



Contents lists available at ScienceDirect

EURO Journal on Computational Optimization

www.elsevier.com/locate/ejco



EUR Opt , the Continuous Optimization Working Group of EURO: From idea to maturity



Tibor Illés^{a,*}, Tamás Terlaky^b

^a *Corvinus Center for Operations Research at Corvinus Institute for Advanced Studies, Corvinus University of Budapest, Hungary*

^b *Department of Industrial and Systems Engineering, Lehigh University, Bethlehem, PA, USA*

ARTICLE INFO

Keywords:

EUR Opt
EURO
Continuous optimization

ABSTRACT

This brief note presents a personal recollection of the early history of EUR Opt , the Continuous Optimization Working Group of EURO. This historical note details the events that happened before the formation of EUR Opt Working Group and the first five years of its existence. During the early years EUR Opt Working Group established a conference series, organized thematic EURO Mini conferences, launched the EUR Opt Fellow program, developed an effective rotating management structure, and grown to a large, matured, very active and high impact EURO Working Group.

© 2022 The Author(s). Published by Elsevier Ltd on behalf of Association of European Operational Research Societies (EURO). This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

* Corresponding author.

E-mail addresses: tibor.illes@uni-corvinus.hu (T. Illés), terlaky@lehigh.edu (T. Terlaky).

1. Introduction

Two insightful documents [2,9] were written in the past years about the history of the EUROpt Working Group (WG). They review the later developments, phases of growth of EUROpt WG, however they are not detailing its creation and its early history. With this note we intend to fill this gap.

To create a lasting organization needs imagination, dedication, and support of key people. Thus, the most critical part of the history of EUROpt WG is its pre-history, when the seeds were planted, and its possible creation was entertained. We discuss who were the initiators of forming a EURO WG for continuous optimization researchers; we highlight key milestones and answer fundamental questions: When did the story of the EUROpt WG start? Who were the key players in our community? Who made influential contributions in creating, forming, and developing the EUROpt WG?

After answering these questions, we turn to discuss in more details the pre-history and the first 5 years of the EUROpt WG. The historical documents [2,9] and the paper [8] by Cafieri, Tchemisova and Weber present a summary of the activities in the last twenty years which further document how has EUROpt WG grown to a leading force of our research community.

2. Pre-history of the EUROpt WG

The site EURO XVII Conference, Budapest, Hungary, was announced at the EURO XVI conference in Brussels and in subsequent EURO Bulletins vol. 7 (3–4) 1998 and vol. 8 (3) 1999 [6]. The organization of EURO XVII started immediately. The president of the Program Committee was the former president of EURO, and later the inaugural Laureate of the EURO Distinguished Service Award, Jakob Krarup, while the president of the Organizing Committee was András Prékopa later recipient of the EURO Gold Medal.

In April 1996, Jakob Krarup visited Tibor Illés at Eastern Mediterranean University, Famagusta, Cyprus. As former President of EURO, Jakob was always open to talk about the structure and functionality of EURO. His favourite instruments were at that time the EURO Working Groups (EWG) and Summer Institutes (ESI).

Jakob knew that Tibor is moving from Cyprus to Delft as a visiting researcher, to join the group of Kees Roos and Tamás Terlaky. Jakob's advice was to work on the foundation of a new EURO WG in linear and nonlinear programming, to complement the EURO WG on Combinatorial Optimization. Despite the crucial and fundamental importance of linear and nonlinear optimization for OR, no WG on continuous optimization was formed before. Jakob continued the WG discussion with Tamás in 1998 in Brussels at the EURO XVI Conference. Jakob provided encouragement, gave thoughtful advice, and remained engaged till the formation of EUROpt WG in 2000. In 1999 Tamás moved to Canada but continued to work on the WG project.



Photo by T. Illés: Jakob Krarup and Péter Kas at the edge of Cyprus, April 1996.

The Hungarian Operations Research Society (HORS) hosted the EURO XVII Conference in Budapest, from July 16–19, 2000. This anchor event provided the perfect platform to build on, to capitalize on the possibility to attract a large group of continuous optimization colleagues for a momentous satellite event.

