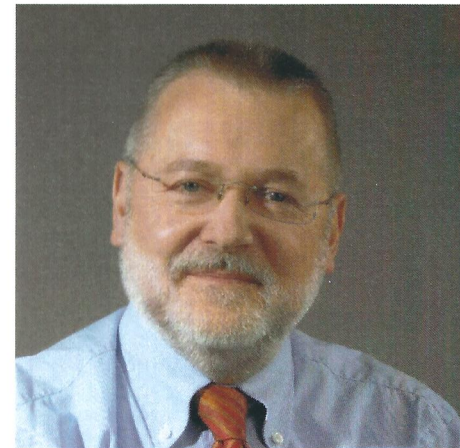# Scientific Colloquium

on the occasion
of the 65th birthday

of
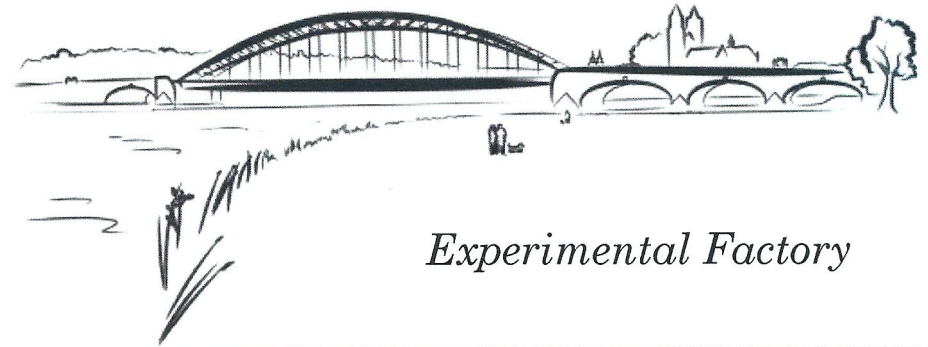
Prof. Dr. Gerhard Wäscher

June 23rd, 2017 in Magdeburg

Program Overview

Experimental Factory

10:00 – 10:45   Welcome Addresses

***

10:45 – 11:30   **OR inside - operational research in real-world projects on production and logistics**

(Maria Antónia Carravilla, José Fernando Oliveira, University of Porto)

***

11:30 – 12:15   **Models and algorithms for container loading problems with practical constraints**

(Ramón Alvarez-Valdés, University of València)

***

12:15 – 13:30	Lunch at Experimental Factory

***

13:30 – 14:15	**Optimization and simulation to improve emergency medical service systems** *(Brigitte Werners, Ruhr-Universität Bochum)*

***

14:15 – 15:00	**A machine scheduling approach to the berth allocation problem under channel restrictions** *(Christian Bierwirth, MLU Halle-Wittenberg)*

***

15:00 – 15:30	Coffee Break

***

15:30 – 16:15	**Collaboration in vehicle routing** *(Richard F. Hartl, University of Vienna)*

***

16:15 – 17:00	**The improved typology revisited** *(Sebastino Kochfeger, University of Ottoburg)*

***

***

Franx

19:00	Get-together and Dinner

***

This event is supported by

OTTO VON GUERICKE
UNIVERSITÄT
MAGDEBURG

and the former PhD students of Gerhard Wäscher

***

Abstracts

OR Inside – Operational Research in real-world projects on Production and Logistics

Maria Antónia Carravilla
Department of Industrial Engineering and Management, University of Porto

José Fernando Oliveira
Department of Industrial Engineering and Management, University of Porto

"Though there is no 'official definition' of Operational Research ('Operations Research' in the US), it can be described as a scientific approach to the solution of problems in the management of complex systems. [...] The objective of Operational Researchers is to work with clients to find practical and pragmatic solutions to operational or strategic problems, often working within tight timing constraints. [...] OR can use advanced quantitative methods, modelling, problem structuring, simulation and other analytical techniques to examine assumptions, facilitate an in-depth understanding and decide on practical action." (in the EURO - The Association of European Operational Research Societies website: https://www.euro-online.org/web/pages/301/or-and-euro).

