Optima@ISMP

Editorial

Three years ago, during the business meeting at ISMP 2009 in Chicago, Berlin was announced as the next site of ISMP. Later that night we were sitting together in the lobby of the conference hotel in Chicago, talking about the exciting perspective of having ISMP 2012 in Berlin.

A lot has happened since then; dozens of meetings held, hundreds of phone calls made, thousands of emails sent, and tens of thousands received. The program committee together with the cluster and session chairs have come up with a truly impressive conference program totaling more than 1700 talks in 40 parallel tracks, rounded up with a fine selection of invited lectures. This record-setting size of ISMP 2012 (also in terms of number of participants: roughly 2000) has been a great surprise for all of us and an additional source of motivation. Books were written, presentations scheduled, locations chosen, and after all – thanks to the sedulous commitment of many – we hope to be well prepared to meet your expectations this week. And what has always remained, of course, is the excitement of having the chance to welcome you all in this wonderful city.

Now that you are here, we will keep you up to date and provide useful and entertaining information every morning with a new issue of this newsletter. The Optima@ISMP newsletter has been established at ISMP 2009 in Chicago. This year, Andreas Loos and his team are taking the next step in turning this into a tradition one day.

Each day of the conference, a member of the organizing team will write the editorial of the Optima@ISMP newsletter and give you their personal view on ISMP.

We wish you an inspiring week of science and pleasure in Berlin.

Martin Skutella and
Michael Hintermueller

Announcement of the 2012 winners in the Konzerthaus Berlin (Photo: Christoph Eyrich)

And the Winners Are ...

(al) The winners of five ISMP prizes and the finalists of the Tucker prize have been announced.

○ The *Dantzig Prize* goes to Laurence Wolsey from Catholic University of Louvain and Jorge Nocedal from Northwestern University. Jorge Nocedal has made fundamental contributions to the theory of nonlinear optimization methods. Laurence Wolsey has been one of the most influential scholars in the field of mathematical optimization, contributing significantly to foundational understanding of the geometry of mixed integer programs, to duality theory in discrete optimization, and to the development of effective new methods for a variety of applications, particularly in production planning and scheduling.

○ The *Lagrange Prize* goes to Emmanuel Candes from Stanford University and Ben Recht from the University of Wisconsin for their paper *Exact Matrix Completion via Convex Optimization* (Foundations of Computational Mathematics (2009) 9:717–772). Do you know the Netflix problem to estimate the preferences of users of an online video shop based on partial data? Candes' and Recht's paper covers some theory behind: It demonstrates the power of nuclear norm relaxation, which is a convex programming problem that is expressible as semidefinite programming. The paper considers the problem of filling in unknown entries of a partially specified matrix M so that the rank is minimized. This problem is $\mathcal{NP}$-hard in general, but the authors show that if M is generated according to a certain probabilistic model, then the resulting instance can be solved in polynomial time via nuclear norm relaxation.

○ The *Fulkerson Prize* is awarded for the following three papers.

– Sanjeev Arora, Satish Rao, and Umesh Vazirani: *Expander flows, geometric embeddings and graph partitioning* (J. ACM, 56 (2009), pp. 1–37). The paper concerns with edge cuts in n-vertex graphs of approximately minimum size with bounded ratio of the numbers of vertices on either side and presents an algorithm within a factor of $\mathcal{O}(\sqrt{\log n})$ of optimal.

– Anders Johansson, Jeff Kahn, and Van H. Vu: *Factors in random graphs*, (Random Structures and Algorithms 33 (2008), pp. 1–28). Consider a random k-uniform hypergraph H with n vertices and edge-probability p, where k divides n. What value of p guarantees that, with high probability, H contains a perfect matching? Answer to this long outstanding question: Read their paper!

– László Lovász and Balázs Szegedy: *Limits of dense graph sequences* (Journal of Combinatorial Theory Series B 96 (2006), pp. 933–957). This paper connects extremal combinatorics and measure theory. It shows that for a natural metric, graph sequences have a limit object in the space of symmetric measurable functions from the unit square to the unit line.

○ The *Beale-Orchard-Hays Prize* goes to Michael Grant and Stephen Boyd, Professor at Stanford University, for their software CVX. Michael Grant is currently the chief technologist at Tune Energy, a small startup offering advanced analytics and optimization for electricity retail. Together with Stephen Boyd, he developed CVX, turning Matlab into a modeling language for convex programming.

○ The *Tucker Prize Finalists* are Amitabh Basu, Oliver Friedmann, Guanghui Lan – more about them is coming soon.

