Automata's Inner Movie

Science and Philosophy of Mind

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TABLE OF CONTENTS

LIST OF ACRONYMS

AA	=	Acetylsalicylic Acid
ANN	=	Artificial Neural Networks
ANNC	=	Artificial Neural Networks Controller
AI	=	Artificial Intelligence
BS	=	Brain States
CNS	=	Central Nervous System
DAS	=	Darwinian Axiomatic System
DL	=	Deep Learning
ECS	=	Emotional-Competent-Stimulus
EDVAC	=	Electronic Discrete Variable Automatic Computer
ENIAC	=	Electronic Numerical Integration and Computer
FAS	=	Formal Axiomatic System
FEM	=	Free Energy Minimization
fMRI	=	Functional Magnetic Resonance Imaging
FP	=	Folk Psychology
FSM	=	Formal Symbol Manipulations
FWP	=	Free-Will Perception
LoT	=	Language of Thought
IIT	=	Integrated Information Theory
IQ	=	Intelectuall Quotient
ITF	=	Informational Teleofunctionalism
ITS	=	Satisfying Informational Teleosemantics
kNN	=	K-Nearest Neighbor Algorithm
MDL	=	Minimum Description Length
MIQ	=	Machine Intelligence Quotient
ML	=	Machine Learning
MS	=	Mental States
NAS	=	Newtonian Axiomatic System
NPL	=	National Laboratory of Physics
PC	=	Principal Components

PCA	=	Principal Component Analysis
PDF	=	Probability Distribution Function
PEM	=	Prediction Error Minimization
PMR	=	Puzzle of Mental Representation
PP	=	Predictive Processing Paradigm
PSS	=	Physical Symbolic Systems
RNA	=	Ribonucleic Acid
SNS	=	Social Network Services
TM	=	Turing Machines
TSM	=	Turing Supermachines
UAI	=	Universal Artificial Intelligence
ZFC	=	Axiom of Choice

LIST OF ILLUSTRATIONS

PREFACE
WHAT IS NEUROPHILOSOPHY? REDUCTIVE VS NON-REDUCTIVE APPROACHES AND DISTINCT DOMAINS

Georg Northoff
University of Ottawa

Many papers in this volume document that recent neuroscientific progress has led to the extension of neuroscience to apply and include also concepts like consciousness, free will, self, etc. that were originally discussed in philosophy. This has led to the recent emergence of a new field, neurophilosophy. The term "neurophilosophy" is often used either implicitly or explicitly for the characterization of an investigation of philosophical theories in relation to a neuroscientific hypothesis. According to Breidbach, "neurophilosophy" has already been implicitly practiced at the turn of the last century by, for example, W. Wundt (Breidbach, 1997: 393-4).

Another neurophilosopher though not named as such was Schopenhauer who was probably the first philosopher to introduce the concept of the brain in the philosophical context. The French philosopher M. Merleau-Ponty may also be considered a neurophilosopher since in his *Phenomenology of Perception* he explicitly introduces the brain and its neural organisation and links it to perception and other originally philosophical concepts. Other important developments in this regard were the paper about naturalized epistemology by W. Quine (1969) and the book about the self and its brain by Popper and Eccles (1977). Though these approaches differ widely, they at least share the presupposition that the brain may be important to consider in explaining our possible knowledge and the concept of mind.

Yet, it was Patricia Churchland who explicitly introduced the term “neurophilosophy" (Churchland, 1986). Her concept of neurophilosophy set a certain standard in defining neurophilosophy by possible reduction and elimination of originally philosophical concepts by neuroscientific concepts and facts. She thus did not only consider the brain to be relevant for

knowledge and the concept of mind but claimed much stronger that the latter can be reduced to the former. This had important implications since then the term neurophilosophy is almost exclusively reserved for reductive-eliminative approaches. Neurophilosophy in this sense is considered to be the "application of neuroscientific concepts to traditional philosophical questions" (Bickle et al., 2012: 1). Since "neurophilosophy" in this sense aims at revealing the neural correlates of originally philosophical terms (like, for example, free will, personal identity, consciousness, etc.), one may also speak of a "neuroscience of philosophy" or "Empirical Neurophilosophy". "Empirical Neurophilosophy" focuses on the investigation of the neural (and psychological) conditions of originally philosophical concepts like free will, self, action, consciousness, etc.

