Spring Semester, 2005
Instructor: J. Horty

PHIL 858:
Revising and Combining Beliefs

Description

This seminar focuses on the related problems of belief revision (revising beliefs with new, possibly conflicting information) and belief aggregation (combining multiple, possibly conflicting bodies of information).

The course will be organized as follows. (A) We will begin by reviewing the standard Alchourron/Gardenfors/Makinson (AGM) theory of belief revision. (B) We will then touch on some selected topics related to the AGM theory: the epistemic semantics for conditionals and Gardenfors's impossibility result, the difference between belief revision and belief update, and the problems posed by iterated revisions. This is all basic material, which anyone with a course in the area should know. (C) After that, we will consider some recent work on combining, rather than just revising, belief sets. Much of this work has been done by computer scientists concerned with the problem of merging knowledge bases, but there are also relations to social choice theory. (D) We will then look at a new problem in judgment aggregation, known as the "discursive dilemma," which involves combining separate beliefs supported by reasons into group beliefs that are also supposed to be supported by reasons. (E) Finally, we will consider how these issues relate to the problem of combining the multible "extensions" generated by some theories of nonmonotonic reasoning into a single belief set.

The course is interdisciplinary: we will be reading papers by philosophers, logicians, computer scientists, economists, and and legal and policical theorists.

Prerequisites: you should be completely comfortable with elementary metatheoretic reasoning about first-order logic; all additional material and techniques will be taught.

Time and place

Thursdays from 2:00 till 4:30 in Skinner 1116.

Office, phones, etc.

Office: Skinner Building, Rm. 1101. Office phone: x55892. Home phone: 301-585-4586. You are welcome to call me at home. Email: horty@umiacs.umd.edu. I'll let you know my exact office hours once they've sorted themselves out, but I'm generally available for appointments.

Course materials

The following books should be on reserve in the library:

Gardenfors [8],
Gardenfors [9],
Hansson [14],
Lewis [22],
Sen [34],
Stalnaker [37].

Papers for copying will be available in the Philosophy Lounge, and most of the more recent things are available on the web. I'll let you know where to find various things as we get to them.

Course work

Students who want credit for the course must do three things:

1. Turn in assigned problem sets, which will be nuts and bolts, nothing tricky;
2. Take a midterm exam, which will be take home, open book, and again, nothing tricky;
3. Complete a final project of some kind, which can be either a standard term paper, a technical project of some kind, or even a final problem set—we'll talk about this.

The course will be run as a seminar, and everyone attending, students and auditors, will have to help present the material. These presentations will be frequent but short—no big deal, and good practice.

The grade will be based on a combination of homework, midterm, class presentations, and project. The project is most important, but I'll give a lot of weight to whatever you do best.

Course topics

Here is a tentative list, subject to student interest and how things go.

A. The AGM theory: basic results.

   1. Models of epistemic states.
      Readings: Gardenfors [8, Chapters 1–2]
      Background and related material: Hansson [14, Chapter 1],
      Spohn [35], Stalnaker [37]
   2. Contractions and revisions: postulates.
      Readings: Gardenfors [8, Chapter 3]
      Background and related material: Gardenfors [10], Hansson [14, Chapters 2-3],

3. Contractions and revisions: semantic models.
   Readings: Gardenfors [8, Chapter 4], Katsuno and Mendelzon [18]
   Background and related material: Grove [12], Lewis [22, Chapter 1], Makinson [26]

B. The AGM theory: selected topics.

1. Epistemic conditionals: an impossibility result.
   Readings: Gardenfors [8, Chapter 7]
   Background and related material: Hansson [13], Stalnaker [36]
2. Belief update vs. belief revision.
   Readings: Katsuno and Mendelzon [19]
   Background and related material: Grahne [11], Lewis [22, Section 2.3]
3. Iterated revision.
   Readings: Friedman and Halpern [6]
   Background and related material: Darwiche and Pearl [4]

C. Belief aggregation.

1. Majority and arbitration
   Readings: Konieczny and Pino Perez [20]
   Background and related material: Baral et al. [1]
2. Belief aggregation and preference aggregation
   Readings: Maynard-Zhang and Lehmann [28]
   Background and related material: Sen [34, Chapters 1-3]

D. Aggregating reasoned beliefs.

1. The discursive dilemma.
   Readings: Pettit [31], Pettit [30]
   Background and related material: Kornhauser and Sager [21]
2. An impossibility result.
   Readings: List and Pettit [25], List and Pettit [24],
   Background and related material: Chapman [3], Deitrich [5], Gardenfors [7], List [23], van Hees [39], Pauly and van Hees [29]

E. Belief aggregation and nonmonotonic reasoning

1. Background: multiple extensions
   Readings: Reiter [33], Horty [15]
   Background and related material: Horty et al. [17], Touretzky et al. [38]
2. Combining multiple extensions
   Readings: Horty [16], Makinson and Schlechta [27], Prakken [32]
   Background and related material: Borgida and Imielinski [2]

References

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