

1st MEETING OF
COMPLEX SYSTEMS
AND SPORT

COM & COM

4th International
CONFERENCE OF
COMPUTER
SCIENCE IN SPORT

Barcelona, May 14 - 17.

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INEFC

Institut Nacional
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de Catalunya



CENTRE DE RECERCA
MATEMÀTICA.



UNIVERSITAT POLITÈCNICA DE
CATALUNYA

The **1st Meeting of Complex Systems and Sport** and the
4th International Conference of Computer Science in Sport

is organized by the

Institut Nacional d'Educació Física de Catalunya (INEFC Barcelona)

in cooperation with

Centre de Recerca Matemàtica (CRM)

and

Universitat Politècnica de Catalunya (UPC).

The event has the intention of bringing together scientists from different disciplines including sport science, mathematics, computer science, exercise physiology, biomechanics, coaching, medicine, physiotherapy, psychology, as well as other areas.

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Castellano



Català

Last modified: 08/05/2003

Maria Zakyntinaki

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The complex and nonlinear nature of the human response to exercise is poorly explained by the traditional models currently used in sport science. These traditional models work best in modelling the response to linear isolated events. This however is only a very small set of the probable or possible events which may occur. The development and application of new complex or nonlinear models and tools will have a major impact on the current learning, training or testing methods commonly used. They will enable us to capture more closely both the nonlinear nature of the response to exercise and also the complex interactions occurring in the practice.

The **1st Meeting of Complex Systems and Sport** is intended to bring together a diverse group of internationally recognised scientists working on different fields, with the aim of applying their knowledge to physical activity and sport. The main objectives include presenting recent developments and open problems as well as to generating new and interesting ideas regarding an alternative nonlinear and complex approach to both modelling learning, testing or training methods. Besides presenting the main concepts and applications of complex and nonlinear mathematics, the meeting is also intended to generate interdisciplinary research projects and also lead to the enrichment of the daily practice of professionals working in the field of physical activity and sport.



During the last years, Computer Science has become an important interdisciplinary partner for numerous traditional sciences. This is due to the fact that the use of data and media, the design of models, the analysis of systems etc. increasingly requires the support of suitable tools and concepts that are developed and available in Computer Science. For this reason and due to the need for international cooperation in this field the first International Symposium of Computer Science in Sport was organised in Cologne (1997). From then on every two years the conference has been successfully organised in different European cities (Vienna, Cardiff). The intention is to provide a platform for the exchange of the latest experiences and ideas regarding the use of Computer Science and supporting the development of theory and practice in sport.

This **4th International Conference of Computer Science in Sport** is intended to reinforce the connections between complex systems and computer science, presenting the necessary tools for the study of complex systems in sport. Special emphasis will be focused on modelling techniques and computer based concepts applied to sport science. It is expected that these tools will enable the study of learning and training processes as dynamical complex systems and will allow the development of an alternative scientific paradigm to that currently used in sport. Finally, the conference will present other recent contributions of computer science to physical activity and sport, emphasising on education and multimedia.