While Neurophilosophy is often completely identified or equated with Empirical Neurophilosophy these days, especially in the Anglo-American world, European continental authors (Walter 1998; Northoff, 2001, 2004, 2014) point out a wider notion and concept of Neurophilosophy. Such a wider concept of neurophilosophy can then also include European authors like M. Merleau-Ponty and A. Schopenhauer who argue against a reductive-eliminative approach. Such different concepts of neurophilosophy being either narrow and reductive, as dominating in the Anglo-American world, or wide and non-reductive as in the European-continental tradition, raises the question for methodological and conceptual issues in neurophilosophy which may be subsumed under the concept of "Theoretical Neurophilosophy" (Northoff, 2001; 2004; 2014).

Theoretical Neurophilosophy focuses predominantly on the development of a definition and methodological principles and strategies for the linkage between philosophical theory and neuroscientific hypothesis. These methodological principles may differ from the ones that are presupposed in philosophy and neuroscience respectively as well as from the ones that are applied in the linkage of philosophical concepts with concepts from other sciences (like physics or chemistry). The core feature of Theoretical Neurophilosophy is the investigation and definition of the specific neurophilosophical methodology as distinguished from neuroscientific and philosophical methodology.

The specific methodological feature of Neurophilosophy consists of the hybrid nature of neurophilosophical concepts (see also Bennett and Hacker, 2003). Neurophilosophical concepts like consciousness, free will, etc. are on the one hand neuroscientific concepts that are measured in orientation on empirical-experimental standards thus presupposing facts, while on the other hand they are philosophical concepts that are measured in orientation on logical-conceptual standards. Since both

empirical-experimental and logical-conceptual measures are integral components of neurophilosophical concepts, they must be linked to each other in neurophilosophical investigation. This requires special methodological strategies that are different from both neuroscience and philosophy that both investigate only one component, i.e., either facts or concepts. Hence, neurophilosophical methodology may be characterized by what may be called "concept-fact linkage" that must be considered truly transdisciplinary rather than intradisciplinary.

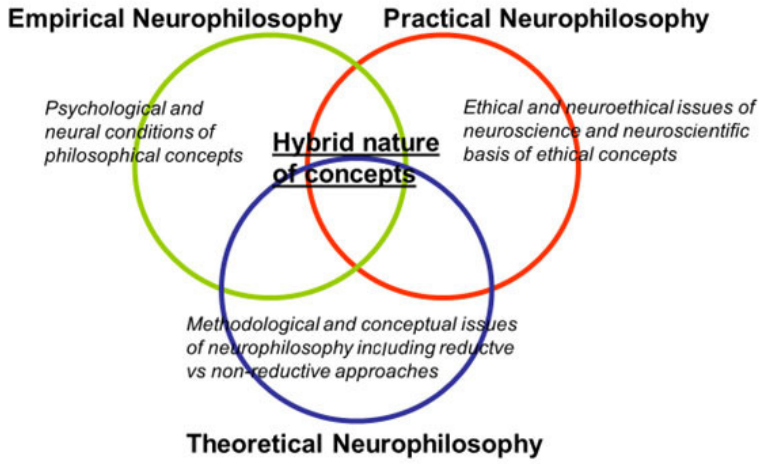

Figure 0.1: Distinction between Empirical, Practical and Theoretical Neurophilosophy.

