Computational Neuroscience: Neural Dynamics

Gregor Schöner
Gregor.Schoener@rub.de

Language

- slides will be in English

- lectures will be in English

- ask questions in German and ask for clarification of terms

Schedule

- Lecture every Thursday 14:15 to 16:00

- Exercise session from 16:15 to 17:00

Who am I

- theoretical physicist by training, but working in theoretical neuroscience/ cognitive science and motor control for over 20 years

- second life as a roboticist/computer vision person

- way stations: Saarbrücken, Stuttgart, Boca Raton Florida, Bochum, Marseille, Bochum...

What am I?

- Chair Theory of Cognitive Systems

- Director of the Institut für Neuroinformatik

- joint appointment in the Faculty of Physics and Astronomy and in the Faculty of Electrical Engineering and Information Technology

My research

- research in two related areas

    - embodied cognition: motor control, movement planning and representation, decision making, action and spatial memory, visual working memory, perceptual representations, motion perception, grounding of language

    - autonomous robotics: scene representation, object recognition, behavioral organization, reaching and grasping, timing, learning

- based on the theoretical approach of "DST" (dynamical systems theory) and "DFT" (dynamical field theory)

Dr. Mathis Richter

- will run the exercises

- also available for questions etc.

- mathis.richter@ini.rub.de

- postdoc at the INI who works on the perceptual grounding of concepts and the generation of conceptual descriptions from perception

Who are you?

Please send this information

- to mathis.richter@ini.rub.de

- Name, First name

- Studienfach

- Fachsemester

- (Prüfungsordnung)

- Matrikelnummer

Web page

- www.ini.rub.de

- then search for course under teaching/ courses…

Exercises

- are critical to the learning experience!
  - reading… understanding technical texts, understanding problem descriptions
  - writing technically, making drawings, documenting thought

- there will be readings, to which exercise sheets will be directed

- there will be an essay exercise to practice writing and organized text

Exercises

- hand-outs via the web page

- … hand-ins on paper or by email to Mathis Richter

- hand-ins will be corrected by a team, led by Mathis and will receive a "grade"

- graded hand-ins will provide bonus point that can improve your final mark by 10% or more

"Hands-on" sessions

- we will have a few "hands-on" sessions "life" in the exercise hour…

- to do simulations, to analyze equations, practice drawings etc.

- you work in groups/alone and we interact with you…

Matlab

- some exercises will make use of Matlab (the "matrix laboratory"), an interpreted language for numerical simulation.

- a free license is available for RUB students… go to

  http://it-services.ruhr-uni-bochum.de/software/matlab

Rules for credit

- see the online "rules" document…

- oral exam needed for passing
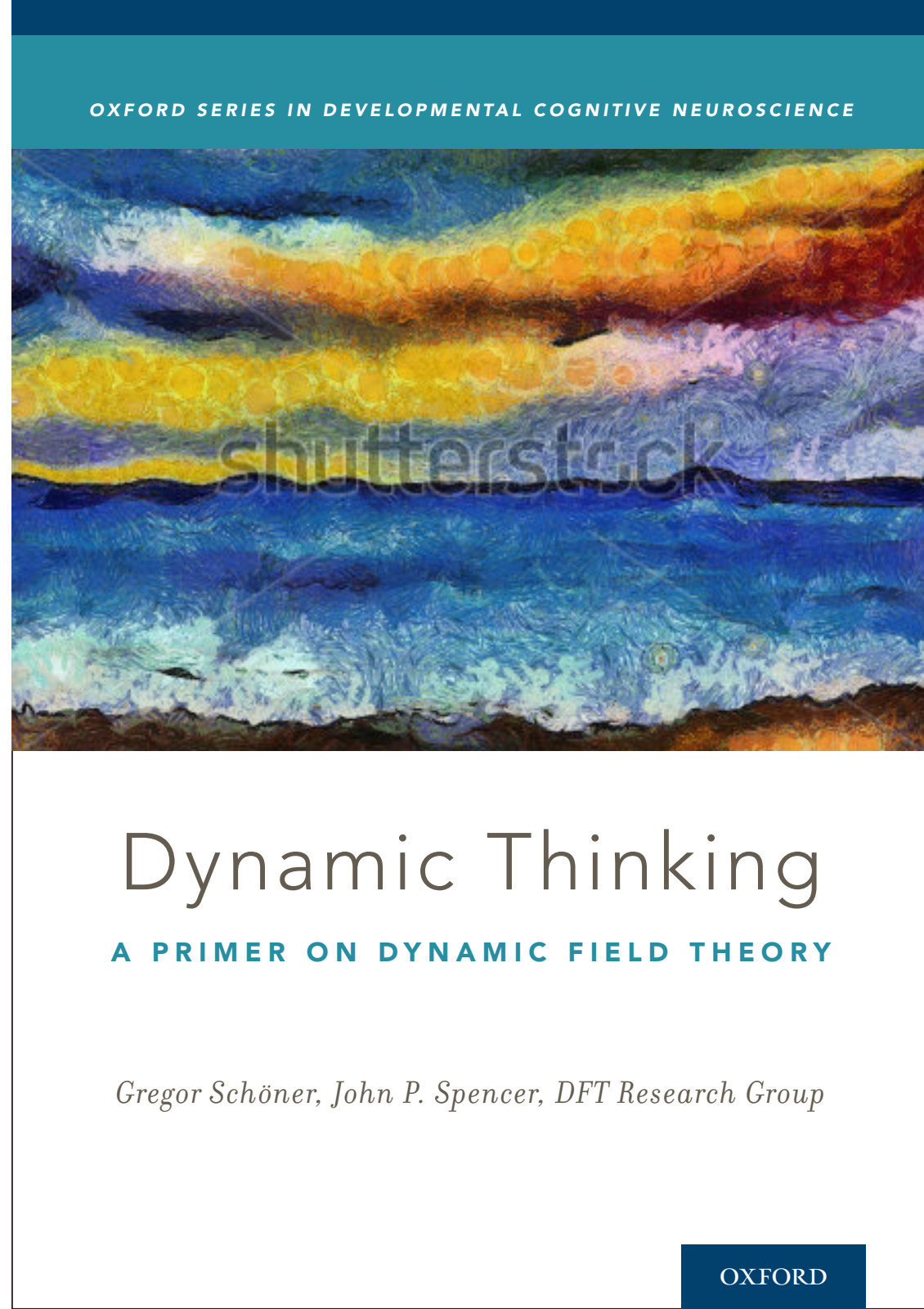
- bonus points from exercises

Tutorials

- I'll insert tutorials, special units the give background you might be missing… in response to feedback from you, e.g.
  - mathematical concepts like nonlinear dynamics and instabilities
  - neuroscience background like fundamentals of neurophysics, neuroanatomy, neurophysiology
  - cognitive science background like connectionism vs. information process, symbolic computation etc.

Individual tutoring

- we offer help, e.g. for those students with less of a mathematical back-ground… ask us/me and we arrange a tutorial session

- or also for those you who struggle with other parts, the conceptual language, the neural background..

Script/text book

■ We will be following in part a new book

OXFORD SERIES IN DEVELOPMENTAL COGNITIVE NEUROSCIENCE

Dynamic Thinking

A PRIMER ON DYNAMIC FIELD THEORY

Gregor Schöner, John P. Spencer, DFT Research Group

OXFORD

Script/text book

- We will essentially do the first 4 chapters (of 15)

- You will get to read them…

Dynamic Thinking

A PRIMER ON DYNAMIC FIELD THEORY

Gregor Schöner, John P. Spencer, DFT Research Group

OXFORD