be a direct consequence of developments leading to different notions of the social brain, it is the newest attempt to understand the social brain and as such is situated in the discursive field discussed in this section.

Yet, in one point Cacioppo and Berntson were indeed correct: the narrative of the social brain was marginalised for the best part of the 20th century and particularly after the Second World War. In this period brain research was dominated by behaviourism, cybernetics and cognitive science. While behaviourism believed that only visible reactions to external stimuli were valid parameters for scientific examination and was not interested in localisationist theories or in brain processes, cybernetics and its successor cognitive science were primarily interested in the computational abilities of the brain and the computational simulation of brain processes (Hagner 2007: 189). In the quest for the basic principles of the brain the interactions with others did not play a role, at least not in mainstream neuroscience.[57] The 'social' was not investigated as a biological category. Hagner (2007: 290) suggests that a crucial reason for this avoidance of connecting psychological research with biology and brain anatomy was the shock of

[56] For a more detailed analysis of the history of emotions in the brain see Dror 2001.

[57] The work of scientists such as Paul MacLean or also Kurt Goldstein can be seen as an exception to that rule.

how National Socialism abused this kind of research for racist politics and mass murder. However, the positive appraisal for genetic research, which freed itself from associations with eugenics as well as the neurosciences, indicates that reasoning about the biological foundations of human behaviour lost its connotations with National Socialism and racism. A starting point for this development may be seen in the publication of Edward O. Wilson's *Sociobiology* (1975), which will be discussed in more detail in the following chapter. But it became particularly salient with the publicity and public appraisal of the human genome project in the 1990s (Kay 2000: 326-7, see also Samerski 2002).

5.5 The Social Brain since 1990

Since the 1980s, the social brain has returned to the debate in three independent discourses, all contributing important theories for contemporary notions of the social brain: narratives of the social brain, the somatic marker hypothesis and the mirror neuron theory. All three concepts of the social in the brain have great impact on the emergence of social neuroscience and the debates within that field.

5.5.1 Evolutionary Narratives of the Social Brain

The first to coin the term "social brain" was cognitive neuroscientist Michael Gazzaniga in 1985. In his book *The Social Brain. Discovering the Networks of the Mind* he contemplates the biological foundations of sociality in the human brain, which he defines as the ability of making sense of social cues, for instance by giving meaning to actions of others. These contemplations are a corollary of his research in split-brain patients. He argues that the way the human brain is organised and able to construct beliefs is the foundation of culture, thus understanding neurobiology will help understanding culture and the relationship between biological processes and human behaviour (Gazzaniga 1985: 3). He supports a modular notion of mind and brain. However, since the many modules (Gazzaniga speculates that we have some hundreds to some thousands of them) might independently cause behaviour, some entity for making sense of these behaviours is necessary. That this "interpreter", as he calls this entity, is located in the dominant hemisphere is evidence for the importance of behaviour and subsequent interpreting of this behaviour for our notion of selfhood. The belief to be an autonomous individual, being in full control of our actions is an integral part of our notion of who we are (ibid.: 5-6). Gazzaniga provides evidence from human

prehistory suggesting that abilities of inference, preference and language are crucial for the emergence of a belief system and thus for the emergence of culture. While rudiments of these abilities may have been present in early humans, an accelerated evolution of these abilities coincided with the formation of larger groups and the possibility of division of labour (ibid.: 151-164).

From his perspective on beliefs about us and others as an internal strategy of making sense, he draws some conclusions for creating society and culture:

> "I am claiming that a culture becomes more caring and humane the more its citizens feel themselves to be a part of the problems that beset their lives. The only sure way to bring them close to such problems is to structure a culture where they deal with the problems at a personal level." (ibid.: 198).

Gazzaniga's theory of the social brain has political consequences, which he elaborates in a fictive conversation with a student. He argues, once social agencies are created to solve problems, citizens expect them to solve all their problems and delegate the responsibility to these agencies. If the possibility of delegating responsibility to some abstract agency is reduced or impeded, people would be forced to deal with their problems personally and find other more personal solutions (ibid.: 198-200). Thus, he postulates downsizing of social welfare for the greater good of society, since it would force people who are equipped with social brains to take responsibility for their own and their families' well-being.

While Gazzaniga's theory is not very clear about the relationship between the brain and the social and is not integrated in social neuroscience discourses, it is important since it explicitly anticipates an interpretation of the social that is implicit in later social neuroscience: the notion that Homo sapiens' biological make-up provides the preconditions for organising a social life without any institutional regulations.

A few years later, another neuroscientist stepped forward with an evolutionary theory of the social brain. Leslie Brothers (1990) investigates evidence of social cognition from primate studies as well as lesioned patients and neuropsychological disorders such as autism. She defines social cognition as

> "*the processing of any information which culminates in the accurate perception of the dispositions and intentions of other individuals*" (Brothers 1990: 28, emphasis in original).

Like Gazzaniga, she suggests a modularised perspective on the brain and argues for a module for social cognition. Also in accordance with Gazzaniga, she maintains that the

formation of and living in large groups played a crucial role in the evolution of social cognition (ibid.: 29-32). She identifies two crucial components of social cognition, the processing of social affects and face recognition. Complex social life, she stresses, calls for a great variety of social signals and social affects; a group of differentiated and subtle feelings serve as those signals. Brother proposes that the ability to process these affects has evolutionary roots in the social existence of Homo sapiens and that affected processes located in limbic structures such as amygdala and orbital frontal cortex (ibid.: 41). Faces are important social cues; they provide indicators for distinguishing individuals and reveal an individual's emotions. Thus, faces help to distinguish members of the group and to read social signals about potential dangers from within or outside the group. Evidence from primate studies indicates that fast processing of biological motion, gaze direction and facial expression are crucial factors in social cognition (ibid: 44-5).

Brothers' theory of the social brain is an evolutionarily-based theory of the origins of social cognition. Living in complex social structures, so the argument goes, made it necessary to read social signals and hence a system of decoding these signals evolved. The theory provides a neurobiological foundation of social cognition research, which emerged at the same time, integrating findings and hypotheses from the cognitive sciences, integrating research in areas as different as primatology and clinical neuropsychology, and, in this endeavour, anticipating the integrative approach of social neuroscience. Research in face recognition and in emotions should become an integral part of social neuroscience research.

The last narrative of the social brain is the so-called social brain hypothesis. Developed in the 1980s by the psychologists Peter Byrne and Andrew Whiten (1988), it tries to provide an answer to the question why primates and particularly humans have so large brains, even though they are very expensive to maintain – the adult human brain consumes about 20% of the body's energy intake. Despite the cost, there had to be an evolutionary advantage of large brains, otherwise they would simply not exist. The social brain hypothesis maintains that the large brain is necessary for meeting the computational demands of complex social groups (Dunbar 1998: 178). To test this hypothesis, anthropologist Robin Dunbar and colleagues (among others) correlated the size of the neocortex with the size of social groups in non-human primates and found a significant correspondence between these two factors. The neocortex is an evolutionarily young structure only present in mammals and particularly large in

primates. It is supposed to be seat of cognitive processes underlying consciousness and reasoning. He argues that the group size serves as a measure for the complexity of social interactions, because the number of possible relationships increases with group size (ibid.: 179-81). From these investigations Dunbar interpolated that the group size the human brain is capable of dealing with is 150 (ibid.: 186-7). An investigation of small-scale hunter-gatherer and horticultural societies provided evidence for this hypothesis. A group of that size appears to be the largest one in which humans can directly interact, know everyone and have personal relationships with all other group members. Moreover, Dunbar reports that

> "(a) more extensive exploration of human groups in other contexts suggests that groupings of this size are widespread and form an important component of all human social systems, being present in structures that range from business organizations to the arrangement of farming communities" (ibid.: 187).

Thus, the magic number of 150 does not only seem to be the maximum number but also the most common number for humans to aggregate in. This serves as another evidence for the evolutionary advantage of groups of a certain size.

None of these three narratives of the social brain says anything about what evolved first: whether the growing neocortex was a reaction to more complex social relationships or whether it enabled these relationships or whether perhaps both influenced each other mutually. Yet, they all agree that certain cognitive skills evolved to cope with social complexity and, while they all focus on different aspects, they agree on the importance of understanding the species' evolutionary history for making sense of how modern humans living in complex societies cope and interact with the social environment. Moreover, they agree that the primate brain and particularly the human brain evolved certain skills just for that purpose. Consequently, the way we act in social interactions is determined by evolutionary heritage. None of the discussed theories explicitly discusses the impact of history, culture, society, or life experiences on social cognition abilities in an individual or a group. Only in an evolutionary time frame these factors may have an impact on how future generations may engage with each other. At least at the basic level they are investigating it appears to be a mere one-way street from evolution (i.e. behaviour that was adaptive a long time ago) to present behaviour.

With these narratives of the social brain, 'social' is back as a biological category. Like in the preceding narratives of the social brain, evolution plays a key role for all three discussed theories. Yet, while earlier narratives operated with goal-directed notions of

evolution leading to ever more perfection, in the late 20th century Darwinian theories are dominating, i.e. non-teleological interpretations of evolution.

Particularly Brothers' and Dunbar's approaches are crucial for social neuroscience and build starting points for investigating evolutionary origins and the role of certain brain areas in social cognition (Adolphs 2009: 698-701). Brothers' review of clinical cases again draws to a large extend on Damasio's work with brain-lesioned patients. Damasio suggests his own hypothesis of a social brain, which is the subject of the next section.

5.5.2 Somatic Marker Hypothesis

Like other neurologists before him, Damasio derived his theory of the social brain from cases of his own clinical practice. He interpreted the behaviour of his patients as dissociation, a neuropathological state, in which one or more functions are dissociated from the rest. In some cases, for instance, the patients showed changed character traits after a brain lesion while cognition and behaviour remained intact (Damasio 1994: 11-12). Moreover, Damasio and his team observed that some of their patients could abstractly describe codes of conduct and value systems they developed prior to their brain lesion and were able to distinguish socially accepted from improper behaviour in psychological tests. Yet they were unable to follow these norms in their own behaviour in everyday situations. Moreover, they observed that those patients diagnosed with dissociation, were impaired in their decision-making abilities.

Basing on these observations as well as their re-interpretation of the historical case of the railroad worker Phineas Gage,[58] Damasio and his team developed their "somatic marker hypothesis". Somatic markers produce what generally is called a gut feeling. Or in Damasio's words, the purpose of these markers is

> "to provide the subject with a conscious 'gut feeling' on the merits of a given response, and force attention on the positive or negative nature of given response options based on their forseeable consequences" (Damasio et al. 1991: 220-1).

[58] In 1848, Phineas Gage, an American rail worker, was severely injured during a dynamite accident. An iron rod was blasted through the frontal parts of his brain causing severe damages. However, about two months after the accident, he was seemingly more or less fully recovered with only minor physical injuries remaining. Yet, his colleagues, friends and family observed a significant change in his behaviour. Gage, who was formerly described as a polite, responsible and pleasant fellow, suddenly became angry, impulsive, and short-tempered and seemed to have lost control over himself. Due to his changed attitude and behaviour he lost job and friends and in later years travelled with a circus, presenting himself and the iron rod to the audience (Damasio 1994: 7-10; first described by Harlow 1848). By drawing on this case and not on other cases described by European neurologists such as Paul Broca's patient „Monsieur Tan", who served as model cases in European neurology, Damasio situates himself clearly in a US-centred research tradition.

In his book *Descartes' Error* (Damasio 1994), Damasio argues that these somatic markers are crucial for dealing with everyday social decision-making situations by not only recalling mental memories of related or similar situations in a person's past but also by recalling how she felt in that situation. He speculates that somatic markers "probably increase the accuracy and efficiency of the decision process. Their absence reduces them" (ibid.: 173). In short, the somatic marker hypothesis says that good experiences are connected with good memories leaving a positive somatic marker, i.e. an incentive for deciding in favour of similar actions in future decision-making processes while bad experiences are connected with bad memories leaving negative a somatic marker, i.e. an alarm bell, leading to deciding against similar actions in future decision-making processes. Thus, these markers serve as a kind of filter, sorting out options in a decision-making process connected to negative memories (ibid.: 174-5). They are acquired in the process of socialisation by external circumstances, not only including events but also norms and rules, but can change throughout the entire life if new experiences are made (ibid.: 179). Using a more sociological language, these somatic markers are an incorporation of life experiences and social norms. They are part of what Bourdieu calls habitus, an incorporated structurising structure of thinking, acting, feeling, taste, body composure, etc. The habitus depends on the individual's position within the social field, her socioeconomic background, education, gender, and class (Bourdieu 1979[1987]).

In the cases of dissociation observed in acquired sociopathy – in his clinical practice as well as in the historical case of Phineas Gage – Damasio concludes that these somatic markers are not working properly. The emotional connection to prior experiences is interrupted and thus decisions are made without any reference to socially accepted (and thus rewarded) behaviour in the past.

It is important to note that this hypothesis means a crucial shift in thinking about the brain, rationality and emotions. While earlier brain theories, which allowed a space for emotions in the brain, located them in the back of the head and/or the subcortical structures, far away from the seat of reason and cognition, Damasio proposes that emotion and rationality are in fact coupled and influence each other. While this relationship between emotions and rationality was almost unthinkable in the heyday of cognitive science, it is now widely recognised not only in social neuroscience but also in neuroeconomoics and neuromarketing (Glimlicher et al. 2009). Particularly the latter is not merely interested in academic reflections on this issue but seeks commercial

application in restructuring advertising according to new neuroscientific findings. Thus, the notion of emotional influences in decision-making triggered a whole new line of business (Ariely/Berns 2010). Here the relationship between emotions and sociality is strongly entangled: emotions help the individual to navigate the social world and are thus keystones in any social interaction.

For the genealogy of the social brain, the somatic marker hypothesis is important in a second respect, the coupling of biology with the cultural and social environment. Somatic markers are neuronal structures and as such belong to the biological make-up of the organism, yet they are shaped by the society in which the individual grows up. Damasio describes the relationship between somatic markers and society or culture as follows:

> "The automated somatic-marker device of most of us lucky enough to have been reared in a relatively healthy culture has been accommodated by education to the standards of rationality of that culture. In spite of its roots in biological regulation, the device has been tuned to cultural prescriptions designed to ensue survival in a particular society. If we assume that the brain is normal and the culture in which it develops is healthy, the device has been made rational relative to social conventions and ethics" (Damasio 1994: 200).

Thus, the social is inscribed in the process of brain development and adjusted to new experiences over the entire life span and it is specific for living in a certain society in a certain time. The ability to behave socially is part of the biological make-up with which humans are born, yet the way this sociality takes shape depends on the particular beliefs and values of the society one is born into.

Damasio's work and particularly his somatic marker hypothesis are crucial for understanding contemporary notions of the social brain. He introduces what Margaret Lock would call "local biologies" (Lock/Kaufert 2001) into thinking about the social and the brain. By stressing the importance of the social and cultural context, he allows neurobiology to change according to circumstances. Brains differ, depending on time and place. Thus he opens a space of thinking about brain and environment in an interactive rather than a deterministic way. Moreover, his role in bringing emotions back into neuroscientific research cannot be overestimated. Also for the development of the concept of theory of mind in cognitive psychology and neuroscience, his work on brain-lesioned patients is crucial (cf. Baron-Cohen 1997: 91-2). And he is often cited by social neuroscientists or even seen as a social neuroscientist himself – for instance, some of his texts are included in a volume with key readings in social neuroscience, edited by

Cacioppo and Berntson (2005). He also contributed to the popularisation of neuroscientific research by writing popular science books on the relationship between emotion and cognition (cf. *Descartes Error* (1994), *The Feeling of What Happens* (1999), *Looking for Spinoza* (2003), *Self Comes to Mind* (2010)).

5.5.3 The Mirror Neuron Theory

Around the same time when Damasio developed his somatic marker hypothesis, in Italy a team of neuroscientists working with macaque monkeys reported to have found another neuronal structure enabling primates to engage with others.

In 1992, a group from the University of Parma published a study about a group of neurons in a specific area of the Macaque brain (F5) responsible for motor action. These neurons, they reported, did not only fire when the monkey performed a certain action but also when it observed another monkey or a human experimenter performing this action (Pellegrino et al. 1992: 176). The researchers speculated that these neurons may play a role in understanding behaviour of others in social situations, allowing for fast reactions to these actions. Moreover, they reported that some neurons in the tested region also fired when the experimenter conducted a movement only similar to the monkey's and they draw a direct link from that latter finding to studies in the neurological condition of ideomotor apraxia. Patients affected by this disorder are reported not only to have difficulties imitating gestures but also to have difficulties in understanding the meanings of gestures, which has been interpreted as evidence for shared cortical circuits of gesture perception and limb praxis. The authors let the reader to speculate what that means for their own findings and conclude their report by stating that

> "(a)lthough our observations by no means prove motor theories of perception, nevertheless they indicate that in the premotor cortical areas there are neurons which are endowed with properties that such theories require. It is interesting to note that the anatomical location of inferior area 6, and in particular of F5 (in macaque brains, S.M.), correspond in large part to that of Broca's area in the human brain" (ibid.: 179).

Soon, however, these cautious hypotheses gave way to more confident speculations about the connection between these neurons and motor perception. In 1996, the same group first proposed the term "mirror neuron" for the class of neurons described (Gallese et al. 1996: 594). In that paper they suggest that mirror neurons could play a role in imitation and thus in social learning (which depends on imitating conspecifics) and/or in the understanding of motor action, i.e.

> "the capacity to recognize that an individual is performing an action, to differentiate this action from others analogous to it, and to use this information in order to act appropriately" (ibid.: 606).

Moreover, they present evidence from studies in humans, proposing that mirror neurons do not only exist in monkeys but also in humans and the homology between area F5 in monkeys and Broca's speech area in humans gives rise to the speculation that mirror neurons may also be responsible for speech perception (ibid.: 607). It followed an ever-increasing interest in this group of neurons, their hypothesised function transferred to a growing number of areas of animal and human social life (and even learning robots).
In a 2003 paper, Vittorio Gallese, a leading member of the Parma group, proposed a general theory of how the brain understands the social world. He states:

> "if my theory is correct, a single mechanism – embodied simulation – can provide a common functional framework for all apparently different aspects of interpersonal relations" (ibid.: 521).

Embodied simulation, in his theory, is an automatic, unconscious and pre-reflexive process of modelling the events and objects an organism engages with. Since it is not possible to engage with events or objects as such, these models are the only possible means of engaging with the (social) world in all its aspects: "simulation of actions, simulation of emotions, simulation of feelings and sensations" (ibid.: 524). The cortical correlate of embodied simulation is the mirror neuron system:

> "*Mirror neurons instantiate at the sub-personal level the multimodal intentional shared space*" (ibid.: 525, original emphasis).

Thus, not only motor action understanding is relying on the mirror neuron system, also mechanisms such as empathy, i.e. feeling what others feel, depend on these neurons.

The mirror neuron school had great impact both on the scientific community and on the broader public. Their theory seemed to explain human social behaviour, development and learning. Moreover, mirror neurons suggested that we participate in another person's joy and distress automatically, one could even say by biological default. This was an important step towards rendering Homo sapiens as a social species. The mirror neuron hypothesis was also a catalyst in engaging in social neuroscience research, particularly in research on empathy, as will be discussed in the next chapter.
Yet, after the first excitement faded away, the evidence for these neurons was contested. Some only stated that no prove has so far been found in humans, others even claimed that the original discovery in monkeys has not been replicated outside the Parma lab. In

2009, some fifteen years after the first publication of research suggesting the existence of mirror neurons in macaque monkeys, Gregory Hickok, cognitive neuroscientist at the University of California, Irvine, presents *Eight Problems for the Mirror Neuron Theory of Action Understanding in Monkeys and Humans* (Hickok 2009). He questions both the assumed role of mirror neurons in action understanding in monkeys and the empirical grounds for generalising the mirror neuron theory to humans and higher-order cognitive functions such as speech perception, imitation, theory of mind, or empathy. Rather polemically he contests this generalisation:

> "The problem with statements such as this (that mirror neurons are involved in higher-order cognitive processes, S.M.), and many like it, is that the species that has been shown to possess mirror neurons does not, to our knowledge, possess any of these higher-order cognitive processes, and the species that possesses higher-order cognitive processes has not been shown conclusively to possess mirror neurons" (ibid.: 1234).

He argues that while the initial discovery and theory of a mirror neuron system in monkeys is both interesting and reasonable, it has never been adequately tested. Moreover, he stresses that action understanding in humans is more than perceiving a certain motor act since it always includes imposing a meaning on that act and because human action is always interpreted as intentional and goal-directed. If mirror neurons are about motor action understanding, they cannot further understanding the intentionality of the action, yet if they are about understanding another individual's goals as some mirror neuron theorists assert, they cannot at the same time be the basis for action understanding, since a goal can be reached by an array of different actions. Thus, mirror neuron theory logically cannot be the all-explaining theory of neuronal bases of human social behaviour, their proponents would like it to be (ibid.: 1240-1).

The mirror neuron debate is not yet over, evidence in favour and against is still brought on the floor (cf. Gallese et al. 2011) and it is too early to decide whether the mirror neuron theory will become accepted canonical knowledge in the neurosciences or whether it will be just another episode in the history of compelling but in the long run unconvincing theories about how mind and brain work. Like other such theories, it enjoys a broad popularity outside the scientific community – perhaps not least because it provides a pro-social theory about human social interaction. The idea of automatic response to other people's behaviour and even emotions is indeed alluring, since it is evidence in favour of a social default of human nature.

5.6 Somatisation of the Social

All three narratives about the social and the brain, the social brain hypothesis, the somatic marker hypothesis, and the mirror neuron theory, are important for contemporary concepts of the social in the brain. Whilst the first provides an evolutionary explanation about why and how social cognition may have evolved and potentially constrain the possibilities of social organisation, the latter two contribute to somatising human nature by somatising the mind. They are both examples of bringing the body back into neuroscientific theories of human thinking, acting and feeling. Moreover, the two variants of somatisations of thinking, acting and feeling in these two concepts yield a somatisation of the social. The somatic markers imply an incorporation of experiences and norms of the social world into a neurological structure, the 'somatic marker device'. Doing so, these experiences and norms shape the way the brain operates in decision-making processes. The mirror neuron theory follows another line of reasoning by implying that the preconditions for social perception and interactions are to be found in a neuroanatomical structure, the mirror neuron system. In their different lines of argumentation, both theories give a possible explanation of socially deviant behaviour: if the somatic marker device or the mirror neuron system does not work properly, the social abilities of the concerned individual are severely impaired and thus her biology constrains her social behaviour.

Both theories also challenge the paradigm of cognition via mentalising, a mere rational process without somatic resonance. They claim that bodily experience plays a crucial role in perception, thought and action. In the case of the somatic marker hypothesis, past experiences will generate emotions and feelings associated with these experiences and these will be felt somatically. Thus, new experiences will be linked to these somatically stored emotions and feelings. In the case of the mirror neuron theory, an important part of cognition is imitation – the mirror neurons replay the social stimuli. Thus, both theories provide evidence for the hypothesis that living in a social world and finding one's way in the complexities of social relationships not merely requires cognitive skills but also emotions and automatic processes as more direct abilities of connecting with others. The vernacular gut feeling is an essential part of navigating the social world.

Moreover, somatic-marker hypothesis and mirror neuron theory also allow for modifications of neuronal structure due to social and cultural influence. Somatic markers develop and change with new experiences and mirror neurons mirror the stimuli they perceive and might hence be a mechanism for social learning. The idea that

the brain can be shaped by external influences opens a space for including dynamical aspects in the relationship between nature and culture.[59] Thus it is also a potential link with integrative evolutionary theories considering the role culture plays in evolution (Jablonka/Lamb 2005, Tomasello 1999, 2009). At the same time, however, the shift only renders relevant the somatic resonance a social event generates. Other aspects such as what causes that event and how it is interpreted cannot be answered by somatic-marker hypothesis or mirror neuron theory.

5.7 Conclusion

After outlining the genealogy of the social in social psychology in the previous chapter, in this chapter I investigated the notion of the social in the brain sciences, the other parent discipline(s) of social neuroscience.

Since the emergence of modern brain science with Gall's organology, brain anatomists, psychiatrists and neurologists have been interested in the relationship between the brain and the social. The theories and means of explanation have changed over the course of the last two centuries, but what is striking is that until the end of the 20th century the pathological served as the object of study from which theories about the normal were derived. All but two discussed theories about the relationship between the brain and the social were inferred from research with neurological or psychiatric patients. The remaining two, the social brain hypothesis and the mirror neuron theory, base on studying non-human primates. This observation is in accordance with the bibliometric study indicating that only in the first decade of the 21st century, research in non-pathological subjects became the dominant approach in investigating the social brain (see chapter 2).

In the presented genealogy of the social brain, some recurring themes can be detected: for instance the notion of a striving to become a part of a greater whole or the claim that, while the brain determines our behaviour, it is still necessary to work on ourselves to become better people. Another recurring theme is the relationship between the brain and the social. On the one hand, deterministic notions of the brain claim that this relationship is a one-way street; the brain causes behaviour and thus social actions. On the other hand, some psychiatrists have been arguing that negative social influences lead

[59] Thus it may be more than a coincidence that at the same time when these narratives of the social brain became heard, also notions of brain plasticity and adult neurogenesis transformed from being outsider's fancies to accepted scientific knowledge (cf. Rees 2010b; Rubin 2009).

to a degeneration of the brain and by doing so allow for social influences on biology, even if only in pathological cases. Also, since the first modern brain theories emerged, their proponents proclaimed themselves to be experts of human nature, human behaviour and thus also experts for questions of social reforms – experts for creating a brain-friendly society.

In the 19th century, the concept of evolution became prominent in thinking about the brain and thus also in thinking about the relationship between the brain and the social. In the course of the 20th century, different research fields contributed to evolutionary explanations of human behaviour and these are at the core of late 20th century's narratives of the social and the brain, contributing to a somatisation of the social.

While debates about the relationship between the brain and the social are part and parcel of the history of the brain sciences, what perhaps is new is the general attention for the "good news" from social neuroscience providing evidence for the cooperative nature of the human condition and the evolutionary advantage of social behaviour. The next chapter will investigate the changes in evolutionary narratives leading to this perspective on human nature.

6. Nothing in Social Behaviour Makes Sense – Except in the Light of Evolution

6.1 Selfish Genes and Social Brains

After having defined the research endeavour, discussed its research methods, and situated its notion of the social in the history of social psychology and the brain sciences, I now will look into the concept of human nature which is both implied in and fed by social neuroscience research and its definitions of social brains. I want to begin this chapter with another episode from my interviews. This episode shows how in social neuroscience's reasoning about human nature narratives of the social brain are combined with a narrative of the evolutionary advantage of pro-social behaviour.

Social Neuroscientist E, who is a strong advocate of investigating evolutionary foundations of sociality, got quite excited when talking about his research interests, namely the question "how do we aggregate from the individual to the social?" After speaking about the evolutionary adaptiveness of loneliness, he explained his particular interest in evolutionary biology and how this is related to his general research questions. He began by employing an interesting metaphor:

> "I believe that genes are just Xerox machines, right, whatever they did that let them to end up in a gene pool, gets duplicated (...). These, what Dawkins calls selfish genes, have engineered social brains in us because we have offspring with long periods of dependency and we're not a particularly formidable species in isolation. So we do a lot better when we work together, we're more likely to survive and our offspring is more likely to survive. (...)"

Talking about genes in this manner, they become actors in several ways. First, they are copying machines, simply duplicating whatever is there to be duplicated. Second, they have done something in the past that has been advantageous – otherwise they wouldn't be still around, thus they are also the objects that get duplicated. Third, they are engineers of social brains. The metaphor of genes as engineers implies the active designing of a construction plan and subsequent manufacturing of brain structure and functions. Social brains, too, have to be advantageous, otherwise "selfish genes," being 'interested' in their reproduction, would not have engineered them, i.e. the genes for social brains would not have made it into the gene pool.

But how, I was asking him, would cooperation increase our and our offspring's likelihood to survive?

> "If I'm willing to have a personal risk," he explained "and I take a reward from you benefiting, as long as I identify with you, then that's gonna promote collective action

> that's better than my individual, or the sum of our individual parts. So we're gonna have a special advantage of a group identity, ok, and that leads to the engineering of a social brain where the complexity of the social brain increases the demands for processing complexity, increasing the neocortical thickness and connectivity of the brain."