The concept of Theoretical Neurophilosophy is closely related to the one of "philosophy of neuroscience" as it is reflected in the recent literature (see Bechtel et al., 2001; Bickle and Mandik, 2012). Like the philosophy of psychology and philosophy of physics, the "philosophy of neuroscience" represents an "attempt to address foundational issues in neuroscience" (see Bechtel et al., 2001: 7). For example, the question of the sort of explanation in neuroscience is raised, like whether neuroscientific explanation is in accordance with the deductive-nomological model as suggested by Hempel. Another central question concerns the problem of 'naturalization'. Can neuroscience apply the same strategies for 'naturalization' of philosophical terms as other disciplines (like, for example, physics and chemistry)? Are the general methodological principles for 'naturalization' valid in neuroscience too or is there a need to develop special strategies for neuroscience in particular?

The question for linking concepts and facts, i.e., "concept-fact linkage" (Northoff 2004; 2014a and b; 2016; 2018) does not concern a specific philosophical problem in neuroscience but rather a specific philosophical problem in neurophilosophy. For instance, the consideration of the empirical data from neuroscience may lead to a shift from the mind-body problem to the world-brain problem in philosophy (Northoff, 2016; 2018). Methodologically, one may speak of a "philosophy of neurophilosophy" rather than a "philosophy of neuroscience". Theoretical Neurophilosophy as conceptualized here is understood in a rather broad sense and is supposed to include both "philosophy of neurophilosophy" rather than just "philosophy of neuroscience".

In addition to Empirical and Theoretical Neurophilosophy, one may also distinguish "Practical Neurophilosophy" which these days is coined "Neuroethics" (Roskies, 2002; Morano et al., 2003; Northoff et al., 2006). Neuroethics can broadly and preliminarily be defined by the drawing of relationships between neuroscientific observations and ethical concepts. Neuroethics is concerned with ethical issues in clinical and scientific neuroscience like informed consent and enhancement that arise from neuroscientific progress. Most importantly, neuroethics also investigates the neural mechanisms and conditions underlying ethical concepts like moral judgment, free will, etc.

To sum up. The many interesting contributions in this book aim linking philosophical questions with neuroscientific insights. Such a methodological approach of linking neuroscience and philosophy has been subsumed under the umbrella term "neurophilosophy". Neurophilosophy develops from the encounter of neuroscience which has led to intense debate in philosophy about how its originally mind-based concepts are related to the brain and its neural function. While some proponents in the especially Anglo-American world suggest reductive replacement of philosophy by neuroscience as manifest in what they call neurophilosophy, the opponents claim for a more non-reductive form of neurophilosophy where both philosophy and neuroscience are closely intertwined but distinct. I here sketch the field of such non-reductive neurophilosophy by distinguishing different domains, empirical (neuroscientific investigation of originally philosophical concepts), theoretical (methodological and conceptual issues), and practical (neuroethical questions) neurophilosophy. In conclusion, a non-reductive neurophilosophy opens the door for a truly transdisciplinary exchange between philosophy and neuroscience which will lead to novel questions and approaches in both disciplines.

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INTRODUCTION

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The existence of the conscious mind is one of the most intricate problems of this century. The complexity of the problem is easily understood when one wants to study this concept. If you search for the word "mind" or "consciousness" in any search engine, thousands of entries and documents will be found, from the most mystical to the most scientific. You will also find a diversity of academic disciplines trying to solve the problem: researchers in neuroscience, psychology, computer science and, of course, philosophy. It was in the context of this latter discipline that the problem has historically emerged (one recalls the groundbreaking work done in this respect by Modern thinkers like Descartes, Locke and Reid). It´s fair to say, however, that nowadays the intellectual work on this topic was enriched by many disciplines.

This book will bring together researchers from a variety of areas to jointly present and discuss some of the most relevant problems around the conscious mind. This academic plurality perfectly characterizes the complexity with which a current researcher is confronted to discuss and work on this topic.

Our “inner movie” is a fascinating aspect of our life. Without it, we would not know how to enjoy a good glass of Portuguese red wine or the moving Samuel Barber’s *Adagio for Strings*. One can ask, of course, if this apparently simple verb – *to enjoy* – is exclusive of human beings. Is it possible that in the near future artificial beings may also have their own inner movie? Will they ever use that strange verb? Can the theories of the past help us to frame present problems and discover future solutions? Should we change those old-fashioned theories and look for different ones? Can human intelligence be suppressed by artificial intelligence? If so, what should we do with these entities? For instance, are they entitled to any rights? Or are they mere objects that do not deserve any moral status?

