

# Belief Revision and Conditional logic

**Nicola Olivetti**

Dipartimento di Informatica  
Universita' di Torino  
Email: [olivetti@di.unito.it](mailto:olivetti@di.unito.it)

## **Abstract**

The objective of belief revision theory is to formalize how a rational agent changes its own knowledge or beliefs in face of new information. Belief revision has been widely studied in the last twenty years since the seminal work by Alchourrón, Gärdenfors and Makinson, who proposed a set of postulates for revision, universally known as AGM-theory.

The formalization of hypothetical and counterfactual reasoning is the object of conditional logics, whose bases have been laid by Lewis, Nute, Stalnaker, and Chellas.

There is a deep connection between hypothetical reasoning and belief revision first noticed by the philosopher F.P. Ramsey, as formulating an hypothesis means essentially to revise *temporarily* one's beliefs.

A first formalization of a possible relation between conditionals and belief revision has been proposed by Gärdenfors who has devised a very natural correspondence between them known as Ramsey Test. Unfortunately, Gärdenfors has shown that this correspondence leads to a strong negative result (called the Triviality Result) according to which there is no significant belief revision system compatible with the Ramsey Test. This negative result has then stimulated a wide debate and literature aiming to reconcile the two sides of the coin, belief revision and conditional logic.

We show that we can establish a mapping between belief revision systems and conditionals by means of the Ramsey Test, without incurring in the Triviality Result, provided we put a natural restriction to the AGM postulates. Moreover, we can derive a conditional logic, called BCR, from our restricted AGM postulates by means of the Ramsey Test. This logic has a sound and complete axiomatization with respect to its standard semantics, in terms of selection-function models; moreover it is decidable. We can show that there is an isomorphism between belief revision systems and selection function models of BCR. The logic BCR therefore provides a logical formalization of belief revision in the object language of conditional logic.

**[Joint work with Laura Giordano and Valentina Gliozzi]**