This is a vision shared by the person honoured in this colloquium and therefore in this talk we will present three projects with real-world companies, involving the use of Operational Research in the resolution of concrete problems in Production and Logistics. The first project took place in a paper mill, where the goal was to simultaneously plan the production of jumbo paper rolls and their cut in narrower rolls and rectangular sheets, while satisfying customer orders and minimising the wasted paper. A chemical company proposed the second project where the goal was to optimize the production and storage of several products and by-products of the production chain, so that demand is met and the capacities are not exceeded. The final project regards a rent-a-car company, and aimed to optimize the assignment of reservations to vehicles, including the decisions of accepting or not a reservation and of moving cars to a different station, so that the overall profit is maximised.

All these projects address problems for which an out-of-the-shelf solution did not exist and resulted in decision support tools that are now regularly used by the companies, with a true impact in their daily life, and...OR Inside.

***

Models and algorithms for container loading problems with practical constraints

Ramón Alvarez-Valdés
Department of Statistics and Operational Research, University of València

The standard problems in Cutting & Packing, considering only geometric constraints, have been extensively studied. Among them, the Container Loading Problem (CLP), SSSCSP according to Wäscher et al.'s typology (2007) for the case of minimizing the number of identical containers, has been the subject of many exact and heuristic approaches. Although references to the need for including practical constraints can be traced back to Bischoff and Ratcliff (1995), only in recent years have these practical constraints received increasing attention in academic studies, and the survey by Bortfeldt and Wäscher (2013) has contributed to classifying the various types of practical constraints that appear in Container Loading Problems and to pointing out the existing research gaps.

In this paper, I will review the work on CLPs with practical constraints developed in recent years by our research group, with special emphasis on the integer linear models we have designed and tested.

***

Optimization and simulation to improve emergency medical service systems

Brigitte Werners
Faculty of Management and Economics, Ruhr-Universität Bochum

To reach all emergencies within a given very short period of time, a sufficiently large number of ambulances have to be allocated to optimally determined emergency bases. During our long-lasting cooperation with the fire and emergency department in Bochum we developed and used the decision support system SPR² to improve emergency medical service systems.

Empirical studies have shown temporal and spatial variations of emergency demands as well as variations of travel times during the course of a day. Therefore, varying numbers of ambulances are required. In location and allocation planning models, several aspects can be integrated and respective optimal solutions on a tactical level are determined. In particular our model, which optimizes the empirically required coverage and uses flexible locations, determines sophisticated solutions. To evaluate the consequences of such solutions on an operational level and to convince different interest groups, comprehensive simulation studies are conducted. Dynamics, multi-criteria and uncertainty of a real world setting are taken into account.

<div align="center">***</div>

A machine scheduling approach to the berth allocation problem under channel restrictions

Christian Bierwirth
Faculty of Law and Economics, MLU Halle-Wittenberg

Shipping channels are often a constraint to port capacity due to the significant capital cost and environmental impact of channel dredging. Capacity impacts of channel operations are most significant in tidally restricted ports, where deep draft vessels are only able to move through the channel during narrow windows around high-tide in order to maintain sufficient under-keel clearance. Channels are often narrow which constrains the capability of vessels passing in opposing directions. There has been much research to-date around berth allocation and sequencing, but in channel constrained ports the value of existing approaches can be limited. In this paper we present an approach to optimise the scheduling of channel movements and furthermore, to integrate the channel scheduling and berth allocation/sequencing problems. A MIP formulation is presented for this problem, based on a no-wait bidirectional ow-shop with parallel machines and time window constraints. Benchmark problems from the literature for berth allocation/sequencing have been modified to incorporate a range of channel configurations and used as test cases for the proposed model.

<div align="center">***</div>

## Collaboration in Vehicle Routing

Richard F. Hartl
Department of Business Administration, University of Vienna

After a short summary of the contributions of Gerhard Wäscher to his current main research area "vehicle routing" and of connections between his and my research (vehicle routing with loading constraints, vehicle routing in garbage collection) this talk will focus on the relatively new area of Collaboration in Vehicle Routing.

