



Final report

ESI X - Combinatorial Optimization

Groupe HEC - Jouy-en-Josas - France

July 2 - 15, 1994

ESI X – Combinatorial Optimization

Groupe HEC – Jouy-en-Josas – France

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This is the final report on the 10th EURO Summer Institute (ESI), held in France in July 1994, on the subject of Combinatorial Optimization. The organization of these two weeks was a challenging affair and, when it was finished, there still remained a tremendous amount of work, including the preparation of the special issue of EJOR dedicated to this ESI.

Though intensive, it was a great pleasure for us to organize this event, and we were helped in this respect by many people and supported by our universities and sponsors. We want to thank all of them, as well as the 25 young researchers who participated actively in the ESI and for whom it was a memorable experience.

Considering the special interests of this ESI, we thought it would be nice to have something by which group members could be recognized, especially if it had a relationship with combinatorial optimization. We therefore gave each participant a bag with which he or she could get real-life experience with knapsack optimization. The photograph below is a representation of our experimental equipment...

Catherine Roucairol
PRISM - UVSQ

Hervé Thiriez
Groupe HEC



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Admittance

Limited to 20 promising young scientists (age 25-35) from different European countries.

Activities

Each participant will present a research paper on a topic within the theme. In addition to these seminars, the Scientific Committee will also organize lectures by invited experts. A special issue of EJOR (European Journal of Operations Research) will be prepared based on papers presented at the Institute. To facilitate network building among the participants, the Organizing Committee will prepare a rich and varied social program.

Location – Accomodation

Groupe HEC is located in a splendid park, 10 miles south-west of Paris. Free accomodation and registration will be provided for the selected participants.

Applications

Applicants should submit their curriculum vitæ together with an unpublished paper within the theme of the Institute to their

national OR society. These societies will select their national candidates and submit their applications to the organizers of ESI X before April 1st, 1994. The final choice will be made by the Scientific Committee, and the selected candidates notified by May 1st, 1994.

Information

Available from your national OR society or directly from the Organizing Committee.

Scientific Committee

- Catherine Roucairol, *Université de Versailles and INRIA*
- Hervé Thiriez, *Groupe HEC*
- Jacques Carlier, *Université de Compiègne*
- Pierre Dejax, *Ecole Centrale Paris*
- Gerd Finke, *Université de Grenoble*
- Eric Jacquet-Lagrèze, *AFCET*
- Martine Labbé, *Université Libre de Bruxelles*
- Michel Minoux, *Université Paris VI*
- Gérard Plateau, *Université Paris-Nord*
- Pierre Tolla, *Université Paris Dauphine*
- Dominique de Werra, *Ecole Polytechnique Fédérale de Lausanne*

Organizing Committee

- Catherine Roucairol, *Université Paris VI and INRIA*
- Gérard Plateau, *Université Paris-Nord*
- Hervé Thiriez, *Groupe HEC*
- Pierre Tolla, *Université Paris Dauphine*

Theme

This EURO Summer Institute is suitable for students who are presently engaged in Combinatorial Programming, either in theoretical aspects or in business, industry or public administration applications... All the fields of Combinatorial Programming will be taken in consideration. However, a particular emphasis will be attached to the following topics :

- combinatorial models in manufacturing ;
- new heuristic methods for difficult problems ;
- local search methods ;
- interior point methods ;
- routing problems ;
- communication networks ;
- recent developments in classical combinatorial problems (e.g. assignment, knapsack, partitioning problems, ...)

Deadline for papers:
December, 1993.

Location

Groupe HEC is located in the countryside, just outside Paris, in a very pleasant and attractive setting. The buildings are within a magnificent park with athletic facilities for everyone. A meeting room will be available for the participants. Address : Groupe HEC, 1 rue de la Libération - F-78350 Jouy-en-Josas - France.

Food and lodging

Rooms will be offered to the participants on campus. The campus restaurant and cafeteria will be open to the participants.

Social activities

Several social activities will be organized since the conference site, Jouy, is five miles away from Versailles and not far from Paris (45 minutes by public transportation). The fact that the campus is located outside the town of Jouy, with few facilities to go out, will help create a friendly atmosphere.