The narrative of beneficial pro-social behaviour suggests that if Person A identifies with Person B, she may be willing to take a risk not for her own benefit but for Person B's benefit. But Person A will still take a reward for her action because of her identification with person B. It is almost as if she benefited from it herself. The results of the identification and ensuing mutual aid are group identity and collective action, which are more advantageous than individual behaviour. However, in order to process the notion that we benefit by somebody else benefiting from our actions the brain has to be capable of processing complex information generated by these complex social identities as well as to be able to think abstract. This is why the human brain has been engineered in the way it has been – with neocortical thickness and connectivity of the brain. The brain has been shaped by the needs of the environment and - in the case of humans - by the advantages of living in a social group, a form of social organisation which implies the aforementioned complex information. This reference to the social brain hypothesis seems to work as the foundation of my interview partner's argumentation.

But, my interview partner continues, it is not only about the individual brain,

> "we go beyond that, I believe, and that is by developing all these ways of connecting, including language, emotion expressions, we also produce a more powerful processing unit. You look at computers now, much of the power we get from computers is because they are connected, collective and their ways to do it are the prior connections we call the internet, right. Well, we have the same thing in humans because our brains are connected and so that's where our special adaptability comes from and that's a result of this increased selfishness of the genes because we're all more likely to survive and prosper."

Brains connect with other brains and thereby produce 'processing units' that are more powerful than a single brain could ever be. The computer metaphor of cognitive science is transferred to the social brain. However, it is no longer the metaphor of the autonomous computer but rather the trope of a vast network of computers connected via the internet that provides the appropriate analogy for the processing capacities of the social brain. Undoubtedly, the single brain has enormous capacities but its real power results from creating a bigger processing unit by connecting with other computers and their capacities. The means of connections that Social Neuroscientist E singles out, are language, a traditional subject of neuroscience, and emotion expression, which has not been a subject of neuroscience until recently. By stressing the importance of emotion

expression as a means of connection between brains, he hints on the most important turn taking place in social neuroscience.

What he was saying so far, he admitted, was

> "just pure story telling but if in conditions of deprivations, when hominids first started to evolve, if we acted very selfishly, we had offspring that had a period of object dependency, those who acted selfishly in conditions of deprivation – didn't share defence, didn't share food – may well have lived longer and have more offspring but their genes didn't make it into the gene pool, because nobody gives care to take care of them, feed them, right. So, that means, we had these genes that made it into the gene pool, were not determined by reproductive capacity, which is where evolutionary psychology sometimes stops, they say it's all about reproduction. It's not for humans and a handful of other species, it's not your ability to reproduce, it's your offspring's to reproduce. And that changes the operations of the selfish genes, the selfish genes now have to engineer social, caring, communal brains."

My interviewee claims to provide evidence to the previous story telling by referring to the evolutionary past of the species. He needs two assumptions to make this evidence valid, the first assumption is that hominids – members of the family of hominidae, i.e. living humans and fossil apes that possessed certain human characteristics – evolved in times of deprivation. The second assumption is that in times of deprivation, in the short term, it may have been beneficial to act selfishly because the selfish individual may have lived longer and produced more offspring. In the long run, however, sharing with others has been more advantageous than selfishness because you can assume that if you help others, others will help you and, above all, your offspring as well. But if an individual behaved selfishly, others are less willing to help their offspring during the period of dependency.[60]

For humans, he argues, the ability to reproduce is not sufficient to ensure evolutionary success; because of the long infant-dependency the offspring's ability to reproduce is a better parameter for success. And since it is not only about the individual's ability to reproduce (as it may be for fish or reptiles for example), it is in the best interest of genes to engineer the gene carrier (i.e. the individual) in a way that they care not only for themselves but also for other members of their group. Hence, the engineering of social brains that are capable of caring for others was an evolutionary advantage for selfish genes of Homo sapiens and its predecessors.

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[60] At its core, this argument – the fictive choice between selfish and cooperative behaviour – only covers the male perspective. It is only males, who may benefit from spreading their genes by mating many women. Females, as anthropologist Sandra Hrdy points out, always depend on the assistance of others in rearing their offspring. Thus, if they intend to let their offspring survive, they have no other option than to cooperate and build lasting relationships with others (cf. Hrdy 2009).

The evolution of a social brain, Social Neuroscientist E continued, is

> "one solution, right, and humans took that particular accidental mutation, that's the turn we took. You can do it by highly fixed action patterns, flies, bees, ants, that's a different social solution but we took this one because we're so abstract thinking, anyway we took this kind of alternative route."

The "caring and communal brain" is only one solution among many. Other species took other turns to cope with living in large groups. But humans evolved the social brain, for reasons not quite clear – my interviewee speaks at the same time of accidental mutation and a reason for that mutation: Homo sapiens's ability of abstract thinking. This contradiction between an accidental and a causal mutation is interesting since it hints at a central problem of explaining human behaviour by evolutionary theory: while it is possible to observe behaviour and to hypothesise how this behaviour evolved it is never possible to find solid reasons for why this happened. Yet it seems to be a demand among evolutionarily arguing scholars of human behaviour to find exactly these causal relationships: behaviour a evolved because of environmental factor b.

This passage from my interview circles around a point that is essential for social neuroscience: rendering the social as an integral component of Homo sapiens biological set up and evolutionary inheritance. It is not always as explicit as in this passage but it is the background assumption of social neuroscience research, which investigates the biological and cognitive foundations of sociality. This also becomes evident in statements such as "(h)uman survival depends on the ability to function effectively within a social context" (Singer et al. 2004: 1157). Rendering research in such a way sets grounds for looking at the biological foundations of how to cope with social contexts. These biological foundations of sociality are the subject of this chapter. In the last part, I will also discuss how this concept of human nature fits contemporary discourses about social welfare and individuals' responsibility for their own wellbeing.

In social neuroscience's narrative of sociality, an evolutionary perspective of human beings and their social world is crucial. As has become evident in the interview passage opening this chapter, the notion of a social brain is closely interwoven with evolutionary explanations about why human beings have these social brains. This perspective fundamentally differs from the evolutionary narrative most popular in the last quarter of the 20th century, the narrative of the autonomous individual involved in a struggle of all against all. In this chapter first the narrative of the autonomous individual is discussed before several aspects of this new narrative of the Homo empathicus are being assessed.

Anthropologist Allan Young describes the recent transformation in notions of human nature as the shift from 'Human Nature 1.0' to 'Human Nature 2.0.' 'Human Nature 1.0' has been the canonical view on human nature in the Anglophone West in the second half of the 20th century. At originates in Enlightenment debates about rationality and autonomy. In its centre is an autonomous individual, which is rational, self-interested and self-contained. The mind is the body's command centre; it is the locus of self-awareness and "agency of self-identity and continuity". The individual can only infer about other minds via symbols and signs (Young 2012: 159).

In 'Human Nature 2.0', some of these features have been re-framed. Most importantly, a direct contact between minds is possible via "mind reading". Mind reading is an umbrella term for several neural abilities which recently came to the attention of neuroscientists, such as neural resonance, mirroring or empathy. Moreover, although the individual remains autonomous, it is also driven by a higher rationality, the rationality of natural selection. Lastly, the mind is an epiphenomenon of the social brain (the relationship between brain and mind, however, is by no means clear). The notion of the self-contained, autonomous individual transforms into an entity more dependent and related to others and the environment. While the individual in the narrative 'Human Nature 1.0' could never be sure whether the world outside her mind actually exists, the individual in the narrative 'Human Nature 2.0' is in direct and active contact – not via signs and symbols but by mental engagement with the external world and its agents (ibid.: 159-160). However, it is important to keep in mind that the new narrative's elements are not new in themselves. In the last chapter I showed how – mainly in Continental thought traditions – notions of the social brain have been prevalent in the course of the history of the brain sciences. What is new is the combination of various older narratives as well as the attention it recently receives in (Anglophone) Western discourses.

This chapter's aim is to trace this recently emerging narrative of pro-social human nature within the emerging research field of social neuroscience and related disciplines. The narrative of 'Human Nature 2.0' bases on cooperation, empathy, altruism, and other forms of pro-social behaviour and thus a rewriting of evolutionary narratives, formerly focusing on natural selection for selfish behaviour. This turn towards a cooperative concept of human nature is often connoted with a certain belief in the goodness of humankind in contrast to earlier attempts to biologising the evil (for instance in the tradition of Konrad Lorenz). The objective is to evaluate how the social neurosciences take part in writing the new narrative, and how it is embedded in contemporary cultural discourse.

6.2 The Puzzle

When I began thinking about social neuroscience, it occurred to me that there was a big puzzle in the whole matter: Why did people become interested in studying social interactions at a time when the autonomous individual seemed to be at its height? And not only did they become interested in human social interactions but framed the attitude of these interactions as cooperative and altruistic. In this research, empathy became the salient paradigm for understanding sociality. As the primatologist Frans de Waal puts it in a recent book on empathy in humans and animals: "Greed is out, empathy is in" (de Waal 2009: ix).

This focus on pro-social behaviour needs some explanation, because it is a new trend in scientific investigations of human behaviour and because in the light of the strong economic flavour of the political discourses at the time of its emergence this approach seems to be anachronistic. During the last thirty years, the general attitude of policy-making in Western welfare states has been transformed and seemed to orient itself by Margaret Thatcher's famous quotation that

> "there is no such thing as society. There are individual men and women, and there are families. And no government can do anything except through people, and people must look to themselves first. It's our duty to look after ourselves and then, also to look after our neighbour" (Thatcher 1987).

Since the implementation of neo-liberal deregulation programmes, first in Chile after Augusto Pinochet's putsch in 1973, then in the UK and the US after the elections of Thatcher in 1979 and Ronald Reagan in 1981, and subsequently in most Western (and via World Bank policies also non Western) states, policy-making began to be more guided by economical models of organising society (Harvey 2005: 7-8). Michel Foucault, who – among other things – was a historian of neoliberalism, observed that neoliberalism is not only a form of organising economy and society but a thought style affecting all areas of life, be it economic, political, social, or personal (Foucault 2004: 305). In its American form[61] it was a movement towards generalising the economical form of the market to areas not traditionally subject to trade relations, such as the society as a whole or social welfare systems in particular. The notion of supply and

[61] Foucault distinguishes between German, French and American forms of neoliberalism. The present study is concerned with cultural phenomena originating in the United States, thus the American form of neoliberalism is crucial. Moreover, as Foucault observes, American neoliberalism and its notion of freedom as well as its perspective on social and economical issues becomes a global demand of both the political left and right (Foucault 2004: 304).

demand is also applied to non-economical relationships, thus rendering the subject under investigation in an economical perspective (ibid.: 336).

The leading and most prominent academic institution in developing these policies was the Chicago School of Economics. Its members did not only achieve highest academic honours such as Nobel Prizes in Economics but also took an active role in policy-making by advising governments. For instance, one of its members, Milton Friedman, became a close advisor to former US-President Ronald Regan (Ebenstein 2007: 208-9). However, not only was a (neo-)liberal economic theory that is famously associated with the Chicago School of Economics put into practice, but also a certain concept of personhood that was connected with this theory – most prominently in the work of Chicago economist Gary Becker (e.g. Becker 1976, 1996). Becker aims at developing economical approaches to all human behaviours and stresses that all human behaviour can be seen as attempts of profit-maximising (Becker 1976: 14). Thus, he can investigate health, marriage, child rearing, irrationality, education, or criminality by applying cost-benefit calculations and he is convinced

> "that the economic approach is a comprehensive one that is applicable to all human behavior, be it behaviour involving money prices or imputed shadow prices, repeated or infrequent decisions, large or minor decisions, emotional or mechanical ends, rich or poor persons, men or women, adults or children, brilliant or stupid persons, patients or therapists, businessmen or politicians, teachers or students. The applications of the economic approach so conceived are as extensive as the scope of economics in the definition (…) that emphazises scarce means and competing ends" (ibid.: 8).

In this theory, human beings are understood as rational agents, as entrepreneurs not only in the realm of economy but in all spheres of life. This figure of the Homo economicus dominated (neo-)liberal economic theory and policies in the last quarter of the 20th century (Foucault 2004: 314-5). But it does not stop at policy making; as Foucault emphasises, economical thinking leaves the realm of economy and enters new spheres; practically all areas of human action can be analysed in economical terms. This is not merely a way of analysing the world but, like all other methods of understanding the world, imposes a certain world-view on the subjects studied – in this case the doctrine that the logic of calculating costs and benefits of one's actions is valid in all areas of life and even in intimate relationships such as those between parents and children or between spouses. All interpersonal relationships understood as exchange relations and are subdued to a logic of exploitation (ibid.).

6.2.1 Sociobiology

At the same time, across campus, cultural anthropologist Marshall Sahlins, a severe critic of the Chicago School's approach to economy and human nature, writes a polemical essay on *The Use and Abuse of Biology* (Sahlins 1976). In this essay he points out that simultaneously to the rising popularity of the School's theories a field of biology emerged, which took the neo-liberal perspective on society and transferred it to the 'social world' of animals. Then again, they used this perspective on animals to explain human society. Sahlins proposes that

> "(i)t might be said that Darwinism, at first appropriated to society as 'social Darwinism', has returned to biology as a genetic capitalism." (ibid.: 72)

Yet, this attempt of thinking nature and society together is not as new as the subtitle of Wilson's controversial book – a 'new synthesis'[62] – leads to assume. On the contrary, it can be traced back to at least Early Modern British Philosophy.

> "Since Hobbes, at least, the competitive and acquisitive characteristics of Western man have been confounded with Nature, and the Nature thus fashioned in the human image has been in turn reapplied to the explanation of Western man. (...) Human society is natural, and natural societies are curiously human. Adam Smith produces a social version of Thomas Hobbes, Charles Darwin a naturalized version of Adam Smith; William Graham Sumner thereupon reinvents Darwin as society, and Edward O. Wilson reinvents Sumner as nature" (ibid.: 93).

Sahlins argues that this new field, soon to be called sociobiology, adopts an economic ideology appropriate to competitive markets, just like older endeavours of naturalising human nature have taken their social order as a guide for deciphering nature. In sociobiology, older notions of natural selection by 'differential reproduction' have been replaced by notions of natural selection by 'maximisation' and 'optimisation.' This perspective on selection puts the focus of attention on DNA rather than the individual organism or the species. He points out that this new focus on genetic reproduction reifies reproduction of DNA as an end in itself:

> "The structure of this argument transforms selection into the *means* by which DNA optimizes itself over the course of the generations. The orienting force of evolution is thus transferred from external life conditions to the organism itself" (ibid.: 73).

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[62] Which not coincidentally reminds of the 'Modern Synthesis', the synthesis of Darwinian evolutionary theory and genetics, which was introduced by biologists in the 1930s and 40s (e.g. Dobzhansky 1937). This groundbreaking synthesis fuelled research in evolutionary biology. Likewise, Wilson announces the aim of sociobiology was "to reformulate the foundations of the social sciences in a way that draws these subjects into the Modern Synthesis" (Wilson 1975: 4).

This perspective on evolution again led to Dawkins' (1976) popularisation of the notion of the 'selfish gene', which social neuroscientists like my interview partner from the opening passage consider to be the driving force behind the social brain.
Sociobiology and its successor evolutionary psychology are important in the present discussion of social neuroscience's notion of the social for two reasons: first, these projects of naturalising human nature did not only look for biological foundations of human behaviour, but also sought to provide evolutionary explanations for the emergence of all behaviour traits, including complex social behaviour. Second, exactly these evolutionary explanations have been subject to severe critique (e.g. Sahlins 1976, Haraway 1991, Gould/Lewontin 1979, see below), showing that retrospect evolutionary stories aiming to define a status quo as nature is telling more about the worldview of those telling the stories than about how this behaviour might have come about (see also Schmitz 2006).

To understand why social neuroscience's assumption of pro-social behaviour as a default in human nature marks such a notable shift, it is important to present the preceeding narratives of sociobiology and evolutionary psychology as well as their critics in some detail. In the introduction to the mentioned book, Harvard biologist Edward O. Wilson stakes the claims for sociobiology. He maintains that in a Darwinian sense, organisms do not live for themselves or for reproducing other organisms. Their primary purpose is to reproduce genes and an organism is nothing more than a gene carrier.

> "Natural selection is the process whereby certain genes gain representation in the following generations superior to that of other genes located at the same chromosome positions. When new sex cells are manufactured in each generation, the winning genes are pulled apart and reassembled to manufacture new organisms that, on the average, contain a higher proportion of the same genes. But the individual organism is only their vehicle, part of an elaborate device to preserve and spread them with the least possible biochemical pertubartion" (Wilson 1975: 3).

It logically follows that the most successful genes will form the distinct character of a species. Since the genes' aim is to replicate as much as possible, various strategies have been developed: strategies prolonging the survival of the individual, strategies for successful mating and rearing offspring, and strategies of cooperation and most importantly altruism. The emergence of altruism in complex social organisations in the animal kingdom, from insect societies to Homo sapiens, formed the central theoretical riddle of sociobiology. The problem, from sociobiology's point of view, is that helping

others might weaken an individual's chance of survival and reproduction. Therefore the question is how and why a behaviour which decreases individual fitness could evolve. While looking for evidence of his theory in various species, Wilson's main intention is to explain human social behaviour in all its aspects, including ethics, religion and other aspects traditionally left out of biological investigations of humans. A few years after publishing *Sociobiology*, he dedicated an entire book to that issue (Wilson 1978[2004]). He suggests that human sociobiology will eventually become the basic discipline for all human sciences, being able to answer questions about human instincts and how they form human nature. Until then, two biological sciences are of particular importance for understanding human nature: neuroscience and evolutionary biology. Neuroscience provides insights into the question of how the human brain evolved – how it works and how it creates mind. Evolutionary biology provides answers to the question why the human brain works the way it does, why it evolved the way it did and not in any other random way (ibid.: x). Wilson has quite clear ideas about the outcome of that research:

> "The essence of the argument, then, is that the brain exists because it promotes the survival and multiplication of the genes that directs its assembly. The human mind is a device for survival and reproduction, and reason is just one of its various techniques" (ibid.: 2).

Yet, not only individual behaviour can be explained by looking into the evolutionary history of the species and thus into the genes. The same is true for society and culture, which are defined as hypertrophic structures, rooting in biology:

> "I interpret contemporary human social behaviour to comprise hypertrophic outgrowths of the simpler features of human nature joined together into an irregular mosaic. Some of the outgrowths, such as the details of child care and of kin classification, represent only slight alterations that have not yet concealed their Pleistocene origins. Others, such as religion and class structure, are such gross transmutations that only the combined resources of anthropology and history can hope to trace their cultural phylogeny back to rudiments in the hunter-gatherers' repertory. But even these might in time be subject to a statistical characterization consistent with biology" (ibid.: 96).

This reductionist approach towards culture and society allows to look for all bases of human behaviour in Pleistocene hunter-gatherer bands. No matter how complex contemporary societies are, they are always constrained by the unchangeable genetic predispositions of their members. For understanding contemporary social behaviour and social organisation, it is necessary to understand why this specific behaviour had been an advantageous adaptation to the Pleistocene environment.

But what does sociobiology have to say about classes of behaviour that define humans as a social species? Wilson defines four universals of human social behaviour, namely aggression, sex, altruism, and religion. These are discussed in the second half of his book. He basically argues that they all have roots in human evolution and structure the way we act today. For the present search of the narrative about human nature, the character traits aggression and altruism are crucial, since in the interpretation of these traits a general argumentative shift took place between sociobiology's reasoning in the 1970s and social neuroscience's reasoning in the early 2000s.

According to Wilson, aggression is a feature of humankind's past that we still carry around, some sort of an unwanted inheritance. Over the course of human evolution, aggression served as a strategy of defending oneself and one's kin against the dangers of the environment, of rivalling bands or dangerous animals. Apparently, Wilson speculates, human brains are programmed to separate other people into friends and strangers and to fear and combat the actions of the latter. Even though modern societies have more sophisticated ways of conflict resolution than violence, we have to cope with that evolutionary inheritance, since it is hardwired in our genes (ibid.: 119).[63]

While the evolution of aggression seems to be quite a self-evident mechanism for Wilson, he is more puzzled with the emergence of altruism. As mentioned, he is concerned with this issue in his earlier work, since altruistic behaviour seems to decrease evolutionary fitness rather than to increase it.

Sociobiology's answer to that problem is kin selection. In this concept, the unit of reproduction is neither the individual nor the group (as in other theories of evolution, cf. Wynne-Edwards 1962) but the kin, because an individual shares his genes with his relatives according to a fixed ratio: for instance with parents, siblings and children one half of the genes, with aunts, uncles, nieces and nephews one quarter of the genes and so on. Now, if an individual's altruistic action at least doubles a child's or a sibling's fitness, it also increases the chance of his own genes to reproduce. The further distant a relation, the higher the increase of fitness for them has to be to make an altruistic act beneficial (Wilson 1975: 117-9). In this reasoning, altruism among kin is in fact rational behaviour since it increases one's genes' chance for reproduction, as long as the maths is done correctly. It is possible, Wilson speculates, that most noble acts of altruism towards strangers or even self-sacrifice have their evolutionary roots in kin selection,

[63] However, Wilson sees some potential in consciously using other traits. If humankind as a whole consciously decides to give priority to other strategies of conflict resolution, other psychological traits might become prevalent over time (ibid.: 119).

since for the longest period of time in human history, the most important unit of social organisation was the family (Wilson 1978[2004]: 153). Yet, altruistic acts have also always taken place between non-kin. In sociobiology, these acts are classified as reciprocal altruism. The basic idea is that if I help you, I can hope that you will help me later or pay me in another form (Wilson 1975: 120). Wilson argues that this form of altruism is in its core selfish, since its aim is to gain from it in the long run.

Wilson stresses that pure, or hard-core altruism, the product of kin selection, is in the long run "the enemy of civilization" (Wilson 1978[2004]: 157), because it orients the individual towards closest kin only. Consequently, if this was the only form of altruistic behaviour, civilisations of larger scales would be almost impossible:

> "International cooperation will approach an upper limit, from which it will be knocked down by the perturbations of war and economic struggle, cancelling each upward surge based on pure reason. The imperatives of blood and territory will be the passions to which reason is slave" (ibid.)

Yet, Wilson does not believe in this dark future of humankind, since he believes humans to be sufficiently selfish to maintain a good and working social contract benefiting everyone's interests.

In the logic of sociobiology, any social behaviour has to be explained in terms of evolutionary adaptability. Even though Wilson admits cultural differences in certain behaviours, he stresses that each of these culturally formed behaviours can be traced back to their origin in evolutionary history. Thus, no social behaviour makes sense except in the light of evolution. Only behaviour enabling genes to reproduce could survive in the history of humankind.

Sociobiology was by no means uncontested. As already shown, critical voices soon became to be heard, raising questions about the political and social situatedness of sociobiology as a theory of human social behaviour. The alleged political programme of sociobiology was not the only point of critique. Turning again to Sahlins, he raises another problem from an anthropological stance: if kin selection is one of the driving forces behind the evolution of Homo sapiens, it would necessarily follow that kin is a category that can be defined merely by biology. However, this is not the case. Defining who does and who does not belong to one's kin, is highly determined by the standards and customs of the culture one is living in (Sahlins 1976: 57-61).[64] Thus, the interpretation of seemingly biological universals is highly influenced by cultural practice; the

[64] On the complexity of notions of kinship in Western Societies see also Schneider (1968) on notions of kinship in North America.

author's own cultural standards become reified as nature in sociobiological explanations of human behaviour. Consequently, Sahlins reads Wilson's theory as a product of the culture he lives in: North American capitalist society of the mid-20th century.

Sahlins, however, was not the only critic of sociobiology. Also biologist and historian of science Donna Haraway observed that concepts of nature were always based on both scarcity and competition, which are also the pillars of capitalism and patriarchy (Haraway 1991: 68). A group of Wilson's colleagues at the biology department of Harvard University claimed that sociobiology's reading of evolution yields to a deterministic notion of biology. They stated that not all behaviour we see today evolved as an adaptation to the environment. Rather, since genes are never responsible for only one thing, it is not clear what it was selected for. They coined the architectural term 'spandrel' to describe the phenomenon that structures exist which did originally not have any function but later turned out to be useful (cf. Gould/Lewontin 1979). At the same time, feminist biologists began to shift the perspective on evolution by including women and their role in the species' survival into theories that were hitherto centred on the hunting male. Anthropologist Adrienne Zihlmann and her colleagues developed the woman-the-gatherer theory, arguing that focusing on the male figure of the aggressive hunter (who is also the model for sociobiology) only ignores women's contribution to providing food for the group. With the woman-the-gatherer hypothesis they rendered women as active agents in the process of evolution rather than understanding them as a passive resource (Tanner et al. 1976; Zihlman 1978).[65] These voices, and particularly the feminist critique of women's absence in biology and other sciences, show that sociobiology's interpretation of the nature of human nature were by no means uncontested at their time.

6.2.2 From Sociobiology to Evolutionary Psychology

In the 1990s, also in the United States a new branch of psychology emerged, basing on the principles of sociobiology and aiming at understanding the evolutionary foundations of human behaviour. This field called itself evolutionary psychology and like preceding sociobiologists, evolutionary psychologists defined their approach to the human mind as a unification of science of human nature (Tooby/Cosmides 1992: 20). The editors on the first volume of evolutionary psychology, Jerome Barkow, Leda Cosmides and John Tooby (1992) locate human nature in a principled history of the universe in which

[65] The women-the-gatherer hypothesis was criticised for not challenging the gender dichotomy underlying the suggested division of labour (Harding 2001: 138; see also Heer 2012).

everything from pulsars to incest avoidance can be explained by a causal matrix (ibid.). In a much-cited contribution to that volume, Cosmides and Tooby investigate the "Psychological Foundations of Culture" (Tooby/Cosmides 1992). Before they come to their own argument, they explain why – in their perspective – social sciences cannot provide sufficient explanations about the world we are living in, namely because by default "the social sciences" would ignore the biological aspects of life. Cosmides and Tooby introduce the "Standard Social Science Model" (SSSM)[66] which – according to them – is dominant in all social sciences, including sociology, cultural anthropology, history, and parts of psychology. Doing so, they create an image of their intellectual antagonists that is very clear-cut. "The social sciences" reject all genetic explanations of human behaviour and take a clear stance on the "nurture" side of the nature-nurture-debate: they argue for a blank slate, a human mind that is empty at birth and going to be filled by education in a social and cultural environment. According to SSSM, the mind was shaped by the external world only, biological foundations were of no relevance for understanding the human mind, behaviour, and social world (ibid.: 22-31).[67]

Cosmides and Tooby need this picture of a well-defined opponent to emphasise their own effort of bringing biology back into the psychological debate, to have a more empirically grounded and evidence-based approach to human behaviour. They argue that even though "the social sciences" have generated some important insights into human social life and the constitution of human nature, they are too dogmatic and ignore the biological substrates and the evolutionary advantage of a specific behaviour. They argue that mental evolution happened along the same adaptive mechanisms as physiological evolution. To make their point clear, they compare the evolution of psychological traits with the evolution of the bodily constitution of Homo sapiens. Both, they argue, are features of a universal human nature:

> "Empirically, of course, the fact that any given page out of Gray's Anatomy describes in precise anatomical detail individual humans from around the world demonstrates the pronounced monomorphism present in complex human adaptations. Although we cannot yet directly 'see' psychological adaptations (except as described neuro-anatomically), no less could be true of them. Human nature is everywhere the same" (ibid.: 38).

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[66] For a detailed critic of Toby and Cosmindes' misinterpretation of the social sciences and their establishing a rather arbitrary straw enemy, see H. Rose 2000.

[67] In developing this alleged standard model of the social sciences, they – rather arbitrarily - mainly refer to sociologist Emile Durkheim and anthropologist Clifford Geertz, both standing for a structuralist approach to the social and cultural world, and to the behaviourist tradition. The latter is particularly important as an antagonist for evolutionary psychology, because behaviourism is associated with the "blank slate theory", that humans are born without any character traits or mental predisposition. These are acquired over time via training.

