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# BULLETIN

139

December 2011

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SCHWEIZERISCHE VEREINIGUNG FÜR OPERATIONS RESEARCH

ASSOCIATION SUISSE DE RECHERCHE OPERATIONNELLE

ASSOCIAZIONE SVIZZERA DI RICERCA OPERATIVA

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S V O R



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**OR 2011 Conference: Review**  
**New SVOR/ASRO Committee**  
**SVOR/ASRO Competition 2012**

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## Editorial

Dear members,

It is a great pleasure to me to write this editorial as new president of the Swiss Operations Research Society.

This year has been very intensive. Among other activities we celebrated the 50th anniversary of our Society in Zurich during the International Conference of Operational Research, OR2011. During this conference, September 1th 2011, our Society organized the General Assembly where a new committee has been elected for three years. I first would like to thank the departing members Daniel Costa and Hans-Jakob Lüthi for their intensive, active and profitable contributions to SVOR/ASRO. Daniel has been involved in the committee for 14 years, 6 of them as treasurer and 6 as a president. His increasing professional activities now force him to dedicate less time to other initiatives but we know that his passion for OR is not changed, as was possible to listen during his semi-plenary lecture at OR 2011. Hans-Jakob represents a piece of OR history in Switzerland and has contributed to increase OR reputation and visibility for many years. He is now retiring and is also leaving the committee after 3 years of intensive activities, ended with the great success of OR2011.

With these departures SVOR/ASRO loses a committee member from industry and a committee member from academia. We have immediately selected two new members in similar areas. In fact, Marco Laumanns is a Research Staff Member of the Business Optimization Group in the Mathematical and Computational Sciences Department of the Zurich Research Lab. Marco is an expert in robust and stochastic optimization with a very interesting experience as senior researcher at ETH Zürich. Robert Weismantel is now the new Head of IFOR, the Institute for Operations Research at ETH in Zurich. Robert is famous for his work in discrete mathematics and optimization for which he has obtained many international awards. We are happy to welcome two new motivated and enthusiastic members in the committee.

What about the future? OR in Switzerland is solid but mainly inside universities. Anyway, we need to continually working to consolidate and to enlarge our academic community. OR has to be promoted in Switzerland also organizing OR related events and conferences; remember, SVOR/ASRO is happy to financially support such initiatives. The main challenge, however, is to attract industries toward our domain and to involve them more in our Society. We have already started to discuss inside the committee how to reach this goal. A first step, for sure, is to improve our visibility with a new web-site and more initiatives will come. Last, but not least, we are interested in continuing promoting OR among young people to raise their awareness toward this discipline. The new FantaHockey competition 2012 for Swiss High Schools is a good stimulus in this direction.

I came into this committee in 1999 and I learned a lot from all members in this years. For me it is an honor to represent SVOR/ASRO and to contribute to its success. I thank you all and I wish you and your families a fruitful and pleasant 2012.

Luca Maria Gambardella

SVOR/ASRO President  
25.11.2011

### New committee to further promote OR in Switzerland and beyond

Dear members,

The SVOR committee is renewed every three years by the general assembly. The elections for the period 2011-2014 took place during the last general assembly held at the University of Zürich on September 1st, 2011.

After serving the SVOR committee for 14 years, 6 of them as a treasurer and 6 as a president, I decided to not extend my contribution in the new committee. This decision was not easy since my passion for Operations Research is unaltered and the challenges faced by SVOR are not diminishing. This decision was mainly motivated by the increasing difficulties to combine SVOR activities with my other professional and family responsibilities.

The last 14 years made up a thrilling period during which Operations Research developed further internationally, received a lot of attention and reached outstanding results in a variety of application areas. The SVOR contribution to this overall success is clearly limited but not negligible. It can be summarized as follows:

- Regular prizes for the best MSc and PhD theses carried out in Swiss OR Institutes.
- Organisation of competitions among high-school and university students to promote OR and encourage them to register in Mathematics and OR study programs. Since 2004, SVOR organized 6 competitions involving more than 200 students across Switzerland.
- Assistance in the organisation of national and international OR conferences. Recent events benefiting from the support of SVOR include: Joint IBM OR Days 2009, 2010 and 2011, IPCO 2010, RMC 2009 and 2010, GO VI, Tristan IV, NAPIO 2008, OR Symposium 2008.
- Publication of the SVOR bulletin and SVOR website to inform our community about OR activities and events.
- Sustain the communication vector between the academic and industrial worlds. This is a great challenge as OR no longer has a natural “home” in academia and industry. For 6 years in a row, the general assembly was organised within the premises of a company taking advantage of OR solutions. This experience will certainly be extended in the future.

I welcome Luca in his new role of SVOR president and I am trusty that the new committee will excel in promoting further our discipline in Switzerland and beyond.

Thank you all for your trust and contribution over the years.

Dr. Daniel Costa  
11.10.2011

## The new SVOR / ASRO committee for 2011 - 2014



*From left to right:*

- Michela Thiémard, EPF Lausanne
- Michel Bierlaire, EPF Lausanne
- Luca Maria Gambardella, IDSIA, Lugano
- Robert Weismantel, ETH Zürich
- Andreas Klinkert, ZHAW, Winterthur
- Marco Laumanns, IBM Research, Zürich

## Announcement of the General Assembly 2012

The next SVOR/ASRO general assembly is planned for Wednesday, March 21st 2012, at Nestlé in Wangen AG. During the morning there will be a visit to the industrial location. After the lunch offered by SVOR/ASRO, the general assembly will take place in the afternoon.

## Vereinsrechnung 2010 / Comptabilité 2010 (Update)

The 2010 balance sheet published in the bulletin 138, April 2011, contained a minor typing error. The correct sheet is given below (updated entries are marked with an asterisk '\*').