Furthermore, the Summer School will include the French national holiday (July 14th), with its numerous activities. There will also be a barbecue party at the house of the new president of AFECT, Eric Jacquet-Lagrèze, who lives in Jouy.

Editorial for the Special Issue of EJOR

Catherine ROUCAIROL,
Chief Editor
*Université de Versailles Saint-Quentin,
PRISM, France*

Hervé THIRIEZ, CoEditor
Groupe HEC, Jouy-en-Josas, France

Jakob KRARUP, Guest Editor
*DIKU, Department of Computer
Science, University of Copenhagen,
Denmark*

Gérard PLATEAU, Guest Editor
*LIPN, Université Paris-Nord,
Villetaneuse, France*

Pierre TOLLA, Guest Editor
*LAMSADE, Université de Paris-
Dauphine, Paris, France*

ESI X, the 10th EURO Summer Institute, was held on 2-15 July 1994 on the campus of Groupe HEC (Ecole des Haute Etudes Commerciales) south-west of Paris, close to the small village of Jouy-en-Josas and to Versailles. The theme of ESI X was *Combinatorial Optimization*.

Combinatorial optimization has indeed experienced a tremendous growth during the last few years. Much significant research has been carried out on many frontiers in the intervening 15-20 years and a wide variety of new applications have been reported on in the literature. However, in view of the theoretical developments, the documented ability to solve realistic problems, the wealth of open questions that still remain, and for the benefits of the next generation of researchers, the idea of organizing a EURO Summer Institute on the subject appeared to be both timely and pertinent.

But the organization of such an event is subject to a number of difficulties. The first one related to the selection of the participants.

The selection process

The objective of the ESI, as defined by tradition, was to select 20 promising young scientists (aged ≤ 35). But most national OR

Societies submitted at least 2 candidates, Italy offering no less than 6 candidates !

The Scientific Committee was happy to observe that Combinatorial Optimization was attractive to so many qualified researchers, but faced a more than difficult task in the selection which had to follow.

The ultimate selection process was a complex affair involving several conflicting objectives. The quality of the papers submitted was obviously taken into account but also the national distribution and the distribution of the papers among the numerous subfields of Combinatorial Optimization. As a consequence, we were in some cases led to reject papers of high quality.

The final number of 25 candidates representing 15 different countries – but originating from 19 countries ! – appeared to be surprisingly large.

The final candidates were sent by the following OR societies :

- Austria (2) – Belgium (2) –
- Denmark (2) – Finland (1) –
- France (4) – Germany (1) –

Greece (1) – Italy (3) – Norway (1) – Poland (2) – Portugal (1) – Spain (1) – Switzerland (1) – Turkey (1) – U.K. (2). And that includes participants also originating from Albania, Algeria, China and Irak ! The average age was 24, with a minimum of 20 and a maximum of 28.

The themes represented by the final candidates covered the recent trends in Combinatorial Optimization – metaheuristics, polyhedral approaches – as well as more traditional problem areas such as scheduling, knapsack, 0-1 quadratic programming, ...

The scientific program

During the first week, each participant presented his research paper to the ESI.

The list of papers follows.

George Adamopoulos (GR)	Optimal multicriteria scheduling on parallel non identical processors
Alper Atamtürk (TK)	Efficient algorithms for the minimum cost perfect matching problem on general graphs
Mette Helene Bjoerndal (N)	A model for combining leased lines and compression devices in a private telephone network
Bertrand Bugnon (CH)	A new method for dynamic scheduling
Alberto Caprara (I)	Odd cut sets, odd cycles and zero-1/2 Chwatal-Gomory cuts
Eranda Cela (A)	Heuristics for biquadratic assignment problems and their computational comparison
Peter Ivan Cowling (B)	Bounds for the symmetric TSP through matroid formulation
Frederico Della Croce (I)	Generalized pairwise interchanges and machine scheduling
Maciej Drozdowski (PL)	On the complexity of multiprocessor task scheduling
Virginie Gabrel (F)	Détermination d'ensembles stables maxima et évaluation du nombre de stabilité pour le problème de la planification à moyen terme de la production d'un satellite d'observation
Jarmo Hemminki (SF)	Container loading with variable strategies in each layer
Golinar I. Jalal (DK)	The p-active facility location problem
Safia Kedad (F)	Parallel Machine Scheduling: Applications to the packaging lines in the food industry