Tibor Illés and Tamás Terlaky decided to organize a satellite event, The 2nd Workshop on Interior Point Methods, just before the EURO XVII Conference, and submitted a proposal (March 2000) to Jakob Krarup, the PC Chair, of the EURO XVII Conference: *“We (T. Illés and T. Terlaky) would like to initiate a EURO Working Group on Linear and Nonlinear Optimization. For this reason, we would like to organize a workshop (The 2nd Workshop on Interior Point Methods, The 1st Workshop on Interior Point Method was held in Budapest, January 5, 1992) before EURO 2000 (Friday and Saturday) and during that Workshop to have the kick-off meeting of the EURO Working Group on Linear and Nonlinear Optimization. The topic of the 2nd Workshop on Interior Point Methods will be Cone-linear Optimization.”*

Jakob replied enthusiastically and gave further valuable advice how to launch and form the WG. Subsequently we contacted several colleagues from Europe, Canada, and the USA. Quickly it became clear that there is a strong support among the continuous optimization community to organize a new EURO WG on Continuous Optimization. The first official announcement on the planned creation of a WG on Continuous Optimization, later called EUROpt WG, was prepared and signed by Tamás Terlaky (as acting coordinator) and Tibor Illés as an initiator, on April 19, 2000, just after the official approval of our proposal from the EURO XVII Conference PC Chair had been received. Illés and Terlaky circulated the letter using their own research networks. Since neither of them were living in Hungary at that time, they contacted Tamás Rapcsák, a member of the EURO XVII OC, to help them in organizing a workshop before the EURO XVII Conference with the aim to launch a new WG on continuous optimization. Rapcsák was

very helpful and with his colleague Éva Nóra Nagy helped in Budapest with the local arrangements of *The 2nd Workshop on Interior Point Methods*.

On July 14, 2000, more than 30 participants, including the most prominent leaders of the “Interior Point Revolution”, gathered at the Budapest University of Economics (Hungarian abbreviation was BKE) to participate at the workshop and to become founding members of the WG on Continuous Optimization. Most of them carried a printed version of the letter signed by T. Illés and T. Terlaky. A lively discussion started about launching and naming the new WG. The first document contained a very simple suggestive name:

Continuous Optimization Working Group (COWG).

After joining the participants, Jakob Krarup promptly started to joke with T. Illés: “*What if a minor typo in the abbreviation would give COW G.*” We were just couple of years after that sheep Dolly, the first cloned mammal, became a star. Jakob said that someone could think that COW G is a name of a project for cloning cows and added: “*We are not in the business of cows! It is forbidden to use that abbreviation.*” Since Jakob knows some Hungarian, immediately told in perfect Hungarian to Illés, Terlaky and Rapcsák: “*Szigorúan tilos!*” (In English: *Strictly forbidden.*) That was, how the search for a good abbreviation, a good name for the continuous optimization WG started. The same day the founding members agreed that *EUROpt* should be the trademark name of the new EURO WG on Continuous Optimization. The objectives of the newly founded WG were summarized in the original report from 2000 as follows

Objectives of the EurOpt working group:

- to form a community in continuous optimization in Europe, organized under the umbrella of EURO;
- to disseminate state-of-the-art knowledge and facilitate research on continuous optimization in Europe;
- to contribute to the education of young optimization people;
- to establish regular information channels and regular meetings;
- to build links with the users of continuous optimization methods;
- to involve industrial organizations in the activities;
- to make the *EurOpt* visible for the outside world by establishing vital contacts with sister working groups of other societies.

In the agreed official name, the O should be printed italic,
reminding us that there is letter O in both of EURO and optimization.

The organizational structure, and duties of the leaders of the *EUROpt* WG were defined too:

Organization:

- The EurOpt has an elected coordinator: *Tamás Terlaky* and a vice-coordinator: *Tibor Illés*, *Department of Operations Research. Eötvös Loránd University of Sciences, Kecskeméti u. 10-12., Budapest, Hungary (E-mail: illes@math.elte.hu).*
- The coordinator represents the EurOpt WG at different bodies/committees of EURO and directs, organizes the activities of the working group based on the suggestions of the members.
- The vice-coordinator prepares and updates the membership list, the WEB page of EurOpt, and in accordance with the coordinator do all the mailing and administrative duties of the WG.
- The term of the coordinator and vice-coordinator is three years.