The separation of nature and nurture, which they see propagated by "the social sciences", is problematic, they argue, since ethologists, sociobiologists, behavioural ecologists, and evolutionary psychologists have proven that in human behaviour causality does not flow from the external world to the individual but the other way round – the biological make-up determines the options of behaviour we have (ibid.: 48). Like sociobiologists, evolutionary psychologists assume that the main purpose of organisms is to reproduce genes that are able to solve problems in a way that they increase either the organism's or the organism's kin's probability to create offspring. Natural selection is the only known way in which complexly organised functionality in living organisms can be found (ibid.: 53). Thus, social organisation as well as psychological traits has evolved only to the purpose of increasing the reproductive fitness of gene-carriers. Consequently, a reasonable way to look at human behaviour is to ask:

> "What is the underlying panhuman psychological architecture that leads to this behavior in certain specified circumstances?' and 'What are the design features of this architecture – if any – that regulate the relevant behavior in such a way that it would have constituted functional solutions to the adaptive problems that regularly occurred in the Pleistocene?" (ibid.: 55).

The environment was as much shaped by evolution as were the genes, since it has evolved side by side with the organism. During the course of evolution, different evolved developmental programmes interacted with different parts of the environment and rendered them relevant for a given programme or were causal for its development (ibid.: 84-5). Accordingly, culture and society as parts of the environment have to be explained by evolutionary terms. Rudiments of culture and society co-evolved with the modern Homo sapiens.

> "The social and cultural are not alternatives to the biological. They are aspects of evolved human biology and, hence, they are kinds of things to which evolutionary analysis can properly be applied. Social scientists need to recognize that humans have evolved to expect, rely on, and take advantage of the richly structured participation of the environment – including the human social and cultural environment – in the task of adaptive development" (ibid.: 86-7).

Yet, this does not mean that all societies and cultures are the same. Cosmides and Tooby employ the metaphor of a juke box: we all have the same make-up, the same stock of possibilities, but it depends on when and where we are, which of these options is chosen. They suggest that this common make-up constitutes a 'metaculture': a system of universally recurring relationships that is established by universal species-typical psychological and physiological architectures, interacting with each other and the

developmentally relevant environment, both natural and cultural. These nature-environment interactions form standard patterns of impacting the human mind and thus create the alleged meta-culture (ibid.: 91). These panhuman universals make it possible to have cultural variability on universal grounds.[68]

However, one question remains open: if sociocultural and biological evolution do influence each other, why are we stuck with a palaeolithic brain? If evolutionary psychologists take their own claims seriously, they should allow for brain-environment-interactions that have the force of changing the biological make-up of the brain. However, they claim that the human mind and brain were shaped in the palaeolithic era and are thus adjusted to the Palaeolithic environment. But somehow, this co-evolution seemed to have stopped with the end of the Pleistocene, otherwise the notion of pan-human universals would make no sense, as sociologist Hilary Rose and neurobiologist Steven Rose emphasise. Yet, as they point out, humans succeeded in changing species by artificial selection in breeding domestic animals in only a few generations. Thus, if other species can change in a relatively brief period of time, why not Homo sapiens? (Rose/Rose 2000: 2).

Hilary Rose points out that we only have fragmented evidence from prehistory and can only speculate – for instance it is not sure whether "Lucy", the famous Australopithecus, was indeed a female as is commonly assumed. Thus, a big problem that is not addressed by evolutionary psychology is how reverse engineering, the attempt to understand origins of human behaviour by analysing what is still present, should work if so little is known about the psychic make-up of stone age humans (H. Rose 2000: 118).

In their approach to culture and society, evolutionary psychology adopts sociobiology's reductionist approach. They complement the evolutionary interpretation of cultural and social human life with the idea that the human mind consists of various modules, each of which is responsible for tasks of a specific domain.

This had become possible because of the cognitive turn in psychology which brought the notion of modules and domain specificity into the discussion of psychology. The

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[68] Hilary Rose observes an interesting rhetorical difference between sociobiology and evolutionary psychology. While sociobiology was interested in defining differences between 'primitive' humans and 'civilised' humans, 'race' is not a category in evolutionary psychology. And this for a very simple reason: "Attention to difference, whether by behaviour geneticists or social scientists, spoils their assumption of a universal, gendered human nature fixed in the Pleistocene. Hence they concentrate on what they claim are universal cultural practices, such as the age difference between men and women in marriage, child abuse by stepfathers, universal standards of female beauty, and so forth, arguing that these are evolutionary adaptations" (H. Rose 2000: 117-118).

notion of domain-specific modules goes back to linguist Noam Chomsky and cognitive scientist Jerry Fodor.[69] This theory assumes that the brain is divided into various modules, each being responsible for a specific array of tasks, for instance face recognition, language, motor perception, or social cognition (Ward 2012: 5-7). Cosmides and Tooby argue that this kind of research suggests that certain emotional and motivational mechanisms have evolved which specifically address adaptive problems in crucial areas of species' survival such as parenting, kinship, mate choice, or aggression (ibid.: 101). They maintain that for each adaptive problem a certain module evolved. Consequently, to fully understand the human mind, it is necessary to understand the adaptive purposes of its modules:

> "all reliably developing functional mechanisms in a species' psychological architecture must (1) be ascribed to the operation of natural selection, (2) be consistent with its principles, and indeed (3) be organized and specifically designed to solve the narrowly identifiable sets of biological information-processing problems defined by selection operating within the context of a species' ancestral mode of life" (Cosmides/Tooby 1997: xvi).

Thus, it should be possible to locate specialised modules for all kinds of character and behavioural traits in the mind. The relation between mind and brain, however, is by no means explicitly discussed.[70]

6.2.3 Biologising Sociality

Both sociobiology and evolutionary psychology contributed to a biological conception of society and culture. Both use stories about an assumed evolutionary past of Homo sapiens to explain contemporary social and cultural standards, the standards of the world how they see it or how they would like to have it. In both disciplines the notion of a hierarchy of disciplines prevails in which biology as the more fundamental science has greater explanatory power than social sciences. The former can provide insights in the foundations of social behaviour and thus the foundations for the social sciences. They have the power to reveal the truth, whereas the latter can only speculate about epiphenomena. For both, sociobiology and evolutionary psychology, the search for

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[69] Fodor explicitly discusses to Gall's theory of mental organs as the historical root of contemporary theories of domain specificity. He argues that Gall's theory did not get the apprisal it deserved because was equated with phreonology and with it was discredited as fraud (Fodor 1983: 14-23). By defining Gall as the first theorist of domain specificity while bypassing phrenology, Fodor gives his own argument a historical relevance and simultaneously defends it against accusations of pseuroscience associated with phrenology.

[70] In the index of *The Adapted Mind*, neither the term 'brain' nor any 'neuro-'term are listed. Thus, questions related to the brain seem to be of no relevance in any of the 18 contributions to this first volume on evolutionary psychology.

universals in human behaviour is central. These universals are found in the biological make-up and result in a common evolutionary history. The only essential differences found between humans are those between the sexes, since they have different tasks in the reproductive process, which is the main task of all living organisms. The driving force behind evolution and thus behind social behaviour is the reproduction of genes. Consequently, the most rational behaviour would be selfish, because it ensures the fitness of the gene carrier. Social behaviour such as altruism is either reduced to selfish profit maximisation (reciprocal altruism) or explained by kin selection: my altruistic behaviour helps copies of my genes that my relatives carry.

Yet, what serves as the theoretical foundation of sociobiology and evolutionary psychology is not the only possible perspective on evolution. Most severe critics of sociobiology and then evolutionary psychology point out flaws in their argumentation and theories of genetic inheritance (cf. Gould/Lewontin 1979; Gould 1997; Haraway 1991; Lewontin et al. 1984; Sahlins 1976; Rose/Rose 2000).

Richard Lewontin, Steven Rose and Leon Kamin published their intervention against sociobiology under the provocative title *Not in Our Genes* (1984). Their most important point of critique is that a notion of human nature, which is rooted in biology cannot be changed and is inaccessible by social institutions. Thus, the deterministic argument that human behaviour as we see it today has emerged because it has proven to be evolutionarily adaptive withdraws any possibility of social change. If a certain behaviour has proven to be the best to cope in the world, how would we dare to change it (ibid.: 264)?

Similar critic has arisen when evolutionary psychology entered the stage. Stephen and Hilary Rose initiated a debate between biologists, psychologists and social scientists, all of them taking a critical stance towards newly emerging evolutionary psychology. The impetus of the book presenting the different aspects of the discussion is that evolutionary psychology is not only flawed in its analyses of human social behaviour, but that it is in fact an ideology, postulating individualist, Hobbesian ideas about human nature and society. Since evolutionary psychologists claim that – while being politically neutral – their findings should have consequences for social and public policy, their claims should be discussed politically as well as scientifically (Rose/Rose 2000: 3).

Sociobiology's and evolutionary psychology's reading of the evolutionary origins of human behaviour leads to the assumption that biology is destiny but at the same time, we can change biology by bioengineering (Rose/Rose 2000: 4). This reading puts

questions of morality and social institutions in the realm of biology (Nelkin 2000: 20) and thus withdraws it from the realm of negotiation. In evolutionary psychology's reading, a strict Darwinian evolutionary theory would transform the social sciences into sound biological sciences (Rose/Rose 2000: 5).

The contributors to that volume make different readings of evolution strong and stress that even Darwin himself admitted that other forces next to natural selection were important in the development of species' traits (S. Rose 2000: 259). Besides notions of selfishness and survival of the fittest, there are notions of cooperation as survival strategy (such as that proposed by Peter Kropotkin, see below). Evolution does not make sense in the way evolutionary psychologists want to see it. It cannot explain everything because it is not teleological and because natural selection is not the only vehicle change takes (Gould 2000: 88-89).

Hilary Rose suggests that 'biobabble' has replaced 'psychobabble', indicating a shift in the general understanding of human nature. While in the second half of the 20th century, psychoanalytical interpretations of human nature were dominant in cultural discourse, academic investigations and self-descriptions of individuals, in recent years, biological explanations about who we are and why we feel like we do and also the remedies against suffering has become increasingly biological (H.Rose 2000: 106).

This rather long excursion into the world of sociobiology and evolutionary psychology attempted to show how recent attempts of investigating the biological foundations of sociality have been subject to much critique, both methodologically and regarding underlying assumptions of human nature. The critics of these endeavours have challenged the evolutionary narratives about Pleistocene humans and maintained that these stories tell more about those telling them than about the past they are talking about. In fact, so the critics, the evolutionary narrative is a rather ahistorical reification of what one knows and takes for granted, i.e. the life realities of middle classes in Western societies of the 20th and 21st century (Sahlins 1976, see also Haraway 1989). A certain reading of evolution is described as the only true way of natural selection; other perspectives on the process of evolution are either ignored or ridiculed. Social neuroscience's narrative of human nature differs from sociobiology's and evolutionary psychology's narratives by focusing on cooperation rather than competition. Yet, by locating sociality in the brain and embedding it in an evolutionary narrative, the structure of the argument remains the same. The roots of any behaviour lay in the species' past, it is part of the biological make-up and evolution is the only valid

explanatory framework for its emergence. Moreover, when looking at the critique of biological determinism and reductionism, Lewontin et al. rise in their book *Not in Our Genes*, some striking similarities to social neuroscience can be found. Lewontin et al. (1984: 7) observe that evolutionary explanations of human behaviour operate in a certain scheme. Social phenomena, they argue, are perceived as the sums of individuals' behaviours. These behaviours are considered to be measurable entities located in the brain. Sometimes, environmental factors are considered but the emphasis lays on biological factors. By reifying certain behaviours as biological entities located in the brain, norms and deviations are created. Deviations are perceived to be pathological and thus are framed as medical problems.

Looking at social neuroscience research as discussed in the last chapters, it becomes obvious that similar accusation of reductionism can be applied, even if the rhetoric is non-reductionist. Social neuroscientists, such as Cacioppo and Bernston (1992) or Ochsner and Lieberman (2001), stress that this research field seeks an integrative approach, including research on various levels of investigation, from the molecular to the social. Yet, as has been shown, research on a social level is only integrated in social neuroscience research if it is conducted with a quantitative approach or can be translated into a quantifiable language (see chapter 4). The only valid notion of the social is an analysis of the social as a capacity of the individual that can be located in her brain, measurable and quantifiable. Hermeneutic, historical or structuralist approaches are not translatable into quantifiable research and can thus not be integrated in social neuroscience research. Later on in this chapter, it will be argued that social neuroscience, too, creates a norm and that deviance from normal social behaviour is pathologised. Its source is sought in the individual rather than in environmental factors.

While it is too early to say whether social neuroscience is just another version of sociobiology, working on the same issues only with other methods and a changed notion of human nature, this striking resemblance indicates that certain epistemological ideas persist. The question arising from the debates about sociobiology and evolutionary psychology is: what is the epistemological and political purpose of looking into the biological foundations of human social behaviour? This is a question social neuroscience still needs to answer.

6.3 The Puzzle Revised – Evolution and Sociality

Despite their focus on selfishness and profit-maximising, sociobiology and evolutionary biology are relevant for understanding social neuroscience's concept of evolution of social behaviour. Another episode from the Lab shows how strongly evolutionary narratives serve as bases for explanations of social behaviour.

H. was the graduate student I was most talking to about science in general and methodological and conceptual problems in particular. Partly this was due to the fact that we shared an office and partly because he liked talking about it a lot.

When he was talking about science, the most important things for him were the production of data and causal relationships between the factors studied. If a study failed to provide either of the two, in his eyes that was bad science. For him, only biology mattered –if something could not be explained by biology, it was not real. However, this biology could be complex, as becomes obvious in his critique of evolutionary psychology. The topic came up during one lunch break. H. had recently attended a conference where he heard a talk about video game addiction and told me that he constantly gets annoyed by the video addiction debate. I asked him why he did not like the talk and he replied that it is problematic to take criteria of the DSM and use them for other phenomena. I told him that my concerns are rather that social problems are explained by biological causes and then treated with pills. Besides, I was not sure how fast evolution had to work if there is already an organic cause for video game addiction. This cue provoked him to produce a long litany about how bad evolutionary psychology was. He made the usual statement that they only come up with just-so-stories instead of providing evidence and proof. But he also criticised that evolutionary psychologists often ignore that it is never clear which traits were selected for and which were mere by-products. He told me about this old professor he had as an undergraduate student who always repeated one story – that about a Russian geneticist who selected foxes for certain character traits and ended up with foxes of a certain fur colour. This phenomenon showed that one could not tell which trait was selected for and which was merely a phenomenon that happened to come with that trait.

H.'s perspectives about good scientific practice and the right questions cumulated in a conversation we had a few weeks before I was leaving. In May, a leading social neuroscientist was delivering a lecture at the University, speaking about loneliness. In the talk he was arguing for a notion of loneliness as a biological signal (or the social equivalent to physical pain) and suggested to study it on different levels of organisation

from the genetic to a demographic level. He understood loneliness as an evolutionary advantageous adaptation because it makes people interact with each other and this increases the chances of survival.

A few days later, at a graduate student barbecue, I was speaking to H. about this talk. He did not attend it and asked me what the talk had been about and how I liked it. I told him that the presented work on loneliness sounded interesting enough to me. H., however, was sceptical about this research. Admittedly, he said, they did use biomarkers but they cannot show any causal relationships. Well, I said, they do show causal relationships between loneliness and bad health. Yet, H. pointed out, that does not tell us what causes loneliness. Besides, he was sceptical in regard to self-reports – what did it mean if somebody said she was lonely? He rambled a bit more about this kind of work and then announced that at some point before I leave he wants to tell me about his huge project he plans to do. He had been talking about this project for a while, always hinting that it was something huge – something that would explain a lot about human evolution and behaviour. After we got our next beer he decided that it was time to tell me. He explained that he wanted to show something banal that nobody else had studied so far. It would explain, among other things, why we are bipedal. He has a friend who already has data in primates that support his hypothesis – thus it would be perfect because it will be an evolutionary explanation without being a just-so-story. Since I promised him not to tell anybody, I won't. But he told me the basics of his hypothesis which would provide an integrative explanation to both biological and cultural phenomena. After discussing the project a while, we found out how to get more beer than the two free and the scientific part of the conversation was over.

This episode stands as an example for the relevance evolutionary explanations have in social neuroscience, both in estimating the validity of research and in rationales behind designing experiments. It is not always as explicit as in H.'s account but it comes to the surface when people refer to humans as species or social animals or when they compare human behaviour with that of animals such as non-human primates, rats, bees, or crabs. The difference between Homo sapiens and other animals is seen as one of degree. Talking about the active role of ancestors on our lives, again Interviewee E explained how Homo sapiens' concept of sociality transcends the here and now in time and space:

> "certainly in Japan, they have ancestors who are no longer here but they extend their influence through your thinking about them and consultation with them. They have a very real influence but it's only through your thinking about them. (...) about my way of thinking, we and a handful of species have and I'm only certain about us, I won't

> rule out others. I think, one of the features that makes us like that is our neocortical complexity and connectivity, that's where we differ a lot from other species, is both that increased complexity and connectivity. And Robin Dunbar's argument is that neocortical development itself reflects the demands of social complexity, not ecological complexity. "

However, the notion of evolution is not as straitforward as that of evolutionary psychology as becomes evident in the opening passage of this chapter. Yet, evolutionary psychology is indeed attractive to social neuroscience to some extend. The Head of the Lab once remarked that he really likes evolutionary psychology, however, he does not understand why we are supposed to have a stone-age brain in a modern scull. This passing remark is important since it shows the other fundamental notion of social neuroscience – that the brain is highly adaptive to new situations, with more than Palaeolithic tools for solving problems.

Not all social neuroscientists I interviewed used examples from evolution in our conversations but, on a common ground, they all assume that the brain is social, that it is responsive to social stimuli, and that it can be modified by social stimuli. This assumption goes back to the "Social Brain Hypothesis" as discussed in chapter 5. Social skills are no longer a mere add-on to evolutionarily older acquired traits but a fundamental part of human evolution and human nature, which cannot be understood without a profound knowledge of these. One of the social neuroscientists I interviewed, turned the traditional view of cognitive science upside down when he explained:

> "Everything about human intelligence and memory and so on, evolved to *serve* our social and emotional needs, those are the prime movers. And I think that's really pretty cool." (Social Neuroscientist C)

Older notions perceived rationality and cognitive processes as being at the centre of the human mind. Emotions were understood as either unimportant or as interfering with cognitive processing, a form of noise that had to be either ignored or reduced. Damasio's somatic marker hypothesis questioned this order by suggesting that emotions and rationality are intertwined, that emotions are part of each decision-making process (see chapter 5). Keeping that in mind, my interviewee's account on the relationship between emotions and cognitive skills appears a rather radical break with this old notion. Instead of being classified as noise or being on an equal level with cognitive processes, he defines emotions as a part of the sociality which is the core of human behaviour, the driving force behind al human action. In his statement, Social Neuroscientist C goes further than Damasio by claiming that emotions and rationality

are not equal partners but that emotions are the 'prime movers.' All other mental abilities are subordinated to that higher drive. While this radical perspective may be nothing more than a rhetorical emphasis of emotion's importance, this quotation demonstrates that the evolutionary narrative has changed.

Social neuroscientists study human social behaviour and find that humans are a highly social species, individuals being dependent on others for survival and well-being. Their notion of evolution may be one of fitness, but this notion of fitness is not based on the idea of the struggle of all against all – they contest the assumption that by default individuals are selfish profit-maximisers who only look for their own benefit without caring for other people's well-being. On the contrary, they assume that it comes quite naturally to humans to cooperate. And not only do they claim that individuals cooperate – they find evidence for the cooperative nature of humankind in humans' evolutionary history and the neurobiological and hormonal substrate of the brain and the nervous system. The notion of evolution underlying social neuroscience's research focuses on the needs resulting from living and surviving in groups rather than the profit maximising individual living on the cost of others. Cost and benefit calculations may still play a crucial role in this notion of evolution, but by looking at social behaviour from this perspective it appears that cooperation and altruism are beneficial; that they have been adaptive to evolve social behaviour in hunter-gatherer communities. For one's own profit maximisation it pays to help others or, as evolutionary anthropologist Michael Tomasello puts it, we are both selfish and altruistic by nature and this is the reason – by the way – why we have moral dilemmas (Tomasello 2009).

For sociobiology, altruism was a riddle in want of explanation. At the turn of the century, this began to change. In social neuroscience and other fields, altruism and other pro-social behaviour became the norm and aggression and other anti-social behaviour are in want of explanation. The proponents of the new notion of human nature identify the ability to empathise with others as the basis of these pro-social behaviours. The following section will investigate the concept of empathy in social neuroscience before in the last section of this chapter I will situate this shift towards pro-sociality in a broader social discourse.

6.4 Empathy

In social neuroscience, empathy is understood as a basic mechanism of engaging with other people. Both, phylogenetically and ontogenetically, this mechanism is older than

other processes of engaging with other minds such as mentalising, social cognition or theory of mind. The actors of social neuroscience themselves do not always agree on the relationships between these concepts and sometimes even use them synonymously (for an overview see Batson 2009). This somewhat messy situation will also be reflected in this section, jumping from the philosophical-psychological concept of *Einfühlung* to the cognitive concept of theory of mind to mirror neurons and finally ends with a brief overview of current neuroscientific research in empathy.

In a contribution to a recent book on the social neuroscience of empathy, psychologist Daniel Batson phrases the two general questions concerning empathy as follows: How do we know another person's thoughts and feelings? And: what leads one person to respond with sensitivity and care to the suffering of another? Whilst some researchers (philosophers, developmental psychologists, cognitive scientists, neurophysiologists, and primatologists) are more interested in the first question, i.e. in a particular form of knowledge, others (again philosophers and developmental psychologists but also social psychologists) are rather interested in the latter, i.e. in a particular form of action (Batson 2009: 3).

He identifies eight different concepts of empathy that are all used simultaneously in contemporary psychological research and that contribute more or less to answering these questions. These concepts are:

- cognitive empathy as the ability to know another person's internal states, including thoughts and feelings;
- imitation as the adoption of posture or the matching of neural responses of an observed other (most prominently in the mirror neuron theory);
- *Einfühlung* as the ability to project oneself into another person's situation;
- perspective taking as the ability to imagine how one would think and feel in the other person's place;
- compassion as the feeling for another person's distress.

The last three concepts he identifies do not yet have a specific label:

- coming to feel like another person feels;
- imagining how another person is thinking
- and feeling and feeling distress at witnessing another person's suffering (ibid.: 4-8).

The underlying question of these different definitions of empathy is: how do we know what is going on in another person's mind and why do we respond to another person's distress in a pro-social way?

6.4.1 History of Empathy

The concept of empathy, so the story goes in social neuroscience, is a rather recent one. The editors of the aforementioned handbook state:

> "Given the long evolutionary history of the capacity for empathy, there is some irony in the fact that the word *empathy* has a relatively short history, being not much more than a hundred years old" (Decety/Ickes 2009: vii).

In fact, the term empathy celebrated its hundredth anniversary just the same year the volume Social Neuroscience and Empathy was published. It was the psychologist Edward Titchener (1909) who first used the term, deriving it from Greek *em* or *en*: "into" and *pathos*: "feeling or suffering". Thus he created a literal translation for the term *Einfühlung*. The concept of *Einfühlung* had been used in German aesthetics and philology and was brought into psychology by Titchener's teacher Theodor Lipps.

Lipps was professor of psychology in Munich and had a strong interest in the psychology of art and in aesthetics. In his psychology of arts and aesthetics, he used the concept of *Einfühlung* to describe the phenomenon that the contrast between oneself and a perceived object disappears. As a psychologist, he was interested in the question how that is possible psychologically and argued for an aesthetic imitation: the act of feeling to be identical with the perceived figure or even to feel oneself within the perceived figure (Jahoda 2005: 154-5).

Lipps, however, was not the first to use *Einfühlung* in the context of art. The term was coined by Robert Vischer, an art historian and representative of German aesthetics. In his doctoral thesis (Vischer 1873) he used *Einfühlung* (feeling (oneself) into) as a technical term in relation to the appreciation of art as one kind of feeling regarding a piece of art (Jahoda 2005: 153). While this was perhaps the first time that the noun *Einfühlung* had been used in an academic context, the verb *einfühlen* goes back to Romantic thinkers such as Herder or Novalis (Stueber 2006: 6).

Before it entered psychology, the concept of empathy was intended to fill the gap between the perception of an object and the beholder's aesthetic appreciation of that object. While perception was subject to positivist scientific inquiries, for instance the investigation of the visual or nervous system, aesthetic appreciation had to be explained psychologically. The concept of empathy should explain the "non-inferential and quasi-

perceptual character of aesthetic experiences" (ibid.) and should mediate between the observable perceptual and the non-observable psychological. As philosopher Karsten Stueber observes:

> "Aesthetic experiences are understood as specific perceptual encounters with external states of affairs that cause certain internal resonance phenomena that are projected into and felt as a quality of the perceived object" (ibid.).

For Lipps, aesthetic appreciation of objects is grounded in drawing analogies between their form on the one hand and human body and motion on the other. In aesthetic appreciation, the form of an object causes the same response as expressions of human bodies. Consequently, empathy is not merely an aesthetic concept but also a basic sociological and psychological category (ibid.).

According to Lipps, the basis for empathy is an innate tendency to mimic motor movement that is instinctual. The most famous example for this instinctual imitation is the contagious force of yawning. In this perspective, empathy is a kind of inner resonance. Yet, in this resonance the observed feelings can still be distinguished from one's owns, the self is not completely lost in the perceived object or person. Lipps aimed to distinguish empathy from a more theoretical approach to another person's mind, i.e. inferring mental states from analogy. He states, *Einfühlung*

> "is not the name for any inference; rather it is the name for an original and not further derivable, at the same time most wonderful fact, which is different from inference, indeed absolutely incompatible (with it)" (Lipps 1907: 713, quoted in Stueber 2006: 8-9).

Empathy as an academic concept has a second root in German humanities, namely in philology. While (Romantic) aesthetics was concerned with *Einfühlung*, the hermeneutic tradition in philosophy focused on the question of *Verstehen* (understanding).

In his attempt to define the humanities and to delimit them from the natural sciences, philosopher Wilhelm Dilthey argued that the main difference between the two was that natural sciences intended to explain the natural world, whereas the humanities aimed to understand historical and cultural events. These were holistic events, structured by meaning and significance and they were organised by human purposes and values. Since the objectives of natural sciences and humanities were so different, they also required different methodologies. He argued that it was not possible to understand events holistically with the explanatory instruments of the natural sciences. Hermeneutics, the method Dilthey suggested for the humanities, came originally from

philology. He based his methodology on the work of the philologist Friedrich Schleiermacher, who argued that for understanding a text, besides the linguistic and grammatical analysis, it was necessary to fully understand the social and historical position of the author. Dilthey now claimed that this method could be transferred to other subjects and employed for understanding other minds, the actions, utterances, or written texts of others and consequently also cultural systems such as law, art or religion. The main tool for this endeavour was *Nacherleben* (re-experiencing) or inner imitation of another mind to understand its products. Consequently, for him psychology was the foundation of all humanities, investigating how individuals experienced themselves and others in the external world. Yet, he did not have in mind the explaining psychology of the natural sciences but rather an understanding psychology. While hermeneutic thinkers did not use the terms of aesthetics, *einfühlen* und *Einfühlung*, their concept was close enough, and once the concept of empathy was established, it became a common way of thinking about the perception of other minds (Stueber 2006: 11).

Empathy became a central concept in the humanities because, it was argued, only in this manner specific phenomena could be understood as expressions of underlying mental realities. The two independent schools of thought, Lipps's aesthetic-psychological concept of empathy as an instinctual inner resonance and imitation person and the hermeneutic concept of inner imitation for understanding another mind, were quite distinct and had different aims, but together they opened up a space of thinking about how we perceive and understand other minds.

While empathy made its entry into psychology in the late 19th and early 20th century and despite some speculations about its neurological foundations in Lipps' theory, it is clearly located in the realm of psychology and philosophy, not in the realm of neurology. It was concerned with questions about how we can understand the world, including the people living in it. "Understanding" implied to figure the meaning of the observed act, feeling or situation. It could not be thought without taking into account the object of observation and the relationship between perceiver and perceived. Thus, it was a concept going beyond the individual; in the hermeneutic tradition it was even considered to stand in opposition to a physiological psychology orienting itself towards the natural sciences.

This changed fundamentally when the concept of empathy was integrated into neuroscientifically informed psychology about a century after its first introduction into psychology. To understand how a hermeneutic concept entered a quantitative science

such as social neuroscience it is necessary to make a big leap forward to the 1990s, autism research and the concept of theory of mind.