<b>Aufwand / Dépenses</b>	Aufwand / Dépenses	Ertrag / Recettes	<b>Ertrag / Recettes</b>
Bulletin	1'910,17		Bulletin
Joint IBM OR Days & GV	7'411,20		Joint IBM OR Days & AG
		5'372,00	IBM Sponsoring
Vorstandssitzungen	545,30		Séances du comité
Post-/Bankspesen	30,65		Frais poste/banque
SVOR Internet Auftritt	68,00		Site Internet ASRO
Porti	10,70		Port
SZVS, SATW, EURO, IFORS	880,00		SZVS, SATW, EURO, IFORS
SVOR Preis Master	1'000,00		Prix ASRO Master
SVOR Wettbewerb	2'150,45		Concours ASRO
Defizitgarantie IPCO			Garantie Déficit IPCO
Workshop	4'000,00		Workshop
SATW Zuschuss		2'000,00	Subside SATW
Beiträge und Geldgeschenk von Mitgliedern		*8'030,00	Cotisations et dons des membres
Zinsertrag		371,90	Intérêts
<b>Total</b>	<b>18'006,47</b>	<b>*15'773,90</b>	<b>Total</b>
<b>Verlust 2010</b>		<b>*2'232,57</b>	<b>Perte 2010</b>
<b>Total</b>	<b>18'006,47</b>	<b>18'006,47</b>	<b>Total</b>

## Bilanz per 31. Dezember 2010

## Bilan au 31 décembre 2010

	Aktiven / Actifs	Passiven / Passifs	
Postcheckkonto	6'597.66		Compte postal
Konto Kantonalbank BE	52'038.35		Compte Banque Cant. BE
Debitor Verrechnungssteuer			Débiteurs - Impôts anticipés
	556,55		
Andere Debitoren	*6'020,00		Autres débiteurs
Transitorische Passiven		1'439,56	Passifs transitoires
Kreditoren		10,80	Créditeurs
Kapital per 01.01.2010		*65'994,77	Capital au 01.01.2010
Verlust 2010	*2'232,57		Perte 2010
<b>Total</b>	<b>*67'445,13</b>	<b>*67'445,13</b>	<b>Total</b>
<b>Kapital per 31.12.2010</b>	<b>*63'762,20</b>		<b>Capital au 31.12.2010</b>

# OR 2011 Conference: Review



## OR 2011: A biased review

*Prof. Dr. Hans-Jakob Lüthi*

For the last few months, for my administrative IFOR team and the former IOR-team from UNIZ as well as myself, our top priority has been the preparations for OR-2011. We are proud to report that our efforts were well received by the 850 participants from around the world.

Such a success rests on many shoulders: the program committee, chaired by Karl Schmedders, who invited world-renowned speakers for the plenary lectures, who opened up the semi-plenary lectures to colleagues working outside of the core OR disciplines and finally we persisted in having a moderate quality assurance for the contributed papers by asking the stream chairs for an acceptance rate of around 80%. In the end we accommodated more than 620 lectures within 197 sessions – a task assigned to over 50 students from both hosting institutions ETH and UNI Zurich.

The superb administrative support I received from my conference administrators, Galit Shoham, Annette Ryter and Marc Wiedmer, was the key to the smooth running of the conference!



Furthermore, during the planning stages of OR 2011 we decided that the conference should become sustainable and we went a step further to provide an awareness program during the conference and to “do the best and offset the rest”:



With a project designed by the Center for Integral Logistics and the Institute for Sustainable Development of the Zurich University of Applied Sciences we committed ourselves to organizing a sustainable conference, i.e. to minimize its adverse ecological and climatic effects focusing on the conference’s carbon footprint in the areas of travel, accommodation, catering, conference materials and infrastructure. We will fully evaluate the carbon footprint of the event and compensate for a part of the conference by supporting carbon offset with “myclimate – The Climate-Protection Partnership”.

I am not sure if the awareness program was well appreciated by all of the participants – but I strongly believe that scientific and technological advances, as discussed in the stream “Energy, Environment and Climate” of the conference, might still not be sufficient to achieve a sustainable way of living – and must be complemented with a change in our day to day behavior.

Was the conference a success, was it worth the effort?

As the organizer, I tried to shape the conference according to my understanding of Operations Research as an interdisciplinary science focusing on modeling complex socio-technical systems in order to gain insight into behavior under interventions by “decision makers”. Dealing with “organized complexity” lies at the core of OR – and designing useful support systems to master the challenge of system management in complex environment is the ultimate goal of our professional society. Indeed the closing lecture by Professor William Pulleyblank entitled “Optimizing Twenty-First Century Decision Making” impressively illustrated the importance of advanced analytics and optimization methods to public and private organizations. Some of the main issues addressed in his lecture include:

- How do we deal with the unprecedented amount of data in our decision-making?
- How can we effectively incorporate risk measurement and management in our decision-making?
- How do we enable the transition from strategic planning systems to real-time operational systems?
- What optimization and analytics opportunity are being created by the rapid growth of social networks?

Clearly the opportunities for OR are great but many obstacles remain to be overcome. Let’s further the advancement of our science and the development of new capabilities to cope with the increasing challenges of our society – the future of OR truly remains bright!

Organizing this conference was my parting contribution to the OR Society before my resignation as the director of IFOR and my retirement. I wish my successor, Robert Weismantel, a prolific and prosperous future – and hoping that you will all continue to support his mission as you did mine! Thank you and my best wishes.

# Sustainable OR 2011

## Carbon Footprint of the International Conference on Operations Research 2011

Helene Schmelzer, Zentrum für Integrale Logistik, ZHAW

In cooperation with the Centre for Integral Logistics and the Institute for Sustainable Development of the Zurich University of Applied Sciences the organising committee of this year's Conference on Operations Research in Zurich has set up the project "Sustainable OR 2011", committing itself to organise a sustainable conference, i.e. to minimise its adverse ecological and climatic effects. Besides the organisational measures and an awareness programme during the conference the event was evaluated regarding its greenhouse gas emissions, covering the four main categories **travel** (participants' journey from hometown to Zurich), **accommodation** (energy, water, waste at the hotel), **catering** (from food production to preparation) and **infrastructure and materials** (energy, water, waste at the conference venue, printing materials, gifts).

The results of the analysis are evident: with 94% travel makes up the greatest part of the total greenhouse gases emitted during the conference, followed by accommodation (4%), catering (1%) and infrastructure and materials (<1%). The total greenhouse gases amount to approx. 786.4 t of carbon dioxide equivalents (CO<sub>2</sub>e) or around 0.9 t CO<sub>2</sub>e per participant. In comparison, the average greenhouse gas emissions of a Swiss are about 10 t a year.