○ The *Tseng Memorial Lecturer* will be Yinyu Ye from Stanford University. He is one of the leading heads in continuous optimization and interior point methods for more than the last 20 years – and played an important role in promoting optimization research in the Asia-Pacific region, for instance as one of the founders of the Pacific Journal of Optimization.

Announcement of the Tseng Memorial Lecture on Tuesday, H 0105

Yinyu Ye: *The Simplex and policy-iteration methods are strongly polynomial for the Markov decision process with a constant discount factor*
(Chair: Sven Leyffer)

Abstract. We prove that the classic policy-iteration method (Howard 1960), including the Simplex method (Dantzig 1947) with the most-negative-reduced-cost pivoting rule, is a strongly polynomial-time algorithm for solving the Markov decision process (MDP) with a constant discount factor. Furthermore, the computational complexity of the policy-iteration method (including the Simplex method) is superior to that of the only known strongly polynomial-time interior-point algorithm for solving this problem, which seems consistent with practical observation. The result is surprising since the Simplex method with the same pivoting rule was shown to be exponential for solving a general linear programming (LP) problem, the Simplex method with the smallest-index pivoting rule was shown to be exponential for solving an MDP regardless of discount rates, and the policy-iteration method was recently shown to be exponential for solving a undiscounted MDP. We also describe most recent progresses in this research direction.

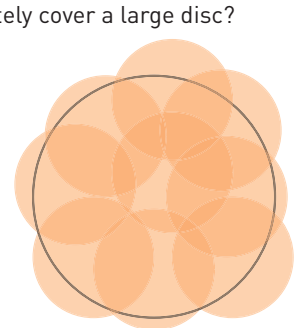
Biographical sketch: Yinyu Ye is currently Professor of Management Science and Engineering at the School of Engineering and the Director of the MS&E Industrial Affiliates Program, Stanford University.

He is an INFORMS Fellow, and has received several research awards, including the 2009 John von Neumann Theory Prize for fundamental sustained contributions to theory in Operations Research and the Management Sciences, the inaugural 2006 Farkas prize on Optimization, and the 2009 IBM Faculty Award.

The Puzzle

(al) In Hungary, mathematical competitions have a long tradition first established by physicist and science manager Lorand Eötvös in 1894. His competition has been renamed the *Kürschák Mathematical Competition* in 1947 to honor math professor József Kürschák (1864–1933), a teacher of Dénes König and John von Neumann.

This small puzzle comes from the competition from 1947: A small disc has radius 1, a large disc has radius 2. What is the minimum number of small discs that are needed to completely cover a large disc?



Today's Plenaries

- Rakesh Vohra: *Polymatroids and auction theory*, 09.00–09.50, H 0105
- Dimitris Bertsimas: *A computationally tractable theory of performance analysis in stochastic systems*, 17.00–17.50, H 0105
- Katya Scheinberg: *Using randomized models in black-box and derivative free optimization*, 17.00–17.50, H 0104

Random Picks

- Ever wondered how optimization in oil exploration works?

David Brown: *Optimal sequential exploration – Bandits, clairvoyants, and wildcats*, 10.30–10.55, MA 141

- Marketing in social networks can be seen as a game theoretical problem.

Konstantinos Bimpikis: *Competitive marketing strategies over social networks,* 11.30–11.55, MA 043

- A new notion of instance-dependent robustness, an approximate feasibility test for dual-value sequencing.

Nicole Megow: *Nearly optimal universal solutions for knapsack and sequencing on an unreliable machine*, 14.15–14.40, H 3021

- How to reconstruct in polynomial time how evolution might have been working.

Mareike Fischer: *When sets of species make an evolutionary tree unique*, 13.15–13.40, H 2033

- Claw free graphs – the *drosophila* of combinatorial optimization.

Henning Bruhn: *Clique or hole in claw-free graphs*, 16.15–16.40, H 3005

- A sequential quadratic optimization (SQO) method with strong global and fast local convergence guarantees – even for infeasible problem instances.

Frank E. Curtis: *Infeasibility detection in nonlinear optimization*, 15.45–16.10, H 0110

Optimal History

(al) In a small workshop in Berlin-Kreuzberg, Konrad Zuse completed in 1941 an electromechanical computer that was freely programmable: The Z3. This machine was destroyed in 1943 during an bombardment of Berlin.

Horst Zuse, the oldest of Konrads five children, received his PhD degree in computer science from TU Berlin in 1985. He will tell the history of origins of several early computers – and his father's Z3.