6.4.2 Cognitive Autism Research

Autism was first described as a distinct psychiatric disorder by US-based Austrian psychiatrist Leo Kanner in 1943. Kanner described the key features of autism as an extreme aloneness and an inability to relate to other people, moreover as the fear of change of known circumstances and intrusions from the external world such as noise. Kanner's definition of *early infantile autism* soon became part of psychiatric discourse; new criteria such as the lack of affective contact and repetitive behaviour were added. Yet, it only entered DSM as independent from schizophrenia in the manual's third edition in 1980 (Nadesan 2005: 10-11).

A year after Kanner's description of early childhood autism, another Austrian psychiatrist, Hans Asperger, working in Vienna, described a similar syndrome, unaware of Kanner's work due to the hindered communication between the US and German-occupied countries during the war. The crucial difference between the cases he observed and the ones described by Kanner was their intellectual and cognitive ability, which was average to above average, particularly in areas of logic. Moreover, the communicative skills of the children Asperger described was less impaired (ibid.: 12-14).[71]

While autism had been of interest in psychology for more than half a century, the dominant paradigm for Autism research used to be psychoanalysis until recently. Causes for autism were located in the social environment of children, particularly in its relation to objects and other people and the infant's failure to distinguish itself from others. Thus, mother-infant-relations were of special interest for understanding autism (ibid.: 87-89).

As in other areas of psychology, the cognitive paradigm had replaced psychoanalysis as the dominant framework in autism research and treatment by the 1990s. In cognitive autism research, the mind and related brain processes rather than environmental factors are in the centre of attention. Nadesan observes differing approaches between cognitive neuropsychology, taking a top-down perspective, and cognitive neuroscience, taking a bottom-up perspective (ibid.: 115). For the question about how empathy came into the brain, the top-down approaches and particularly research on theory of mind deficits in

[71] Asperger's syndrome is now included in the DSM-IV as part of the autism spectrum disorders (Nadesan 2005: 14).

autism are more relevant than the bottom-up approaches. Hence, in the following the perspective will be on these.

In cognitive psychology, the concept of theory of mind describes the ability to put oneself into the position of another person and, by doing so, to be able to understand the other person's perspective, her intentions, beliefs and desires as being different from one's own intentions, beliefs and desires and to predict her actions (Premack/Woodruff 1978: 515; Baron-Cohen et al. 1985: 38) – one could also speak of some sort of cognitive empathy in Batson's terminology (Batson 2009). Ontogenetically, this capacity develops much later than basic empathy. Children between three and four years first pass theory of mind tests, while recent studies report that empathy could be shown in infants of 18 months and younger (Pfeifer/Dapretto 2009: 185). Some autism researchers, particularly the groups around Uta Frith at UCL and around her former student Simon Baron-Cohen at the University of Cambridge, argue that autistic individuals lack this theory of mind. They introduced this hypothesis in their 1985 paper *Does the Autistic Child Have a "Theory of Mind"?* (Baron-Cohen et al. 1985). They state that autism's main symptom is the failure to form social relationships. However, comparative studies with children having other cognitive impairments such as Down's syndrome show that a low IQ cannot be the cause of these lacking abilities of building social relations, since children with Down's Syndrome can form these relations and autistic children with an IQ in the normal range or above cannot. The authors argue that the characteristic feature of autism is a lacking ability to form second-order representations, which are crucial for developing a theory of mind (ibid.: 38). Employing a false-belief task,[72] they showed that autistic children did not take the perspective of the other person while Down's Syndrome and children affected by neither condition did. They conclude that autistic children cannot distinguish between their own and another person's knowledge of a situation and explain this by a lacking ability to represent mental states of others (ibid.: 43).

Baron-Cohen's hypothesis of impaired theory of mind in autism in closely connected with an evolutionary explanation of how the mind works, particularly with the notion of specific cognitive or mental modules for specific cognitive or mental tasks. Not

[72] In the false-belief task, also known as the Sally-Anne task, a child observes two dolls – Sally and Anne – in a room. Sally puts a marble in a drawer and leaves the room. While she is away, Anne puts the marble from the drawer into a box. When Sally comes back, the child is asked where Sally will look for the marble. The test is passed if the child points to the drawer, indicating that she knows that Sally has a false belief because she does not know that Anne had moved the marble into the box (Baron-Cohen et al. 1985: 41-2).

surprisingly, Leda Cosmides and John Tooby, the protagonists of evolutionary psychology, contributed a foreword to Baron-Cohen's essay *Mindblindness* (1997). They appreciate that psychologists finally realise that it is not the world that organises the mind but rather the mind that imposes its own "kinds of organization" on the world it perceives. These kinds of organisation have evolved by natural selection and proven to be adaptive to a species' environment.

> "On this view", they suggest, "our cognitive architecture resembles a confederation of hundreds or thousands of functionally dedicated computers (often called modules) designed to solve adaptive problems endemic to our hunter-gatherer ancestors" (Cosmides/Tooby 1997: xiiv-xiv).

Baron-Cohen argues along these lines when he speaks about a "Theory of Mind Mechanism" that enables us to infer from another person's behaviour to her mental state. While Tooby and Cosmides imply that Baron-Cohen argues for a "Theory of Mind Module", he himself does not seem to be quite decided about whether it is a module of its own or a part of another module (he suggests that it might be a part of a "social module" as proposed by Leslie Brothers, ibid.: 96). He argues for a neuronal correlate of mind reading in the brain, consisting of amygdala, superior temporal sulcus (STS) and orbitofrontal cortex (OFC) (ibid.: 91). While he admits that the localisation of mindreading capacities has to be speculative since evidence is sparse, he feels "obliged to at least address the question of where in the brain the mindreading system might be located" (ibid.: 88). Evidence from patient, animal and imaging studies shows that impairments of these three brain regions lead to deficiencies in emotion perception and social perception (amygdala), face processing tasks (STS) or social judgement (OFC), all elements that are crucial for mindreading (ibid.: 94-5). In Baron-Cohen's theory, the ability to engage with other people is physically located in the brain and theoretically located in the framework of evolutionary psychology.

This cognitive theory of empathy as a lack of skills for mindreading is crucial for social neuroscience. Research sparked by Baron-Cohen et al.'s study was quite influential for developing concepts of social cognition, mentalising and theory of mind, which are at the core of social neuroscience. While the cognitive approach of Baron-Cohen et al. is clearly in line with the cognitive tradition in social neuroscience, the alliance with evolutionary psychology might be less important for social neuroscience itself. However, it shows how its concepts and theoretical approaches are related to evolutionary narratives about human nature.

These developments in autism research, particularly the debate about theory of mind are crucial for social neuroscience's notions of empathy. It incorporates concepts of theory of mind and of mirroring as two levels of engaging with other minds and brains, as will be shown in the following section.

6.4.3 Social Neuroscience and Empathy

The already mentioned volume on the social neuroscience of empathy (Decety/Ickes 2009) includes an array of approaches towards the question of how empathy with others is possible, how it is involved or absent in psychiatric disorders but also on the evolutionary origins of empathy. The main questions guiding social neuroscience's research in empathy are: why do we have the capacities for empathy, how do they work and what happens when the do not work? These three pillars of contemporary interest in empathy research shall be discussed briefly in this section.

Evolution of Empathy

By now it should have become clear that it is difficult to assess the evolutionary origins of behavioural traits in modern humans. Nevertheless, it is a common approach in life sciences to explain why certain allegedly universal behaviours occur. Sue Carter, a leading researcher on oxytocin and monogamy in rodents, and her co-authors present "*Neural and Evolutionary Perspectives on Empathy*" (Carter et al. 2009) in the mentioned volume on the social neuroscience of empathy. They argue that sociality is a central capacity for many mammals to survive and suggest to reconsider theories of group selection (ibid.: 170). One main argument for group selection is that it has proven to be advantageous to share the responsibility for detecting dangers. From this cooperation in protecting the group, more general practices of social communication and knowledge sharing emerged, which are the foundation of all communities and societies (ibid.: 173). The ability to read the facial expressions of conspecifics provides the basis for emotion recognition and emotion sharing. This is possible through certain circuits in the mammalian brain. Thus, Carter et al. argue, basic processes of empathy are crucial for survival and very possibly provide also the biological basis for higher forms of empathic engagement with others. A common way of digging into the evolutionary history of Homo sapiens are comparative animal studies, for instance with Carter's seemingly monogamous prairie voles or with other primates. Yet, within the field of biological empathy research, the debate is still open whether empathy should be

considered to be a uniquely human feature or a trait shared with non-human primates or even rats, as was suggested by a recent and widely noticed study (Bartal et al. 2011).[73] Another possible way is to look for genes associated with a trait. Baron-Cohen, in his recent book on human cruelty, suggests that certain genes might be responsible for empathy. However, he has to remain speculative and furnishes his search for genes associated with empathy with careful caveats stressing that he is not arguing for a direct gene-empathy link but is rather interested in gene-environment-interactions (Baron-Cohen 2011: 85-87). This genetic reasoning is showing quite nicely the apparent urge of contemporary researchers to find biological evidence for the good nature of humankind. In the mentioned book he investigates human cruelty as "zero degrees of empathy", so the British title of his book.[74] Empathy is defined as a normal human trait which exists in different degrees and is distributed along a bell curve among any given population. People can have different degrees of empathy, measurable with the empathy quotient, similar to measuring intelligence with the intelligence quotient. Yet, Baron-Cohen identifies two kinds of deviations, having zero degrees of empathy: "negative zero" and "positive zero". The former group are dangerous psychopaths[75] and the latter group harmless or even valuable for society, people with any disorder from the autism spectrum. To define "zero degrees" of empathy as deviant it is necessary to define an empathic normality. Baron-Cohen's speculation about genes responsible for empathy is a crucial step for defining a genetic normality of pro-social behaviour and pathological states of empathic skills. If the assumed 'genes for empathy' work properly, the empathic skills are in a normal range. Only if these genes are broken or switched off, empathic skills fall beneath the normal range. The causes for functioning or non-functioning empathy skills lay in the genetic make-up of the individual and are thus difficult to change. Baron-Cohen does not say, however, what the consequences of this quest for empathy's genetic basis are – is in this perspective another option thinkable than genetic screening and locking away individuals showing genetic markers for psychopathy? His theory of psychopathy shows indeed striking similarities to Lombroso's criminal anthropology (Gould 1997; see chapter 5). While Lombroso was

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[73] Also other mammals such as whales, dolphins, seals (de Waal 2009: 126-9) or elephants (ibid.: 132-7) are said to have empathic skills.

[74] The US title is *The Science of Evil*, refers to the tradition of looking for the evil in nature in the tradition of Konrad Lorenz and it is more Hollywood and more compatible to George W. Bush's war against terror and the axis of evil.

[75] While psychopathy is not a diagnostic category according to DSM IV, it is a commonly used term in social neuroscience.

looking for evidence for his theory in physiognomy and anatomy of 'inborn criminals', Baron-Cohen is looking for evidence on the neural and genetic level. Yet, both locate the true nature of criminality in nature rather than culture. Psychopathy or criminality are features of the biological make-up of affected individuals. In both cases, the individual is in the focus of attention and the site for intervention, not the society, in which these forms of behaviour occur. The only possible consequence from this perspective is to "screen and intervene" (Rose 2010).

It is important to keep in mind that narratives of the evolutionary origin of empathy, such as those presented here, are as much speculations about human nature as narratives of the evolutionary origin of entrepreneurism or war mongering or of nature as an entrepreneur that were popular with sociobiology and evolutionary psychology. Without Doctor Who's skill of time travelling, there is simply no way of knowing how hominids did live, think, feel, and act over the course of evolution and if they had been more similar to allegedly aggressive chimpanzees or supposedly peaceful bonobos for instance.[76] Evolutionary explanations of contemporary human's behaviour tell more about the assumptions and beliefs of those developing the ideas than about the evolution of social behaviour (Schmitz 2006: 208).

Social Neuroscience of Empathy

While it is commonly accepted in social neuroscience's epistemology that empathy must have an evolutionary benefit, since it seems to be a rather old mechanism and its basic components are rooted in old brain structures and perhaps in genes, less agreement exist about the methods for measuring empathy. This is due to the various concepts about what empathy actually is (see Batson 2009), each concept requiring its own method(s) of investigation. Stimuli used for measuring empathy are for instance video clips with actors telling emotional life events (e.g. Zaki et al. 2009), watching emotional faces (e.g. Jabbi et al. 2007) or watching people in painful situations (e.g. Singer et al. 2004). Such research is interested in the neural activation when watching others in distress or pain. Two different states are distinguished: to imagine oneself in the observed position and to imagine others in the observed position. In the first state, personal distress is higher and thus it is supposed that an act of helping another person is rather egoistic, to alleviate one's own distress. The second state however, or so is

[76] For a discussion of bonobos as a boundary object and figure in utopias of peaceful societies see Nicolodi 2009.

speculated, leads to an altruistic act caused by empathic concern for the other person (Singer/Lamm 2009: 90).

Focusing on another person's feeling might lead to empathic concern, while putting oneself in another person's shoes might rather lead to personal distress (Decety/Lamm 2009: 203). Thus, for experiencing empathy, the ability to distinguish between self and other is crucial. Decety and Lamm point out that while recent neuroscientific research suggests that the mere process of observing others in painful situations already yields activations in neural networks associated with pain processing in the observer,

> "this overlap is not complete (...). Both in the insula and in the cingulate cortex, the perception of pain in others results in more rostral activations that does the firsthand experience of pain. Also, vicariously instigated activations in the pain matrix are not necessarily specific to the emotional experience of pain; they may be shared by other processes such as somatic monitoring, negative stimulus evaluation, and the selection of appropriate skeletomuscular movements of aversion. Thus, the shared neural representations in the affective-motivational part of the pain matrix might not be specific to the sensory qualities of pain, but instead be associated with more general survival mechanisms such as aversion and withdrawal" (Decety/Lamm 2009: 201-2).

The form of empathy discussed by Singer/Lamm and Decety/Lamm is the most fundamental form of empathy, resulting in visceral feelings of compassion for another person's distress. It might provide the basis for other forms of empathy, including cognitive abilities such as the cognitive understanding of what another person feels or theory of mind. To explain these higher forms of empathy, the mirror neuron theory seemed to be attractive. In the early years of the 21st century, the idea that mirror neurons might not only be responsible for motion recognition but also for all kinds of behaviour and affective states of others, seemed to be rather attractive for the young and emerging field of social neuroscience and numerous studies found activation in the assumed mirror neuron system (for an overview see Iacoboni 2009). The implied possibility of direct communication between brains via a set of special neurons appeared to be an appealing hypothesis. Moreover, the mirror neuron theory promised to provide a model for how processes such as theory of mind would root in evolutionarily old processes such as motor perception. In a recent review of research on the role of mirror neurons in empathy, Marco Iacoboni states that several experiments have provided solid data for a network involved in simulation-based empathy, consisting of mirror neuron areas, the insula and the limbic system. In fact, it may provide a biomarker of both empathy and sociality (Iacoboni 2009: 665). Yet, as has been discussed in chapter 5, the mirror neuron theory is not uncontested in (social) neuroscience.

No matter whether a mirror neuron system in humans exists and whether it is involved in empathy, several studies have supported the theory that an unconscious mirroring of other people's affective states is a prerequisite for social learning as well as for empathy. However, the process of mirroring is not necessarily connected to one single area, as the mirror neuron theory proposes. Several crucial areas for perceiving and processing social stimuli such as other people's emotions have been suggested, including amygdala, insula, anterior cingulate cortex as well as other regions in the prefrontal cortex (Adolphs 2009: 705-6). While the basic empathy discussed by Singer/Lamm and Decety/Lamm is interpreted as an automatic and mostly unconscious process of sharing feelings and emotions, theory of mind and other forms of cognitive empathy imply a cognitive understanding of another person's perspective. Recent research findings propose a multidimensional and integrative approach to these different aspects of empathy and challenge the separation of affect and cognition (Shamay-Tsoory 2009: 215). It has been suggested that the ability to empathise is the foundation of prosocial behaviour such as altruism and is connected with forms of social cooperation and deception and may be the foundation of culture and sociality (Adolphs 2009: 697, Frith/Frith 2010b: 171). The concept of altruism is of particular importance in the related field of neuroeconomics, which investigates altruism in economic games (most prominently Fehr/Fischbacher 2003). This research in fairness is fundamental for changing the notion from a Homo economicus to a Homo empathicus since studies have shown that people do not always act profit-maximising. Rather, in neuroeconomic experiments, they opt to punish cheaters even if this costs. Like it has been suggested for empathy, Fehr and Fischbacher argue for an evolutionary foundation of this altruistic punishment.

While early social neuroscientific research investigated empathy as a more or less isolated feature, context has increasingly been integrated into social neuroscience investigations of empathy during the last years. For instance, Tania Singer et al. (2006) studied how perception of fair or unfair behaviour modulated the empathic concern for that person. Also the impact of experiencing exclusion and the ability of wilfully controlling an emotional situation have been investigated (Adolphs 2009: 707-8). More generally, social neuroscientists also point out that we do not empathise always and with everybody. Two cases are frequently subject to social neuroscience research. The first subject is measunging differences in empathic concern for minorities such as homeless,

immigrants or investment bankers or more generally for outgroup members[77] in comparison to empathic concern for members of one's own group (e.g. Fiske et al. 2007). The second case is empathy in health care. For medical staff, particularly surgeons, it is on the one hand important to empathise with their patients; on the other hand, it is important to keep themselves emotionally at a distance when conducting painful procedures such as surgeries. It has been suggested that cognitive mechanisms control empathic engagements with others (Ward 2012: 165-6.). While these everyday cases of less-than-normal or not-empathising with others are still in the range of what is defined as normal human behaviour, other forms of non-empathetic behaviour are classified as pathological. These are subject of the last part of this section.

What Happens When Empathy does not Work?

With the focus on empathy as a basic human capacity, social neuroscience does not only create a new norm, but also new forms of deviance. Those not being able to empathise become popular subjects of investigation. In the words of Baron-Cohen, these are the zero-negative and zero-positive cases of psychopathy and autism. Both conditions show "zero degrees" of empathy, but in the case of psychopathy, this is harmful to others (Baron-Cohen 2011: 30-1) while in the case of autism, it is harmless or even beneficial for others (ibid.: 83-4).

Baron-Cohen's catchy way of defining zero-negative and zero-positive cases of non-empathetic conditions is gaining new interest in the light of social neuroscience. Both, autism and antisocial personality disorders such as psychopathy are seen as conditions in which empathic skills are not working normally. In conditions classified as autism spectrum disorders (ASD), the mechanisms responsible for theory of mind is interpreted to be impaired, as has been discussed above.

The research in anti-social personality disorders (APD) bases on research subjects who had come in conflict with the law, which makes it difficult to study the neuronal and genetic foundations of these conditions without reproducing notions of inborn criminality traits. However, this is rarely reflected on. It has been shown that delinquents diagnosed with APD can tell the difference between right and wrong behaviour, thus it has been argued that their moral decision-making abilities are intact. However, it has been speculated that they do not feel the difference (Glenn/Raine 2009: 890). This is in line with Damasio's studies with his brain-injured patients who showed

[77] These are often studies with 'racial' outgroups, for instance African Americans watching Black and White faces, Caucasians watching Caucasian and Asian faces etc.

normal decision making abilities but could not act according to the norms they were able to describe (see chapter 5). In contrast, other studies have found an increased activation of amygdala and other areas associated with emotion processing in young people diagnosed with conduct disorder (e.g. Decety et al. 2008). It has been speculated that this might indicate an increased enjoyment of watching others in pain (Glenn/Raine 2009: 891). However, this sounds a little like an ex post explanation of data that do not fit the expectations, since these young people are not supposed to empathise with their victims (see also Young 2012: 171-3). James Blair, a leading neuroscientist of psychopathy, observes that the psychopaths he studies in American prisons have intact functions of abstract reasoning and executive functions but impaired abilities in moral reasoning, and that they are less aroused by the distress of others. He argues that a dysfunction in the neuroarchitecture, mainly in amygdala and orbitofrontal cortex, interferes with socialisation and that affected people are more likely to learn anti-social strategies of conflict resolution and goal achievement (Blair 2009: 900-1).[78] Nikolas Rose (2010) points out that neuroscientific and genetic research in psychopathy and other undesired behaviours fosters the hope of researchers and practitioners to identify susceptible individuals early, enabling interventions which may help the concerned individual to overcome their genetic disposition to their own and society's benefit. However, in a culture of anxiety and fear as is characteristic for contemporary Western societies, it is more likely that preventive interventions protecting the society rather than helping the individual would be implemented (ibid.: 96-7).

> "In any event", he concludes, "perhaps we need to pause, and to ask ourselves what are the benefits, and what are the dangers, of this emerging logic for the conduct of conduct: not so much 'discipline and punish', but 'screen and intervene'" (ibid.: 97).

The growing interest in autism and psychopathy indicates that while social neuroscience's focus lies on studying normal social behaviour, it also contributes to creating new deviances in the form of autism and psychopathy. As with intelligence measured in IQ bell curves, only the below average empathy skills appear to be

[78] While environment is likely to play a role in the development of anti-social behaviours, an influential longitudinal study investigated the question why not all people experiencing maltreatment in childhood develop anti-social behaviours (Caspi et al. 2002). The research team found a genetic difference between subjects developing anti-social behaviours and those who did not, when experiencing maltreatment during childhood and argued that a certain genotype of the MAOA gene made children more resistant to developing anti-social behaviour. These findings let assume that even if environmental factors are important for developing certain behavioural dispositions such as anti-social behaviour, the individual genetic make-up makes affected children more or less prone to that behaviour. Thus, genetic analyses could provide statistical prognoses about the development of anti-social behaviour under given conditions. However, these consequences of the findings are not discussed in the study.

problematic. Web of science shows two articles dealing with hyperempathy compared to thousands of articles discussing anti-social behaviour and autism. Not having enough empathy skills is the problem. People on the other end of the curve might be praised for their charitable efforts in the purpose of humanity rather than being problemised as not fitting into the bell curve.

After reviewing some of social neuroscience's approaches to empathy, it has to be stated that, while it developed some methods for measuring brain stated associated with empathy, social neuroscience has no answer to the question what empathy is. Without a theoretical concept about the nature of empathy, research has to remain rather speculative. Yet, despite all vagueness – or possibly exactly because of it – the idea of empathy as a human ability rooted in evolution and thus being an integral part of human nature is extremely successful within the research field and beyond, as a glance at the pop-psychology corner of any bookstore will tell. But perhaps – as the Head of the Lab once contemplated – it is simply a fashion. Today everyone is "doing empathy" but in five years time research might have moved on to the next issue. Calling it a fashion indicates a pragmatic approach to research: these days, it is fashionable 'to do empathy' and research gets sufficient attention but as soon as the general interest lessens, another hot topic will be found. While history will show whether this side remark indeed reflects practice in social neuroscience, the last section of this chapter attempts to locate the current interest in empathy in a broader context of contemporary debates about sociality and society.

6.5 Transformation of the Social

6.5.1 Towards a Homo empathicus?

For the analysis of the present undertaken here, the evolutionary narrative of empathy and the increasing interest in neuroscientific investigations of empathy are of particular interest. While social neuroscience's epistemology is rooted in an evolutionary narrative of human nature and in the notion the reproduction of DNA as the driving force behind evolution, its point of reference is no longer the selfish and profit-maximising individual of sociobiology and evolutionary psychology. Other, more cooperative approaches towards human social behaviour and evolution find their way into social neuroscience's theories of how sociality might have come into existence. For instance, the notion of "mutual aid" as an evolutionary force as strong as struggle for existence, first suggested

by the Russian Anarchist Peter Kropotkin (1902/2006), is taken up occasionally by social neuroscientists (e.g. Carter et al. 2009).

Social neuroscience is not alone with its interest in pro-social behaviour as a core feature of human nature, as I will cursorily discuss in this section by presenting two recent contributions to the contemporary empathy discourse, before situating the current interest in empathy in a broader debate about transformations of the social. Ethologist and primatologist Frans de Waal (2009), who is a strong voice in this discourse, also refers to Kropotkin's theory of mutual aid. He discusses Kropotkin as a counter position to social Darwinism as expressed by Spencer. Rather than facing a struggle of all against all, during his voyages to Siberia Kropotkin observed mutual aid of conspecifics against a hostile environment. De Waal stresses that the cold and meagre environment of Siberia differs fundamentally from the tropical regions on which Darwin's evolutionary theory bases. Thus, de Waal speculates, the dominant strategy for survival may rather depend on specific environmental conditions than being a universal constant. If resources are sparse and dangers plenty, other strategies are beneficial than if resourses are plenty and dangers are sparse. Moreover, he stresses that in his own work with non-human primates he observed mutual aid between non-related individuals (de Waal 2009: 32-35, see also Todes 1989), an evidence clearly contradicting altruism-theories basing on kin selection only. In the last chapter of his book with the telling name *Age of Empathy – Nature's Lesson for a Kinder Society*, de Waal ponders about the question what he would change about human nature if he could and comes to the conclusion that he would foster empathy (ibid.: 204). He opposes a point of view prominent in sociobiology, namely that competition and aggression are in our genes, and makes another aspect of human nature strong, the disposition for empathic behaviour (without denying the aggression part of human nature).[79] He emphasises that empathy is a basic structure that Homo sapiens shares with other mammals:

> "Empathy engages brain areas that are more than a hundred million years old. The capacity arose long ago with motor mimicry and emotional contagion, after which evolution added layer after layer, until our ancestors not only felt what others felt, but understood what others might want or need" (ibid.: 208).

[79] However, de Waal's own interpretation of primate behaviour has shifted in the decades since the publication of *Chimpanzee Politics* (1982). Donna Haraway points out that in this study, de Waal focuses on strategic, rational and aggressive chimanzee males and draws analogies to humans, also focusing on males. Females, both chimpanzees and humans, are located in a special sphere, the social, which works on a more cooperative basis. Yet, in this early narrative, it is marked as the other (Haraway 1989: 147-8). For de Waal's role in popularising the narrative of the cooperative bonobo and the evolution of his argumentation over the last thirty years, see Nicolodi 2009.

Because empathy is an evolutionarily very old mechanism, de Waal argues, it is a very robust trait, which can unfold in every individual. Yet, de Waal stresses, it has to be consciously trained because it is also possible to counter that trait, for instance in dehumanising enemies. He argues that it is society's responsibility to provide the room for fostering empathy in individuals (ibid.: 209-10). Arguing in this manner, he is very close to the brain anatomists and neurologists of the 19th and early 20th century, such as Combe, Meynert or Monakow, who also argued that while the brain strives towards sociality, it needs constant training to do so, as discussed in chapter 5.

The narrative de Waal tells is very interesting in itself. From his own work, he provides many anecdotes of animal cooperation. The animals he observes helping each other, mostly monkeys and apes, are not necessarily biologically related. Thus, he argues, it cannot be kin selection that is the driving force behind prosocial behaviour. Rather, empathy is a deeply rooted evolutionary trait that Homo sapiens shares with other mammals. Yet, he does not deny that other part of human nature, the part that is aggressive and selfish, and argues that it is for us to decide which of these traits we want to focus on, to foster and to train. Thus, we have to decide ourselves which of our closest relatives we want to follow: do we want to be warmongering chimpanzees or peaceful hippie bonobos?

In his argument, he associates sociobiological concepts of human nature with conservatism and neoliberal policy-making, while his own observations are presented as politically neutral. On the basis of scientific investigation, they seem to show that current policy-making is wrong and should focus more on creating a kinder society. Yet, his argumentation is as strongly interwoven with a political agenda as the one he criticises. He uses the same argumentative tools others used before him, only with a different content. While sociobiologists and evolutionary psychologists argued that "we" are selfish and aggressive and politics could not change that, de Waal now claims that "we" are cooperative and altruistic and politics should provide a space in which these traits could unfold.

The notion of empathy as a basic trait in human nature is also taken up by academics and journalists concerned with public goods and policy making. The sociologist and political adviser Jeremy Rifkin even aims at rewriting the history of human civilisation by focusing on the empathic rather than the competitive elements in it. The basis of his argument is a "new view of human nature" cumulating in the figure of the Homo empathicus. Drawing on research in primatology, namely de Waal, and in neuroscience,

particularly mirror neurons and social neuroscience, Rifkin argues that human nature is much more social than previously assumed. Thus he can claim that

> "(w)e are both a cooperative and competitive animal. But it is the former sensibility that is wired to our biology and that sets the ground rules. We are, first and foremost, a social species. Within that context, we sometimes compete to advance our interests. If, however, our self-interest strays too far from the social bond, we risk ostracization" (Rifkin 2009: 129).