On July 15, 2000, the workshop has continued under the umbrella of the one-day old EUROpt WG. Most of us felt that, by founding the EUROpt WG, we did something particularly valuable for the continuous optimization community, and for EURO in general.



Participants of the IPM workshop on July 15, 2000, at the Turul statue, Tata, Hungary.

At the workshop we had four internationally highly regarded featured speakers Prof. H. Wolkowicz (Waterloo, Canada), Prof. M. Kojima (Tokyo, Japan), Prof. F. Potra (Maryland, USA), Prof. Y. Ye (Iowa, USA) at the *2nd Workshop on Interior Point Methods*. These colleagues reported their results at the EURO XVII Conference as well.

We think that this is the best place to tell an unforgettable story from the first day of the workshop. A very kind person in a classical black suit, white shirt with a tie and

a very heavy knapsack has entered the room of the workshop around 8 am and kindly introduced himself. All of us in the room were quite keen to learn what is in the seemingly heavy knapsack. Later, from his heavy knapsack, several copies of his newly defended habilitation thesis shown up and landed in hands of some of us as a gift. I (Tibor) keep on my shelf a copy of the habilitation dissertation written by Gerhard-Wilhelm (known by everyone as Willi) Weber, later Chair and Honorary Chair of EUROpt WG, given on the day when the EUROpt WG was founded.

Important to know that the EUROpt Workshops are not only scientific events, but forums of making friendships, and therefore a nice excursion and a good conference dinner was (and still is) part of the EUROpt WG events right from the beginning. Éva Nóra Nagy was an excellent organizer and she was responsible for the excursion and the conference dinner. The scientific part of the workshop was closed by the talk of Willi, as the last speaker. Instead of a closing ceremony, we had a fast lunch and travelled by bus to Tata, a nearby small town, with a lake, castle, nice centre, and an impressive statue (a mythical bird called Turul) on the top of a hill.



Jakob Krarup and Tamás Terlaky at the edge of the conference dinner table on July 15, 2000, in Tata.

Nóra guided us through every interesting part of Tata with a knowledge of a professional tourist guide and selected an extremely good restaurant for the conference dinner. The closing words of the first EUROpt Workshop were told by Jakob Krarup and Tamás Terlaky. Before that, Tamás even gave a short preview on the EURO XVII Conference.

The number of EUROpt WG members on July 19, 2000, when the EURO XVII Conference has been closed, reached almost 60 and at the beginning of the 2nd EUROpt Workshop in Rotterdam, 2001, the number of members has already been doubled.

The following year was filled with activities to set up EUROpt WG as a lasting organization. Tibor created the first web page of EUROpt WG at Eötvös University [4]. Later, in 2003, the web page was redirected to the new web page that was created by Willi Weber's team at the Middle-East Technical University (METU) [5] in Ankara, Turkey. The current version of EUROpt WG's web page [3] can be found at the EURO web page. This web page contains an excellent chronological overview of the history of the EUROpt WG prepared by Willi Weber and his co-authors. Those days, Tamás set up EUROpt WG's first bank account in The Netherlands to deposit savings from the workshops and to establish solid foundation to cover expenses. The organization of the 2001 Rotterdam EUROpt Workshop started immediately, which cemented the tradition of having regular events to celebrate the achievements and impact of Continuous Optimization.