A closer look at the travel activities shows that around 96% of the travel emissions are due to air travel. Train and car travel each account for 2% of the total travel emissions, though being the mode of transportation of almost half of the participants:

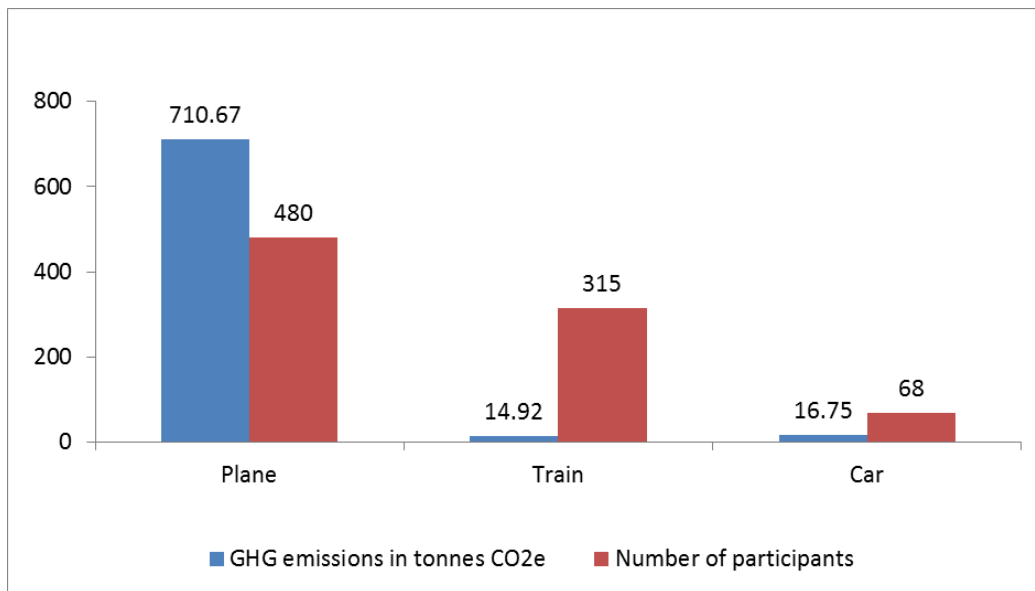


Figure 1: Travel emissions by modes of transportation

The high emissions of air travel are mainly driven by the relatively high emission levels of air travel in general and the long distance flights. Figure 2 shows the greenhouse gases of air travel for each air passenger and illustrates that the long distance flights (participants 360-480/ destinations Asia, America, Oceania) are the main drivers for the high emission levels. In other words, the journey of 14% of the participants accounts for 66% of the total conference's carbon footprint.

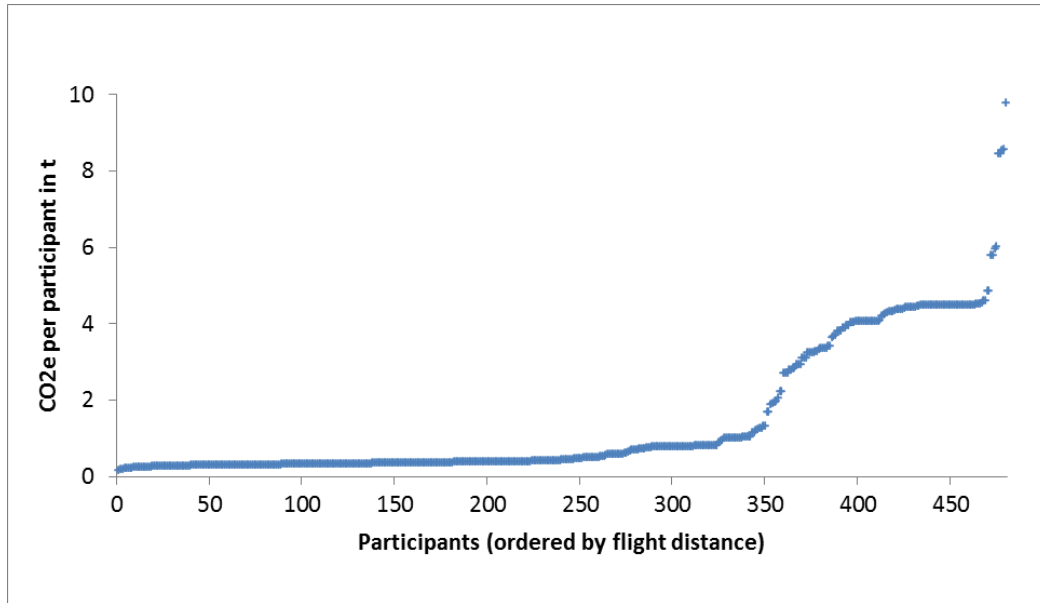


Figure 2: Air travel emissions per air passenger

Looking at these results, at first glance an international conference seems to be incompatible with sustainability issues. However, there are also possibilities to minimise the greenhouse gases of such an event. The short distance flights of the conference (up to 700 km one way) add up to 73 t CO<sub>2</sub>e. If these would have been replaced by train travel, about 54 t CO<sub>2</sub>e could have been saved – more than the total emissions caused by accommodation, catering, infrastructure and materials (44 t CO<sub>2</sub>e). Organisational measures and the choice of the conference venue and the catering company are also important influencing elements. Among other factors the low level of the emissions of infrastructure and materials of the OR 2011 can be explained by the green energy supply at the University of Zurich, the venue of the event, and the efforts of the conference organisation to minimise greenhouse gas emissions (e.g. by reducing printing materials, CO<sub>2</sub>-neutral USB flash drives, etc.). Finally, the conference committee compensated for a part of the emitted greenhouse gases by supporting carbon offset projects, covering accommodation, catering, infrastructure and materials, which amount to approx. 44 t CO<sub>2</sub>e equivalents. The participants were encouraged to offset their travel emissions. At the end of the day, with combined efforts of the event organiser and the participants an international conference can become a sustainable one.

### AIRO 2011 Activities

*Prof. Dr. Luca Gambardella, AIRO Delegate*

From 2012 the new president of AIRO, Associazione Italiana di Ricerca Operativa, is Prof. Anna Sciomachen.

#### **Prize for the best master thesis 2010**

Many thesis have been examined by the commission composed by Silvano Martello (Pres.), Daniela Ambrosino, Daniela Favaretto, Paola Festa e Stefano Lucidi. The general quality of these theses was very high and the commission decided to give two AIRO prizes:

- *Giovanni Pantuso*

*Promoter: Marielle Christiansen, Manlio Gaudio, Henrik Andersson.*

*Title: An algorithm for combining routing and storage of maritime goods.*

The thesis deals with a complex optimization problem where in parallel goods has to be stored (inventory management) and has to be routed in case of maritime transport. The thesis proposed a detailed mathematical model and a metaheuristic algorithm that uses mathematic properties of the model. The work has been considered for its important contribution both in the algorithmic and modelling aspects.

- *Mauro Portone*

*Promoter: Chefs Triki*

*Title: Problems periodic vehicle routing: solution of a case study.*

The thesis considers the Periodic Vehicle Routing Problem and applies it to a real case of a company that deals with the distribution of fuels. The thesis analyzes the major heuristic techniques and proposes a new procedure that improves performance. The thesis has been considered for its application, for its algorithmic performance and for its good computational experiments.