His interpretation of the latest research in primatology and neuroscience allows him to draw an image of human nature rather different from the Homo economicus of sociobiology. Not the competitive part is the core of our behavioural predispositions but the cooperative component. On these grounds Rifkin reevaluates the history of civilisation and claims that consciousness has developed with the different stages of this history and that empathy has been growing in the process. Yet, with the growing complexity of social organisation, also demands on each individual have increased. Referring to the social brain hypothesis, he maintains that while Homo sapiens is a social species thriving for collectivity, group sizes over approximatively 150 individuals are too big for the brain to processes and to maintain meaningful bonds with (ibid.: 613). Today's young generations, he argues, are sensitive to issues such as non-hierarchical structures, anti-discrimination or gender equality and minority rights. Even global corporations, he observes, now take up the non-hierarchical network approaches of governing (ibid.: 543).

6.5.2 Neosociality

In the epistemological shift in conceptualising human nature, represented by de Waal and Rifkin, some questions remain open. Like their predecessors in sociobiology and evolutionary psychology, the representatives of the new version of human nature refute the idea of a blank slate. On the contrary, they argue, human beings are born with certain character traits and predispositions guiding their future live, thinking, feeling, and acting. Yet, rather than stressing the competitive and selfish aspects of an alleged human nature, this new approach focuses on the cooperative and altruistic aspects of human nature. Suddenly, we are no longer hard wired for the struggle of all against all but rather for creating a helping and caring community (if perhaps only on small levels, since our brain cannot properly cope with groups larger than 150 people). While sociobiology and evolutionary psychology claimed to find evidence for the competitive Homo economicus in human history, the advocates of the new human nature seek to

find evidence of good Samaritans throughout the history of humankind. Both schools interpret evidence and counter-evidence in a way it fits their evolutionary narrative and both have their own reading of Darwin.[80] In the case of sociobiology and evolutionary psychology, critics have identified their entanglement with a politico-economic discourse of free market liberalism. Now, forty years later, we still live in a free market-based economy and society, yet the rhetoric is changing. In this section I propose an answer to the question what happened to make an integration of more social aspects in concepts of human nature thinkable, plausible or even desirable at the turn of the millennium.[81]

One possible way of thinking about these new phenomena is that the end of the Cold War made it possible to walk new paths in regard to human nature. Without Communism as a rivalling ideology to Western individuality, it was no longer necessary to stress the autonomy of the individual, which is prone to become a profit-maximising free market entrepreneur. The fall of the Iron Curtain made it ideologically possible to think about sociality and mutuality without raising the suspicion of being a communist and infiltrating the Western world with Soviet ideology.[82] As discussed in chapter 4, early American social psychology was explicitly a project of defending the free individual against collective ideologies. This is no longer necessary, and while the methods live on in social psychology and social neurosciences, the epistemological framework is rather different. Moreover, the events of 9/11 sparked a wave of solidarity and collectivity not only in the United States but around the non-Arab world (and simultaneously providing new narratives of the evil in form of Islamist terrorists).
Perhaps the focus on pro-social behaviour is part of a trend towards more social warmth and collective responsibility and against phenomena of the unleashed market. The focus on empathy and altruism implies a hope for proving that humans – by nature – are good.

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[80] It becomes quite fashionable to accuse Spencer of interpreting Darwin "red in tooth and claw" and more competitive than he actually was (de Waal 2009: 28). However, particularly in the US discourse, referring to biological evolution and Darwin is important if one does not want to be accused of an anti-evolutionary stance or even creationism.

[81] Even Wilson revises his theory of sociobiology, admitting that cooperation and altruism play a greater role in evolution than he previously had argued (Nowak et al. 2010).

[82] Perhaps this danger is not quite banned yet and it might be a little more than a mere anecdote when de Waal reports that after they published research on monkeys, his group got emails insulting them as communists because their research shows cooperative behaviour, while they perceive their monkeys as "little capitalists with prehensile tails, who pay for one another's labor, engage in tit for tat, understand the value of money, and feel offended by unequal treatment. They seem to know the price of everything" (de Waal 2009: 195-6).

Perhaps we are not automatically good, but we are so by default and have to train our capacities to live up to the standards nature has put within us.

Another possible way of interpreting the recent focus on pro-social behaviour is to reflect on the observation that social skills have become important competences on the job market. Sociologist Eva Illouz points out that a kind of emotional competence has been seen to be crucial for entrepreneurial success for the better part of the 20th century, before the term was even coined. Already in guidebooks from the 1930s, the skill to put oneself into the perspectives of others, combined with a positive attitude and control of one's ones emotions was postulated as a secret recipe for success (Illouz 2008: 80). Over the last decades, but increasingly so since the 1990s, emotional competence became a new form of social capital in two ways: the control, strategic usage and rational reflection of one's own emotions on the one hand and empathy with another person's emotion on the other hand (ibid.: 239). In this process, traditional, gendered concepts of selfhood are getting blurred since everybody is supposed to control their emotions, which is connoted with masculinity, and to empathise with others, which is connoted with femininity (ibid.: 81). If anything, the allegedly female abilities of caring for others and putting oneself into someone else's shoes move towards the centre of these newly desirable soft skills and become part of desired leadership qualities.
Not only on the job market, also in discourses about social security, social cmpetences become an important factor. Sociologist Stephan Lessenich argues that society and notions of social and sociality are currently transforming into what he calls *neosociality*. In the history of the welfare state, he argues, social programmes shifted between two poles in conceptualising what sociality is, where responsibility for social welfare is located, and how social cohesion and integration should be reached. The one pole stresses the collective responsibility for the social and thus focuses on a public and democratic organisation of welfare. The other pole focuses on individual responsibility for the social. Their manifold individual acts will sum up to the social – either being guided by an invisible hand or totally unguided. Currently, according to Lessenich, the social and the society are transforming towards an active society (*Aktivgesellschaft*) in which responsibility for the social is delegated to the individuals and located within them. This, Lessenich argues, means a fundamental transformation of the concepts of both the social and the individual (ibid.: 29).

> "We experience today (...) a fundamental reorientation in governing the social – a fundamental social reform consisting of privatising the former public responsibility

> for the social. More precisely, the responsibility for the social is delegated to each and every individual, inscribed into their subjective action orientation and lifestyle patterns" (Lessenich 2009: 30, own translation).

He argues that this mode of political production of society leads to a new form of the social – what he calls the neosocial – in which the locus of the social is put into the individual. Individuals are not only responsible for their own wellbeing but also for the society as a whole. In neosocial reasoning, responsibility for oneself and social responsibility fall together (ibid.: 32).

Elsewhere he argues that the new welfare state constitutes the society as the aim at which the social-compatible actions of individuals are targeted. By activating socially responsible thinking, acting and feeling in individuals, the care for oneself and the care for the "greater good" of the society are equated (Lessenich 2008: 85). The welfare state is reorganised in terms of activation and individuals are given incentives for not becoming a burden on society and for acting socially responsible (ibid.: 122). While this transformation of welfare states can be observed globally, the welfare reforms of the Clinton administration served as a model for others, most notably British and German labour market reforms (Lessenich 2011: 311). Clinton stressed that the aim of welfare was to bring everybody who is able to work into work by means of providing training, child care, and transportation and thereby to "end welfare as we know it" (Caraley 2001: 527). Sociologist Richard Sennett, a severe critic of the neoliberal transformation of economy and society, stresses that while these transformations are not solely an American phenomenon, the culture leading to these new social policies is deeply rooting in the American economical system (Sennett 2006: 8-9), and – one is inclined to add – the American individualist culture as discussed in chapter 4. Notions of individual responsibility and self-management in health care, pensions, education, or one's own employability resonate with ideas of individual freedom and of individual responsibility for leading a successful life.

While Sennett is interested in the consequences for community and cooperation (see also Sennett 2012), Lessenich focuses on the expectation the new welfare state puts on individuals, namely to act in a way they will not be an unnecessary burden on society – neither now nor in future. Yet, there is another aspect of the transformation of the social. Not only should the individual behaviour minimise the social cost and risks, for instance by maintaining one's health or by maintaining one's employability via lifelong learning, but the individual should also actively contribute to the community as a whole, for example by voluntary work. Voluntary services, from museum or national park guards

to reading grandmothers to trainers of youth sports clubs, do two things: on the one hand they give the individual the chance to do a meaningful and hopefully fulfilling task – on the other hand, they lower the costs for maintaining valuable but not life-supporting elements of a community (Lessenich 2011: 311).

Behold in this light, social neuroscience's concept of human nature stressing the relevance of altruism, empathy and cooperation in Homo sapiens' evolution provides the biological foundation of this neosocial individual. Individuals' actions should be socially responsible by avoiding and preventing any potential risks for society, as represented by the welfare state. The message to each of us is clear: avoid unemployment, illness and poverty so that the state does not have to financially support you. Moreover, an active voluntary contribution to the community strengthens cohesion and lowers the costs for the public. If, as this new version of human nature makes us belief, the default set-up of the human mind is to be empathic, altruistic and cooperative, it should be rather easy to implement neosocial forms of government. Humans do care for those around them and while perhaps it is difficult to identify with a large and thus abstract national state providing social security, on a smaller, communal level, their evolutionary inheritance may unfold if the setting is right. The social brain hypothesis, as discussed in chapter 5, provides support for this line of argumentation by suggesting that the human brain can cope with groups of 150 members maximum. A society consisting of small communities and working with the principle of subsidiarity would also be a better society, since it reflects the natural needs of the species.

6.6 Conclusion

In social neuroscience research, empathy is understood as the norm, as the default neuronal make-up. Empathy gets the status of a standard model for studying social interactions – we interact by connecting with others. Researchers such as de Waal or Tomasello stress that both cooperation and competition are essential parts of human nature. Yet, the lens through which human behaviour is interpreted has changed. It is now studied through the lens of empathy as norm rather than competition as default behaviour.

Now, this leads to an image of a person quite different from the selfish, profit-maximising Homo oeconomicus propagated by older biologically based concepts of human nature, such as sociobiology's view on humans as a social species. As its predecessor's, social neuroscience's concept of sociality and human nature is also

rooted in evolution. However, it is not based on the idea of the struggle of all against all: it does not assume that by nature people are selfish, cost and benefit calculating profit-maximisers who only look for their own benefit without caring for other people's well-being. On the contrary, it suggests that it comes quite naturally to humans to cooperate. And not only do social neuroscientists claim that individuals cooperate – they find evidence for the cooperative nature of humankind in humans' evolutionary history and the neurobiological and hormonal substrate of the brain. Costs and benefits still play a crucial part in this notion of evolution but, by looking at social behaviour from this perspective, it appears that cooperation and altruism are beneficial. Working together, so the argument goes, made life easier and increased the chances of survival of the group's offspring. Social emotions and the ability to read those emotions evolved to enable the communal life that was crucial for early hominids' survival.

In social neuroscience discourse, evolution is the background assumption underlying all explanations of human behaviour and sociality. The 'evolution as the driving force behind everything'-assumption may not always be explicit but it is implied in neuroscientific investigations of social behaviour in several ways: first, social neuroscientists look at neuronal correlates of social cognition, social stimuli, and interactions. That means they stress the biological underpinnings of sociality rather than historical or cultural aspects. And thus they look for evolutionary explanations of sociality: why had certain neuronal structures or networks, hormones or behaviour been adaptive? Also the adoption of the social brain hypothesis in social neuroscience and the use of animal models for social behaviour are clear indicators for the evolutionary perspective on sociality. Even though social neuroscientists do not refer to evolution in all programmatic statements or interpretations of their research and only rarely make explicit inferences to human nature, their research takes place in an evolutionary framework and, by correlating 'social' and brain, they look for human nature in a quite literal, biological, sense. By locating human sociality in the brain and evolutionary history it is brought into the biological make-up of each "healthy" and "normal" individual.

I want to conclude this chapter with the hypothesis that in the end it is not so big a contradiction if at a time when societies consider their members as individuals who are responsible for their own well-being, a new discipline emerges that is interested in the social dispositions of human nature. At a time when the societal framework does not provide for social cohesion anymore, social neuroscience – together with other human

sciences – provides the basis for placing the responsibility for this cohesion within the individual. By locating sociality in the brain and evolutionary history, it becomes a part of every human being's nature, it becomes naturalised. Moreover, social relations now are intelligibly investigated within the individual. However, it is not simply a new approach to a given object of study but a new concept of what the social is. The social is not defined by structures, institutions, or power relations, all of which can potentially be changed, but as a biological category – nature – that cannot be changed. Sociality becomes a naturalised, innate quality and thus every "normal" individual is capable of behaving socially. At a time when responsibility for social cohesion is de-centralised by the principle of subsidiarity, the neural capacity for cooperation is found. In this process, a new norm is created cumulating in the new figure of Homo empathicus. And with it new categories for exclusion emerge: those who are not social enough or even anti-social are probably so because of an anomalous biological make-up and they are potentially deviant, as in the case of psychopaths. For the rest of us, however, there is hope: we can trust our biology, train our social and empathic potential and thus help to make the world a better place.

7. Concluding Considerations

One of the most important insights of history of science and social studies of science is that scientific practice never takes place in a context-free space. On the contrary, it is entangled with concepts of morality, values, the political system, power structures, societal organisation, and so forth. Moreover, history of science and science studies have shown that scientific facts are not found but produced and cannot be separated from a network of beliefs, technologies and practices. While this is true for all areas of scientific research (as well as other realms of culture), it becomes particularly significant when it comes to human sciences and the investigation of human social life, which is always a site of struggle of conflicting world views about the power of definition and of maintaining or changing the – historically contingent – status quo. Research on the social brain in its attempt to find biological correlates of social interactions and behaviour ascribed to members of specific groups is part of such a network of beliefs, practices and technologies.

In this concluding chapter I first offer some critical reflections on the major theme of this study – social neuroscience's notion of the social – before exploring how an area of the social world that has been subject to scientific investigation for a long time already is inscribed into individual brains: gender differences and gender relations.

7.1 Critical Reflections on Social Neuroscience's Notion of the Social

> "I think it's an interesting question why people are suddenly so interested in showing that prejudice happens in the brain, or – that is, the lay public seems to enjoy and finds interesting observations like fear happens in the brain or romantic love does happen in the brain, because it is unclear what the alternative hypothesis would be since I don't think that most people think it happens in your toe, right?" (Social Neuroscientist A)

This is part of what a social neuroscientist replied to my question about the media attention his field of research has currently been getting. He states quite clearly that – in his perspective – there is no reasonable alternative to studying human nature via the brain. His polemic assumption that there is no alternative to looking for fear or love in the brain because no one thinks it happens in the toe might be correct for the educated public in the 21st century's Western cultures. However, this notion about how and where we feel is not much older and perhaps not much wider spread than that. Historical studies (e.g. Fischer 2002, Wilson 2004) show that other imaginations about emotions, feelings, passions, or whatever you want to call it are not only possible but were

actually directive for how people experienced their bodies (Duden 1987) and thus for how they felt. Phrases such as “butterflies in the stomach”, “lump in my throat” or “head over heals” are reminiscences of these notions and, despite knowing better, it is difficult to deny having a gut feeling about an issue once in a while.

While my interview partner is probably right in assuming that nobody (in Western societies of the early 21st century) would deny that the brain does play a crucial part in thinking, acting, and feeling and probably no-one would be surprised to find an active brain while a person is doing something, it is important to keep in mind that the quest for emotions in the brain requires a thought style in which it is possible to belief that the seat of emotions is the brain rather than the toe, respectively the liver or the heart as the Ancient Greek believed. Looking at the questions social neuroscientists tackle in their research, it soon becomes evident that they focus on the way social stimuli are perceived and processed in the brain – no matter whether they study empathy, attitudes towards out-group members, or voters’ behaviour. In this perspective, other people are stimuli, external impulses triggering a reaction within the individual. Like their predecessors in experimental social psychology, social neuroscientists need an individualistic concept of the social to render their questions accessible for the neuroscientific methods they employ. In his study of British imaging units, anthropologist of science Simon Cohn argues that neuroscience might broaden its scope by investigating the ‘social brain’ but

> “by retaining its basic epistemological assumptions based on localization and materialism, what it describes as ‘social’ becomes merely an extension of the same restricted notions of human nature that informed early periods of behaviourism” (Cohn 2008b: 101).

Cohn makes two very important observations: first, imaging experiments operate with the behaviourist stimulus-response paradigm, which is in apparent contradiction to their rejection of behaviourist theory. Second, in neuroscientific investigations the ‘social’ is mapped onto the brain and has thus to be conceptualised as a material entity.

Mapping emotions or other expressions of human interaction onto the brain indicates a major shift in the concepts of human nature. Locating for instance emotions and reasoning in the same brain structures as Damasio did in his somatic marker hypothesis (Damasio et al. 1994) is only thinkable in a thought style that does not strictly separate thinking and feeling or even sees them as antithetic forces or as arrayed in an hierarchical order (ratio controls emotio). Defining social realities as interactions

between brains (Singer 2003: 12) requires a thought style in which it is possible to consider single organs as actors.

The epistemology of the 'social' underlying social neuroscience research simultaneously focuses on units smaller than the individual, specifically neurons (respectively neuronal activation), hormones, and genes and on an entity much bigger than the individual, namely the evolutionary history of the entire species. In this perspective, the focus of research is not primarily on the space of interaction, at what people do, what happens between people, or what they do together. Rather, the scientific interest is directed towards what happens within the individual, in the individual brain, while at the same time biological universals serve as the level of explanation. Sociality thus becomes an individualised and internalised part of the biological make-up of every normal person, but at the same time it serves a bigger whole, the evolution of the human species. In the hands of (not only) social neuroscience, the complicated relationship between nature and culture is transforming again. For instance in the notion of the flexible and plastic brain, social interactions shape brain structures and networks, which again are the driving forces behind social interactions. Consequently, the old distinction demarcating conflicting notions about human nature over the last centuries seems to fuse into a new synthesis in which it is meaningless to speak of either nature or culture.
While it is certainly true that social neuroscience takes into account environmental factors and influences and thus has not a strict programme of biologising the social by locating it in neural structures and functions, this is only true to a certain extent, because the locus of investigation is the individual, not the social world. Research interest in "core social motives", "trust between individuals" or "attitudes in social groups" to name three of social neuroscience's research clusters represent only a minority of possible research questions about the social world, all having a very limited notion of the social as intersubjectivity. Certainly, methodological constraints can explain this limitation to a certain degree but it is not merely a matter of methodology. Rather, it is a matter of how we see the world and of what the important factors are in understanding human nature.
Paul Rabinow (1999) described this development as the transformation towards a "biosociality." Social structures become less important and identities are increasingly based on individual, biological attributes such as shared genes rather than on social or collective attributes. Studying the social via commonalities in genetic or neuronal make-up differs fundamentally from investigating the external conditions of social structures

or culturally shared symbols and signs. Investigating social interaction via brain states, neuronal activation, hormones and genes implies a tendency towards a causal metaphysic. In this perspective, behaviours or states are perceived as outcomes of causal chains and it is assumed that if initial states and inputs were known, later states and behaviours could be predicted (Cromby 2007: 158). Rendered such, the social appears to be an epiphenomenon of neuronal processes. Cromby discusses the possibilities and limitations of cooperation between social neuroscience and social sciences. He argues that notions about the interdependence of bodily states and feelings as well as the interdependence between experiences in the social world and brain structures or processes can enrich debates by transcending dualisms, such as body and mind or individual an society (Cromby 2007:155-6). However, he does see some fundamental conceptual problems for collaboration. A very basic problem is that social neuroscientists and social scientists do not speak a common language. While a term can be unproblematic in one discipline, it can be highly contested in the other. Moreover, some terms can have different meanings in different disciplines. Hence, social neuroscientists and social scientists working together might get lost in translation if they are not aware of using diverging terminologies while talking about the same object of research. Another problem is that conceptualisations of social influence and the (social) brain in social sciences diverge from those in neurosciences. Instead of following a causal metaphysic, social sciences stress the reflexivity of human behaviours and states as well as their implication with "dynamic structures of meaning" (Cromby 2007: 157-64).

In social neuroscience, reactions to social stimuli, social attitudes, emotions, and actions are located in the brain – brain states, structures, neuronal activation, hormones, and genes. However, brain states differ fundamentally from social situations and thus the question that social neuroscientists have to ask themselves is whether the knowledge they generate can contribute to understanding the social world or whether it remains on the level of understanding the brain – which obviously is important for clinical matters as well as basic research in biology. While my interview partners emphasised their interest in basic research aiming to understand how the brain works, newspapers are full of neuroscientists' public interventions about issues such as free will, education, theology, political science, or marketing. Hence, it is important to ask what social neuroscience or other neuro-subdisciplines can contribute to understanding the social world – besides the observation that somatic factors do play a role in social interactions.

This observation is not new to social sciences and humanities. The body has long been recognised as a crucial factor for humanities and social sciences. This is partly the result of phenomenological philosophy, particularly in the tradition of Maurice Merleau-Ponty, who developed a theory of recognising the world which is based in the experience of the recognising subject who is bound by his corporeality (Merleau-Ponty 1945 [2002]). Other important factors in bringing the body into the humanities were feminist historical analyses and critiques of science (see for instance Duden 1987, Martin 1987, Honegger 1991, Schiebinger 1993) which were done with an impetus differing distinctly from social neuroscience's attempt of locating the social in the body. These scholars have shown that somatic experiences depend on specific historical and social constellations. Michel Foucault's historical studies of regimes of truths and power and the formation of subjects inspired many studies of the interaction between the material body and discursive and power regimes forming and disciplining it (e.g. Butler 1993). Other scholars integrated the body in their social theory, most importantly Pierre Bourdieu (1987[1979]) with his concept of habitus as incorporated social structures and experiences. This brief overview indicates that for social sciences and humanities it is not a big surprise to hear that bodily correlates of thinking, feeling and acting exist, since the body has been a part of their discourses for at least as long as biological sciences were interested in issues traditionally subject to the humanities.

It follows that, notwithstanding social neuroscience's emphasis on the importance of different levels of investigation, accepting the neuronal level's dominance in explaining human social behaviour is both the key precondition for cooperation with other disciplines and the point of departure for extending this type of research to other levels. Social neuroscientists often describe what they do as research into the "foundations" or "bases" of social behaviour (see e.g. Semin/Echterhoff 2010; Carter et al. 2009; the Research Priority Programme "Foundations of Human Social Behavior" at University of Zurich). Choosing these terms already indicates that not all levels are regarded to be equally important for understanding social behaviour; on the contrary, the most basic level is considered to be the most important one since it supposedly contains the foundations of anything happening on the other levels. Moreover, it remains unclear how across-level investigations can integrate different kinds of knowledge, such as quantified and hermeneutic approaches. The consequence is that, as sociologist Troy Duster points out, contemporary science tends to dismiss any attempt to study human behaviour in a unit larger than the individual as "'political,' 'soft,' humanistic, and not

amenable to scientific investigation" (2006: 5). Problems faced by larger entities (or being located on other levels) could be addressed by policy and are hence easier to apprehend and to amend than problems on a molecular level, which is assumed to be more basic and hence to provide "more enduring truths" (ibid.) about human social behaviour. This focus on 'more basic' processes is an integral part of the concept of 'levels' itself, which implies a hierarchy in the organisation of life in which the existing order is the result of evolutionary dynamics explaining the natural history of the world (Matusall et al. 2011: 13-4).

Roepstorff even insinuates a conceptual imperialism of brain mapping because this field expands its research interests into areas previously investigated by other research traditions and because it scrutinises every fragment of human thinking, acting and feeling within a neuroscientific thought style (Roepstorff 2004: 1106). By doing so, it imposes its concepts on all phenomena studied, resulting in a biological gaze onto fields which were hitherto not available for scientific investigation (ibid.: 1110). Social neuroscience's rejection of reductionism reaches its limits precisely in the necessity to correlate all phenomena in the social world to bodily states because it assumes that knowing the bodily states would explain phenomena in the social world – understood as epiphenomena of chemical processes in interacting organisms.

These reflections on social neuroscience's notion of the social indicate that the kind of knowledge generated is entangled with the research perspective and methods used for investigation. Its specific notion of 'social' is embedded in a broader discursive context, depending on the specific historical, social and cultural constellations of the early 20th century. Social neuroscience is a young research field and the relationship between the social and the brain in this emerging field has not yet been subject to analyses from the perspective of science studies. For a related subject, however, the relationship between gender and neuroscience, an array of critical examinations already exists (for a recent volume see Bluhm et al. 2012). While gender brain research is not a top priority in social neuroscience and was not discussed during the interviews I conducted, the following coda is important for two reasons: first, gender – together with 'race' – is one of the most common sample categories in social neuroscience research without being reflected on. Second, since this research is already established and much written about, it may help understanding how an object of investigation changes when it is transferred from the social world, including power structures, history, meaning etc to the biological world, subject to mechanisms of evolution and cause and effect.

7.2 Sex in the Brain

> "But despite the many recent insights of brain research, this organ remains a vast unknown, a perfect medium on which to project, even unwittingly, assumptions about gender" (Fausto-Sterling 2000: 118)

In the history of science, women's inferiority has been "proven" time and again in ways that appear to us today clearly discriminatory, scientifically untenable or simply ridiculous. Hagner (2008b) argues that state-of-the-art science as well intra-disciplinary disputes have always been entangled with more general social developments, fears, and hopes. Some neuroanatomists, particularly in the second half of the 19th century argued for cerebral differences between men and women (ibid.: 56-7). They often made assumptions about brain capacities that today are clearly identified as racist and sexist but were common sense and broadly accepted in scientific and societal discourses then (ibid.: 60).

7.2.1 Feminist Critique of Biological Gender Research 1979

While women remained to be the "other" in the course of the 20th century, 'women's biology' no longer prevented them from claiming and getting access to the public sphere. The research on sex differences continued with a less discriminatory undertone perhaps, but still manifested the male dominance in relevant field such as political leadership (men are more aggressive) or hard sciences (men are more rational).
Reflecting these developments, Susan Leigh Star contended thirty years ago that

> "nearly all the articles on sex differences in brain asymmetry (…) are based on a network of interlocking assumptions which have no foundation in observed or observable reality, but which are sexist, political, reductionist and dangerous. They are epistemologically connected closely with other research in the area of sex differences which has called upon 'biology,' or upon what writers agree to be biology, to 'prove' things they would like to believe about women and men" (Star 1979: 113-4).

On a methodological level, she points out that while some observations might be "accurate, precise, and repeatable" (ibid.: 114), what is often ignored are explanatory variables such as the participant's training and education – or, one might add, pre-experimental life experiences – and experimenters' expectations. On an epistemological level, she stresses that the division in male and female subjects in itself may serve to reify and maintain this culturally created dichotomy. Moreover, the relationship between nature and nurture is more complex than often claimed in sex research which interprets anything having a biological correlate to be innate. She also observes that hypotheses

about lateralisation – the specialisation of the two hemispheres of the brain – soon became a scientific fact, even though it was based on only one small sample study with lesioned patients (ibid.: 119-123).
Other authors in the same volume on biological gender research stress that the nature-nurture debate is not easily solved by focusing on one side or the other, since both sides are entangled (Lowe/Hubbard 1979: 95). And Ruth Bleier, also in this volume, claims that not only the inference from hormonal studies in animals to the effect of hormones to human behaviour is severely flawed, but that these studies themselves are not at all yielding to unambiguous results (Bleier 1979: 51-54). All three mentioned papers stress that these studies serve a certain social purpose of maintaining a status quo of a patriarchal order and do not take place "in a social and economic vacuum" (Lowe/Hubbard 1979: 106). The authors agree on the observation that biological sex research is influenced by political interests of maintaining the patriarchal order by inscribing differences between men and women, specific characteristics, skills and behaviours in the biological make-up, particularly in hormones and brain structure. This research takes the dichotomy between men and women and a heterosexual norm for granted and reifies them. Moreover, the authors maintain that experiments are often flawed and unjustified inferences are made.