Valérie Lampe (B)	An industrial disposing problem: a simulated annealing solution
Carrie Lin Ka Yuk (UK)	A comparative study of both standard and adaptive versions of threshold accepting and simulated annealing in three scheduling problems
Frederico Malucelli (I)	Lower bounds for the quadratic semi-assignment problem
Alexander Jason Orman (UK)	On the complexity of coupled-task scheduling
Ulrich Pferschy (A)	The inverse-parametric knapsack problem
David Pisinger (DK)	A minimal algorithm for the multiple-choice knapsack problem
Helena Ramalhinho Lourenço (P)	Local optimization and the job-shop scheduling problem
César Rego (F)	An efficient implementation of ejection chain procedures for vehicle routing problems
Laure Renotte (F)	Approximability preserving reductions for NP-complete problems
Juan Jose Salazar Gonzalez (SP)	The symmetric generalized traveling salesman polytope
Stefan Tschöke (D)	Solving the 2-dimensional cutting-stock problem using a portable parallel branch and bound library
Rafal Walkowiak (PL)	Parallel tabu search for two-dimensional irregular cutting

For some participants, this was their first presentation outside their home country. Overall, the presentations were of excellent quality. As a matter of fact, a sort of competition grew out of these presentations and – as time went – they became more and more sophisticated and creative (nice fonts, color, graphic illustrations, special effects...). This culminated with an original and beautiful presentation (of Italian origin) without transparencies, using the blackboard as the only visual aid (in the old tradition of “discrete” mathematicians) which brought down the house.

During the second week, there were parallel working sessions by theme, the main themes being : Heuristics – Graph – Scheduling – Knapsack – Cutting stock & Location – Polyhedral and Quadratic Assignment Problem. The most demanding part of the organizers’ task was to run the working sessions, where the contributions to this special issue of EJOR were prepared.

In the second week, there were also presentations of recent work by Professors Jakob Krarup (DIKU), Gerd Finke (IMAG, Grenoble), Hervé Thiriez (Groupe HEC) and Dominique de Werra (EPFL, Switzerland), with presentations of “open” problems.

Special thanks must be extended to Jakob Krarup who spent the two full weeks with the group and was a tremendous help as well on the scientific side as with the social life.

Keeping in pace with tradition, this special issue of EJOR is dedicated to this Institute. The selection procedure for the papers included in this issue took place in December and was quite demanding, since only 11 papers – by lack of space – could be kept amongst the 20 papers eventually submitted.

Considering the enthusiasm and dynamism the participants to this ESI showed in regard to Combinatorial Optimization, the Scientific Committee felt it was interesting to break with the tradition by which such special issues open with an invited review. We therefore invited the participants, the researchers of the next decade (at least), to write this review by themselves.

The took the gamble and set up a workgroup to that purpose. Their work continued well after the ESI, with meetings in Italy and numerous e-mail exchanges. As a consequence, you will enjoy this review on Combinatorial Optimization by participants of the ESI.

Social program

The social program is always a major component for the integration of people from so many different origins. There were many unforgettable moments : the visit of the Château de Versailles and of its gardens, the latter by a searing heat – the BBQ at the University of Versailles – Montmartre – the French Senate (which is normally not open to public visits) – an evening at the home of Hervé Thiriez – several evenings down by the lake at HEC. As far as the social activities are concerned, the ESI wishes to thank the new President of AFCET, Eric Jaquet-Lagrèze, who also took the whole group for dinner to his home.

Groupe HEC was also most helpful by providing the ESI not only with meeting rooms but also with extensive sports facilities, personal e-mail accounts, and a food of far better quality than typical university standards.

Jouy-en-Josas is close to Versailles and Paris, just far enough from Paris to avoid participants running away to Paris instead of taking part in the afternoon sessions... but close enough for the “14 juillet” national day : “Liberté, Egalité,

Fraternité” is a motto which should appeal to all young Europeans ! The main problem we met with the social program was that the World Cup often was a major distraction : never program a ESI during a soccer World Cup !