3. EJOR special issue

For the EURO XVII Conference (July 16–19, 2000) held in Budapest we organized a stream of 17 sessions with 51 talks on linear and nonlinear optimization and related topics. The organized sessions were the following

- Pivot methods in LO (T. Illés),
- Linear Complementarity Problems (T. Illés),
- LP and QP software (I. Maros),
- Semi-infinite programming (2 sessions, M.A. Goberna, M.A. Lopez),
- Novel interior-point algorithms (T. Terlaky),
- Semidefinite programming and combinatorial optimization (T. Terlaky),
- Cone-linear optimization (C. Roos),
- Computational aspects of IPMs (T. Terlaky),
- Extensions and applications of IPMs (T. Terlaky),
- Interval methods (T. Csendes),
- Global optimization (2 sessions, T. Csendes),
- Generalized convexity/monotonicity (2 sessions, S. Komlósi),
- Equilibrium systems (S. Komlósi),
- Variational inequalities (G. Kassay, J. Kolumbán).

These talks together were more than 20% of the official program and broadly covered the continuous optimization subject area.

In average those sessions we organized were attended by 30–50 persons (well above the average of the other sessions). It is interesting to note that the talks, even at such sessions as *Pivot methods*, *Linear Complementarity Problems* and *LP and QP software* which were not in the mainstream of the research of those days, were attended by over 40 persons, which was an excellent achievement. The sessions about interior point methods and related topics have attracted even more colleagues.

Two of the founding members of the EUROpt WG, István Maros (Imperial College London, UK) and Tamás Terlaky (McMaster University, Hamilton, Canada) gave semi-plenary talks related to continuous optimization which were attended by about 80 people, a remarkable figure early morning after the fascinating conference banquet.

In the sessions organized by the founding members of the EUROpt WG, numerous worldwide known researchers, among others R.W. Cottle, K. Anstreicher, H. Wolkowicz, M. Kojima, F. Potra, C. Roos, Y. Ye, S. Gass, J. Stoer, J-P. Crouzeix contributed to the success of our sub-stream. Many of them submitted and published papers in the EUROpt WG special issue of EJOR.

The guest editors of the special issue were T. Illés (Eötvös University, Budapest), T. Rapcsák (MTA SZTAKI, Budapest) and T. Terlaky (McMaster University, Hamilton, Canada). The EJOR special issue [11] attracted 24 paper submissions. Due to the page limitations, only 15 papers have been selected for publication in the special issue, 2 were completely rejected and 7 others were redirected to other journals such as CEJOR and PUMA. More than 70 colleagues were participating in reviewing the papers and more than 300 e-mails and some ordinary mails have been exchanged during the preparation of the EJOR special issue. The EUROpt WG special issue is volume 143, number 2 of EJOR, was published in 2002. To date the papers received 540 citations (reading December 31, 2021, google scholar) in total.

Author(s)	Pages	Citations
T. Illés, T. Rapcsák, T. Terlaky	231 – 233	editorial
J. Peng, C. Roos, T. Terlaky	234 – 256	66
F.A. Potra	257 – 267	39
R.J. Caron, H.J. Greenberg, A.G. Holder	268 – 290	30
F. Glineur	291 – 310	10
M. Halicka	311 – 324	34
M. Kojima, L. Tunçel	325 – 341	15
Q. Han, Y. Ye, H. Zhang, J. Zhang	342 – 355	36
H. Wolkowicz	356 – 364	10
T. Rapcsák	365 – 376	48
G. Kassay, J. Kolumbán, Zs. Páles	377 – 389	83
M.A. Goberna, M.A. López	390 – 405	108
K. Meer, G.W. Weber	406 – 418	7
J. Zhang, Y. Xue, P. Zhong, N. Deng	419 – 431	1
L.N. Vicente	432 – 451	5
J. Blomvall, P.O. Lindberg	452 – 461	48

The papers covering the semi-plenary talks of Terlaky (T. Illés, T. Terlaky, Pivot versus interior point methods: Pros and cons, pp. 170–190, received 76 citations) and Maros (I. Maros, M.H. Khaliq, Advances in design and implementation of optimization software, pp. 322–337, received 52 citations) have been published [12,13] in 2002 in the special issue of EJOR volume 143, number 3 edited by J. Krarup and D. Pisinger.

