

European Science Foundation
STOCHDYN

School on

STOCHASTIC DYNAMICS:
FROM WIENER PROCESS
to ECONOPHYSICS

16.03. – 19.03.2006

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and

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Final Program

16/03 – 18/03 (March) 2006 in Güstrow, close to Rostock (near Baltic Sea).

13 participants from Germany (Rostock, Halle) and Sweden (Luleå).

Donnerstag, 16.03.2006

Vormittag

10.00 - 12.00 Arrival
12.00 - 13.30 *Mittagessen*

Nachmittag

14.00 - 15.00 R. Mahnke (Rostock) & St. Trimper (Halle):
Opening and Introduction:
Lect. 1: Basic Stochastic and Statistic Tools for Complex Systems
15.00 - 15.45 Ch. Liebe (Rostock):
Time Series Analysis of the NGSIM–Vehicular–Dataset
15.45 - 16.15 *Kaffeepause*
16.15 - 17.00 K. Zabrocki (Halle):
System with Feedback:
On a Non–Markovian Fokker–Planck Equation
17.00 - 17.45 A. Strömberg (Luleå):
Monte–Carlo Approach for Vehicular Traffic

Freitag, 17.03.2006

Vormittag

09.30 - 10.30 St. Trimper (Halle):
Lect. 2: Introduction in Phase Transition:
Stochastic Models and Dynamic Critical Phenomena
10.30 - 11.15 M. Brandau (Halle):
Introduction into Networks: Epoxy Networks
11.15 - 12.00 M. Strauch (Halle):
Introduction into Polymerphysics:
Randomized Rouse Model
12.00 - 13.30 *Mittagessen*

Nachmittag

- 14.00 - 15.45 Visit of Barlach's Studio;
Around the Inselsee
- 15.45 - 16.15 *Kaffeepause*
- 16.15 - 17.00 Th. Michael (Halle) :
Introduction into Ferroelectricity:
Influence of Layer Defects in Ferroelectric Thin Films
- 17.00 - 17.45 H. Hartmann (Rostock)
A Drunken Sailor Close to Quay

Sonnabend, 18.03.2006

Vormittag

- 09.30 - 10.30 R. Mahnke (Rostock)
Lect. 2: From Wiener process to Traffic Flow
- 10.45 - 11.30 J. Hinkel (Rostock)
What is a Traffic Breakdown Physically?
- 12.00 - 14.00 *Mittagessen*

Nachmittag

- 14.00 - 16.00 Walking or Bicycle Tour around Güstrow, Departure

Final List of Speakers/Participants

1. Mahnke, Reinhard, Dr. (Rostock)	lecturer
2. Trimper, Steffen, Prof. (Halle)	lecturer
3. Brandau, Marian (Halle)	PhD student
4. Grünberg, Oliver (Rostock)	student
5. Grünwald, Peter (Rostock)	student
6. Hartmann, Hannes (Rostock)	student
7. Hinkel, Julia (Rostock)	PhD student
8. Kiesel, Thomas (Rostock)	student
9. Liebe, Christof (Rostock)	student
10. Michael, Thomas (Halle)	PhD student
11. Strauch, Michael (Halle)	PhD student
12. Strömberg, Anders (Luleå, Sweden)	student
13. Zabrocki, Knud (Halle)	PhD student

Totally 13 participants
from Germany (Rostock (7) & Halle (5))
and Sweden (Luleå (1)).

Scientific Results

The scientific program has been grouped into

- **Introductory lectures on stochastic dynamics**
- **Short contributions to specific problems**
- **Discussions about physics of stochastic processes and beyond**

General problems and methods

The organizers **Reinhard Mahnke** and **Steffen Trimper** demonstrated in three introductory lectures the broad variety of stochastic processes in physics.

A summary of the main probabilistic tools for complex systems was given as well as the stochastic dynamics describing critical phenomena like phase transitions. The lecturers touched the concept of stochastic differential equations, master equation, Fokker–Planck equation together with applications ranging from vehicular traffic to polymers.

The lectures gave examples for the order parameter dynamics in systems with broken symmetry. It was mentioned that the mapping from real space into order parameter space including choosing an order parameter is always some kind of art. Finding the simplest description is often the key to the problem. In particular, concerning nucleation and traffic flow the size of the new phase (droplet, congestion) is often one choice.

In addition to the mentioned three lectures there were eight contributions by graduated students.

Summary and Conclusions

The school on **Stochastic Dynamics: From Wiener Process to Econophysics** was dedicated to PhD-students and students from Rostock and Halle, who helped us, together with our collaborators (Steffen Trimper from Halle and Hans Weber from Luleå), to make the general ideas of stochastic processes as well as its applications more transparent and applicable in physical models. One important step was to link the mathematical point of view together with the physical point of understanding of stochastic dynamics. This main aim of our school was reached. The link between all participants was the knowledge of stochastic methods taught at university level.

This school was devoted to students of higher semesters and to post graduate students (PhD-students) in mathematics, physics and related natural

sciences. Our aim was to contribute to the education of enthusiastic students and young scientists.

The school offered the excellent opportunity to discuss in a closed manner some aspects of the application of stochastic theory to different directions like traffic, finance and biology. The talks demonstrated the broad variety of methods available and applicable. The school was a platform for students and young scientists to present own results. We are convinced that the school was very successful for all participants.

Finally we would like to mention that our school in Güstrow gave a good opportunity for the exchange of ideas, discussion of interesting presentations and preparation of further projects like papers and conference proceedings. Now there are two contributions based on our **STOCHDYN** funding under consideration:

1. K. Zabrocki (Halle), S. Tatur (Ekaterinburg), St. Trimper (Halle), R. Mahnke (Rostock): Relationship between a Non-Markovian Process and Fokker-Planck Equation, arXiv:cond-mat/0603252, submitted to Physical Review E, 2006.
2. K. Zabrocki, S. Tatur, St. Trimper, R. Mahnke: Relationship between Non-Markovian- and Drift-Fokker-Planck Equation, In: Traffic and Granular Flow '05 (Eds.: A. Schadschneider, M. Schreckenberg, D. E. Wolf), pp. xxx-yyy, Springer-Verlag, Berlin, 2006.