Acknowledgments

The funding of an ESI is always a difficult process, since the participants are completely taken in charge : room, board, social activities, ... In this case, the total budget was more than \$ 30,000 with EURO picking up around 40 % of the tab, and many other contributors helping out. We wish to extend our thanks to all the sponsors who made this event possible :

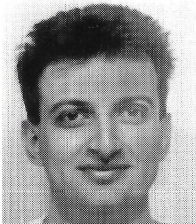
- EURO
- Groupe HEC (Ecole des Hautes Etudes Commerciales), Paris
- Ministère de la Défense : DRET, Direction des Recherches, Etudes et Techniques
- EDF, Electricité de France
- AFCET, the OR society of France
- OR, the OR Society of the U. K.
- LAMSADE, Laboratoire d’Aide à la Décision de Dauphine

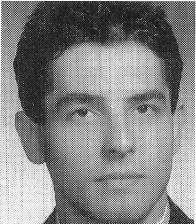
- PRISM, Université de Versailles Saint-Quentin
- LIPN, Université Paris-Nord
- Ecole Centrale Paris
- Beyers & Partners
- Artemis/IMAG, Laboratoire de Grenoble
- Diagma, a French consulting company
- Cosytec, a French consulting company


Concluding remarks

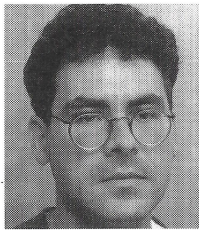
We have learned much through the organization of this ESI. We hope others will continue in these tracks, both with the organization of other ESIs, and with work in Combinatorial Optimization. Our special thanks go to the new EURO Gold Medalist, Jean-Pierre Brans, who created the ESI concept in 1984 !

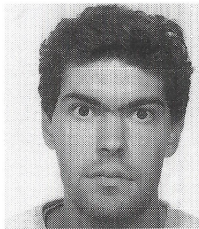
List of Participants

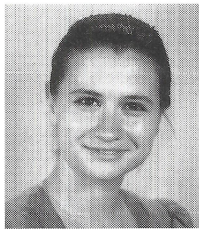
	Name	George Adamopoulos
	Birthdate	
	Origin	Greece
	Institute	University of Piraeus
	Address	80 Karaoli & Dimitriou str. 185 34, Piraeus
	Country	Greece
	e-mail	

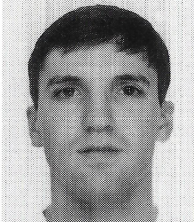
	Name	Alper Atamtürk
	Birthdate	
	Origin	Turkey
	Institute	Bilkent University
	Address	Dept. of Industrial Engineering TR06533 Bilkent Ankara
	Country	Turkey
	e-mail	isyc.gatech.edu

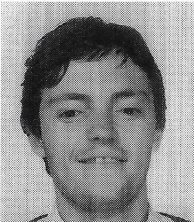
	Name	Mette Helene Bjoerndal
	Birthdate	
	Origin	Norway
	Institute	Norweg. School of Ec.& Bus. Adm.
	Address	Inst. of Finance and Manag. Science Helleveien 30 N-5035 BERGEN-SANDVIKEN
	Country	Norway
	e-mail	for_mb@debet.nhh.no

	Name	Bertrand Bugnon
	Birthdate	
	Origin	Switzerland
	Institute	Inst. Inform. de l'Univ. de Fribourg
	Address	Regina Mundi, Faucigny 2 CH - 1700 Fribourg
	Country	Switzerland
	e-mail	bugnon@uhifr.ch

	Name	Alberto Caprara
	Birthdate	
	Origin	Italy
	Institute	Universita di Bologna
	Address	Dipartimento di Elettronica, Informatica e Sistemistica - viale Risorgimento 2 I-40136 Bologna
	Country	Italy
	e-mail	alberto@boder1.cineca.it


	Name	Eranda Cela
	Birthdate	
	Origin	Albania
		Institute Technical University Graz
	Address	Institut für Mathematik B Steyergasse 31 A-8010 Graz
	Country	Austria
	e-mail	cela@fmatbds01.tu-graz.ac.at