These and other issues will be discussed in this volume. Through its interdisciplinary language, the reader will finish this work with basic notions of several academic disciplines that will concur to better frame the role of each area of knowledge and its relevance to deal with these topics.

The book will have suitable material for researchers in several fields such as Cognitive Science and Neuroscience, Psychology or Artificial Intelligence, but may also be useful for students of any course of study or degree. It can also be used as a guide to some courses at various levels, from BA to MAs and PhD courses of various fields.

The volume is organized as follows: Part I will introduce the general problems of Philosophy of Mind and some historical perspectives. Part II will be focused on understanding the input that the empirical sciences can offer to the theoretical problems. Part III will discuss some of the core concepts of the field, namely, perception, memory and experience. Part IV will debate human and artificial intelligence and, finally, Part V will reflect about the computation and the ethics of big data and artificial intelligence.

The Part I opens with an introductory chapter on Philosophy of Mind in general, and on the topic of reductionism. The goal of Steven S. Gouveia is to introduce the reader to the basic concepts and discussions of the Philosophy of Mind and, then, to show why "reductionism", that is, the theory that advocates that all philosophical concepts should be reduced to empirical ones is scientifically and logically implausible.

The second chapter by Hortense de Villaine focuses on a specific author, Thomas Henry Huxley, and his view about the so-called "mind-body problem". The intuition of the author is that to recognize the contextual origin of the problem at stake can benefit to provide a historical depth to the specific debate about Huxley's view on consciousness, namely the defense of epiphenomenalism.

Manuel Curado follows with an essay against the philosophy of mind. According to this author, the problems that philosophy of mind deals with have been addressed by some of the best thinkers in History. It is not easy to explain this situation to someone outside the contemporary debate. The subjects are manifestly difficult, but it is also true that they have been known for a long time. In a sense, philosophy of mind should not exist. Why? Because enough time has already elapsed; because it reveals a shadows' theater in which one part of the mind tries to understand itself and the other parts; and finally, because what philosophy of mind does today pretends that thousands of attempts made in past centuries were not decisive or at least informative. Something is rotten in the Kingdom of

Philosophy of Mind. The result is what one would expect: the current multiplication of problems hides the complete inability to understand what the conscious mind is and does in the physical world. Moreover, philosophy of mind is nowadays oblivious of its own intellectual history, a subject left to autonomous investigators. This chapter seeks to address the malaise that arises when one tries to understand past projects of the philosophy of mind.

Lastly, to close the first part of the book, Ivan V. Ivanov presents a chapter on one of the most influential intellectuals of Modern Philosophy: George Berkeley. The chapter will be focusing on Berkeley's puzzle that challenges common-sense realism and his arguments against materialism.

Part II follows, devoted to the influence of the empirical sciences to theoretical problems. In the fifth chapter, Zong Ning will intend to present a solution to several problems raised by the idea that theorists fail to offer a detailed teleosemantics (consistent with the Predictive Processing framework) that can ground the mental in physical states because of the phenomena of underdeterminedness. The author will end up supporting an anti-realist representationalist position that may solve the problems of other classical solutions.

The next chapter, by Federico Zilio, aims to discuss the strengths and weaknesses of the Integrated Information Theory of Consciousness, one of the most influential theories of consciousness. The goal is to challenge this theory through contemporary issues in philosophy of mind and phenomenology. The chapter will conclude with a new version of the theory that redefines its ontological and epistemological backgrounds assumptions.

The following chapter by Nathália Pantaleão will analyse the relevance of the brain in the process of attributing meaning to the world in the natural language. The author will end up emphasising that there are possible explanatory limits to this kind of cerebral explanations of linguistic developments if one considers the semantic aspect as an emergent product of the relations between an agent and the world.