The President Prof. Renato De Leone assigned to the two winners of the Awards AIRO degree thesis in 2010 (the prize is € 1.000,00 each).

#### **Working day 2012**

The working day 2012 will be in Salerno. The organization is given to Prof. Raffaele Cerulli.

#### **Euro Informis Conference 2013**

The new Euro-Informs 2013 will be organized in Roma from 1st to 4th July 2013. Information is available at [www.euro2013.org/](http://www.euro2013.org/).

### ASST/SATW 2011 Activities

*Dr. Daniel Costa, Délégué ASRO auprès de la SATW*

L'académie suisse des sciences techniques (ASST/SATW) a été fondée en 1981. Il s'agit un réseau de personnalités, d'institutions et de sociétés spécialisées qui sont actives dans le domaine des sciences techniques ainsi que dans leur application et leur promotion. La SATW

s'engage, par le biais de publications et d'événements, à promouvoir la technique au service de la société et à favoriser la compréhension de la technique par la société.

La SATW est une association de droit privé, politiquement indépendante et sans aucune orientation commerciale. Elle regroupe environ 230 membres individuels et 60 sociétés, représentant les disciplines techniques en Suisse et dans le monde. L'académie a recours à des commissions et des groupes de travail dans différents domaines. Ceux-ci organisent des manifestations spécialisées et élaborent des études et des recommandations. La SATW dispose de commissions permanentes qui se consacrent aux domaines de l'énergie, des sciences biologiques appliquées, de la nanotechnologie, des technologies de l'information et de la communication, de l'éthique ainsi qu'aux rapports entre la technique et la société.

Le site [www.satw.ch](http://www.satw.ch) présente une liste exhaustive des manifestations organisées par la SATW ces derniers mois. Je vous invite à vous y rendre pour mieux connaître cette académie et y découvrir les nombreux champs d'activités dans lesquelles elle s'implique. Ci-dessous, un bref descriptif des manifestations récentes:

- 7 avril 2011, Berne, Assemblée Générale de la SATW avec notamment une présentation du Dr. Hans Hess, Président de Swissmem, sur le thème «Forschung und Nachwuchs für die Schweizer Industrie».
- A l'occasion de cette assemblée générale, René Dändliker a remis la présidence de la SATW à Ulrich W. Suter. Ce dernier a été professeur de chimie macromoléculaire à l'ETH Zurich jusqu'en 2008. Entre décembre 2001 et novembre 2005, il a fait partie de la direction de l'ETH en tant que vice-président pour la recherche. Ulrich W. Suter a fait ses études dans le département de chimie de l'ETH Zurich où il a également enseigné. Il s'est ensuite consacré à la recherche, notamment aux États-Unis. En 1982, il a obtenu un poste au MIT avant de revenir à l'ETH Zurich en 1988. Ulrich W. Suter prend la tête d'une académie qui se trouve en pleine phase de modernisation.
- 16-17 juin 2011, Berne, Congrès SATW sur le thème «Zukunft Bildung Schweiz: Von der Selektion zur Integration».
- 4-9 septembre 2011, Genève, World Engineers' Convention.
- 16 septembre 2011, Empa Akademie Dübendorf, Workshop SATW sur le thème «Ingenieurnachwuchsförderung».
- 19-21 septembre 2011, Davos, World Resources Forum.
- 27 octobre 2011, Pädagogische Hochschule FHNW de Soleure, «Green IT Learning Nachhaltige Informatik im Schulumfeld».
- Afin de stimuler la curiosité des jeunes face aux formations scientifiques et techniques, la SATW organise régulièrement des TecDays et des TecNights. Le programme récent et futur comprend les manifestations suivantes: 02.12.2010 Kantonsschule Wohlen, 09.12.2010 Kantonsschule Zürcher Oberland, 25.5.2011 Kantonsschule Trogen, 23.9.2011 Freies Gymnasium Zürich, 3.11.2011 Kantonsschule Frauenfeld, 16.11.2011 Kantonsschule Wettingen, 15.03.2012 Schweizerische Alpine Mittelschule Davos, 09.05.2012, Gymnasium Oberwil.

Notre association est membre de la SATW et bénéficie depuis plusieurs années d'un support financier. Ce support nous permet d'organiser le concours d'optimisation destiné aux gymnasiens, dans le but de promouvoir la recherche opérationnelle et des études universitaires en mathématiques appliquées.

### SVOR-Preis 2012 für Masterarbeiten

Die SVOR schreibt jedes Jahr einen Preis von CHF 1000 aus, durch den herausragende Arbeiten auf dem Gebiet des Operations Research in Theorie oder Anwendung ausgezeichnet werden. Die eingereichten Arbeiten werden von einer durch den SVOR-Vorstand bestimmten Jury beurteilt. Der ausgesetzte Preis wird entweder einem einzelnen Preisträger zuerkannt oder unter mehreren Preisträgern aufgeteilt.

Teilnahmeberechtigt sind alle an einer schweizerischen Universität oder Hochschule eingeschriebenen Studentinnen und Studenten. Als Wettbewerbsarbeiten werden nur Masterarbeiten anerkannt.

Die folgenden Bedingungen müssen erfüllt sein:

- Die Arbeiten müssen zwischen dem 01.03.2011 und dem 29.02.2012 abgeschlossen worden sein.
- Die Arbeiten sind durch den betreuenden Universitäts- bzw. Hochschuldozenten zusammen mit einem Gutachten über die Arbeit beim SVOR-Vorstand zuhanden der Jury einzureichen. Eine Zusammenfassung von maximal 3 Seiten ist beizulegen.
- Die Preisträger verpflichten sich, ihre Arbeit an einer SVOR Veranstaltung zu präsentieren.

Die Arbeiten sind bei der Geschäftsstelle SVOR, c/o Michela Thiémard, Case Postale 64, 1015 Lausanne 15, bis zum 15.03.2012 einzureichen.

### Prix ASRO 2012 pour les travaux de Master

Chaque année, l'ASRO met au concours un prix de CHF 1000 qui récompense le meilleur travail, théorique ou appliqué, dans le domaine de la recherche opérationnelle. Les travaux seront jugés par un jury nommé par le comité de l'ASRO. Le prix pourra être décerné à un candidat unique ou attribué à plusieurs lauréats.

Tous les étudiants et étudiantes inscrits dans une université ou une haute école suisse peuvent participer au concours. Seuls les travaux de Master peuvent être soumis à ce concours.

Les conditions suivantes doivent être satisfaites:

- Les travaux doivent être achevés entre le 01.03.2011 et le 29.02.2012.
- Les travaux doivent être envoyés au comité de l'ASRO à l'attention du jury, accompagnés du préavis d'un professeur. Un résumé d'un maximum de 3 pages doit être inclus.
- Les lauréats s'engagent à présenter leur travail lors d'une réunion de l'ASRO.