	Name	Peter Ivan Cowling
	Birthdate	
	Origin	U. K.
	Institute	Université Libre de Bruxelles
	Address	SMG, CP 210/01 Bd. du Triomphe 1050 Bruxelles
	Country	Belgium
	e-mail	cowling@ulb.ac.bc


	Name	Frederico Della Croce
	Birthdate	
	Origin	Italy
	Institute	D.A.I. Politecnico di Torino
	Address	Corso Duca degli Abruzzi 24, 10129 Torino
	Country	Italy
	e-mail	dellacroce@polito.it

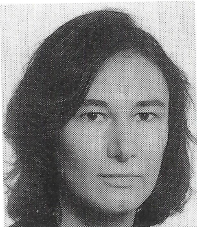
	Name	Maciej Drozdowski
	Birthdate	
	Origin	Poland
	Institute	Institute of Computing Science
	Address	Poznan University of Technology ul. Piotrowo 3a 60-965 Poznan
	Country	Poland
	e-mail	maciej_d@poczlv.tup.edu.pl

	Name	Virginie Gabrel
	Birthdate	
	Origin	France
	Institute	Université Paris-Dauphine-LAMSADE
	Address	Place du Mal de Lattre de Tassigny 75775 Paris Cedex 16
	Country	France
	e-mail	gabrel@lamsade.dauphine.fr


	Name	Jarmo Hemminki
	Birthdate	
	Origin	Finland
	Institute	University of Turku
	Address	Dept of Applied Math. 20500 Turku
	Country	Finland
	e-mail	jhemminki@utu.fi

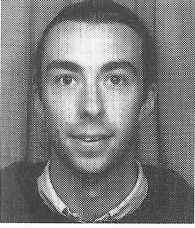
	Name	Golarin I. Jalal
	Birthdate	
	Origin	Irak
	Institute	University of Copenhagen
	Address	Universitetsparken 1 DK-2100 Copenhagen O
	Country	Denmark
	e-mail	gala@diku.dk


	Name	Safia Kedad
	Birthdate	
	Origin	Algeria
	Institute	Ecole Centrale de Paris
	Address	Labor. Productique Logistique Grande Voie des Vignes 92295 Châtenay Malabry
	Country	France
	e-mail	kedad@cti.ecp.fr

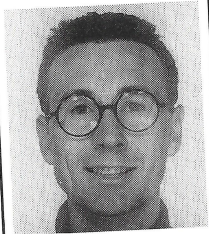
	Name	Valérie Lampe
	Birthdate	
	Origin	Belgium
	Institute	Faculté Polytechn. de Mons
	Address	Service de RO et Maths 9, rue de Houdain B-7000 Mons
	Country	Belgium
	e-mail	lampe@lanssade.dauphine.fr

	Name	Carrie Lin Ka Yuk
	Birthdate	
	Origin	China
	Institute	University of Birmingham
	Address	School of Manufacturing ... Edgbaston Birmingham B15 2TT
	Country	U.K.
	e-mail	linck@uk.ac.bmham

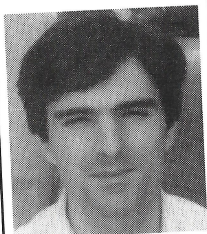
	Name	Frederico Malucelli
	Birthdate	
	Origin	Italy
	Institute	Dipartimento of Informatica
	Address	Datalogisk Institut, 2-del Univ. di Pisa – Corso Italia 40 I-56125 Pisa
	Country	Italy
	e-mail	maluc@di.unipi.it


	Name	Alexander Jason Orman
	Birthdate	
	Origin	U. K.
	Institute	University of Southampton
	Address	Faculty of Math. Studies Highfield Southampton S09 5NH
	Country	U. K.
	e-mail	ajo@uk.ac.soton.maths

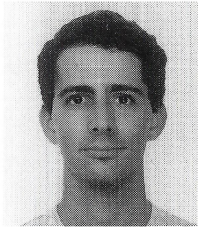
	Name	Ulrich Pferschy
	Birthdate	
	Origin	Austria
	Institute	Technical University Graz
	Address	Institut für Mathematik B Steyergasse 31 A-8010 Graz
	Country	Austria
	e-mail	pferschy@ftug.dnet.tu-graz.ac.at