Historical lecture on Monday:

- Horst Zuse: *The origins of the computer*, 17.00–17.50, H 1012

Today's Weather

08:00	21°C / 69.8°F
11.00	26°C / 78.8°F
14:00	29°C / 84.2°F
17:00	28°C / 82.2°F
20:00	25°C / 77°F

Egon Balas and Annegret Wagler in Berlin – celebrating Manfred Padberg's 60th birthday in October 2001 at the Zuse Institut Berlin. (Photo: Rolf Möhring)

38 + 52 = 90: Two Lifes, One Birthday

(al) Meanwhile, his second life is much longer than his first: Egon Balas worked for 38 years for the communist party in Hungary and Romania. In 1966, he finally succeeded to emigrate from Romania and his mathematical life began, starting with two doctoral degrees (one in economy from the University of Brussels 1967, one in mathematics from the University Paris 1968).

2012 (on June, 22), Egon became 90 years old – and he is therefore one of the most famous examples for the fact that mathematics is *not* only a young man's game. He is an author of more than 220 articles and books – and still active. Among many other things, he is known for his idea of *disjunctive programming* (optimization over unions of polyhedra) which gives a connection between logics and polytope theory and an algorithm to find the convex hull of 0-1-problems. He also performed with virtuosity on the theme of lifting optimization problems into higher dimensions and projecting them again down in the original space – the well known method of *lift-and-project*.

The adventurous story of Egon's first life is told in his autobiography *Will to Freedom: A Perilous Journey through Fascism and Communism* (Syracuse University Press, 2000). Egon Balas was born in a Jewish family as Egon Blatt in 1922 in Klausenburg (today Cluj-Napoca) in Transilvania. He attended the local secondary school (Gymnasium) and chose his first alias Egon Balázs when participating at ping-pong competitions between 1936 and 1938; this which was not allowed to pupils of his school.

Living under alias became normal for Egon in the next years: although being the best pupil in his class, he was not allowed to study physics or mathematics as he liked, because university access was restricted for Jewish people. So Egon became a member of the Hungarian Communist Party and went underground. While his parents and his brother were deported to Auschwitz, Egon's cover was blown in August 1944; he came under arrest. In October 1944 he was after torture sentenced to 14 years in prison. However, Egon could escape.

After war, Egon worked again for the Communist Party and studied at the same time between 1946 and 1949 economy at Bolyai University in Cluj. 1948, he became for one year a secretary in the Romanian ambassy in London. Then, he started teaching economy and worked simultaneously as head of economic affairs in the Ministry for Foreign Affairs of Romania. In 1952, he was arrested for the second time in his life, this time by the communist regime in Romania and for almost two and a half years (mostly in solitary confinement). In the next years, the mathematician in Egon slowly awoke: He worked in optimization (transportation) problems in forest management.

After his emigration 1966, he accepted a professorial appointment with the Graduate School of Industrial Administration at Carnegie Institute of Technology, which had at that time merged with the Mellon Institute to become the Carnegie Mellon University. He does his research there to this day.

Egon won many important prizes: the John von Neumann Theory Prize (1995), the EURO Gold Medal (2001), he is in the IFOR's Hall of Fame since 2006, he was an INFORMS Fellow in 2002 and *Math. Programming* dedicated issue 98 (2002) to him, on the occasion of his 80th birthday. One of his three doctoral sons is Manfred Padberg. And, by the way: Egon Balas was Member of the Program Committee of the ISMP No. 7 through 16.

Happy Birthday, Egon!

Optimal Spare Time: Go Prenzlauer Berg!

(al) Berlin *Prenzlauer Berg* is famous; people living there are supposed to be hip and the district has allegedly the highest birth rate of Germany. However, at least the latter is an urban legend: There are for instance more children per inhabitant in *Kreuzberg* and *Friedrichshain* than in *Prenzlauer Berg*, and much more children in some western parts of Germany. Nevertheless, when strolling around *Kollwitzstraße* or *Helmholtzplatz*, one sees in fact lots of babies and buggies – and lots of coffee shops and restaurants, by the way. One can for instance have a nice dinner next to the *Wasserturm* (water tower) in *Rykestraße/Knaakstraße*, at the Russian restaurant *Pasternak* (Jewish specialties, kosher) or in the *Bar Gagarin* nearby. Sitting there and looking at the Wasserturm (which is used as an apartment house today), you have one of the largest Synagoges of Europe behind you – hidden behind the houses (the entrance is in Rykestraße).

Prenzlauer Berg is also great if you want to check out the real "Berlin food": At underground station *Eberswalder Straße*, one can get Currywurst or Bulette at the famous *Konnopke's Imbiss*. To avoid the queues, you can also get essentially the same offers at *Ziervogel's Kult-Curry* at underground station *Senefelder Platz* – the owner there is the son of Waltraud Ziervogel who runs *Konnopke's*.

