

Symposium of the Collaborative Research Center (SFB 940)

Have We Banished the Homunculus? Dynamic Regulation, Modulation, and Optimization of Cognitive Control

Friday 17th to Sunday 19th July 2015
Hotel Bellevue, Dresden, Germany

Despite considerable progress in elucidating the neurocognitive mechanisms of volition and cognitive control, it is still a fundamental, yet unresolved question how cognitive control is itself “controlled”, i.e., how the balance between complementary control modes (stable shielding vs. flexible switching of goals; goal-directed focusing of attention vs. stimulus-driven attention capture; exploration vs. exploitation) is adapted to changing environments. From this perspective, the regulation of cognitive control can be conceived of as an optimization problem that confronts agents with fundamental “meta-control dilemmas”, which require a context-sensitive adjustment of control parameters in the light of the complementary costs and benefits of different control modes. However, currently we have only a rudimentary understanding of how meta-control parameters are learnt and adjusted to changing contexts and how the balance between complementary control modes and different (e.g., habitual vs. goal-directed) action control systems is modulated by emotions, stress, reward and motivational states. The symposium brings together leading experts in the field of cognitive control, volition, and executive functions, who are invited to present empirical findings, theoretical perspectives and/or computational modeling work with a focus on one the following questions:

- How can one explain in mechanistic terms how control processes are themselves “controlled”, i.e., how cognitive control is dynamically regulated and adapted to changing contexts and task demands?
- How are complementary control processes and competing control systems modulated by motivation and reward? How is the balance between complementary control modes optimized based on their estimated costs and benefits? How are meta-control parameter settings learnt?
- Have we actually succeeded in “banishing the homunculus” from theories of volitional control by decomposing “the will” into a set of cognitive control mechanisms?