	Name	David Pisinger
	Birthdate	
	Origin	Denmark
	Institute	University of Copenhagen
	Address	Universitetsparken 1 DK-2100 Copenhagen O
	Country	Denmark
	e-mail	pisinger@diku.dk

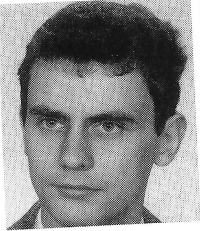
	Name	Helena Ramalhinho Lourenço
	Birthdate	
	Origin	Portugal
	Institute	Faculdade de Ciências
	Address	Universidade de Lisboa Bloco C2 - Campo Grande 1700 Lisboa
	Country	Portugal
	e-mail	helena@gist.deio.fc.ul.pt

	Name	César Rego
	Birthdate	
	Origin	France
	Institute	INRIA / Université Paris VI
	Address	Domaine de Voluceau B. P. 105 78153 Roquencourt - Le Chesnay
	Country	France
	e-mail	rego@eden.inria.fr


	Name	Laure Renotte
	Birthdate	
	Origin	France
	Institute	LAMSADE, U. Paris-Dauphine
	Address	Pl. du Mal de Lattre de Tassigny 75775 Paris cédex 16
	Country	France
	e-mail	renotte@lamsade.dauphine.fr


	Name	Juan Jose Salazar Gonzalez
	Birthdate	
	Origin	Spain
	Institute	Universidad de La Laguna
	Address	DEIOC, Facultad de Matemáticas C/.Astrofisico Francisco Sanchez 38271 La Laguna – S/C. de Tenerife
	Country	Spain
	e-mail	jjsalazar@ull.es


	Name	Stefan Tschöke
	Birthdate	
	Origin	Germany
	Institute	University of Paderborn
	Address	Departm. of Computer Science Warburgerstr. 100 33095 Paderborn
	Country	Germany
	e-mail	sts@uni-paderborn.de

	Name	Rafal Walkowiak
	Birthdate	
	Origin	Poland
	Institute	Institute of Computing Science
	Address	Poznan University of Techn. ul. Piotrowo 3a 60-965 Poznan
	Country	Poland
	e-mail	walkowiak@poznlv.tup.edu.pl

Last, but not least...

	Name	Jakob Krarup
	Institute	University of Copenhagen
	Address	Universitetsparken 1 DK-2100 Copenhagen O
	Country	Denmark
	e-mail	krarup@diku.dk

	Name	Catherine Roucairol
	Institute	PRISM - Université de Versailles Saint Quentin
	Address	23, rue du Refuge 78035 Versailles Cedex
	Country	France
	e-mail	catherine.roucairol@prism.uvsq.fr

	Name	Hervé Thiriez
	Institute	Groupe HEC
	Address	1, rue de la Libération 78350 Jouy-en-Josas
	Country	France
	e-mail	thiriez@frhec1.hec.fr

Budget of the ESI

ESI X : financing

EURO	\$	12 885,78
DRET (Ministère de la Défense)	\$\$	4 716,98
Groupe HEC	\$\$\$	3 773,58
EDF - Electricité de France	\$\$\$	3 773,58
AFCET	\$\$\$	1 886,79
U.K. Operations Research Society	\$\$\$	1 509,43
Other sponsors (see below)	\$	4 078,46
	\$	32 624,60

Other sponsors
Artemis/IMAG, Grenoble
Beyers & Partners
Cosytec
Diagma
Direction générale de l'Armement
Ecole Centrale Paris
LAMSADE, Paris Dauphine
LIPN, Université Paris-Nord
PRISM, Université Versailles Saint-Quentin

ESI : expenses

Housing	\$	13 950,94
Secretaries, mail, photocopies	\$\$	6 384,53
Food	\$\$\$	4 509,16
Brochure	\$\$\$	2 447,17
Social activities	\$\$\$	1 742,39
Computer expenses	\$\$\$	1 738,68
Travel expenses	\$\$\$	1 260,98
Knapsacks	\$	590,76
	\$	32 624,60

Remark

There are differences between the amounts that have been cashed in and/or paid and the amounts listed above, due to the fact that the expenses spread over a period during which the exchange rate between the dollar and the French franc was anything but stable.