For more information and maps, please refer to the ISMP 2012 Berlin Guide!

The Wasserturm in Prenzlauer Berg (Photo: Andreas Loos)

By the way: Optimal Tennis

(al) Professional sport seems to be impossible without computers and mathematical enhancement today. Take for instance the Wimbledon tennis championships this year: IBM registered this year every movement of the players on the tennis courts to compile a huge amount of data. They analyzed the data and fed the results online into their so called *IBM slamtracker* (www.wimbledon.com/en_GB/slamtracker). Users could check in real time how many aces each player won and how many unforced errors or double faults he or she made. From these statistics, the system even recommended how the players should optimally behave in future to raise their chance to win – on the real tennis court, not on the computer.

St. Oberholz at Rosenthaler Platz (Photo: Christoph Eyrich)

Berlin Between Bulette and Foccaccia

(al) Berlin mainly grew in the second half of the 19th century when the town became a center for the machine industry and in the first half of the 20th century by incorporation of surrounding villages (1880: one million inhabitants, 1940: 4.5 million, today: 3.5 million). Therefore, Berlin has a long tradition as a work men's town.

This is why Bulette (something in between Meatball and Hamburger), boiled pork hock (Eisbein) with Sauerkraut or lentil soup (Linsensuppe) are still considered as traditional Berlin food.

A legendary place to eat were the restaurants of *Aschinger*, which once was the largest caterer in Europe. Aschinger does not exist anymore. Their *Bierquelle Nr. 9* ("beer fountain no. 9") was at *Rosenthaler Platz*. At the same place you can find today the restaurant *Sankt Oberholz*. Tody, you can enjoy there real Prenzlauer Berg spirit instead of Linsensuppe: Latte macchiato, Foccaccias and young people behind notebooks.

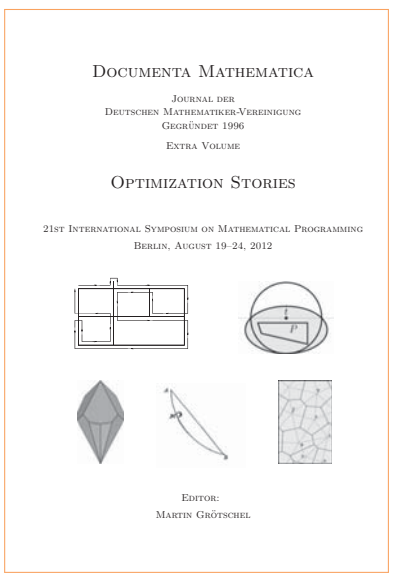
Martin Grötschel

Optimal Reading

(al) Ever heard about this important scientific law: "No named scientific discovery is named after its original discoverer"? It's called *Stigler's Law* – and it has, of course, not been found by the statistician Stephen Stigler, but by the sociologist Robert K. Merton, who called it the *Matthew Effect*, after Evangelist Matthew: "Those who have will get more".

Optimization is (like every part of maths) full of examples supporting this law. Did Newton create Newton's Method? (No.) Who invented Gauss elimination? (Not Gauss, but some unknown Chinese mathematicians.) And what about Voronoi-Diagrams? (Well, guess ...)

Martin Grötschel, Secretary of the International Mathematical Union and chairman of the Einstein-Foundation Berlin, has edited a collection of 41 *Optimization Stories* – much more than only a test of Stigler's Law. His book is separated into six parts: Stories about the "old masters", stories from linear programming, discrete and continuous optimization, from computing and miscellaneous stories from optimization, and it is published on the occasion of ISMP 2012.



The list of authors contains many well-known names, among them Rolf Möhring, Alexander Schrijver, William H. Cunningham, Robert E. Bixby, and Eberhard Knobloch. Together with Grötschel, they did not want to produce a piece of historical research. Instead they use results from historical research to tell many anecdotes and interesting aspects of optimization. A pageturner not only for the beginners in optimization!

Martin Grötschel (ed.), *Optimization Stories*, Documenta Mathematica (Extra Volume), 2012.

Questions? Comments? Remarks? Just send us an E-Mail: andreas.loos@fu-berlin.de. More News? Visit us on the web: ismp2012.mathopt.org/en/news

IMPRINT. Chief editor: Tina Heidborn. The articles in this issue are from Andreas Loos (al). ViSdP: Andreas Loos, Institute of Mathematics, Freie Universität Berlin, Arnimallee 7, 14195 Berlin

Design: Christoph Eyrich, Berlin
Printing: Oktoberdruck AG, Berlin