The thirty years since these critical examinations of sex research from feminist perspectives have been quite exciting in the biological sciences in general and genetics and the neurosciences in particular, but also in women/gender studies, in the political arena and in the relationship between genders: the human genome was decoded but failed the hope of telling us who we are. It followed extensive research in gene-environment-interaction and epigenetics. The notion of a plastic brain was no longer a fancy of some peripheral scientists, but became accepted knowledge the neurosciences, allowing studies in environmental influence on the brain. New technologies allowed more detailed studies of living brains, thus allowing to study function rather than structure. Gender studies challenged dichotomies between genders as well as heteronormativity; women and LGBT movements[83] gained increasingly more rights, visibility and freedom. The women's share at higher academic degrees increased dramatically, as did their share on the job market and to some degree the division of domestic labour is also changing. Last but not least, history of science and social studies

[83] Social movements for the rights of lesbian, gay, bisexual and trangender people.

of science showed the historical, economical, cultural and social situatedness of scientific knowledge and challenged the claim of objectivity. Did these developments change the way sex/gender is represented in the neurosciences? A brief overview of contemporary literature will reveal that this is not the case.

7.2.2 Gender Brain Science Today

Since the popular *Why Men Don't Listen and Women Can't Read Maps* by Allan and Barbara Pease (2006[1999]), many more books exploring the (neuro)biological underpinnings of differences between men and women have flooded the market. Contrary to the Peases, many of the other authors hold prestigious academic degrees and university positions in psychology, medicine or neuroscience. For instance, Louann Brizendine, author of *The Female Brain* (2006), holds degrees from some of the best US universities and works as a neuropsychiatrist at the University of California in San Francisco. She explains that female brains differ fundamentally from their male counterparts in structure and function. While women and men might come to the same result in a specific task, the way their brains take to get there, differ. Autism researcher Simon Baron-Cohen, working at the University of Cambridge, (2003) prominently postulates the hypothesis of male and female brains, with male brains being good at systemising and female brains being good at empathising. And Susan Pinker, author of *The Sexual Paradox* teaches psychology at McGill University. Her book is another example of bridging between pop-science and science, stressing that sex segregation in the occupational sphere is a result of men and women's different biologies.

These popular books are just the peak of the iceberg of gender brain research and they reveal general trends within this research field. Three recurring assumptions of gender brain research can be identified and are found in any of these books: first, male and female brains are different because men and women had different tasks in Homo sapiens' struggle for existence. Men's task was to hunt and to defend while women's task was to raise and protect the offspring and to gather food. Hence, their brains evolved differently for coping with the respective tasks. Men evolved good spatial skills and an aggressive approach towards the world while women evolved high emotional skills enabling them to detect changes in the mood of their offspring and an attention for details in the vicinity. Second, the differences in male and female brains are triggered by hormones in utero. "Male" sex hormones, particularly testosterone, trigger the development of male brains. Their absence enables the development of female brains. Third, while men usually use one hemisphere at a time and mostly the right one,

responsible for rational thinking and acting, women's hemispheres are better connected which enables them to think more holistically.

Scientists studying the biological underpinnings of gender differences tend to stress that biology influences our lives much more than we like to believe and that it takes a lot of courage to pick at the taboo of innate differences in the hostile environment of political correctness characterising modern societies believing that all people should be the same even though they are not (Brizendine 2006: 24, Pinker 2008: 2, Pease/Pease 1999: xvii). This rhetoric combined with a strong reference to human evolution puts the speakers in the position of pioneers of scientific truth which makes it difficult to critically question their findings without being stigmatised as being anti-scientific.[84] However, one might want to stop and ask why a field that is so crucial for the way our social world is organised is not only subject to biological research, but why it is that this biological research inscribes the socially contested status quo in seemingly stable biology? Our social world is apparently transforming, giving more liberties and choices to women for instance, which makes the question even more obvious. Recently, scholars from various disciplines, ranging from neuroscience and psychology to history, philosophy, or sociology have undertaken the (sometimes not even so difficult) task of scrutinising studies in gender brain research and thus deconstructing some myths of "neurosexism" (Fine 2010) (e.g. the contributions in Karafyllis/Ulshöfer 2008; Fausto-Sterling 2000; Fine 2010; Grossi 2006; Jordan-Young 2010; Kaiser et al. 2009, Young/Balaban 2006). The critique today is the same it was thirty years ago: a historically emerged patriarchal social order is explained by human evolution, the strong focus on biology ignores possible interdependences with the social world, weak results are generalised, context is mainly ignored and the research is maintaining dichotomies. These critiques will be explicated in the following.

Critique 1: Evolutionary Narrative and Historical Blindness

While referring to some dubious Palaeolithic past, gender brain research often is ahistorical. It builds on research in its own area without taking into account its entanglements with sociohistorical developments. While this approach is understandable, since biological sciences are interested in describing biological mechanisms and not in localising them in social contexts, an awareness of these contexts would increase understanding of current research and debates, for instance in the case of notions of

[84] A second rhetorical knack that at least Brizendine and Pinker use is to refer to their own feminist socialisation. This protects them against charges of anti-feminism.

femininity and masculinity in brain organisation research.[85] Rebecca Jordan-Young (2010: 109), working both in the fields of psychology and science studies, points out that most scientists working in brain organisation research take these concepts as a stable given. Femininity and masculinity can be attributed to certain characteristics or abilities. However, this is problematic for two reasons. First, it has been shown that these concepts underwent dramatic changes in the course of history (e.g. Foucault 1976-1984) and that second wave feminism, LGBT movements and the sexual revolution challenged notions of 'normal' sexuality and what it means to be male, female, something in-between or beyond (e.g. Butler 1990). A second reason can be found even closer to the research practice itself: Jordan-Young carefully reconstructs how, within the field of brain organisation research, notions of femininity and masculinity have changed over the last decades. In the 1960s and 70s, men were seen as active, polygamous, sex-centered while women were seen as passive, monogamous and family-centered (Jordan-Young 2010: 130). This changed within that research field during the 1980, when female sexuality was perceived to be active, too, resonating shifts in other cultural discourses (ibid.: 133). These conceptual shifts within a single discipline are masked by scientists' certainty about what is male and what is female, even though also today they would never agree among them about any definition (ibid.: 109-10). This shows that alleged givens in science are not as naturally given as they might appear in the light of brain science.

More generally, Cordelia Fine, a psychologist who thoroughly examined research in the field of gender brain research, points out that the neglect of social and historical factors ignores a crucial point: gender relations change much faster than mere biological evolution would allow. For instance, she argues, historical shifts in occupational gender relations such as the transformation from former masculine domains like schoolteachers or secretaries into feminine domains "don't lend themselves especially well to explanations in terms of genes and hormones" (Fine 2010: 119).

As biologist Sigrid Schmitz (2006: 208) points out, theories about human evolution are always highly influenced by the socio-historical conditions in which they emerge. Contemporary categories of men and women – and only the two – by default living in heterosexual monogamous families, become the perspective from which the past is interpreted. Power structures, gender relations and division of labour are reproduced by

[85] I borrow this term from Jordan-Young (2010). She employs it for describing several approaches investigating the role of hormones in prenatal brain organisation (ibid.: xi).

telling just-so-stories about Palaeolithic life and by depicting and reconstructing early hominiae (Weltersbach, personal communication). Stable biology is contrasted with fluid historical and social processes (Schmitz 2006: 208). This mechanism works even for very recent phenomena such as colour preferences. Psychologists speculate about the genetic origin of gendered colour preference (e.g. Alexander 2003, cited in Fine 2010: 208) while gendered dress codes associating blue with boys and pink with girls are not older than 50 years and their introduction can be interpreted as a response to the concern that masculinity and femininity were not rooted in biology but had to be acquired (Fine 2010: 209).

Critique 2: Hormones and the Notion of Male and Female Brains

In their review of Louann Brizendine's *The Female Brain* (2006), Rebecca Young and Evan Balaban (2006: 634) assert that sex differences are drawn so strong that men and women almost appear to be different species. Yet, neuroscientific research suggests that differences in brain structure and behaviour of men and women are only of small statistical significance while the overlap on individual level is much bigger than the differences in statistical averages. Moreover, the biological evidence is presented as if it would precede differences in behaviour while possible interdependences are not discussed; the focus on hormones ignores the system in which they are embedded.

Again, Brizendine's pop-science contribution is just one example for a general trend, as (Jordan-)Young shows in her monograph (2010). She shows that the basic assumption in brain organisation research is that no matter what your chromosomal sex is,

> "having a male-typical hormonal milieu in utero leads to male-looking genitals and 'masculine' psychological traits, including erotic orientation to women, as well as broadly masculine cognitive patterns and interests" (ibid.: 39)

and the same applies for a female-typical hormonal environment. This assumption largely relies on the role androgens play during gestation. "Sex hormones" are responsible for the growth of genitalia and sexual glands and a chromosomal male foetus will end with feminised genitalia if it is not sufficiently exposed to testosterone in utero. This effect led to hypotheses about androgen-effects on brain organisation and on behaviour.

Several studies have investigated the influence of prenatal testosterone exposure on sex-typed behaviour in humans. And while disagreement between these studies exists (Jordan-Young 2010: 83-87), the idea of foetal testosterone as the driving force behind organising a male brain has become extremely popular, particularly through the work of

Baron-Cohen. He postulates an 'essential difference' between male and female brains. While the male brain is hard-wired for systemising (S-type brain), the female brain is hard-wired for empathy (E-type brain). Baron-Cohen and his research team report negative correlations between amniotic testosterone with eye contact and size of vocabulary in infants, in interest and quality of social relationships and empathy (Baron-Cohen et al. 2004, cited in Jordan-Young 2010: 85). Now, Baron-Cohen argues that being a man does not necessarily mean to have a male brain or being a woman means to have a female brain. He simply claims that "*more* males than females have a brain of type S, and *more* women than men have a brain of type E" (Baron-Cohen 2003: 8, original emphasis), thus it is a statistical claim he makes at best.

Both, Fine and Jordan-Young, emphasise that investigating the influence of testosterone during human gestation is very difficult because only rarely blood samples are taken from unborn children. As a substitute, either maternal testosterone is measured or finger ratios from adults are taken as an indicator for foetal testosterone levels. The problem with this kind of research is that it is not clear how (or if at all) what they are measuring correlates to testosterone acting on the foetal brain (Fine 2010: 109; Jordan-Young 2010: 215-6).

Moreover, Jordan-Young maintains that the well-established effect of androgenes in the development of genitalia cannot simply be transferred to the development of sexual personalities. She points out that animal studies in brain and psychological development are much more problematic than for genital development because brain structures are less similar than genital structures and human psychology is much more complex than animal psychology. Moreover, human brains cannot be sorted reliably into male and female brains because at the individual levels they are too similar and there is no agreement about gendered brain function. Thus, differences in behaviour and traits are a question of statistics which are based on averages of large groups; there is too much overlap between sexes and variation within sexes to speak of male and female brains as categories (Jordan-Young 2010: 48-52).

Critique 3: Lateralisation

Closely related to the critique of hormone-behaviour-links is the critique of gendered brain lateralisation. Neurologist Norman Geschwind and colleagues (Geschwind/Behan 1982: 5099) proposed a theory according to which high levels of foetal testosterone inhibits the growth in the left brain hemisphere. He and others – most prominently Simon Baron-Cohen – have concluded that testosterone exposure leads to a priority of

the right hemisphere, which is involved in systemising and spatial ability, while the left hemisphere is involved in language skills and the ability to empathise (Baron-Cohen 2003: 105). The monolateral activation in men results in stronger local activation in specific tasks, reflected by the common assumption that men can only do one thing at a time. The female brain, a result of less prenatal testosterone exposure, is characterised by interhemispheric connectivity (ibid.: 105-111). Morphometric studies suggest that the corpus callosum, the structure connecting the two hemispheres, is bigger in women than in men, i.e. the ratio of corpus callosum structure to total cerebral volume (Baron-Cohen 2005: 819-20). Female brains are thus believed to be able to use skills of both hemispheres at once, which is important in communication and empathising (Baron-Cohen 2003: 113), but they may also have less space of the right hemisphere devoted to spatial abilities (ibid.: 106).

The theory of bigger corpora callosa in women, however, has been subject to scientific disputes[86] that have been carefully analysed by biologist Anne Fausto-Sterling (2000). She describes the corpus callosum as being embedded into a knotted web of knowledge,

> "linking the underrepresentation of women in science with hormones, patterns of cognition, how best to educate boys and girls, homosexuality, left versus right handedness, and women's intuition" (ibid.: 119).

She concludes that no agreement exists about what the corpus callosum actually is, what belongs to it and what does not (ibid.: 126-30), what influence handedness has and whether it shows significant differences between genders or not (ibid.: 138-40). Moreover, the corpus callosum may change over time due to factors such as experience, health or age (ibid: 144). Fausto-Sterling emphasises that differences found in corpora callosa are only of statistical relevance, depend on sample size and are at least in part linked to political debates (ibid.: 145).

Now, ten years later, scientists trying to locate differences between genders within biology, complain about the straight jacket of political correctness, a strategy which allows them to aggressively postulate their theories about biological gender differences.[87] In this neoconservative climate, Fine observes that despite growing evidence against it, the theory of gender differences in corpus callosum and

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[86] This conflict is also mentioned by Baron-Cohen (2003: 112-3; 2005: 820).

[87] However, even if the biological differences exist and men are better at spacial reasoning, they are not sufficient for explaining phenomena such as the big gap between men and women in science. For instance, the male-female ratio in the top 1% results in math-ability-tests is about 2:1. If this ratio was represented in academia this would lead to about 1/3 female professors in natural sciences and engineering. Even if these differences were mainly biological, biology cannot alone explain why there are less than 1/3 female professors in these disciplines (Ceci/Williams 2011: 5).

lateralisation is still dominant in fields such as language research. After reviewing research in lateralisation, she drily concludes:

> "So let us, with healthy scepticism, summarise all of this as clearly as we can. Nonexistent sex differences in language lateralisation, mediated by nonexistent sex differences in corpus callosum structure, are widely believed to explain nonexistent sex differences in language skills" (Fine 2010: 138).

Critique 4: Context is Ignored

Also on the methodological level, severe critique is raised. Much research in hormone-behaviour-links is conducted with children and women with congenital adrenal hyperplasia (CAH), a condition affecting the adrenal glands in a way that the (anatomically female) foetus is exposed to unusually high levels of androgens during genital differentiation. (Jordan-Young 2010: 47). Due to the high androgen exposures during gestation these children are considered to be particularly suited for research in hormone-behaviour-links.[88] However, Jordan-Young points out, this interpretation ignores two important environmental factors: first, CAH children are expected to behave more masculine and it is a well established fact that expectations influence behaviour; second, masculine behaviour may be over-reported both by parents and children (ibid.: 247).

A third significant environmental factor is ignored in interpreting research with CAH children. The diagnosis entails long-term medical surveillance, including close genital inspection, questions about gender identity and informing parents and children about future fertility. Such experiences are likely to have effects on how children see themselves, it might make them feel insecure, vulnerable, violated, and on how parents treat their children, who are not "normal" girls. However, since the effects of the medical system on the life experience are not part of the discourse in brain organisation research, a very important influence on their behaviour and self-perception is neglected (ibid.: 239-40).

Also children who are categorised as either boys or girls at birth are subject to environmental factors and expectations of their (gendered) behaviour – even before they are born (Fine 2010: 192-4). Since these expectations are at work from the moment the sex of the child is known, it is not possible to distinguish between biological and environmental factors. However, inscribing behavioural differences between genders in biology, in this case in brains that are hard-wired by prenatal hormone exposure, tends

[88] For a detailed review of this research see Jordan-Young 2010.

to neglect influences of non-biological factors and to see the relationship between biology and culture as a one-way street rather than a feedback loop.

Critique 5: Maintaining Dichotomies and Heteronormativity

Thirty years ago, feminist critics accused gender brain science to reify gender dichotomies by dividing research participants in male and female groups. This is still common research practice, as neuropsychologist Anelis Kaiser and colleagues report in their review of fMRI language research. Since these data are collected more or less by default in all experiments, they are often co-examined even if gender differences are not in the focus of a study. This practice leads to manifesting the dichotomy of male/female as a natural given. But more importantly, it leads to reporting differences whilst ignoring similarities. If a small difference in one brain area is found, it is reported while it is rarely mentioned if the same study found similarity in all other areas investigated. This convention is rooted so deeply in scientific practice that it is not even possible to search for sex/gender similarities in scientific databases (Kaiser et al. 2009: 55). Thus, rather than incorporating evidence of changed gender roles and fluid gender identities, gender brain research continues to reproduce an awareness of differences and dichotomies.

Moreover, a certain form of heteronormativity is maintained by the way sexual orientation is investigated. By comparing brains of gay men to those of heterosexual women and by the hypothesis that male hormone exposure in female foeti and female hormone exposure in male foeti leads to homosexuality, the norm of male desiring female and female desiring male is maintained by assuming that lesbians have male brains and gays have female brains. Yet, this dichotomy between androphile and gynophile is only one possible way of framing sexual attraction among many (Jordan-Young 2010: 160-1). Both practices of maintaining gender dichotomies and heteronormativity are arbitrary and not rooted in the subject studied. They reproduce conventions about sex and gender that are cultural and historical interpretations rather than biological givens. By locating them in the neurobiological substrate, not only get the cultural and historical lost, alternatives to these dichotomies remain unthinkable.

7.2.3 Gender Brain Research and Social Neuroscience

Gender relations are a highly contested sphere of the social world, integrating conflicts about economical independence, identity, power or participation as well as questions about how we want to live. It has been subject to academic debates as well as social

struggle for a long time. This is exactly the reason why it is such a good case study for investigating what happens if social phenomena are located in biology and thus reinterpreted as biological facts. Without stating that social neuroscience is heading the same way, the debates about gender neuroscience do highlight some of the pitfalls accompanying the investigation of complex cultural phenomena with the means of quantitative science and locating them in evolutionary narratives.

On the other hand, by stressing the pro-social aspects of human nature, such as empathy and cooperation, the focus of attention seems to shift into the direction of what is considered to be the female brain type. Whether this shift becomes a general shift in thinking about human nature and what, if this is the case, would be the consequences remains to be seen. In the course of the history of the brain sciences, the gendered attribution of abilities and character traits has changed. So, perhaps, empathy and cooperation will become inscribed in male brains if they become valuable components of human nature, maintaining a masculine dominance in human nature as well as in science. Another possibility would be that female brains become the norm and male brains become the other in want of explanation. These two speculations show that current debates in social neurosciences and other human sciences have the potential of altering our understanding of human nature and gender relations. But no matter in which direction the discourses head, the socio-historical contexts of these discourses will shed some light on them.

7.3 Conclusion

In the beginning of this study, I set out on an inquiry of what happens to the social when it is sought in brain regions, neurotransmitters or hormones. Yet, in the course of the investigation, the research perspective shifted and in the end the study is not so much about how “the social” can be investigated in the brain, but rather about what kind of social it is that is present in social neuroscientific research practice and epistemology. One central result is that social neuroscience’s notion of social relates to a new notion of what human beings are and how they normally act, in short a new version of a biologically based narrative of human nature. In this narrative, sociality is the driving force behind human evolution.

I have argued that social neuroscience is a cultural endeavour in the sense that it is embedded in discourses, beliefs and practices of the contemporary social world in which this research is situated: in the way of life, political culture and economical world

view in the West and particularly in the United States. The notion of 'social' employed in social neuroscience research is located in the individual brain, its ability to decode a certain kind of stimuli and to interact with others. Its epistemological roots lie in an individualistic approach to social psychology that emerged in the 1920s and 1930s, whose aim was, among other things, to proclaim and defend the individualistic "American Way of Life" against more collectivistic oriented notions of society and the individual in Europe. The political impetus of this notion of social was even more useful during the decades of the Cold War, but since the Fall of the Berlin Wall it is no longer necessary. The socio-political background of the notion of the social in social psychology seems all but forgotten by those employing this notion of social today as a variable investigated by experimental methods. Yet, the notion of social is set into the broader context of an evolutionary benefit of pro-social behaviour. Since Homo sapiens is a social species organised in communities, individuals who are able to decipher social stimuli, such as emotions, and to act in pro-social ways had better chances of reproduction and hence social brains evolved. This evolutionary heritage equips contemporary humans with the tools for coping with the complexity of social organisations and to engage in social relationships. Not everyone acts socially all the time, but every healthy person bears the potential to do so and has the option to act on that potential. This perspective on sociality means a shift in the conceptual framework of what is the norm and what needs explanation. While protagonists of this new version of human nature do not deny that aggression is as much part of human nature as is empathy, it now becomes marked as the other, the trait which needs to be explained. The emphasis on pro-social behaviour became strong at a time when individualism seemed to be at its height. What at first glance looks like a contradiction can also be read as a contribution to a doctrine of subsidiarity. If the capacity of pro-social behaviour is part of each individual's biological make-up, the responsibility for social cohesion can be put in their hands rather than maintaining state systems of social welfare.

Besides these epistemological findings the study also showed that the research practice itself is a highly social process in several regards, from the design of the experiment and choice of methodology over the recruitment of participants to the experimental situation itself. While all these factors are crucial for a successful experiment and thus the generation of data, they are eliminated from analysis and publication of the data. By ignoring these factors, conventions of the craft are met and the appearance of universally valid findings in human psychology is maintained. Yet, reflecting social

factors, such as recruitment strategies, sample composure or experimenter-participant observation has the potential of enriching psychological and neuroscientific research because it could situate the results in the context of their production.

In the course of my research, several sidelines suggested themselves but in the end had to be left out of the study. Such sidelines are, for instance, the interest in so-called social hormones such as oxytocin (and its competitive brother testosterone) and research in altruism, the notion of a 'good' human nature and how this is located in narratives of good and evil in nature, how the idea of cooperation is found in several realms of contemporary culture, from adventure novels to business organisation, whether practice and epistemology of social neuroscience research in other cultures, scientific and political systems than the US differs from the ones suggested in this study and, last but not least, if and how the knowledge about human nature, which is provided by social neuroscience, enters popular culture and is incorporated in common sense notions about who we are. All of these issues are further stones in the mosaic of a notion of sociality which is in the process of emerging.

I argue that social neuroscience's notion of the social matches a neosocial order, placing responsibility for social cohesion on the individual. But an additional cultural trend recently emerged. In the course of my research, which was conducted during the heyday of the financial crisis, which – as we are told – was brought about by the prototype of the old Homo economicus, the selfish, risk-taking investment banker, voices got stronger that criticised exactly this kind of person, only interested in gaining as much profit as possible on the cost of others. Once national states began to bail out banks, automotive and other industries on the cost of taxpayers who also were exposed to the danger of unemployment, calls for fairness and responsibility for others got louder. The expectations set in US-President Barak Obama during his campaign and in the first months in office as someone giving hope to people doing something together to improve the state of the nation and the world, might stand as an example for a need of feeling a sense of togetherness and a spite for people exploiting the majority for their own goods, which can be also seen in the Occupy movements around the Western world. In this cultural climate, research showing the social foundations of human nature falls on fertile soil. But interaction between science and other realms of cultural knowledge production is one of mutuality and thus the cultural and societal trends towards cooperation and other pro-social acts might also spark research in the nature of

these behaviours. Whether this rather fragile trend becomes more permanent is as open at this point in time, but it constitutes another piece in the puzzle of a contemporary emphasis on pro-social behaviour.

I want to close with two more quotations from my interviews. A social neuroscientist, trained as a social psychologist and based in the US explained that part of his rationale behind doing social psychology and social neuroscience research was:

> "I also thought it was important for psychologists to address real societal issues such as prejudice and discrimination in society - American society and then in general with the conflicts around the world – it could be useful" (Social Neuroscientist B).

Interestingly, he was the only one making such strong references to politics and the world we are living in. He was seconded in this impetus by a European social neuroscientist, who stressed that everybody had the potential of working towards a better world:

> "Everybody can train that (empathy, S.M.). And it's not even a big thing, it's mental training, like when there was this fitness boom everybody thought he had to work out. In our society, only little awareness exists that we can also train our mental world, and cultivate it and that it is not always staying the same, that we can change negative thoughts (…). And that, I think, is important to me, to show over the next decades how it works best and, well, so that things grow closer together in society" (Social Neuroscientist G).

8. References

Adolphs, Ralph (2009): 'The Social Brain. Neural Basis of Social Knowledge.' *Annual Review of Psychology* 60: 693-716.

Adolphs, Ralph (2010): 'Conceptual Challenges and Directions for Social Neuroscience.' *Neuron* 65: 752-767.

Adorno, Theodor W. et al. (1950): *The Authoritarian Personality*. New York: Harper.

Alac, Morana (2008): 'Working With Brain Scans: Digital Images and Gestural Interaction in fMRI Laboratory.' *Social Studies of Science* 38: 177-202.

Alexander, Gerianne (2003): 'An Evolutionary Perspective of Sex-Typed Toy Preferences: Pink, Blue, and the Brain'. *Archives of Sexual Behavior* 32 (1): 7-14.

Allport, Floyd (1924): *Social Psychology*. Boston: Houghton Mifflin Company.

Allport, Gordon (1954): 'The Historical Background of Modern Social Psychology.' In: Lindzey, Gardner (ed.): *Handbook of Social Psychology*. Cambridge (MA): Addison Wesley: 1-80.

Amaro, Edson and Gareth Barker (2006): 'Study design in fMRI: Basic principles.' *Brain and Cognition* 60: 220-232.

Amodio, David (2010): 'Can Neuroscience Advance Social Psychological Theory? Social Neuroscience for the Behavioral Social Psychologist.' *Social Cognition* 26 (6): 695-716.

Arendt, Hannah (2001): *Vita Activa. Oder vom tätigen Leben*. München/Zürich: Pieper. (first: 1958: *The Human Condition*. Chicago: University of Chicago Press.)

Ariely, Dan and Greogory Berns (2010): 'Neuromarketing. The Hope and Hype of Neuroimaging in Business.' *Nature Reviews Neuroscience* 11: 284-292.

Arnett, Jeffrey (2008): 'The Neglected 95%. Why American Psychology Needs to Become Less American.' *American Psychologist* 63 (7): 602-614.

Balaban, Evan (2006): 'Cognitive Developmental Biology: History, Process and Fortune's Wheel.' *Cognition* 101: 298-332.

Banaji, Mahzarin (2010): 'Letter to a Young Social Cognitionist.' *Social Cognition* 26 (6): 667-674.

Baron-Cohen, Simon (1997): *Mindblindness. An Essay on Autism and Theory of Mind.* Cambridge (MA): MIT Press.

Baron-Cohen, Simon (2003): *The Essential Difference*. London: Allan Lane.

Baron-Cohen, Simon (2011): *Zero Degrees of Empathy. A New Theory of Human Cruelty*. London: Allan Lane.

Baron-Cohen, Simon (2011): *The Science of Evil. On Empathy and the Origins of Cruelty*. New York: Basic Books.

Baron-Cohen, Simon, Alan M. Leslie and Uta Frith (1985): 'Does the Autistic Child have a "Theory of Mind"?' *Cognition* 21: 37-46.

Baron-Cohen, Simon, Svetlana Lutchmaya and Rebecca Knickmeyer (2004): *Prenatal Testosterone in Mind: Amniotic Fluid Studies*. Cambridge (MA): MIT Press.

Baron-Cohen, Simon, Rebecca Knickmeyer and Matthew Belmonte (2005): 'Sex Differences in the Brain: Implications for Explaining Autism.' *Science* 310: 819-823.

Barkow, Jerome, Leda Cosmides and John Tooby (eds.) (1992): *The Adapted Mind. Evolutionary Psychology and the Generation of Culture*. Oxford: Oxford University Press.

Bartal, Inbal Ben-Ami, Jean Decety and Peggy Mason (2011): 'Empathy and Pro-Social Behaviour in Rats.' *Science* 334: 1427-1430.

Batson, Daniel (2009): 'These Things Called Empathy: Eight related but distinct Phenomena'. In: Decety, Jean and William Ickes (eds.): *The Social Neuroscience of Empathy*. Cambridge (MA): MIT Press: 3-15.

Baudrillard Jean (1978[2007]): *In the Shadow of the Silent Majorities*. Los Angeles: Semiotext(e).

Beaulieu, Anne (2000): 'The Brain at the End of the Rainbow. Promises of Brain Scans n the Research Field and in the Media.' In: Marchessault, Janine and Kim Sawchuck (eds.): *Wild Science. Reading Feminism, Medicine and the Media*. London/New York: Routledge.