Results of the evaluation questionnaires

	--	-	0	+	++
The ESI has helped me improve my paper	4 %	4 %	20 %	60 %	12 %
Opportunity to build interesting international contacts	0 %	0 %	0 %	28 %	72 %
Intention to further these contacts in the future	0 %	0 %	4 %	36 %	60 %
Overall, the ESI has been scientifically useful to me	0 %	0 %	0 %	76 %	24 %
Appreciation of the organized visits (Versailles, Senate)	0 %	0 %	0 %	43 %	57 %
Quality of the general human atmosphere at the ESI	0 %	0 %	0 %	40 %	60 %
The room and board	0 %	0 %	23 %	45 %	32 %
The overall organization of the ESI	0 %	0 %	8 %	72 %	20 %
My overall appreciation of this ESI	0 %	0 %	0 %	48 %	52 %
Average	0 %	0 %	6 %	50 %	43 %

For each question, there were five possible answers, from very bad (--) to excellent (++) .

Additional remarks or suggestions made by some participants

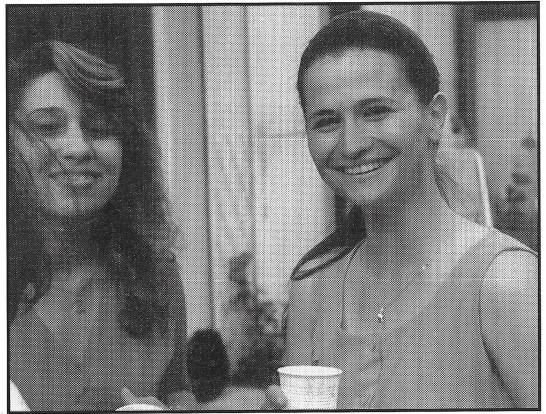
Most of the remarks insist on the quality and global interest of this ESI. Suggestions were made that it would be interesting if more open problems were submitted. The workshops could also have benefited from being more structured. It would be preferable if all the papers could be distributed to all the participants.



Sisters ?

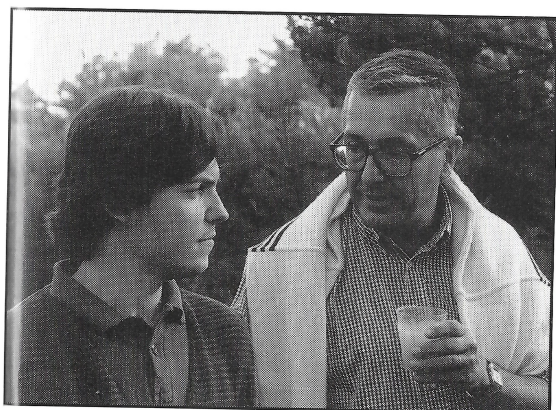
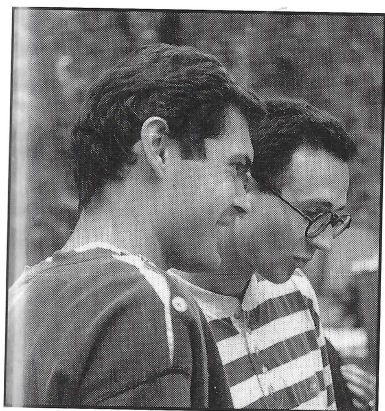


Keeping
an eye...