Les travaux sont à adresser au bureau de l'ASRO, c/o Michéla Thiémard, Case Postale 64, 1015 Lausanne 15, jusqu'au 15.03.2012.

## SVOR Optimierungswettbewerb 2012

Mit dem Ziel, das Operations Research und die entsprechenden Studienmöglichkeiten an den Schweizerischen Hochschulen zu fördern, organisiert unser Verein einen weiteren Optimierungswettbewerb für Mittelschüler. Dieses Jahr bezieht sich die Problemstellung auf die optimale Zusammenstellung eines Hockey-Teams bei beschränktem Budget.

Dieser Wettbewerb findet im Rahmen der Aktivitäten zur Sensibilisierung der Jugend für die Technik statt, welche von der Schweizerischen Akademie der Technischen Wissenschaften (SATW) durchgeführt werden. Die detaillierte Beschreibung der Wettbewerbsaufgabe und das Teilnahmereglement sind auf der SVOR-Website [www.svor.ch](http://www.svor.ch) verfügbar. Die SVOR hat alle Schweizer Gymnasien kontaktiert, um sie auf die Ausschreibung dieses Wettbewerbs aufmerksam zu machen und die Schüler und Schülerinnen für eine Teilnahme zu motivieren.

Gerne können Sie diese Informationen in Ihrem Umkreis weiterverbreiten, insbesondere wenn Sie in der Familie oder im Bekanntenkreis Gymnasiasten oder Gymnasiastinnen kennen. Die Suche nach einer guten Lösung ist unterhaltsam, und die Preispalette ist attraktiv.



## Concours d'optimisation ASRO 2010

Afin de promouvoir la Recherche Opérationnelle et les études universitaires dans ce domaine, notre association organise un nouveau concours d'optimisation destiné aux gymnasiens. Cette année, le problème retenu est lié à la formation optimale d'une équipe de hockey avec un budget limité.

Ce concours s'inscrit dans le cadre des actions de sensibilisation de la jeunesse à la technique menées par l'Académie Suisse des Sciences Techniques (SATW). La description détaillée du problème et le règlement du concours sont disponibles sur le site [www.asro.ch](http://www.asro.ch). L'ASRO a contacté l'ensemble des gymnases suisses pour leur signaler l'existence de ce concours et encourager les étudiants à participer.

N'hésitez pas à en parler autour de vous, surtout si certains membres de votre famille ou de votre entourage fréquentent le gymnase. La recherche d'une bonne solution est un exercice amusant et la palette de prix est alléchante!

## PhD Theses

### Maximal lattice-free polyhedra in mixed-integer cutting plane theory

**Christian Wagner**

*Supervisor: Prof. Dr. Robert Weismantel (IFOR, D-MATH, ETH Zürich)*

*Co-Supervisor: Prof. Dr. Francois Margot (Tepper School of Business, CMU)*

*Research Institute: Institute for Operations Research (IFOR, D-MATH, ETH Zürich)*

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This thesis deals with the generation, evaluation, and analysis of cutting planes for general mixed-integer linear programs (MILP's). The cutting planes are obtained from lattice-free polyhedra, that is polyhedra without interior integer point. The point of departure is an optimal solution of the linear programming relaxation of the underlying MILP. By considering multiple rows of an associated simplex tableau, a further relaxation is derived.

The first part of this thesis is dedicated to the analysis of this relaxation and it is shown how cutting planes for the general MILP can be deduced from the considered relaxation. It turns out that the generated cutting planes have a geometric interpretation in the space of the discrete variables. In particular, it is shown that the strongest cutting planes which can be derived from the considered relaxation correspond to maximal lattice-free polyhedra. As a result, problems on cutting planes are transferable into problems on maximal lattice-free polyhedra.

The second part of this thesis addresses the evaluation of the generated cutting planes. It is shown that the cutting planes which are important, are at the same time the cutting planes which are difficult to derive in the sense that they correspond to highly complex maximal lattice-free polyhedra. In addition, it is shown that under certain assumptions on the underlying system of linear equations and inequalities, the important cutting planes can be approximated with cutting planes which correspond to less complex maximal lattice-free polyhedra. A probabilistic model is used to complement the analysis. Moreover, a geometric interpretation of the results is given.

The third part of this thesis focuses on the analysis of lattice-free polyhedra. In particular, the class of lattice-free integral polyhedra is investigated, a class which is important within a cutting plane framework. Two different notions of maximality are introduced. It is distinguished into the class of lattice-free integral polyhedra which are not properly contained in another lattice-free integral polyhedron, and the class of lattice-free integral polyhedra which are not properly contained in another lattice-free convex set. Both classes are analyzed, especially with respect to the properties of their representatives and the relation between the two classes. It is shown that both classes are of large cardinality and that they contain very large elements.

For the second as well as the third part of this thesis, statements about two-dimensional lattice-free convex sets are needed. For that reason, the fourth part of this thesis is devoted to the derivation of these results.

## Strategic Resource Management for Power Grid Operators

**Michael S. Guarisco**

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Viele Bereiche des täglichen Lebens beruhen auf einer zuverlässigen Stromversorgung. Wann immer diese zusammenbricht, bemerken wir unsere starke Abhängigkeit von der Grundversorgung mit Elektrizität. Im Zuge der Marktöffnung des Elektrizitätssektors kommt dem Stromnetz mit seinem natürlichen Monopol eine kritische Rolle zu. Die in Betriebsgesellschaften ausgelagerten Stromnetzbetreiber unterstehen denn auch einem engen Aufsichtssystem betreffend Übertragungspreisen, Kapazität und Verfügbarkeit. So haben beispielsweise Versorgungsunterbrüche hohe Strafzahlungen zur Folge.

Die vorliegende Dissertation von Herrn Guarisco ist genau in diesem Spannungsfeld zwischen Betriebskosten und Verfügbarkeit eines Netzbetriebs angesiedelt: Im Zentrum der Dissertation steht die Entwicklung und Lösung zweier mathematischer Modelle zur Beschreibung des Zusammenspiels von Betriebsgrösse, Organisation und Netzverfügbarkeit mit dem Ziel, eine "optimale" Betriebsform zu finden. Um es vorweg zu nehmen: Die in dieser Dissertation im ersten Teil erarbeiteten Erkenntnisse wurden bereits zu grossen Teilen im betrieblichen Alltag durch den an dieser Studie beteiligten Industriepartner umgesetzt!

