

TABLE OF CONTENTS

List of Illustrations.....	vii
List of Tables.....	viii
<i>Introduction</i>	ix
Benoit Hardy-Vallee	
Chapter One	1
<i>Natural Decision</i>	
Florian Ferrand	
Chapter Two.....	15
<i>EEG Timing and Libertarianism</i>	
Darren Abramson	
Chapter Three.....	25
<i>Statistical Decision and Falsification in Science :</i>	
<i>Going Beyond the Null Hypothesis</i>	
Dominic Beaulieu-Prévost	
Chapter Four.....	36
<i>Embodied Decisions: Models of Decision Making within a Larger</i>	
<i>Cognitive Framework</i>	
Terrence C. Stewart	
Chapter Five.....	48
<i>How do Ants and Social Caterpillars Collectively Make Decisions</i>	
Audrey Dussutour, Nadia Colasurdo, Stamatios C. Nicolis	
and Emma Despland	
Chapter Six.....	66
<i>Spontaneous Decision-Making in Conversation: Variations across Media</i>	
Roxanne Beaugh Benoit	

Chapter Seven	79
<i>Uncertainty, Risk, and Illusion in Reward Prediction: Evidence from fMRI</i> Ahmad Sohrabi, Andra M. Smith, Robert L. West and Ian Cameron	
Contributors.....	95

LIST OF ILLUSTRATIONS

Fig. 4-1: A generic framework for embodied decision-making models	41
Fig. 5-1: Foraging pattern in ants: tandem running, group recruitment and mass recruitment (from Passera 1984)	50
Fig. 5-2: Patch restricted, nomadic and central-place foraging patterns of social caterpillars.....	52
Fig. 5-3: Experimental set-ups used in the experiments	53
Fig. 5-4 : Integrated experimental and modelling approach used in the study of how collective decisions emerge (from Camazine et al. 2001).....	55
Fig. 7-1 : This diagram illustrates one trial	80
Fig. 7-2 : Means of risk rates are depicted for the three conditions	83
Fig. 7-3 : The main results of RFX.....	85
Fig. 7-4 : The main results of the FFX	86

LIST OF TABLES

Table 5-1: Collective decisions are related to the recruitment behavior of individuals. Collective decisions, their origins and the amplification mechanisms are summarized.....58

Table 7-1. The pairwise comparisons of mean risk rates of the three conditions84

INTRODUCTION

To be, or not to be: that is the question: Whether 'tis nobler in the mind to suffer
The slings and arrows of outrageous fortune, Or to take arms against a sea of
troubles, And by opposing end them?

— Hamlet, Act III, Scene 1

Decision-making has been a formal topic for economists and logicians for many years. The rational agent was modeled as an omnipotent utility maximizer, and the analysis of decision-making consisted in spelling out the logical implications of the perfection of *Homo Economicus*. Nowadays, psychologists, neuroscientists, biologists, philosophers and other scholars are interested in the nature of real decision-making, where cognitive agents are involved. A growing number of interdisciplinary researches deepen our understanding of decision-making processes, creating thus an emerging field where the various levels of description (neuronal, cognitive, formal, behavioral, evolutionary) intersect:

- "Neuroeconomics" (Glimcher, 2003) and "picoeconomics" (Ainslie, 2001) use economic models to analyze neuronal, cognitive and behavioral mechanisms of decision;
- Computational architectures integrate neuroscientific data in decision modeling (Fiorillo et al., 2003);
- Neurosciences investigate neuronal substrates of decision (Sanfey et al., 2003);
- Affective neuropsychology shows the crucial role of emotions in decision (Damasio, 1994; Damasio et al., 1996);
- Game theory and microeconomics take a cognitive (Topol et al., 2007) and experimental turn (Camerer, 2003);
- Behavioral ecology and cognitive ethology model animal behavior with optimality theory (Kacelnik et al., 1997; Krebs et al., 1997)
- Cognitive psychology, following Kahneman and Tversky (1979), finds many judgment errors in practical reasoning, whereas evolutionary psychologists (Barkow et al., 1992; Gigerenzer, 2000) underline the adaptive origin of these so-called errors

- Management sciences are interested in limited rationality of agents in real decision situation (Shafir et al., 2002)
- Naturalistic philosophy see in this work an opportunity of reconsidering the nature of practical rationality and its normativity (Bermúdez, 2003; Stich, 1996)

In 2005, a conference was held at the Université du Québec at Montreal (UQAM) and allowed researchers from various field to interact and discuss such interdisciplinary issues. *Cognitio 2005* was an occasion for philosophers, cognitive scientists and biologists to present the latest developments in their discipline, and this book aims at providing a general overview of current research in the field of cognitive decision-making (see <http://cognitio.uqam.ca/2005>).

In the first two chapters, Ferrand and Abrahamson explore philosophical questions related to decision making. Ferrand is concerned with the everyday concept of decision, where it is construed as a continuous deliberative process. He shows how this definition is deeply entrenched in our ordinary thinking, and analyse its implications. Abrahamson's chapter focuses on the Libet experiments. In these widely-discussed experiments, it was shown that subjects decision was taken (as indicated by EEG recording) before their conscious awareness of the decision. This interpretation and its connections with compatibilism (the philosophical point of view according to which free will and determinism are compatible) and libertarianism (a free action is one that could have been otherwise: hence free will and determinism are not compatible) are discussed.

The two following chapters deal with methodological issues related to the modeling of decision-making. This modeling can be either normative (what should be done) or descriptive (what and how agents usually do). While Beaulieu-Prévost's chapter is concerned with normative issues in psychology, Stewart's chapter focuses on the general problem of modeling decision-making agents. Beaulieu-Prévost is interested in epistemological questions concerning the null hypothesis, that is, the statistical procedure by which psychologists (and other scientists too) decide whether a hypothesis according to which there is no effect (the null hypothesis) should be rejected in favor of an alternative hypothesis that states that there is one. Beaulieu-Prévost shows that not only is this procedure often ill-understood, but often highly problematic. He then suggests how to ameliorate the procedure.

Stewart studies the computational modeling of decision-making in embodied agents. The problem is that there exist a lot of models, but there is no methodology to compare them. Hence Stewart suggests that they should be compared according to three features: their World Model (how simulated

agents represent their environment), their Action Selection process and their Pre-processing (how they update information about the world).

The last three chapters present recent studies of decision-making in human and animals. Dussutour, Colasurdo, Nicolis and Despland study the mechanism by which collective decision making arise in eusocial animals like caterpillars. With simple behavior routines like allelomimesis (imitation of close individuals), they can account for the complexity of collective decisions, instead of explaining it by individual complexity. Roxanne Beaugh Benoit studies decision-making in conversation. She shows that talking implies a lot of spontaneous decisions: who should I talk to, what, when and why should I speak, etc. These decisions are influenced by the perspective taken by the speakers: whether they are considerate, egocentric or automatic in their utterance, the who, what, and how of conversations will change. Finally, using functional Magnetic Resonance Imaging (fMRI), Sohrabi, Smith, West & Cameron study the neural correlates of reward prediction in what they call *Risky Decision Making*: decisions in ambiguous, uncertain, and risky domains. They conducted experiments and present the results of their extensive studies of neural processes involved in the prediction of reward and punishment in gain and loss domains.

This book, we hope, should interest scholars who study the nature, modeling, evolution and substrate of decision-making.

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