4. The fifth anniversary of EUROPT WG: the 17th EURO Mini Conference

Until we arrived to the first, important anniversary of the EUROpt WG, there were three workshops (Rotterdam, 12–13 July 2001; Istanbul, 4–5 July 2003; Rhodes, 2–3

July 2004). The 2001 Rotterdam workshop further solidified *EUROpt*'s standing with an excellent scientific program, and another high quality *EJOR* special issue. The editors of the corresponding *EJOR* special issue [7] were the organizers of the workshop (J. Brinkhuis, J.G.B. Frenk, G. Still, and G.-W. Weber) and the leaders of the *EUROpt* WG (T. Illés and T. Terlaky).



Conference dinner in Rotterdam, 2001 (from left to right): C. Roos, J.B.G. Frenk, B. Frenk, J. Kolumbán, J. Peng, E. de Klerk, T. Illés.

At the third *EUROpt* Workshop we celebrated the election of new leadership. The new coordinators, Florian Jarre and Gerhard-Wilhelm Weber took over the responsibility to organize the scientific and community life of continuous optimizers in Europe, and to attract colleagues from other continents.

The fifth anniversary of *EUROpt* WG was celebrated by organizing a *EURO* Mini Conference in Pécs, Hungary, with local organizers Sándor Komlósi and József Vörös.

The featured topic of the conference was Continuous Optimization in Industry [1].

The announcement of the *EURO* Mini Conference included that a total of 6 invited speakers will report their recent research results on novel continuous optimization methods, optimization software development and their applications in industry:

- Erling D. Andersen (MOSEK Aps, Denmark), MOSEK an Optimization Software Package: Recent Challenges and Opportunities



Conference dinner in Istanbul, 2003 (from left to right): G.-W. Weber (elected coordinator)
T. Terlaky (past coordinator), F. Alizadeh (plenary speaker).

- Aharon Ben-Tal (Israel Institute of Technology, Haifa, Israel), “Nonconvex” Optimization Problems
- Hans Georg Bock (University of Heidelberg, Germany), Direct Optimization Methods for Real-Time Computation of Constrained Optimal Closed-Loop Control and Applications in Industrial and Engineering Processes
- Dick den Hertog (Tilburg University, The Netherlands), Simulation, Approximation, and Optimization
- Basil L. Joffe (Aspen Technology, Inc., Houston, Texas, USA), Global Optimization in Refinery Planning
- Kathryn E. Stecke (University of Texas at Dallas, USA), Addressing Industrial Problems Using Various Mathematical Models

Further, 42 contributed talks were presented in the conference and more than 80 participants enjoyed the conference, the scientific discussions, and the conference banquet at a wine cellar, where the discussions were facilitated by the availability of delicious local wine.

Continuing the tradition, after the EURO Mini Conference an EJOR special issue (featured cluster) [10] has been edited by invited editors T. Illés (Eötvös University, Budapest, Hungary), M.A. Lopez (University of Alicante, Alicante, Spain), T. Terlaky

17th EURO Mini Conference: Continuous Optimization in Industry



(McMaster University, Hamilton, Canada), J. Vörös (University of Pécs, Pécs, Hungary) and G-W. Weber (METU, Ankara, Turkey). Finally, from the 12 submitted papers 8 were accepted for publication in this featured cluster.

Author(s)	Pages	Citations
Illés, Lopez, Terlaky, Vörös, Weber	771 – 772	editorial
de Klerk, den Hertog, Elabwabi	773 – 785	20
Castillo, Kampas, Pintér	786 – 802	249
Hendrix, Casado, Garcia	803 – 815	29
Stinstra, den Hertog	816 – 837	61
Winterfeld	838 – 854	45
Ugur, Karasözen, Schafer, Yapici	855 – 863	7
Shen, Zhang	864 – 887	39
Fábián	888 – 911	121

The featured cluster in EJOR on Continuous *Optimization in the Industry* received more than 550 citations according to google scholar (reading of December 31, 2021).



Participants of the 17th EURO Mini Conference on Continuous Optimization in Industry, University of Pécs, Pécs, Hungary, 2005.