Finally, to close Part II, a co-authored chapter by Nicolás F. Lori, Emilia Samit, German Picciochi and Paulo Jesus, with the ambitious goal of defining the importance of the concept of free will to objective human mental health, will be presented. Several steps will be followed: first, there will be an attempt to define how mental states can be represented in an objective way; secondly, it will be shown how it is possible to represent free will in mental states; and lastly, the two first steps will be converged to offer an objective definition of human mental health. Several kinds of

evidence (literary, religious, and supported by fMRI techniques) will be given to scaffold the anticipated approach.

Part III will start with a chapter by Sami Nenno that will show that our first-person experiences ought not to be examined in terms of experiential stages but in terms of aspect. The argumentation of the author rests on a single premise: smooth dynamics in our perceptual experience, like visual motion, cannot be accounted for. The first part of the chapter will show how this poses a serious problem for analyses in terms of states. The second part is dedicated to an alternative explanation in terms of aspect.

Next, Eros de Carvalho will defend that perception should not be just analyzed by the neural activity only, but by incorporating that feature with the impact of the environment in perception. The idea is to defend what can be called a socially extended mind thesis, that asserts, via the notion of affordance from the ecological psychology framework, that perception can, in particular situations, be socially extended to be fully grasped.

Following, Maiya Jordan will discuss two main questions: is consciousness necessarily self-aware? And, if so, what constitutes that self-awareness capacity? She will argue in favor of a positive answer for the first question. As on the second one, she will defend a pre-reflective account of self-awareness.

To conclude the third part, Veridiana Domingos Cordeiro and Hugo Neri will focus on the following problem: how remembering processes are affected by online social technologies? Starting from the Social Network Services, they will argue that those kinds of technological objects function as having two main purposes: to be a repository and to be a means to enhance the remembering processes in general. They will end up arguing in favor of a conception of distributed memory between peoples' mind and technological artifacts.

Part IV starts with a chapter by Judite Zamith-Cruz and Paulo Vieira. Grounded on several sections, the main problem of this chapter will be to discuss if Artificial Intelligence will surpass human intelligence.

Alexander Lazarov follows with a chapter that will discuss Artificial Intelligence human-like design as the best framework to work the issues raised by recent A.I. technology. The main contribution of the chapter is to show how we can point out similarities and differences between Human and Artificial Intelligence in an objective way.

To finish the fourth part, Andrea Roselli will argue against the arguments in favor of a specific phenomenal character for the passage of time, namely the idea that in order to explain our phenomenological experience we must do it via the content's representation of the stream of consciousness. Using some insights from Artificial Intelligence, she will

show that it is at least possible to have temporal phenomenology without an objective flow of time.

The last part of the book follows. Liat Lavi will discuss apparently different topics that can be equally developed, namely, what discussions on Animal Rights can teach us on the ethical treatment of robots. With the development of artificial intelligence technology, robots are more and more complex, and people are starting to empathize with and anthropomorphize them. The author will argue that both topics are grounded in the physicalist metaphysical framework and in the functionalist interpretation of human nature and suggest that these should be excluded in the framework of discussion on morality and ethics.

Manuel Cebral follows with a chapter on Big Data. Comparing Gilles Deleuze's philosophy with data mining techniques from an epistemological perspective, the author will suggest that some Deleuzian concepts may be useful to rethink data sciences in general.

Finally, to close the sixth section and the book, Igor F. Mikhailov will present a chapter on the concepts of computation and representation. The author will argue that both concepts have played a fundamental role in cognitive science. The classical explanations of both concepts lead to paradoxes on the conceptual level; however, a weaker version could make the concepts feeble for a complete cognitive theory. The author ends up claiming that a lot of work needs to be done before achieving such a theory.

We hope that this book can be useful for several researchers and scholars in general. We are positively sure that a lot of interesting and diverse material will be found in this edited collection. It is also our belief, as it is claimed in the preface by Georg Northoff, that there is an urgent need for a truly transdisciplinary exchange between philosophy and the sciences in order to create some real progress. We hope that this book will become a sound step for such an enterprise.