Beaulieu, Anne (2001): 'Voxels in the Brain: Neuroscience, Informatics and Changing Notions of Objectivity'. *Social Studies of Science* 31 (5): 635-80.

Beaulieu, Anne (2002): 'Images are not the (only) Truth: Brain Mapping, Visual Knowledge, and Iconoclasm'. *Science, Technology and Human Values* 27 (1): 53-86.

Beaulieu, Anne (2003): 'Brains. Maps and the New Territory of Psychology.' *Theory and Psychology* 13 (4): 561-568.

Becker, Gary (1996): *The Economics of Life. From Baseball to Immigration to Affirmative Action: How Real-World Issues Affect Our Everyday Life.* New York: McGraw-Hill.

Becker, Gary (1976): The Economic Approach to Human Behavior. Chicago: Chicago University Press.

Becker, Nicole (2006): *Die neurowissenschaftliche Herausforderung der Pädagogik*. Bad Heilbrunn: Julius Klinkhardt.

Begley, Sharon (2009): 'Of Voodoo and the Brain.' at thedailybeast.com/newsweek/2009/01/30/of-voodoo-and-the-brain.html, retrieved 13.01.2012.

Ben-David, Joseph and Randall Collins (1966[1991]): 'Social Factors in the Origins of a New Science.' In: Ben-David, Joseph: *Scientific Growth. Essays on the Social Organization and Ethos of Science*. Edited by Gad Freudenthal. Berkeley: University of California Press: 49-70.

Ben-David, Joseph and Awraham Zloczower (1962[1991]): 'Universities and Academic Systems in Modern Societies.' In: Ben-David, Joseph: *Scientific Growth. Essays on the Social Organization and Ethos of Science*. Edited by Gad Freudenthal. Berkeley: University of California Press: 125-157.

Berger, Peter and Thomas Luckmann (1966): *The Social Construction of Reality*. New York: Anchor Books.

Berntson, Gary (n.d.): 'Gary Berntson' at faculty.psy.ohio-state.edu/berntson, retrieved 04.01.2012.

Berntson, Gary et al. (2007): 'Amygdala Contribution to Selective Dimensions of Emotion.' *Social Cognitive and Affective Neuroscience* 2 (2): 123-129.

Bjoran, Kristina (2011): 'Looking for Empathy in a Conflict-Ridden World.' Scientific American Blogs, May 18, 2011, blogs.scientificamerican.com/guest-blog/2011/05/18/looking-for-empathy-in-a-conflict-ridden-world, retrieved 16.02.2012.

Blair, James (2011): 'Psychopathy from the Social Neuroscience Perspective.' In: Decety, Jean and John Cacioppo (2011): *The Oxford Handbook of Social Neuroscience*. Oxford: Oxford University Press: 895-905.

Blakemore, Sarah-Jayne, Joel Winston and Uta Frith (2004): 'Social Cognitive Neuroscience. Where are We Heading?' *Trends in Cognitive Sciences* 8 (5): 216-222.

Bleier, Ruth (1979): 'Social and Political Bias in Science: An Examination of Animal Studies and Their Generalizations to Human Behaviours and Evolution.' In: Hubbard, Ruth and Marian Lowe (eds.): *Genes and Gender. Pitfalls in Research of Sex and Gender*. New York: Gordian Press: 49-69.

Bluhm, Robyn, Anne Jaap Jacobson and Heidi Lene Maibom (eds.) (2012): *Neurofeminism. Issues at the Intersection of Feminist Theory and Cognitive Science*. New York: Palgrave MacMillan.

Bourdieu, Pierre (1972[1977]): *Outline of a Theory of Practice*. Cambridge: Cambridge University Press.

Bourdieu, Pierre (1979[1987]): *Die feinen Unterschiede*. Frankfurt/Main: Suhrkamp.

Bourdieu, Pierre (2004): *Science of Science and Reflexivity*. Chicago: Chicago University Press.

Bowler, Peter (1975): 'The Changing Meaning of „Evolution".' *Journal of the History of Ideas* 36 (1): 95-114.

Brizendine, Louann (2007): *The Female Brain*. London: Bantam.

Brooks, David (2009): 'The Young and the Neuro.' *The New York Times*, October 13, 2009: A13.

Brothers, Leslie (1990): 'The Social Brain: A Project for Integrating Primate Behaviour and Neurophysiology in a New Domain.' *Concepts in Neuroscience* 1: 27–251.

Bunzl, Martin, Stephen José Hanson and Russell A. Poldrack (2010): 'An Exchange about Localism.' In: Hanson, Stephen José and Martin Bunzl (eds.): *Foundational Issues in Human Brain Mapping*. Cambridge (MA): MIT Press: 49-54.

Burklund, Lisa; Naomi Eisenberger and Matthew Lieberman (2007): ' The Face of Rejection: Rejection Sensitivity Moderates Dorsal Anterior Cingulate Activity to Disapproving Facial Expressions.' *Social Neuroscience* 2 (3-4): 238-253.

Burri, Regula Valerie (2007): 'Sociotechnical Anatomy. Technology, Space and Body in the MRI Unit.' In: Burri, Regula Valerie and Joseph Dumit (eds.): *Biomedicine as Culture. Instrumental Practices, Technoscientific Knowledge, and New Modes of Life*. London/New York: Routledge.

Burri, Regula Valerie (2008): *Doing Images. Zur Praxis medizinischer Bilder*. Bielefeld: Transcript.

Butler, Judith (1990): *Gender Trouble*. London/New York: Routledge.

Butler, Judith (1993): *Bodies That Matter. On the Discursive Limits of "Sex"*. London/New York: Routledge.

Byrne Richard and Andrew Whiten (eds.) (1988): *Machiavellian Intelligence. Social Expertise and the Evolution of Intellect in Monkeys, Apes, and Humans.* Oxford: Clarendon.

Cacioppo, John (2002): 'Social Neuroscience: Understanding the Pieces Fosters Understanding the Whole and Vice Versa.' *American Psychologist* 57 (11): 820-831.

Cacioppo, John (n.d.): 'John T. Cacioppo.' at psychology.uchicago.edu/people/faculty/cacioppo/index.shtml, retrieved 04.01.2012.

Cacioppo, John et al. (2003): 'Just Because You're Imaging the Brain Doesn't Mean You Can Stop Using Your Head: A Primer and Set of First Principles.' *Journal of Personality and Social Psychology* 85 (4): 650-661.

Cacioppo, John et al. (2007): 'Social Neuroscience. Progress and Implications for Mental Health.' *Perspectives on Psychological Science* 2 (2): 99-123.

Cacioppo, John and Gary Berntson (1992): 'Social Psychological Contributions to the Decade of the Brain. Doctrine of Multilevel Analysis.' *American Psychologist*, 47 (8): 1019-1028.

Cacioppo, John and Gary Berntson (eds.) (2005): *Social Neuroscience*. *Key Readings*. New York: Psychology Press.

Cacioppo, John, Gary Berntson and Jean Decety (2010): 'Social Neuroscience and its Relationship to Social Psychology.' *Social Cognition* 26 (5): 675-685.

Cacioppo, John, Gary Berntson and Jean Decety (2011): 'A History of Social Neuroscience.' In: Kruglanski, Arie and Stroebe, Wolfgang (eds.): *Handbook of the History of Social Psychology*. Hove: Psychology Press (in Press).

Canguilhem, Georges (1966[1991]): *The Normal and the Pathological*. New York: Zone Books.

Caraley, Demitros (2001): 'Ending Welfare as We Know It.' *Political Science Quarterly* 116 (4): 525-560.

Carter, Sue, James Harris and Stephen Porges (2009): 'Neural and Evolutionary Perspectives on Empathy.' In: Decety, Jean and William Ickes (eds.): *The Social Neuroscience of Empathy*. Cambridge (MA): MIT Press, 169-182.

Cartwright, Dowin (1979): 'Contemporary Social Psychology in Historical Perspective.' *Social Psychology Quarterly* 42 (1): 82-93.

Cartwright, Dowin (1948): 'Social Psychology in the United Stated During the Second World War.' *Human Relations* 1: 333-352.

Cartwright, Lisa (1995): *Screening the Body. Tracing Medicine's Visual Culture*. Minneapolis: University of Minnesota Press.

Caspi, Avshalom et al. (2002): 'Role of Genotype in the Cycle of Violence in Maltreated Children.' *Science* 297: 851-854.

Ceci, Stephen and Wendy Williams (2011): 'Understanding Current Causes of Women's Unterrepresentation in Science.' *Proceedings of the National Academy of Sciences of the United States of America (PNAS)* 108 (8): 3157-3162.

Chiao, Joan Y. (ed.) (2009): *Cultural neuroscience: Cultural influences on brain function. Progress in Brain Research*. Amsterdam: Elsevier.

Choudhury, Suparna and Jan Slaby (eds.) (2012a): *Critical Neuroscience. A Handbook of the Social and Cultural Context of Neuroscience*. Chichester: Wiley-Blackwell.

Choudhury, Suparna and Jan Slaby (2012b): 'Introduction: Critical Neuroscience – Between Lifeworld and Laboratory.' In: Choudhury, Suparna and Jan Slaby (eds.): *Critical Neuroscience. A Handbook of the Social and Cultural Context of Neuroscience*. Chichester: Wiley-Blackwell: 1-26.

Christen, Markus (2008): 'Varieties of Publication Patterns in Neuroscience at the Cognitive Turn.' *Journal of the History of the Neurosciences* 17: 207-225.

Choi, Charles (2009): 'How Teenagers Find Themselves. The Development of a Key Brain Area Leads to Self-Consciousness.' *Scientific American Mind* 20 (February/March): 8-9.

Clifford, James and George Marcus (eds.) (1986): *Writing Culture. The Poetics and Politics of Ethnography*. Berkeley/Los Angeles: University of California Press.

Cohn, Simon (2008a): 'Petty Cash and the Neuroscientific Mapping of Pleasure.' *BioSocieties* 3: 151-163.

Cohn, Simon (2008b): 'Making Objective Facts from Intimate Relations: the Case of Neuroscience and its Entanglements with Volunteers.' *History of the Human Sciences* 21 (4): 86-103.

Cooter, Roger (1984): *The Cultural Meaning of Popular Science. Phrenology and the Organization of Consent in Nineteenth-Century Britain*. Cambridge: Cambridge University Press.

Cosmides, Leda and John Tooby (1997): 'Foreword', In: Baron-Cohen, Simon: *Mindblindness. An Essay on Autism and Theory of Mind*. Cambridge (MA): MIT Press: xi-xviii.

Cromby, John (2007): 'Integrating Social Science with Neuroscience. Potentials and Problems.' *BioSocieties* 2: 149-169.

Cureton, Edward (1950): 'Validity, Reliability, and Baloney.' *Educational and Psychological Measurement* 10: 94-96.

Damasio, Antonio (1994): *Descates' Error. Emotion, Reason, and the Human Brain*. New York: Putnam.

Damasio, Antonio (1999): *The Feeling of What Happens. Body and Emotion in the Making of Consciousness*. New York et al.: Harcourt.

Damasio, Antonio (2003): *Looking for Spinoza. Joy, Sorrow, and the Feeling Brain*. New York et al.: Harcourt.

Damasio, Antonio (2010): *Self Comes to Mind. Constructing the Conscious Brain*. New York: Pantheon.

Damasio, Antonio, Daniel Tranel und Hanna Damasio (1991): 'Somatic Markers and the Guidance of Behavior: Theory and Preliminary Testing.' In: Harvey Levine, Howard Eisenberg and Arthur Benton (eds.): *Frontal Lobe Function and Dysfunction.* Oxford: Oxford University Press: 217-229.

Danziger, Kurt (1990): *Constructing the Subject. Historical Origins of Psychological Research*. Cambridge: Cambridge University Press.

Danziger, Kurt (1997): *Naming the Mind. How Psychology Found its Language*. London: Sage.

Danziger, Kurt (2000): 'Making Social Psychology Experimental: A Conceptual History, 1920-1970.' *Journal of the History of the Behavioral Sciences* 36 (4): 329-347.

Daston, Lorraine and Peter Galison (2007): *Objectivity*. New York: Zone Books.

Dawkins, Richard (1976): *The Selfish Gene*. Oxford: Oxford University Press.

Decety, Jean and John Cacioppo (eds.) (2011): *The Oxford Handbook of Social Neuroscience*. Oxford: Oxford University Press: 895-905.

Decety, Jean and William Ickes (eds.) (2009): *The Social Neuroscience of Empathy*. Cambridge (MA): MIT Press.

Decety, Jean and Claus Lamm (2009): 'Empathy versus Personal Distress. Recent Evidence from Social Neuroscience.' In: Decety, Jean and William Ickes (eds.): *The Social Neuroscience of Empathy*. Cambridge (MA): MIT Press: 199-213.

Decety, Jean et al. (2008): 'Atypical Empathic Responses in Adolescents With Aggressive Conduct Disorder: A Functional MRI Investigation.' *Biological Psychology* 80: 203-211.

De Waal, Frans (1982): *Chimpanzee Politics. Power and Sex Among Apes*. New York: Harper and Row.

De Waal, Frans (2009): *The Age of Empathy. Nature's Lessons for a Kinder Society*. New York: Harmony Books.

Diener, Ed (2009): 'Editor's Introduction to Vu et al. (2009) and Comments.' *Perspectives in Psychological Sciences* 4 (3): 272-3.

Diener, Ed (2010): 'Neuroimaging: Voodoo, New Phrenology, or Scientific Breakthrough? Introduction to Special Section on fMRI.' *Perspectives in Psychological Sciences* 5 (6): 714-715.

Dietz, Thomas, Tom Burns and Frederick Buttel (1990): 'Evolutionary Theory in Sociology: An Examination of Current Thinking.' *Sociological Forum* 5 (2): 155-171.

Dingwall, Robert, Brigitte Nehrlich and Samantha Hillyard (2003): 'Biological Determinism and Symbolic Interaction: Hereditary Streams and Cultural Roads.' *Symbolic Interaction* 26 (4): 631-644.

Dobzhansky, Theodosius (1937): *Genetics and the Origin of Species*. New York: Columbia University Press.

Draganosky, Joyce (2005): *The Science of Love*, scienceandfilm.org/films.php?film_id=206, retrieved 05.11.2009.

Dror, Otniel (2001): 'Techniques of the Brain and the Paradox of Emotions, 1880-1930.' *Science in Context* 14 (4): 643-660.

Duden, Barbara (1987): *Geschichte unter der Haut. Ein Eisenacher Arzt und seine Patientinnen um 1730*. Stuttgart: Klett-Cotta.

Duden, Barbara (1991): *Der Frauenleib als öffentlicher Ort. Vom Missbrauch des Begriffs Leben*. Hamburg/Zürich: Luchterhand.

Dumit, Joseph (1999): 'Objective Brains, Prejudicial Images.' *Science in Context* 12 (1): 173-201.

Dumit, Joseph (2004): *Picturing Personhood. Brain Scans and Biomedical Identity*. Princeton: Princeton University Press.

Dunn, Dana (2009): *Research Methods for Social Psychology*. Oxford: Wiley-Blackwell.

Dunbar, Robin (1998). 'The Social Brain Hypothesis.' *Evolutionary Anthropology* 6 (5): 178-190.

Durkheim, Emile (1901[1984]): *Die Regeln der soziologischen Methode*. Frankfurt/Main: Suhrkamp.

Dusek, Val (1999): 'Sociobiology Sanitized: Evolutionary Psychology and Gene Selectionism.' *Science as Culture* 8 (2): 129-169.

Duster, Troy (2006): 'Comparative Perspectives and Competing Explanations: Taking on the Newly Configured Reductionist Challenges to Sociology.' *American Sociological Review* 71: 1-15.

Ebenstein, Lanny (2007): *Milton Friedman. A Biography*. New York: Palgrave Macmillan.

Ellwood, Charles (1901): *Some Prolegomena to Social Psychology*. Chicago: University of Chicago Press.

Ernst, Cecile and Hans Walser (2006): 'Auguste Forel, 1848-1931.' In: Wolpert, Eugen et al. (eds.): *Images in Psychiatry. German Speaking Countries. Austria. Germany. Switzerland*. Heidelberg: Universitätsverlag Winter: 135-146.

Fausto-Sterling, Anne (2000): *Sexing the Body. Gender Politics and the Construction of Sexuality*. New York: Basic Books.

Fehr, Ernst and Urs Fischbacher (2003): 'The Nature of Human Altruism.' *Nature* 425: 785-791.

Fischer, Philip (2002): *The Vehement Passions*. Princeton: Princeton University Press.

Fiske, Susan and Shelly Taylor (1984): *Social Cognition*. New York: Random House.

Fiske, Susan, Amy Cuddy and Peter Glick (2007): 'Universal Dimensions of Social Perception. Warmth and Competence.' *Trends in Cognitive Neuroscience* 11: 77-83.

Fiske, Susan (2009): *Social Beings. Core Motives in Social Psychology*, 2nd Ed. Hoboken: Wiley.

Fine, Cordelia (2010): *Delusions of Gender. The Real Science Behind Sex Differences*. London: Icon Books.

Fleck, Ludwik (1935[1983]): 'Über die wissenschaftliche Beobachtung und die Wahrnehmung im allgemeinen.' In: Fleck, Ludwik: *Erfahrung und Tatsache. Gesammelte Aufsätze*. Frankfurt/Main: 59-83.

Fleck, Ludwik (1935[1980]): *Entstehung und Entwicklung einer wissenschaftlichen Tatsache. Einführung in die Lehre vom Denkstil und Denkkollektiv.* Frankfurt/Main: Suhrkamp.

Fleck, Ludwik (1935[1979]): *Genesis and Development of a Scientic Fact*. Chicago: Chicago University Press.

Flick, Uwe, Ernst von Kardorff and Ines Stein (eds.) (2010): *Qualitative Forschung. Ein Handbuch*, 8th edition. Reinbeck: Rowohlt.

Franklin, Sarah (1997): *Embodied Progress: A Cultural Account of Assisted Conception*. New York/London: Routledge.

Frith, Uta and Chris Frith (2003): 'Development and Neurophysiology of Mentalizing.' *Philosophical Transactions of the Royal Society B* 358: 459-472.

Frith, Chris and Uta Frith (2010a): 'Learning From Others: Introduction to the Special Reviews Series on Social Neuroscience.' *Neuron* 65: 739-743.

Frith, Uta and Chris Frith (2010b): 'The Social Brain: Allowing Humans to Boldly Going Where No Other Species Has Been.' *Philosophical Transactions of the Royal Society B* 365: 165-176.

Foucault, Michel (1975 [1977]): *Überwachen und Strafen*. Frankfurt/Main: Suhrkamp.

Foucault, Michel (1976-1984 [1990-1998]: *The History of Sexuality*, Vol. 1-3. London: Penguin.

Foucault, Michel (1979 [2004]): *Die Geschichte der Gouvernementalität II. Die Geburt der Biopolitik*. Frankfurt/Main: Suhrkamp.

Fuller, Steven (2000): *The Governance of Science. Ideology and the Future of the Open Society*. Buckingham: Open University Press.

Gallese, Vittorio (2003): 'The Manifold Nature of Interpersonal Relations: The Quest for a Common Mechanism.' *Philosophical Transactions of the Royal Society B* 358 (1431): 517-528.

Gallese, Vittorio et al. (2011): 'Mirror Neuron Forum.' *Perspectives on Psychological Science* 6: 369-407.

Gallese, Vittorio, Luciano Fadiga, Leonoardo Fogassi and Giacomo Rizzolatti (1996): 'Action recognition in the promotor cortex.' *Brain* 119: 593-609.

Gazzaniga, Michael (1985): *The Social Brain. Discovering the Networks of the Mind*. Ney York: Basic Books.

Geschwind, Norman and Peter Behan (1982): 'Left-handedness: Association with Immune Disease, Migraine, and Developmental Learning Disorder.' *Proceedings of the National Academy of Sciences* 79: 5097-5100.

Ghandi, Leela (1998): *Postcolonial Theory. A Critical Introduction*. New York: Columbia Uniersity Press.

Gibbons, Michael, Helga Nowotny and Peter Scott (1994): *The New Production of Knowledge. The Dynamics of Science and Research in Contemporary Societies*. London: Sage.

Glenn, Andrea and Adrian Raine (2011): 'Antisocial Personality Disorders.' In: Decety, Jean and John Cacioppo (eds.): *The Oxford Handbook of Social Neuroscience*. Oxford: Oxford University Press: 885-894.

Glimcher, Paul, Colin Camerer, Ernst Fehr, and Russell Poldrack (eds.) (2009): *Neuroeconomics. Decision Making and the Brain*. London: Academic Press.

Gould, Steven (1997): *The Mismeasure of Man*. Revised and Expanded Edition. London: Penguin.

Gould, Steven (2000): 'More Things in Heaven and Earth.' In: Rose, Hilary and Steven Rose (eds.): *Alas Poor Darwin. Arguments Against Evolutionary Psychology*. London: Random House: 85-105.

Gould, Steven and Richard Lewontin (1979): 'The Spandrels of San Marco and the Panglossian Paradigm. A Critique of the Adaptionist Program.' *Proceedings of the Royal Society* B 205: 581-598.

Greco, Monica and Paul Stenner (2008): *Emotions. A Social Science Reader*. London/New York: Routledge.

Greenwood, John (1997): 'Introduction: The Mark of the Social'. In: Greenwood, John (ed.): *The Mark of the Social. Discovery or Invention?* Lanham et al.: Rowman and Littlefield: 1-16.

Greenwood, John (2000): 'Individualism and the Social in Early American Social Psychology.' *Journal of the History of the Behavioral Sciences* 36 (4): 443-455.

Greenwood, John (2004a): 'What Happened to the "Social" in Social Psychology?' *Journal for the Theory of Social Behaviour* 34 (1): 21-33.

Greenwood, John (2004b): *The Disappearance of the Social in American Social Psychology*. Cambridge: Cambridge University Press.

Greenwood, John (2009): *A Conceptual History of Psychology*. New York: McGraw-Hill.

Grossi, Giordana (2006): 'Science or Belief? Bias in Sex Difference Research.' In: Badaloni, S. et al.: *Unter-Representation of Women in Science and Technology. Proceedings of the 3rd Conference Women & Science*. Dept. of Information Engineering of the University of Padua, Italy: 94-106.

Hacking, Ian (1999): *The Social Construction of What?* Cambridge (MA): Harvard University Press.

Hagner, Michael (1996): 'Der Geist bei der Arbeit. Überlegungen zur Visualisierung cerebraler Prozesse.' In: Borck, Cornelius (ed.): *Anatomien medizinischen Wissens*. Frankfurt/Main: Fischer: 259-286.

Hagner, Michael (1999): 'Gehirnführung.' In: Hagner, Michael (ed.): *Ecce Cortex. Beiträge zur Geschichte des Modernen Gehirns*. Göttingen: Wallstein.

Hagner, Michael (2000[1997]): *Homo cerebralis. Der Wandel vom Seelenorgan zum Gehirn*. Frankfurt/Main: Insel.

Hagner, Michael (2001): 'Cultivating the Cortex in German Neuroanatomy.' *Science in Context* 14 (4): 541-563.

Hagner, Michael (2006): *Der Geist bei der Arbeit. Historische Untersuchungen zur Hirnforschung*. Göttingen: Wallstein.

Hagner, Michael (2007[2004]): *Geniale Gehirne. Zur Geschichte der Elitegehirnforschung*. München: dtv.

Hagner, Michael (2008a): 'Das Hirnbild als Marke.' *Bildwelten des Wissens* 6 (1): 43-51.

Hagner, Michael (2008b): 'Genius, Gender, and Elite in the History of the Neurosciences.' In: Karafyllis, Nicole and Gotlind Ulshöfer (eds.): *Sexualised Brains. Scientific Modelling of Emotional Intelligence from a Cultural Perspective*. Cambridge (MA): MIT Press: 53-68.

Haney, Craig, Curtis Banks and Philip Zimbardo (1973). 'Interpersonal dynamics in a simulated prison.' *International Journal of Criminology and Penology* 1: 69–97.

Haraway, Donna (1989): *Primate Visions. Gender, Race, and Nature in the World of Modern Science.* London/New York: Routledge.

Haraway, Donna (1991): *Simians, Cyborgs, And Women. The Reinvention of Nature*. London/New York: Routledge.

Haraway, Donna (1999): 'Situated Knowledges. The Science Question and the Privilege of Partial Perspective.' In: Biagioli, Mario (ed.): *The Science Studies Reader*. London/New York: Routledge: 172-188.

Harlow, John Martyn (1848): 'Passage of an Iron Rod Through the Head.' *Boston Medical and Surgical Journal* 39: 389–39.

Harmon-Jones, Eddie and Piotr Winkielman (eds.) (2007): *Social Neuroscience. Integrating Biological and Psychological Explanations of Social Behavior*. New York: Guilford Press.

Harrington, Anne (1987): *Medicine, Mind, and the Double Brain*. Princeton: Princeton University Press.

Harrington, Anne (1999): *Reenchanted Science. Holism in German Culture From Wilhelm II to Hitler*. Princeton: Princeton University Press (first: 1996).

Harris, Christine (n.d.): 'Christine Harris.' at psychology.ucsd.edu/people/faculty/charris.html, retrieved 12.04.2011.

Harvey, David (2995): *A Brief History of Neoliberalism*. Oxford: Oxford University Press.

Haslam, S. Alexander and Craig McGarty (2004): 'Experimental Design and Causality in Social Psychological Research.' In: Sansone, Carol, Carolyn Morf and A.T. Panter (eds.): *The SAGE Handbook of Methods in Social Psychology*. London: Sage: 237-264.

Heer, Lou-Salomé (2012): *'Das wahre Geschlecht.' Der populärwissenschaftliche Geschlechterdiskurs im SPIEGEL (1947-2010)*. Zürich: Chronos.

Heider, Fritz and Marianne Simmel (1944): 'An Experimental Study of Apparent Behaviour.' *American Journal of Psychology* 57: 243-259.

Henrich, Joseph, Steven Heine and Ara Norenzayan (2010): 'Most people are not WEIRD.' *Nature* 446: 29.

Henry, P.J. (2008): 'College Sophomores in the Laboratory Redux: Influences of a Narrow Data Base on Social Psychology's View of the Nature of Prejudice.' *Psychological Inquiry* 19: 49-71.

Hickok, Greogry (2008): 'Eight Problems for the Mirror Neuron Theory of Action Understanding in Monkeys and Humans.' *Journal of Cognitive Neuroscience* 21 (7): 1229-1243.

Hofstatter, Richard (1955): *Social Darwinism in American Thought*. Boston: Beacon Press.

Honegger, Claudia (1991): *Die Ordnung der Geschlechter. Die Wissenschaften von Menschen und das Weib, 1750-1850*. Frankfurt/Main: Campus.

Hopf, Christel (2010): 'Qualitative Interviews. Ein Überblick.' In: Flick, Uwe, Ernst von Kardorff and Ines Stein (eds.): *Qualitative Forschung. Ein Handbuch*, 8th edition. Reinbeck: Rowohlt: 349-359.

Hrdy, Sandra Blaffer (1981): *The Woman That Never Evolved. A History of Mothers, Infants, And Natural Selection*. New York: Pantheon Books.

Hrdy, Sandra Blaffer (2009): *Mothers and Others. The Evolutionary Origins of Mutual Understanding.* Cambridge (MA): Harvard University Press.

Hubbard, Ruth and Marian Lowe (eds.) (1979): *Genes and Gender. Pitfalls in Research of Sex and Gender*. New York: Gordian Press.

Iacoboni, Marco (2009): 'Imitation, Emathy and Mirror Neurons.' *Annual Review of Psychology* 60: 653-670.

Illouz, Eva (2008): *Saving the Modern Soul. Therapy, Emotions, and the Culture of Self-Help.* Berkeley/Los Angeles: University of California Press.

Jabbi, Mbemba, Marte Swart and Christian Keysers (2007): 'Empathy for Positive and Negative Emotions in the Gustatory Cortex.' *Neuroimage* 34 (4): 1744-1753.

Jablonka, Eva and Marion Lamb (2005): *Evolutions in Four Dimensions. Genetic, Epigenetic, Behavioral, and Symbolic Variations in the History of Life.* Cambridge (MA): MIT Press.

Jahoda, Gustav (2005): 'Theodor Lipps and the Shift From "Sympathy" to "Empathy".' *Journal of the History of the Behavioral Sciences* 41 (2): 151-163.