Collaboration in transportation has been encouraged by public authorities since it serves such ecological goals as reducing road congestion, noise pollution, and harmful emissions. In horizontal collaboration, carriers form coalitions in order to exchange transportation requests. In less than truckload (LTL) settings, the exchange of requests can be organized e.g. through combinatorial auctions, where collaborators submit requests for exchange to a common pool. In modelling this problem, five main phases can be identified

1. Carriers decide which requests to put into the pool (Request selection)
2. Auctioneer generates bundles of requests and offers them to carriers (Bundle generation)
3. Carriers place their bids for the offered bundles (Bidding).
4. Auctioneer allocates bundles to carriers based on their bids (Winner Determination).
5. Coalition profits are distributed

The talk will report recent advances with respect to phases 1 to 4 and discuss unsolved issued with respect to the combination of the 5 phases. One of these is truthfulness vs cheating.

tram station:
Hasselbachplatz
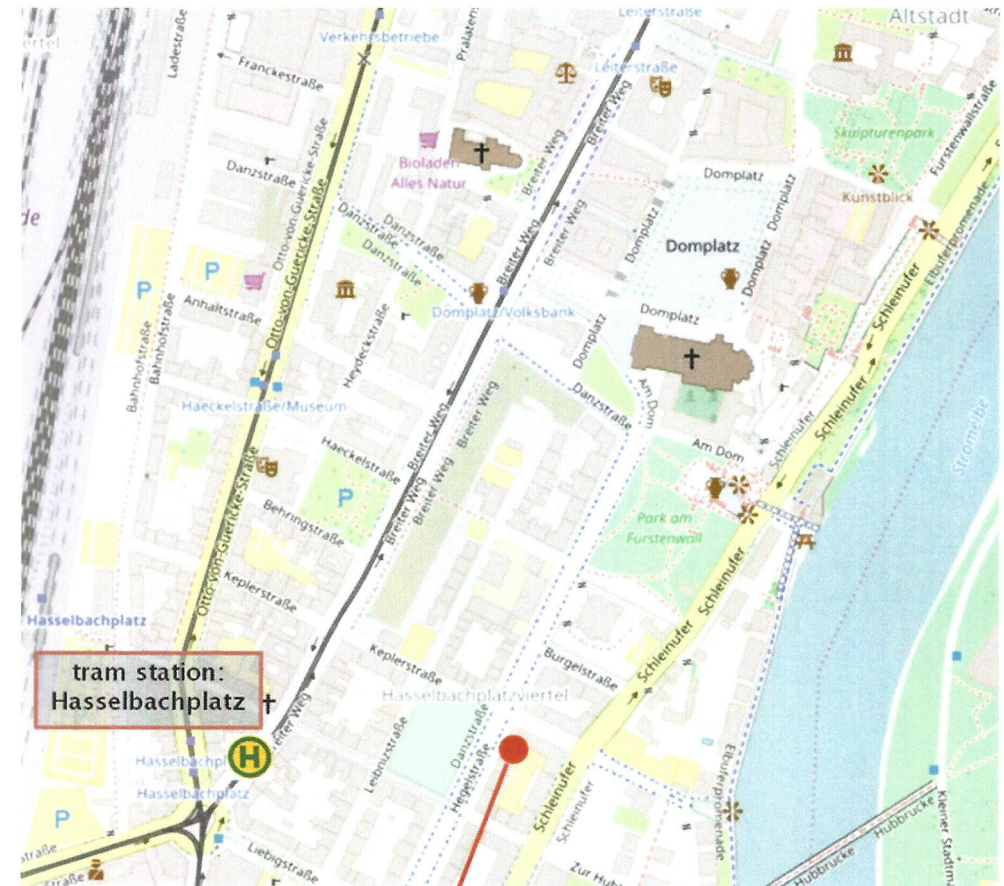
19 Uhr, Dinner: Franx Restaurant
Hegelstraße 39, 39104 Magdeburg

Venue

***

Experimental Factory Magdeburg

Sandtorstraße 23
39106 Magdeburg

***

Franx – Restaurant & Salon

Hegelstaße 39
39104 Magdeburg

***

Contact information

Ms. Jana Tuchen
Mr. Christoph Rippe
Faculty of Economics and Management
Otto-von-Guericke-Universität Magdeburg
Universitätsplatz 2
39106 Magdeburg

Mail: bwl-pl@ovgu.de
           christoph.rippe@ovgu.de
Office: +49 (0)391 6758797