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(Braga, University of Minho,
23/10/2018)

PAGES MISSING

FROM THIS FREE SAMPLE

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Alexander Lazarov is a Bulgarian professional movie-maker (since 1982) and researcher in Philosophy of Information (since 2012). Lazarov's target is to transfer and apply successfully his photographic talent and long year experience of finding strange, unexpected and provocative viewpoints and perspectives to the discourse of philosophical thinking. Currently, his focus falls on how the thousands of years human intellectual effort in the field of philosophy could support engineers to design and develop Artificial Intelligence. Previous books: "Imagination and Imaging: informational and Phenomenological Issues", LAMBERT Academic Publishing, 2017, "The Digital World – Construction and Reality", LAMBERT Academic Publishing, 2015, and Oncoming monography (2018-19) "The Artificial Intelligence Human-like Design Discourse".

Andrea Roselli is a PhD student at University of Roma Tre (Rome, Italy). His areas of specialty include philosophy of time, epistemology, neuroscience and phenomenology. He is interested in how results from experimental sciences can help us address philosophical puzzles, such as 'what does it mean that time passes?', 'how is our temporal experience structured?', 'is our phenomenal temporality compatible with the Eternalist Block Universe?'. He worked with Mauro Dorato on the physics, metaphysics and phenomenology of time. His PhD thesis is entitled 'The Phenomenology of the Passage of Time' and spent three months in the UK as a visiting PhD student in Warwick, Oxford and St. Andrews.

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Hangzhou, China. Holding a degree in Neuroscience, Psychiatry and Philosophy, he is one of the most influential interdisciplinary thinkers of nowadays. He published several books: "Unlocking the Brain Vol. I and Vol. II" (2013), "Minding the Brain" (2014) or "Neuro-Philosophy and the Healthy Mind: Learning from the Unwell Brain" (2016). He just published his new book: "The Spontaneous Brain: From the Mind-Body to the World–Brain Problem" (2018) with MIT Press.

Germán Picciochi (M.D.) was registered for research and teaching for the "Cátedras" of "Citogenética Clínica y Genética de Poblaciones" of the Biotechnology School of the "Universidad Nacional del Litoral" in the school year of 2007/2008 and is a registered MD since 2010 when he obtained his medical degree at the "Universidad Nacional de Rosario" in Rosario (Argentina). Has become specialized in Psychiatry in 2014 by the "Colegio de médicos de Rosario", with a nation-wide registration as a Psychiatrist done at the "Ministerio de Salud de la República Argentina" in 2017. He has been since 2017 a career Physician in both Neuropsychiatry and Behavior Neurology at the "Universidad Nacional de Buenos Aires" and at the "Asociación de Neuropsiquiatría Argentina".

Hortense de Villaine is a PhD student at Université Paris Nanterre, France. Her PhD thesis is dedicated to the mind-body problem in the second half of the nineteenth century in Britain. She aims at showing how the development of cerebral physiology, together with the Darwinian theory, led to the expression of new theses concerning the mind-body problem. She also analyzes all the debates those theses aroused. She is thus a specialist of epiphenomenalism, and more generally of history and philosophy of science in the 19th century. She translated two texts of Thomas Henry Huxley into French and held several conferences about his philosophy and scientific research in France, Canada, Ireland etc.

Hugo Neri has a PhD. in Philosophy, an M.S. in Sociology, and a B.A in Social Sciences from the University of São Paulo. He is currently a visiting scholar at the Department of Sociology of the University of Cambridge. He has a theoretical and an empirical research on common sense that joins different scientific areas such as Sociology, Philosophy of Mind, Artificial Intelligence, and Psychology. His research interests are common sense formation and propagation, risk perception, and social coordination of actions.

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INDEX

C

D

E

F

G

H

I

J

K

L

M

N

O

P

Q

R

S

T

U

V

W

Y

Z