5. Concluding remarks

This paper, as personal recollection, documents the process and the early milestones of the formation of the *EUROpt* WG. We recall the organization of the first three workshops and the 2005 EURO Mini conference which provided the venue to celebrate the 5th anniversary of the *EUROpt* WG. In the early years, a separate special issue of *EJOR* was attached to each workshop and conference, allowing the publication of carefully selected excellent papers on continuous optimization in a single volume.

These special issues have made a significant contribution to making the *EUROpt* WG known in the continuous optimization community worldwide. The development of the *EUROpt* WG has been facilitated by strong support and dedicated work of the *EUROpt* community. More than 150 colleagues were taking an active part in organizing conferences, editing *EJOR* special issues, writing articles, and reviewing those in the first five years.

Members and leaders of the *EUROpt* WG jumped on every opportunity to promote research on continuous optimization in Europe and to recruit new members to the *EUROpt* WG.

Now, when we celebrate the 20th anniversary of *EUROpt* WG, we could conclude that the *EUROpt* WG is a real success story in the European operations research community.



Welcome address by József Vörös, Vice-Rector of the University of Pécs, at the Banquet of the 17th EURO Mini Conference in a wine cellar in Villány, 2005. Next to him Tamás Terlaky PC chair of the EURO Mini Conference.

Declaration of competing interest

We know of no conflicts of interest associated with this publication.

Acknowledgement

The authors are grateful for the incredible support of the continuous optimization community that propelled an idea to a high impact scientific organization. It is impossible to name all the devoted supporter *EUROpt* WG who we would like to thank for their support and friendship. Still, we need to mention two friends. First, we are deeply indebted to Jakob Krarup for his inspiring advise, help and support. Without Jakob's contributions *EUROpt* WG might not come to existence. Second, we would like to express our utmost appreciation to Gerhard-Wilhelm Weber, known by everyone as Willi, who from the start until today spent countless hours to manage, to build, and promote *EUROpt* WG.

References

- [1] [The 17th EURO Mini Conference: continuous optimization in industry, 2005, 70 pages.](#)

- [2] A brief history of EUROPT, <https://www.euro-online.org/websites/continuous-optimization/history>.
- [3] EUROpt WG's web page at EURO, since 2012, <https://www.euro-online.org/websites/continuous-optimization/>.
- [4] EUROpt WG's web page at Eötvös University, 2000–2003.
- [5] EUROpt WG's web page at Middle-East Technical University, 2003–2012.
- [6] EURO Bull. 8 (3) (1999), https://www.euro-online.org/media_site/bulletins/bulletin_vol8_3_1999.pdf.
- [7] J. Brinkhuis, T. Illés, J.G.B. Frenk, G.-W. Weber, T. Terlaky, G. Still, in: International Workshop on Smooth and Nonsmooth Optimization, Rotterdam, July 12–13, 2001, *Eur. J. Oper. Res.* 157 (1) (2004) 1–2.
- [8] S. Cafieri, T. Tchemisova, G.-W. Weber, Twenty years of EUROPT, the EURO Working Group on continuous optimization, *EURO J. Comput. Optim.* (2022), submitted for publication.
- [9] S. Cafieri, H. Weiss, G.-W. Weber, G. Bigi, A brief history of EUROPT (20 years), the European Continuous Optimization working group, 2000-2020, Toulouse, France, https://europt2021.recherche.enac.fr/?page_id=871, 2021.
- [10] T. Illés, M.A. Lopez, T. Terlaky, J. Vörös, G.-W. Weber, in: 17th EURO Mini Conference “Continuous Optimization in the Industry”, Pécs, Hungary, June 29–July 1, 2005, *Eur. J. Oper. Res.* 191 (3) (2008) 771–772.
- [11] T. Illés, T. Rapcsák, T. Terlaky, IPM 2000: continuous optimization, *Eur. J. Oper. Res.* 143 (2) (2002) 231–233.
- [12] T. Illés, T. Terlaky, Pivot versus interior point methods: pros and cons, *Eur. J. Oper. Res.* 140 (2) (2002) 170–190.
- [13] I. Maros, M.H. Khaliq, Advances in design and implementation of optimization software, *Eur. J. Oper. Res.* 140 (2) (2002) 322–337.