Guarisco beschreibt im ersten Teil seiner Arbeit (Kapitel 3) den Aufbau eines mathematischen Ermittlungsmodells, welches Kennzahlen für die (räumliche) Verfügbarkeit an Energie unter (historischen) Ausfallszenarien (Normalfall, Extremfall) und unterschiedlichen Betriebsorganisationen simuliert. Das eigentliche mathematische Kernstück dieses Modells ist ein adaptives Zuordnungsverfahren, mit dem Zweck, die momentan verfügbaren Ressourcen den ausgefallenen, räumlich verteilten Komponenten des Netzes (Transformatoren, Leitungen, etc.) aufgrund eines marginalen Nutzens "optimal" zuzuordnen.

Um unterschiedliche Betriebsformen vergleichen zu können, stützt sich Guarisco einerseits auf etablierte Kennzahlen aus der Energiewirtschaft zur Messung der Systemverfügbarkeit. Andererseits entwickelt er zusammen mit dem Industriepartner die neue Kennzahl "Power at Risk", um den Ausfall von Komponenten zu bewerten, welche nicht zu einem unmittelbaren Leistungsabfall führen jedoch die System-Zuverlässigkeit beeinträchtigen: "Power at Risk" misst die zu erwartende Versorgungslücke bei einem zusätzlichen Ausfall einer kritischen Komponente und erfasst damit einen potentiellen Aufschauklungseffekt. Relevanz und Validität des Ermittlungsmodells werden summarisch anhand einer mit dem Industriepartner erarbeiteten Feldstudie diskutiert.

In den Kapiteln 4 & 5 wird die optimale Einsatzpolitik zur Störungsbehebung im Rahmen der Theorie der Markov Entscheidungsprozesse thematisiert. Guarisco beschränkt sich dabei auf eine stilisierte Modellierung der Ausfälle von Komponenten in einem (redundanten) Hochspannungsnetz. Die Systemzustände entsprechen den ausgefallenen Systemkomponenten und die den Instandstellungsprozess steuernde "Politik" ist durch die Allokation der beschränkten Ressourcen zu den ausgefallenen Komponenten bestimmt. Als Steuerungsgrösse ist die erwartete Versorgungslücke pro Zeiteinheit (average cost) gewählt, welche durch eine "optimale" Politik zu minimieren ist. Zur algorithmischen Bestimmung der Optimalpolitik sind

unterschiedliche Verfahren entwickelt worden, insbesondere kann eine solche mittels eines linearen Programms in der Dimension der Systemzustände berechnet werden. Guarisco verwendet in seiner Arbeit das bekannte Werte-Iterationsverfahren, welches sich in der numerischen Praxis ausgezeichnet bewährt hat.

Im Kapitel 5 wird die Anwendung der Theorie der Markov Entscheidungsprozesse für ein Hochspannungsnetz sorgfältig beschrieben. Man sieht leicht, dass bei dieser Modellierung die Systemzustände exponentiell in der Anzahl der Komponenten des Netzes und der verfügbaren Ressourcen wachsen und sich daher mit diesem – zwar eleganten – mathematischen Modell nur sehr kleine reale Problem-Instanzen exakt rechnen lassen. Guarisco entwickelt deshalb im letzten Teil seiner Arbeit eine Theorie zur Aggregation von Zuständen, welche zu einem wesentlich kleineren Markov Entscheidungsmodell führt und dessen optimale Politik eine beweisbar obere Schranke des Ausgangsproblems ergibt. Die abschliessenden Approximationsrechnungen einer sehr stilisierten praktischen Anwendung (mit ursprünglich über 1014 Zuständen!) sind stimmig – sie bestätigen die ausgezeichnete Systemverfügbarkeit im Hochspannungsnetz dank der hohen Redundanz.

## Bachelor Theses

### Modellierung des Produktionsprozesses von Aluminiumfolien für die Pharmaindustrie

**Helen Ebbe**

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Amcor Flexibles Kreuzlingen produces aluminum foils for use in the pharmaceutical industry. Every fourth tablet blister backing worldwide is produced here, making use of up to 400 000 meters of raw foil. The primary goal of this project was to develop a model of the production planning and scheduling process with the goal of identifying potential for waste reduction during lacquering, laminating and cutting.

Amcor produces aluminum foils in customer-specified sizes from preproduced stock or raw material. We propose an integrated MILP process model from raw material through preproduced stock materials in a limited set of standard specifications, to the final customer product.

Computational experiments were not yet done due to delayed data availability, this will be the focus of our ongoing collaboration over the next year.

## Routing in Personal Rapid Transit

**Martina Furrer**

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Personal Rapid Transit (PRT) is a concept for public transportation in urban areas. In short, it consists of small, automated electric vehicles (pods) running on a track network transporting passengers on demand between closely spaced stations. The passenger chooses the destination of the ride when entering a pod at a station. Automatic control then guides the pod through the network to its destination.

The expected benefits for passengers are that PRT offers convenient non-stop mobility which is predictable and without some of the drawbacks of mass transportation. A passenger can travel alone if desired, can use the time of the ride for working, does not depend on a timetable and does not need to change lines to reach the destination. The expected benefits for the public are that the electricity powered system emits little noise and no pollutants in the city centers.

However, it is not yet clear how much capacity PRT can offer in the case of a larger network. How many passengers can be transported in a large, city-wide PRT system while keeping delays low? A crucial aspect in this consideration is the choice of the routing policy. How can the pods be guided through the network such that a reliable, congestion-free operation can be guaranteed for a large variety of demand patterns?

This project had the purpose of investigating routing policies for PRT networks. A routing policy needs to make a route choice for each pod to its destination and to find a schedule along this route. The first part of the thesis addresses the mathematical modeling of the routing aspects in PRT. The suggested model takes into account that PRT routing is an online problem. A family of objective functions suitable for such an online problem has been suggested.

In the second part, the student has developed a number of routing algorithms. They can be divided into two classes which differ in the amount of information that is taken into account when taking routing decisions. The sequential algorithms consider one vehicle after another, only taking into account reservations of the previously routed vehicles. The second class of push-algorithms takes routing decisions for all vehicles simultaneously, but is restricted to plan only one timestep into the future. For both classes, variations were suggested with the goal to reduce congestion and to achieve a better balancing of the traffic load over the network.

