„Gießener Abendgespräche Kognition und Gehirn"

Mittwochs, 18 bis 20 Uhr, Raum: F9

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„Towards a Cognitive Investigation of Euclidean Diagrammatic Reasoning"

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Euclidean diagrammatic reasoning refers to the diagrammatic inferential practice that originated in the geometrical proofs of Euclid's Elements. A seminal philosophical analysis of this practice by the philosopher and historian Kenneth Manders has revealed that a systematic method of reasoning underlies the use of diagrams in Euclid's proofs, leading in turn to a logical analysis aiming to capture this method formally via proof systems which has been developed in a series of papers by Jeremy Avigad, Edward Dean and John Mumma. The central premise of this project is that our understanding of Euclidean diagrammatic reasoning can be fruitfully advanced by confronting these logical and philosophical analyses with the field of cognitive science. Surprisingly, central aspects of the philosophical and logical analyses resonate in very natural ways with research topics in mathematical cognition, spatial cognition and the psychology of reasoning. In this talk, we will develop these connections, concentrating on four issues: (1) the cognitive origins of Euclidean diagrammatic reasoning, (2) the cognitive representations of spatial relations in Euclidean diagrams, (3) the nature of the cognitive processes and cognitive representations involved in Euclidean diagrammatic reasoning seen as a form of visuospatial relational reasoning and (4) the complexity of Euclidean diagrammatic reasoning for the human cognitive system. For each of these issues, our analysis generates concrete experiment proposals, opening thereby the way for further empirical investigations. In this talk, we will particularly develop the third issue, which makes direct connections with Markus Knauff's neuro-cognitive three-stage theory of reasoning with mental models and visual images.