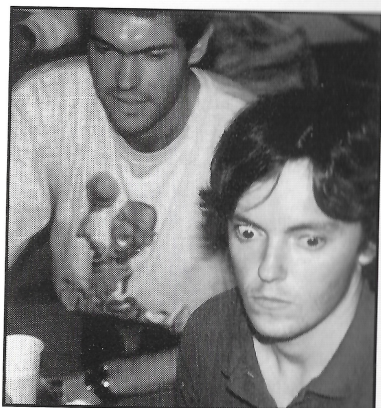




The
dream
team



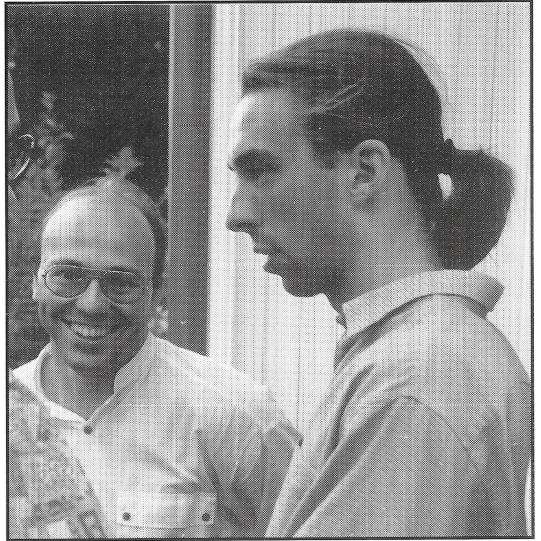
How about a game of tennis ?



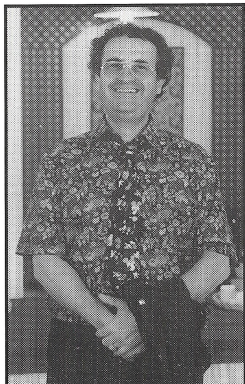
Italy down 1 - 0 !



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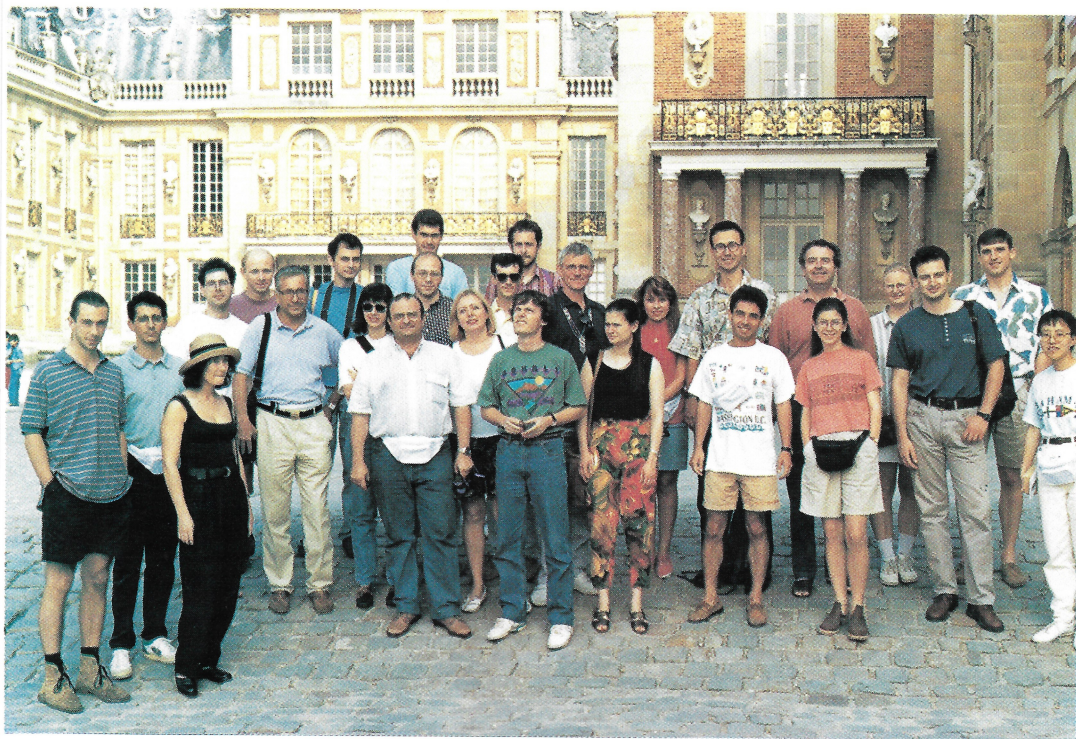


Ulrich misbehaving ?



“I think
the
wallpaper
does not
agree with
my tie”





Participants of the EURO Summer Institute 1994 - ESI X



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