## Management of Demand Time Uncertainty in Inventory Planning

**Nadja Ulrich**

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Most present stochastic models describing demand consist of a joint probability distribution of the random variables representing the demands at different times. In this thesis, we introduce two new demand evolution models: the Random Walk Model defines a joint probability distribution for the demands at different times, as well as for the forecasts for all the times

before their realization time; the Time Uncertainty Model, in addition to defining a joint probability distribution for the demands and the forecasts, considers some dependence among the demands and forecasts which correspond to different times. Such a dependence is formed by considering that the initial demand forecast at each time is divided into a number of blocks and allowing these blocks to change the time of the forecast at which they appear in every timestep. We studied the statistical properties of the demand samples generated by these two models. We investigated the statistical properties of the realized cost, when optimal policies according to Robust Inventory Models are applied to the demand samples. The results showed that in the case of demand samples generated by the Time Uncertainty Model, the robust policies are not quite successful in decreasing the final cost and its variance. Since Lonza's demand is more consistent with the Time Uncertainty Model than with the Random Walk Model, a robust optimization framework characterized by the Time Uncertainty Model might lead to lower final costs.

## **Flexibility of Robust Risk Portfolios**

**Patrick Wyss**

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In risk management, if the probability distribution is estimated with limited accuracy, one can define robust risk measures based on nominal risk measures using a worst-case approach. Given a convex nominal or robust risk measure, finding the optimal-risk portfolio is a convex optimization problem. However, the portfolio set has to be constrained very often because it is not possible to make large changes in the weights of a portfolio. In this thesis, we define the marginal value of exibility as the rate of change in the optimal-risk with reference to the size of the considered portfolio set. We derive an algorithm which allows us to compute the marginal value of exibility of an optimal-risk portfolio. Furthermore, we extend the algorithm for robust convex risk measures. We additionally define the marginal price of uncertainty as the rate of change in the optimal-risk with reference to the uncertainty in the probability distribution and we show how to compute it. Finally, we perform numerical tests using historical stock data of the NYSE and the NASDAQ between 2005 and 2010. On one hand, for nominal and robust CVaR, our examples show the evolution of the marginal value of flexibility as the size of the portfolio set increases. On the other hand, they show the evolution of the marginal price of uncertainty as a function of the uncertainty in the probability distribution using the robust CVaR. Our algorithms enable the investor to assess the value of increasing the portfolio set by admitting larger changes as well as decreasing the uncertainty in the probability distribution by using more accurate estimations.

## Announcements

### New EURO Journals

The following three new EURO Journals are being released:

- EURO Journal on Transportation and Logistics: The journal website is ready <http://www.springer.com/13676>. The inaugural issue will appear in 2012.
- EURO Journal on Computational Optimization: The journal website will be ready by the end of 2011. The inaugural issue will appear in 2013.
- EURO Journal on Decision Processes: The journal website will be ready by the end of 2011. The inaugural issue will appear in 2013.

### EURO Excellence in Practice Award - EEPA 2012

The purposes of the competition are to recognise outstanding accomplishments in the practice of Operational Research, attract more application-oriented papers to EURO Conferences, and promote the practice of Operational Research in general

All interested authors are invited to submit a detailed description of an application of Operational Research which has original features, whether in methodology, application or implementation. This may be in the form of a paper written for publication (although not necessarily published at the time of submission), a client report, or other appropriate documentation. The documentation must describe the work in a way which illustrates how it meets the criteria outlined below. The age limit for published papers is four years. The work must not have been submitted concurrently to another competition. The application is open to Operational Research specialists from any part of the world. Submission deadline is January 31, 2012. The criteria for the evaluation of the papers are, scientific quality, relevance to Operational Research, originality in methodology, implementations and/ or field of application, a real impact to practice, and appreciation by the organisation involved with the application.

Website: <http://transp-or.epfl.ch/eeпа2012/registration.php>

### EURO Doctoral Dissertation Award - EDDA 2012

The EURO Doctoral Dissertation Award is a EURO instrument. It consists of a prize that is awarded at each EURO-K conference. The purpose of the prize is to distinguish an outstanding PhD thesis in Operational Research defended in the countries having an OR society that is member of EURO. It will be awarded for the sixth time at the closing session of the EURO-2012 conference (Vilnius, July 8 - 11, 2012).

The EDDA 2012 jury will only consider PhD theses in Operational Research defended between 15 January 2010 (i.e., the deadline for the preceding edition of the prize) and 15 January 2012 (the deadline for the present edition). The dissertation should have been defended in a University located in a member country of EURO. The author of the dissertation should be a member of a member society of EURO.

Website: <http://www.euro-online.org/web/pages/240/announcement>

## Upcoming Events



### Course DCA 2012

**Discrete Choice Analysis Predicting Demand and Market Shares**

**January 29 - February 2, 2012, EPFL, Lausanne, Switzerland**

[transp-or.epfl.ch/dca/](http://transp-or.epfl.ch/dca/)

Accurate predictions of the demand and market shares are critical for a wide variety of businesses and public organizations. Examples of applications include: predicting demand for a new product under alternative pricing strategies; designing a business plan for a new technology; analyzing the impact of a merger on market shares; forecasting the ridership on a new metropolitan transit service; and analyzing competitive scenarios for introducing a new telecommunication service. To accomplish these tasks, discrete choice analysis provides powerful methodological tools. Based on the modeling of individual behavior, it is used to model in detail the structure of a market, and to predict the impact of various scenarios.

This one-week program undertakes an in-depth study of discrete choice models and their applications. It provides participants with the practical tools necessary for applying new discrete choice techniques. By examining actual case studies of discrete choice methods students will be familiarized with problems of data collection, model formulation, testing, and forecasting and will gain hands-on application experience by using readily available software to estimate and test discrete choice models from real databases. The course will emphasize applications of discrete choice methods to strategic and tactical marketing and to policy-related problems.

The course will cover the following topics: Fundamental methodology, Data collection issues, Model estimation issues, Forecasting techniques, Examples and case studies. It is assumed that participants have a basic knowledge of statistical methods, including linear regression models. No a priori knowledge of discrete choice models is needed. Basic topics are covered early in the week, while more advanced topics are covered later. An introduction to the software package BIOGEME that will be distributed at the course will be provided during the first lab, prior to working on the case studies. It may be useful to review basic statistical methods in a textbook such as R. J. Larsen and M. L. Marx (2001), *An Introduction to Mathematical Statistics and Its Applications* (3rd Edition), Prentice Hall (chapters 1 to 6). The participants will use their own laptop computers during the lab sessions.

The course has been designed by [Prof. Ben-Akiva](#) who is offering it every summer at the [Massachusetts Institute of Technology](#). It is organized in Europe by Prof. Michel Bierlaire, from the [Transportation and Mobility Laboratory](#) at [EPFL](#).