Jahoda, Gustav (2007): *A History of Social Psychology. From the Eighteenth-Century Enlightenment to the Second World War*. Cambridge: Cambridge University Press.

Johansson, Thomas (2000): *Social Psychology and Modernity.* Buckingham: Open University Press.

Jones, Edward and Lorne Mendell (1999): 'Assessing the Decade of the Brain.' Science 284 (5415): 739.

Jordan-Young, Rebecca (2010): *Brain Storm. The Flaws in the Science of Sex Differences*. Cambridge (MA): Harvard University Press.

Joyce, Kelly A. (2008): *Magnetic Appeal. MRI and the Myth of Transparency*. Ithaca: Cornell University Press.

Kaiser, Anelis, Sven Haller, Sigrid Schmitz and Cordula Nitsch (2009): 'On Sex/Gender Related Similarities and Differences in fMRI Language Research.' *Brain Research Reviews* 61: 49-59.

Kaiser, Anelies (2009): 'Feminismus, Geschlechterforschung und die Neurowissenschaft.' In: *Feministisches Institut Hamburg*: www.feministisches-institut.de/neurowissenschaft-2, retrieved 01.04.2011.

Kanwisher, Nancy (2010): 'Functional Specificity in the Human Brain. A Window Into the Functional Architecture of the Mind.' *PNAS Early Edition*: 1-8.

Karafyllis, Nicole and Gotlind Ulshöfer (eds.) (2008): *Sexualised Brains. Scientific Modelling of Emotional Intelligence from a Cultural Perspective*. Cambridge (MA): MIT Press.

Kay, Lily (2000): *Who Wrote the Book of Life? A History of the Genetic Code*. Stanford: Stanford University Press.

Knorr-Cetina, Karin (1981): *The Manufacture of Knowledge. An Essay on the Constructivist and Contextual Nature of Science.* Oxford: Pergamon Press.

Knorr-Cetina, Karin (1999): *Epistemic Cultures. How the Sciences Make Knowledge*. Cambridge (MA): Harvard University Press.

Kropotkin, Pjotr (1902[2006]): *Mutual Aid. A Factor of Evolution*. New York: Dover.

Kruglanski, Arie and Stroebe, Wolfgang (eds.) (2011): *Handbook of the History of Social Psychology*. Hove: Psychology Press (in Press).

Kuhn, Thomas (1962): *The Structure of Scientific Revolutions*. Chicago: Chicago University Press.

Lakoff, Andrew (2005): *Pharmaceutical Reason: Knowledge and Value in Global Psychiatry*. Cambridge: Cambridge University Press.

Latour, Bruno (2007): *Reassembling the Social. An Introduction to Actor-Network-Theory*. Oxford: Oxford University Press.

Latour, Bruno and Steve Woolgar (1979): *Laboratory Life. The Construction of Scientific Facts*. Princeton: Princeton University Press.

LeBon, Gustave (1895): *La Psychologie des Foules*. Paris.

LeDoux, Joseph (1996): *The Emotional Brain*. New York: Simon &Schuster.

LeDoux, Joseph (2000): 'Emotion Circuits in the Brain.' *Annual Review of Neuroscience* 23: 155-184.

Lessenich, Stephan (2003): 'Soziale Subjektivität. Die neue Regierung der Gesellschaft.' *Mittelweg 36* 12 (4): 80-93.

Lessenich, Lessenich (2008): *Die Neuerfindung des Sozialen. Der Sozialstaat im flexiblen Kapitalismus*. Bielefeld: transcript.

Lessenich, Stephan (2011): 'Constructing the Socialized Self.' In: Bröckling, Ulrich, Susanne Krasmann und Thomas Lemke (eds.): *Governmentality. Current Issues and Future Challenges.* London/New York: Routledge.

Lewontin, Richard and Richard Levins (2007): 'The Biological and the Social.' In Lewontin, Richard and Richard Levins: *Biology under the Influence. Dialectical Essays on Ecology, Agriculture, and Health*. New York: Monthly Review Press: 35-38.

Lewontin, Rose Kamin (1984): *Not in Our Genes. Biology, Ideology and Human Nature*. New York: Pantheon.

Lipps, Theodor (1907): 'Das Wissen von fremden Ichen.' *Psychologische Untersuchungen* 1: 694-722.

Lieberman, Matthew (2007): 'Social Cognitive Neuroscience. A Review of Core Processes.' *Annual Review of Psychology* 58: 259-289.

Lieberman, Matthew (2010): 'Social Cognitive Neuroscience.' In: Fiske, Susan, Daniel Gilbert and Gardner Lindzey (eds.): *Handbook of Social Psychology, 5th Edition*. Hoboken: Wiley.

Lock, Margaret and Patricia Kaufert (2001): 'Menopause, Local Biologies, and Cultures of Aging.' *American Journal of Human Biology* 13: 494-504.

Logothetis, Nikos (2008): 'What We Can Do And What We Cannot Do With fMRI.' *Nature* 453: 869-878.

Lynch, Michael (1985): *Art and Artifact in Laboratory Science*. London/New York: Routledge.

MacMartin, Clare and Andrew Winston (2000): 'The Rethoric of Experimental Social Psychology, 1930-1960: From Caution to Enthusiasm.' *Journal of the History of the Behavioral Sciences* 36 (4): 349-364.

Margulies, Daniel (2012): 'The Salmon of Doubt. Six Months of Methodological Controversy Within Social Neuroscience.' In: Choudhury, Suparna and Jan Slaby (eds.) *Critical Neuroscience. A Handbook of the Social and Cultural Context of Neuroscience*. Chichester: Wiley-Blackwell: 273-286.

Marks, Jonathan (2009): *Why I Am Not a Scientist. Anthropology and Modern Knowledge*. Berkeley/Los Angeles: University of California Press.

Martin, Emily (1987): *The Woman in the Body. A Cultural Analysis of Reproduction.* Boston: Beacon Press.

Martin, Emily (1994): *Flexible Bodies. The Role of Immunity in American Culture from the Days of Polio to the Age of AIDS*, Boston: Beacon.

Martin, Emily (1998): 'Anthropology and the Cultural Study of Science.' *Science, Technology and Human Values* 23 (1): 24-44.

Martin, Emily (2007): *Bipolar Expeditions. Mania and Depression in American Culture.* Princeton: Princeton University Press.

Matusall, Svenja (2006): *„Ich weiß, sie kann eigentlich nichts dafür". Popularisierung medizinischer Diagnostik unangepassten Benehmens am Beispiel des Aufmerksamkeitsdefizit-Hyperaktivitätssyndroms (ADHS)*, Magisterarbeit Universität Hannover (unpublished manuscript).

Matusall, Svenja, Ina Kaufmann and Markus Christen (2011): 'The Emergence of Social Neuroscience as an Academic Discipline.' Cacioppo, John and Jean Decety (eds.): *The Oxford Handbook of Social Neuroscience*. Oxford: Oxford University Press: 9-27.

McCabbe, David and Alan Castel (2008): 'Seeing is Believing. The Effect of Brain Images on Judgements of Scientific Reasoning.' *Cognition* 107: 343-352.

McDougall, William (1908): *An Introduction to Social Psychology*. London: Methuen & Co.

McGuire, William (1973): 'The Yin and Yan of Progress in Social Psychology: Seven Koan.' *Journal of Personality and Social Psychology* 26 (3): 446-456.

Merleau-Ponty, Maurice (1945[2002]): *Phenomenology of Perception*. London: Routledge.

Miller, Peter and Nikolas Rose (2008): *Governing the Present. Administering Economic, Social and Personal Life.* Cambridge: Polity.

Mindhacks (n.d.): mindhacks.com, retrieved 13.01.2012.

Mindhacks (2008): 'Voodoo Correlations in Social Brain Studies.' at mindhacks.com/2008/12/29/voodoo-correlations-in-social-brain-studies, retrieved 05.04.2011.

Monakow, Constantin von (1927[1950]): 'Die Syneidesis, das biologische Gewissen.' In: Monakow, Constantin von: *Gehirn und Gewissen. Psychologische Aufsätze*. Zürich: Morgarten Verlag: 231-282.

Monakow, Constantin von and R. Mourgue (1928): *Introduction biologique a l'etude de la neurologie et de la psychopathologie. Integration et desintegration de la fonction*. Paris: Felix Alcan.

Moscovici, Serge and Ivana Marková (2007): *The Making of Modern Social Psychology. The Hidden Story of How an International Social Science was Created.* Cambridge: Polity.

Nadesan, Majia Holm (2005): *Constructing Autism. Unravelling the 'Truth' and Understanding the Social*. London/New York: Routledge.

Nelkin, Dorothy (2000): 'Less Selfish than Sacred? Genes and the Religious Impulse in Evolutionary Psychology.' In: Rose, Hilary and Steven Rose (eds.): *Alas Poor Darwin. Arguments Against Evolutionary Psychology*. London: Random House: 14-27.

Neuroanthropology (n.d.): neuroanthropology.net, retrieved 13.01.2012.

Neurocritic (n.d.): neurocritic.blogspot.com, retrieved 13.01.2012.

Nicolodi, Sandra (2009): *'I'm a Whole Lot Like a Chimanzee and a Lot Like You.' Untersuchungen zu den Bonobos als Grenzfigur*. Lizentiatsarbeit University of Zurich (unpublished manuscript).

Nowak, Martin, Corina Tarnita and Edward Wilson (2010): 'The Evolution of Eusociality.' *Nature* 466: 1057-1062.

Nowotny, Helga, Peter Scott and Michael Gibbons (2001*): Re-Thinking Science. Knowledge and the Public in an Age of Uncertainty*. Cambridge: Polity.

Ochsner, Kevin (2007): 'Social Cognitive Neuroscience. Historical Developments, Core Principles, and Future Promise.' In: Kruglanski, Arie and E. Tory Higgings (eds.): *Social Psychology. A Handbook of Basic Principles, 2nd Edition*. New York: Guilford Press: 39-66.

Ochsner, Kevin and Matthew Lieberman (2001): 'The Emergence of Social Cognitive Neuroscience.' *American Psychologist*, 56 (9): 717-734.

Offer, John (2010): *Herbert Spencer and Social Theory.* London: Palgrave Macmillan.

Ortega, Francesco (2009): 'The Cerebral Subject and the Challenge of Neurodiversity.' *BioSocieties* 4: 425-445.

Ortega, Francesco and Fernando Vidal (eds.) (2011): *Neurocultures. Glimpses into an Expanding Universe*. Frankfurt/Main et al.: Peter Lang.

Panksepp, Jaak (1998): *Affective Neuroscience: The Foundations of Human and Animal Emotions*. Oxford: Oxford University Press.

Pashler, Harold (n.d.): 'Research Interests.' at pashler.com, retrieved 12.04.2011.

Patnoe, S (1988): *A Narrative History of Experimental Social Psychology*. New York: Springer.

Parkovnick, Sam (2000): 'Contextualizing Floyd Allport's *Social Psychology.*' *Journal of the History of the Behavioral Sciences* 36 (4): 429-441.

Pease, Allan and Barbara Pease (1999[2006]): *Why Men Don't Listen and Women Can't Read Maps*. London: Orion Books.

Pellegriono, G. di et al. (1992): 'Understanding Motor Events: A Neurophysiological Study.' *Experimental Brain Research* 91 (1): 176-180.

Perrin, Robert (1976): 'Herbert Spencer's Four Theories of Social Evolution.' *American Journal of Sociology* 81 (6): 1339-1359.

Pfeifer, Jennifer and Mirella Dapretto (2009): '"Mirror, Mirror, in My Mind." Empathy, Interpersonal Competence, and the Mirror Neuron System.' In: Decety, Jean and William Ickes (eds.) (2009): *The Social Neuroscience of Empathy*. Cambridge (MA): MIT Press: 183-197.

Phelps, Elizabeth et al. (2000): 'Performance on Indirect Measures of Race Evaluation Predicts Amygdala Activity.' *Journal of Cognitive Neuroscience* 12: 1-10.

Phelps, Elizabeth et al. (2001): 'Activation of the Left Amygdala to a Cognitive Representation of Fear'. *Nature Neuroscience* 4: 437-441.

Pickersgill, Martyn (2009): 'Between Soma and Society. Neuroscience and the Ontology of Psychopathy.' *BioSocieties* 4: 45-60.

Pickersgill, Martyn and Ira van Keulen (eds.) (2011): *Sociological Reflections on the Neurosciences*. Bingley: Emerald.

Pickering, Andrew (1995): *The Mangle of Practice. Time, Agency, and Science*. Chicago: University of Chicago Press.

Pinker, Susan (2008): *The Sexual Paradox. Men, Women and the Real Gender Gap*. New York: Scribner.

Poldrack, Russell (2010): 'Mapping Mental Function to Brain Structure: How Can Cognitive Neuroimaging Succeed?' *Perspectives on Psychological Science* 5: 753-761.

Prefrontal.org (2009a): 'The Story Behing the Atlantic Salmon.' At prefrontal.org/blog/2009/09/the-story-behind-the-atlantic-salmon, retrieved 12.04.2011.

Prefrontal.org (2009b): 'Human Brain Mapping 2009 – Presentations.' at prefrontal.org/blog/2009/06/human-brain-mapping-2009-presentations, retrieved 12.04.2011.

Premack, David and Guy Woodruff (1978). 'Does the Chimpanzee have a Theory of Mind?' *Behavioral and Brain Sciences* 1: 515-526.

Presitent's Research Committee on Social Trends (1933): *Recent Social Tends in the United States*. New York/London: McGraw-Hill.

Quaiser-Pohl, Claudia and Kirsten Jordan (2004): *Warum Frauen glauben, sie könnten nicht einparken - und Männer ihnen Recht geben. Über Schwächen, die gar keine sind. Eine Antwort auf A. &B. Pease*. München: C.H. Beck.

Rabinow, Paul (1996): *Essays on the Anthropology of Reason*. Princeton: Princeton University Press.

Rabinow, Paul (1999): 'Artificiality and Enlightenment. From Sociobiology to Biosociality.' In: Mario Biagioli (ed.): *The Science Studies Reader*. London/New York: Routledge: 407-416.

Raichle, Marcus (2001): 'A Brief History of Human Functional Brain Mapping.' In: Toga, Arthur and John Mazziotta (eds.): *Brain Mapping. The Systems*. San Diego: Academic Press: 33-75.

Rapp, Rayna (1999): *Testing Women, Testing the Fetus. The Social Impact on Amniocentesis in America*. London/New York: Routledge.

Ratcliffe, Matthew (2008): *Feelings of Being. Phenomenology, Psychiatry and the Sense of Reality*. Oxford: Oxford University Press.

Rees, Tobias (2010a): 'Being Neurologically Human Today: Life and Science and Adult Cerebral Plasticity (an Ethical Analysis).' *American Ethnologist* 37 (1): 150-166.

Rees, Tobas (2010b): 'To Open Up New Spaces of Thought. Anthropology BSC (Beyond Society and Culture). Review Article.' *Journal of the Royal Anthropological Institute (N.S.)* 16: 158-163.

Rheinberger, Hans-Jörg (2001): *Experimentalsysteme und epistemische Dinge. Eine Geschichte der Proteinsynthese im Reagenzglas*. Göttingen: Wallstein.

Rifkin, Jeremy (2009): *The Empathic Civilisation. The Race to Global Consciousness in a World in Crisis*. New York: Jeremy P. Tarcher.

Roepstorff, Andreas (2004): 'Mapping Brain Mappers. An Ethnographic Coda.' In: Frackowiak, Richard et al. (eds.): *Human Brain Function. 2nd Edition*. London: Elsevier: 1105-1117.

Roepstorff, Andreas, Chris Frith and Uta Frith (2009): 'How Our Brains Build Social Worlds.' *New Scientist* 2737.

Roepstorff, Andreas and Chris Frith (2004): What's at the Top of Top-Down Control of Action? Script-Sharing and 'Top-Top' Control of Action in Cognitive Experiments. *Psychological Research* 68: 189-198.

Roepstorff, Andreas and Anthony Jackson (2004): 'Introspection and Cognitive Brain Mapping: From Stimulus-Response to Script-Report.' *Trends in Cognitive Neuroscience* 6 (8): 333-339.

Rose, Hilary (2000): 'Colonising the Social Sciences?' In: Rose, Hilary and Steven Rose (eds.): *Alas Poor Darwin. Arguments Against Evolutionary Psychology*. London: Random House: 106-128.

Rose, Hilary and Steven Rose (eds.) (2000): *Alas Poor Darwin. Arguments Against Evolutionary Psychology*. London: Random House.

Rose, Nikolas (1989): *Governing the Soul. The Shaping of the Private Self*. Cambridge: Cambridge University Press.

Rose, Nikolas (1998): *Inventing Our Selves. Psychology, Power, and Personhood*. 2nd Edition. Cambridge: Cambridge University Press.

Rose, Nikolas (2003): 'Neurochemical Selves.' *Society* 41 (1): 46-60.

Rose, Nikolas (2010): ''Screen and Intervene.' Governing Risky Brains.' *History of the Human Sciences* 23 (1): 79-105.

Rose, Steven (2000): 'Escaping Evolutionary Psychology.' In: Rose, Hilary and Steven Rose (eds.): *Alas Poor Darwin. Arguments Against Evolutionary Psychology*. London: Random House: 247-265.

Rose, Steven (2005): *Life Lines. Life Beyond the Gene*. London: Vintage.

Ross, Edward (1908): *Social Psychology. An Outline and Source-Book*. New York: Macmillan.

Rubin, Beatrix (2009): 'Changing Brains. The Emergence of the Field of Adult Neurogenesis.' *BioSocieties* 4: 407-424.

Sahlins, Marshall (1976): *The Use and Abuse of Biology. An Anthropological Critique of Sociobiology*. Ann Abor: University of Michigan Press.

Sahlins, Marshall (2009): *The Western Illusion of Human Nature*. Chicago: Prickly Paradigm Press.

Samelson, Franz (2000): 'Whig and Anti-Whig Histories – and Other Curiosities of Social Psychology.' *Journal of the History of the Behavioral Sciences* 36 (4): 499-506.

Samerski, Silja (2002): *Verrechnete Hoffnung. Von der selbstbestimmten Entscheidung durch genetische Beratung*. Münster: Westfälisches Dampfboot.

Sareen, J., Campbell, D.W., Leslie, W.D., Malisza, K.L., Stein, M.B., Paulus, M.P., et al. (2007): 'Striatal Function in Generalized Social Phobia. A Functional Magnetic Resonance Imaging Study'. *Biological Psychiatry* 61: 396-404.

Schiebinger, Londa (1993): *Nature's Body. Gender in the Making of Modern Science*. Boston: Beacon Press.

Schiebinger, Londa (2001 [1999]): *Has Feminism Changed Science?* Cambridge (MA): Harvard University Press.

Schinzel, Britta (2006): 'The Body in Medical Imaging Between Reality and Construction.' *Poiesis and Praxis* 4: 185-198.

Schmitz, Sigrid (2006): ‚Frauen- und Männergehirne. Mythos oder Wirklichkeit?' In: Ebeling, Smilla and Sigrid Schmit (eds.): *Geschlechterforschung und Naturwissenschaften. Einführung in ein komplexes Wechselspiel*. Wiesbaden: VS-Verlag: 211-234.

Schneider, David (1968): *American Kinship. A Cultural Account*. Chicago: University of Chicago Press.

Sears, David O. (1986): 'College Sophomores in the Laboratory: Influences of a Narrow Data Base on Social Psychology's View of Human Nature.' *Journal of Personality and Social Psychology* 51 (3): 515-530.

Semin, Gün and Gerald Echterhoff (eds.) (2011): *Grounding Sociality. Neurons, Mind, and Culture*. New York: Psychology Press.

Sennett, Richard (2006): *The Culture of the New Capitalism.* Newhaven: Yale University Press.

Sennett, Richard (2012): *Together. The Rituals, Pleasures and Politics of Cooperation*. Newhaven: Yale University Press.

Shamay-Tsoory, Simone (2009): 'Empathic Processing: its Cognitive and Affective Dimensions and Neuroanatomical Basis.' In: Decety, Jean and William Ickes (eds.) (2009): *The Social Neuroscience of Empathy*. Cambridge (MA): MIT Press: 215-232.

Sherif, Muzafer et al. (1954 [1961]: *Intergroup Conflict and Cooperation. The Robbers Cave Experiment*. Norman: University of Oklahoma Book Exchange.

Singer, Wolf (2003): *Ein neues Menschenbild? Gespräche über Hirnforschung*. Frankfurt/Main: Suhrkamp.

Singer, Tania et al. (2004): 'Empathy for Pain Involves the Affective but Not Sensory Components of Pain.' *Science* 303: 1157-62.

Singer, Tania et al. (2006): 'Empathic Neural Responses are Modulated by the Perceived Fairness of Others.' *Nature* 439: 466–469.

Singer, Tania and Claus Lamm (2009): 'The Social Neuroscience of Empathy.*' Annals of the New York Academy of Science* 1156: 81-96.

Smith, Chris (1982): 'Evolution and the Problem of Mind: Part II. John Hughlings Jackson.' *Journal for the History of Biology* 15 (2): 241-262.

Social Science Research Council (ed.) (1949-1050): *Studies in Social Psychology in World War II. Volumes 1-4*. Princeton: Princeton University Press.

Spencer, Herbert (1885): *Principles of Sociology*. London.

Stam, Henderikus, Lorraine Radtke, and Ian Lubek (2000): 'Strains in Experimental Social Psychology: A Textual Analysis of the Development of Experimentation in Social Psychology.' *Journal of the History of the Behavioral Sciences* 36 (4): 365-382.

Star, Susan Leigh (1979): 'Sex Differences and the Dichotomization of the Brain: Methods, Limits and Problems in Research on Consciousness.' Hubbard, Ruth and Marian Lowe (eds.) *Genes and Gender II*. New York: Gordian Press: 113-130.

Star, Susan Leigh (1983): 'Simplification in Scientific Work: An Example form Neuroscience Research.' *Social Studies of Science* 13: 205-25.

Stichweh, Rudolf (1992): 'The Sociology of Scientific Disciplines: On the Genesis and Stability of the Disciplinary Structure of Modern Science.' *Science in Context* 5: 3-15.

Stouffer, Samuel (1950): *Studies in Social Psychology in World War II. Vol. 4: Measurements and Prediction*. Princeton: Princeton University Press.

Strathern, Marilyn (1992): *Reproducing the Future. Essays on Anthropology, Kinship, and the New Reproductive Technologies*. Manchester: Manchester University Press.

Stueber, Karsten (2006): *Rediscovering Empathy. Agency, Folk Psychology, and the Human Sciences*. Cambridge (MA): MIT Press.

Tanner, Nancy and Adrienne Zihlman (1976): 'Women in Evolution. Part I: Innovation and Selection in Human Origins.' *Signs* 1 (3): 585-608.

Thatcher, Margaret (1987): '"Aids, education and the year 2000!" Interview for Woman's Own.' www.margaretthatcher.org/speeches/displaydocument.asp?docid=106689, retrieved 3.12.2009.

Thomas William and Florian Znaniecki (1918): *The Polish Peasant in Europe and America*. Boston: Badger.

Titchener, Edward (1909): *Lectures on the Experimental Psychology of Thought Processes*. New York: Macmillan.

Todes, Daniel (1989): *Darwin Without Malthus. The Struggle for Existence in Russian Evolutionary Thought*. Oxford: Oxford University Press.

Todorov, Alexander, Lasana Harris, and Susan Fiske (2006): 'Toward Socially Inspired Social Neuroscience.' *Brain Research* 1079. 76-85.

Todorov, Alexander, Susan T. Fiske and Deborah A. Prentice (eds.) (2011): *Social Neuroscience. Toward Understanding the Underpinnings of the Social Mind*. Oxford: Oxford University Press.

Tomasello, Michael (1999): *The Cultural Origins of Human Cognition*. Cambridge (MA): Harvard University Press.

Tomasello, Michael (2009): *Why We Cooperate*. Cambridge (MA): MIT Press.

Tooby, John and Leda Cosmides (1992): 'The Psychological Foundations of Culture.' In: Barkow, Jerome, Leda Cosmides and John Tooby (eds.): *The Adaped Mind. Evolutionary Psychology and the Generation of Culture*. Oxford: Oxford University Press: 19-136.

US News (2010a): 'College Rankings.' at colleges.usnews.rankingsandreviews.com, retrieved 01.09.2010.

US News (2010b): 'How to Use the US News College Directory.' at usnews.com/articles/education/best-colleges/2010/08/17/how-to-use-the-us-news-college-directory.html, retrieved 01.09.2010.

Van Whye, John (2004): *Phrenology and the Origins of Victorian Scientific Naturalism*. Aldershot: Ashgate.

Vidal, Fernando (2009): 'Brainhood. Anthropological Figure of Modernity.' *History of the Human Sciences* 22 (1): 5-36.

Vischer, Robert (1873): *Über das optische Formgefühl. Ein Beitrag zur Ästhetik*. Leipzig: Credner.

Vul, Edward et al. (2008): 'Voodoo Correlations in Social Neuroscience.' *Perspectives on Psychological Science* (precirculating online, not accessible anymore).

Vul, Edward et al. (2009a): 'Puzzlingly High Correlations on fMRI Studies of Emotion, Personality, and Social Cognition.' *Perspectives on Psychological Science* 4 (3): 274-290.

Vul Edward et al. (2009b): 'Reply to Comments on „Puzzlingly High Correlations on fMRI Studies of Emotion, Personality, and Social Cognition".' *Perspectives on Psychological Science* 4 (3): 319-324.

Vul, Ed and Nancy Kanwisher (2010): 'Begging the Question: The Nonindependence Error in fMRI Data Analysis.' In: Hanson, Stephen José and Martin Bunzl (eds.): *Foundational Issues in Human Brain Mapping*. Cambridge (MA): MIT Press: 71-91.

Wagner, Peter (2001): *A History and Theory of the Social Sciences. Not All That is Solid Melds Into Air*. London: Sage.

Ward, Jamie (2012): *The Student's Guide to Social Neuroscience.* Hove/New York: Psychology Press.

Weisberg, Deena Skolnick, Frank Keil, Joshua Goodstein, Elizabeth Rawson and Jeremy Gray (2008): 'The Seductive Allure of Neuroscience Explanations.' *Journal of Cognitive Neuroscience* 20 (3): 470-477.

Wickens, Andrew (2009): *Introduction to Biopsychology, 3rd Edition*. Harlow: Pearson Education Limited.

Williams, Raymond (1976): *Keywords. A Vocabulary of Culture and Society*. London: Fontana.

Wilson, Edward (1975): *Sociobiology. The New Synthesis*. Cambridge (MA): Harvard University Press.

Wilson, Edward (1978[2004]): *On Human Nature*. Cambridge (MA): Harvard University Press.

Wilson, Elisabeth (2004): *Psychosomatic. Feminism and the Neurological Body*. Durham (NC): Duke University Press.

Winkielman, Piotr (n.d.): 'Piotr Winkielman.' at psy2.ucsd.edu/~pwinkiel, retrieved 12.04.2011.

Wynne-Edwards, Vero Copner (1962): *Animal Dispersion in Relation to Social Behavior*. London: Oliver and Boyd.

Young, Allan (2011): 'Self, Brain, Microbe, and the Vanishing Commissar.' *Science, Technology and Human Values* 36 (5): 638-661.

Young, Allan (2012): 'Empathic Cruelty and the Origins of the Social Brain.' In: Choudhury, Suparna and Jan Slaby (eds.) *Critical Neuroscience. A Handbook of the Social and Cultural Context of Neuroscience*. Chichester: Wiley-Blackwell: 159-176.

Young, Rebecca and Evan Balaban (2006): 'Psychoneuroendocrinology.' *Nature* 443, 12 October 2006.

Young, Robert (2003): *Postcolonialism. A Very Short Introduction*. Oxford: Oxford University Press.

Zaboura, Nadia (2009): *Das empathische Gehirn: Spiegelneurone als Grundlage menschlicher Kommunikation*. Wiesbaden: VS Verlag für Sozialwissenschaften.

Zaki, Jami, Niall Bolger and Kevin Ochsner (2009): 'Unpacking the Informational Bases of Empathic Accuracy.' *Emotion* 9 (4): 478-487.

Zihlman, Adrienne (1978): 'Women in Evolution. Part II: Innovation and Selection in Human Origins.' *Signs* 4 (1): 4-20.