Chapter 11
Bipolar Cognitive Mapping and Decision Analysis: A Bridge from Bioeconomics to Socioeconomics

ABSTRACT
The focus of this chapter is on cognitive mapping and cognitive-map-based (CM-based) decision analysis. This chapter builds a bridge from mental quantum gravity to social quantum gravity. It is shown that bipolar relativity, as an equilibrium-based unification of nature, agent and causality, is naturally the unification of quantum bioeconomics, brain dynamics, and socioeconomics as well. Simulated examples are used to illustrate the unification with cognitive mapping and CM-based multiagent decision, coordination, and global regulation in international relations.

INTRODUCTION
The theory of YinYang bipolar relativity opened the door for bipolar quantum bioeconomics (BQBE) as discussed in Chapter 9, in turn, BQBE opened the door for bipolar quantum brain dynamics (Ch. 10) and bipolar quantum socioeconomics for decision, coordination, and global regulation. Indeed, as a grand unification of nature, agent and causality, YinYang bipolar relativity should naturally be the unification of quantum bioeconomics, brain dynamics, and socioeconomics. Under this unification, biological,

DOI: 10.4018/978-1-60960-525-4.ch011
mental, social, and economical accelerations/decelerations are directly or indirectly related to physical acceleration/deceleration which has been proven equivalent to gravitation in general relativity.

In this chapter we present the theory and application of bipolar cognitive mapping to illustrate the quantum nature of brain dynamics in socioeconomics. While decisions in the context of bioeconomics lead to material effects in the context of socioeconomics, brain dynamics can be deemed a symmetry which is defined in particle physics as an operation that doesn’t change how something behaves relative to the outside world except in science fiction. With bipolar cognitive mapping, however, we show that brain dynamics and socioeconomics are unified with decision, coordination, and global regulation from a bioeconomics perspective.

According to YinYang theory everything has two poles: a biological agent society is the equilibrium or non-equilibrium of competition and cooperation; a political system is the equilibrium or non-equilibrium of the left and right wings; market economy is the equilibrium or non-equilibrium of the “bears” and “bulls”; the environment issue is the equilibrium or non-equilibrium of pollution and protection. Every relation between two agents or agencies is the equilibrium or non-equilibrium of conflict and common interests even for a married couple or for two allied countries. While objects and systems in the universe including the universe itself form a global equilibrium or non-equilibrium of action-reaction forces, international relations form a global equilibrium or non-equilibrium among human societies on the earth. If we consider the universe as an egg and equilibrium as a chicken, we have the question: “which one came first and which one created the other in the very beginning?”

Naturally, we need to ask the question: If our brain is considered a neurobiological universe, how does it interact with its bipolar equilibrium and non-equilibrium context in decision, coordination, and global regulation? Theoretically and practically, the bipolar context with logically definable causality and bipolar relativity provide a basis for cause-effect reasoning – a focal point in mind reading, cognitive mapping, and decision making as well as in quantum computing.

In this chapter we consider cognitive mapping as a process of mind reading from speeches, articles, behaviors, and activities of a person that is a different kind of mind reading from using fMRI technology. We use examples in cognitive map based (CM-based) decision, coordination, and global regulation in international relations to illustrate the bipolar equilibrium-based unification of brain dynamics, bioeconomics, and socioeconomics.

While BQCA can be typically used for bioeconomics simulation and regulation as discussed in Chapters 8 and 9, BQCA representation of cognitive maps (CMs) can be considered bipolar physical level CMs. Thus, brain dynamics, bioeconomics, and socioeconomics are all involved in CM-based decision, coordination, and global regulation. It is shown that (1) bipolar cognitive mapping can be used for cause-effect reasoning and bipolar clustering enables conceptual cognitive maps (CCMs) in bipolar relational forms be converted to visual cognitive maps (VCMs) more suitable for mind reading.

The remaining presentations and discussions of this chapter are organized in the following sections:

- **Mind reading, cognitive mapping, and quantum mind theory.** This section presents a brief background review and a classification of cognitive mapping.
- **Bipolar quantum brain dynamics.** This section presents a unifying theory and an architectural design for bipolar cognitive mapping.
- **Bipolar crisp cognitive map development.** This section presents an application of bipolar cognitive mapping and CM-based decision, coordination, and global regulation in international relations in crisp equilibrium or non-equilibrium relational forms including the topics: (1) An
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