**INFORMS Conference on Business Analytics & Operations Research**  
**15-17 April 2012, Huntington Beach CA, USA**  
[meetings2.informs.org/Analytics2012](http://meetings2.informs.org/Analytics2012)

The INFORMS Conference on Business Analytics and O.R. addresses people from practice and academia working in the analytics, operations research or, management science fields: 20 focused tracks, 100 talks, 50 poster presentations, Analytics Connect job fair, soft skills workshops, technology workshops, INFORMS professional colloquium and executive forum.

Proposals in all areas and all topics within the business analytics and O.R. arena are welcome. This year, the Committee hopes to receive submissions in three focus areas: healthcare analytics, supply chain management & logistics, and forecasting & risk management. Priority is given to real-world business topics and high-quality academic work geared to real situations.



**SCOR 2012**  
**3rd Student Conference on Operational Research**  
**20-22 April 2012, Nottingham, UK**  
[www.scor2012.com](http://www.scor2012.com)

Building on the success of the previous Student Conferences on Operational Research, we are proud to announce the 3rd edition, SCOR 2012.

PhD students from all European Universities studying Operational Research, Management Science or a related field are kindly invited to submit an abstract for presentation at the conference. The purpose of SCOR 2012 is to provide a friendly environment for doctoral candidates to develop their presentation skills, to receive constructive feedback on their work and to meet other students with similar interests. Deadline for abstract submission: Friday 17th February 2012

Presenters will also be invited to submit a paper (no more than 10 pages) on their work to be published electronically as part of the SCOR 2012 proceedings. This will be available in the Dagstuhl OpenAccess Series in Informatics (OASIs).

Chairman: Stefan Ravizza, University of Nottingham, [smr@cs.nott.ac.uk](mailto:smr@cs.nott.ac.uk)

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## *European Chapter on Combinatorial Optimization*

**ECCO XXV**

**The 25th Conference of the European Chapter on Combinatorial Optimization**

**April 26 - 28, 2012, Antalya, Turkey**

[www.eccoxxv.org](http://www.eccoxxv.org)

The ECCO annual meeting aims to bring together researchers in the field of Combinatorial Optimization to present their work, share experiences, and discuss recent advances in theory and applications. Topics of interest include but are not limited to

- applications of combinatorial optimization in logistics and supply chain management, manufacturing, energy production and distribution, telecommunications, game theory, bioinformatics, health informatics, healthcare, finance, discrete and hybrid dynamical systems, data mining, machine learning, and other fields
- exact solution algorithms, approximation algorithms, heuristics, and meta-heuristics for combinatorial optimization problems
- graph theory and network flows
- integer programming, global optimization, stochastic integer programming, multi-objective programming

Authors are invited to submit an abstract of their paper in English by February 1, 2012 online. Participants of ECCO 2012 are cordially invited for submitting papers for the special issue on Advances in Combinatorial Optimization and Related Topics of the journal Optimization.

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**2012 INFORMS International Conference**

**24 - 27 June 2012, Beijing, China**

[meetings2.informs.org/beijing2012](http://meetings2.informs.org/beijing2012)

The conference will be hosted by Tsinghua University, Beijing, and will take place at the National Convention Center in the Beijing Olympic Park. The theme of the conference will be OR/MS for a Sustainable World. The role of OR/MS in the delivery of social, environmental and economic benefits is increasing in importance but also presents unique challenges and opportunities. The 2012 INFORMS International Conference will be a showcase of relevant research that addresses these challenges and opportunities in the OR/MS context. It will also provide an opportunity for networking for all participants.

Beijing, as the capital of China with over 5,000 years' history, has numerous historic and scenic spots, such as the Great Wall, the Forbidden City, the Summer Palace, and the Temple of Heaven. Moreover, Beijing has undergone many changes in recent years and is becoming a thoroughly modern and cosmopolitan city. The 2012 INFORMS International Conference will provide you with a memorable opportunity to experience it.

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**EURO 2012**  
**25th European Conference on Operational Research**  
**July 8 - 11, 2012, Vilnius, Lithuania**  
[www.euro-2012.lt](http://www.euro-2012.lt)

The subject of the conference is - OR connecting sciences. OR is in its own right a multi-disciplinary field. It provides strategies and decisions for individuals as well as institutions, taking into account complex interaction between people and world.

By connecting to a larger set of existing and new sciences, it is our hope that OR can become an instrument for providing adequate solutions to new challenges in business, technology and society as whole. The Conference will focus on the most relevant topics and issues of European and global science in the field of OR theory and advanced applications.

Vilnius, the historical capital of Lithuania, dating back to the 14th century, has the most beautiful and the largest old town, awarded with the status of World Cultural Heritage by UNESCO, with Vilnius University being the oldest one in Eastern Europe. It is rapidly expanding as a modern European capital, so you can experience the harmony of the old and the new Vilnius. For the participants of the conference this will provide beautiful atmosphere and the mood for work and friendship.

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## OR 2012

**Operations Research 2012, International Annual Conference of the German OR Society  
September 4 – 7, 2012, Hannover, Germany**

[www.or2012.de](http://www.or2012.de)

Special attention will be given to the three topics Energy, Markets and Mobility:

- Climate-neutral production, transportation, storage and use of energy lead to numerous new research questions for OR.
- Understanding and managing financial markets as well as markets for goods and services challenge OR experts - think of the recent financial crisis or the current food crisis.
- More and more people demand mobility, over both short and long distances. New mobility concepts that are both efficient and sustainable need to be understood and managed.

The OR 2012 conference in Hannover will address these topics from an OR perspective, treating them not only in isolation, but also with respect to their numerous and exciting interconnections, such as new energy for new mobility concepts and new market mechanisms for sustainable energy production, to name but a few. We will draw on the vast local expertise to organize an exciting and truly interdisciplinary conference in Hannover. As in former years, the conference will also provide ample opportunities to present OR-related research results in 18 different streams, representing both the many problem-oriented and the methodological aspects of Operations Research as a rich and vivid academic field.



## INFORMS Annual Meeting 2012

**14 - 17 October 2012, Phoenix AZ, USA**

[meetings2.informs.org/phoenix2012](http://meetings2.informs.org/phoenix2012)

Phoenix, a cosmopolitan city in the heart of the desert Southwest looks forward to hosting you as the OR/MS global community comes together to share its latest developments, renew old relationships and make new friends. The theme of the meeting, INFORMATICS RISING, blends the growing role of OR/MS techniques for understanding natural and artificial systems and coupling with computing and communication technologies to drive decision making for enriching our personal lives and enhancing our professional activity. Through talks, panels and tutorials, experts from academia, industry and government will present recent developments and opportunities in key thematic areas including healthcare delivery, security, global enterprise, sustainability and education as well as the underlying tools of the profession.