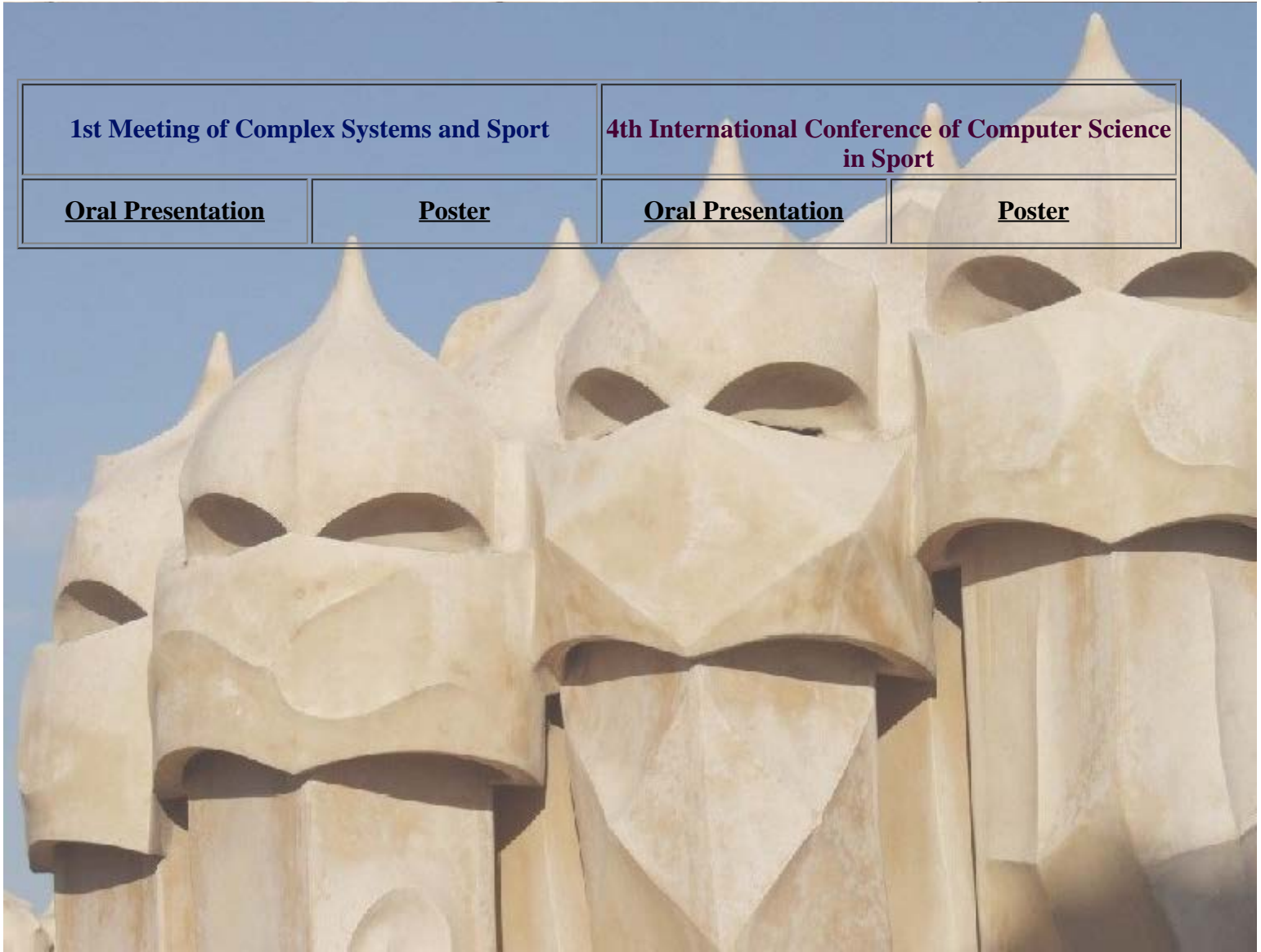
GRANTS RESOLUTION

The following applicants have been awarded with a grant covering their registration fees to the 1st Meeting of Complex Systems and Sport & the 4th International Conference of Computer Science in Sport.

Name	Surname	Institution	Awarded by:
Albert	Gil Galve	INEFC-Centre de Barcelona	CRM-UPC
Javier	Rodríguez Navarro	Universitat de Barcelona - Facultat de Matemàtiques	CRM-UPC
José Pablo	Sanchez Casas	Universitat Politècnica de Catalunya - Facultat de Matemàtiques	CRM-UPC
Gonzalo Marcelo	Ramírez Avila	Université Libre de Bruxelles	CRM-UPC
Cassie	Wilson	Loughborough University	CRM-UPC
Olivier	Oullier	Center for Complex Systems and Brain Sciences - FAU	CRM-UPC
Brynja	Kohler	University of Utah	CRM-UPC
Alejandro	Ferrer San Juan	Universidad Europea de Madrid - FCCAFD	CRM-UPC
Rafael	Peinado	University of Limerick	CRM-UPC
António Paulo	Pereira Ferreira	Universidade Técnica de Lisboa	CRM-UPC
María Teresa	Sanegre Llopis	Universidad de València - Dpt. d'Educació Física i Esportiva	CRM-UPC
Renata	Zumbakyte	Lithuanian Academy of Physical Education	CRM-UPC
Daniel	Link	Univesity of Augsburg	CRM-UPC
Nader	Rahnama	Liverpool John Moore University	CRM-UPC
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Zoltán	Vass	Semmelweis University Budapest	CRM-UPC
Klaus	Tschismar	Westfälische Wilhelms-Universität Münster	CRM-UPC
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Christian	Eder	University of Vienna	CRM-UPC
Mikel	Zabala Díaz	Universidad de Granada - FCCAFD	CRM-UPC
Sarajko	Baksa	University of Zagreb	CRM-UPC
Sebastian	Weber	Deutsche Sporthochschule Köln	CRM-UPC
Valentí	Massana	Centre d'Alt Rendiment Sant Cugat	CRM-UPC
Francisco	Ortega Porcel	Universidad de Granada - FCCAFD	CRM-UPC
Helena	Ylla-Català Puigrefagut	Universitat Politècnica de Catalunya - Facultat de Matemàtiques	CRM-UPC
Daniel	Guimarans	Universitat Autònoma de Barcelona	CRM-UPC
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Gemma	Zapater Rodríguez	INEFC-Centre de Barcelona	INEFC
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1st Meeting of Complex Systems and Sport		4th International Conference of Computer Science in Sport	
<u>Oral Presentation</u>	<u>Poster</u>	<u>Oral Presentation</u>	<u>Poster</u>



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- [Jürgen Perl](#)
- [Bengt Saltin](#)
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- [Susan Ward](#)

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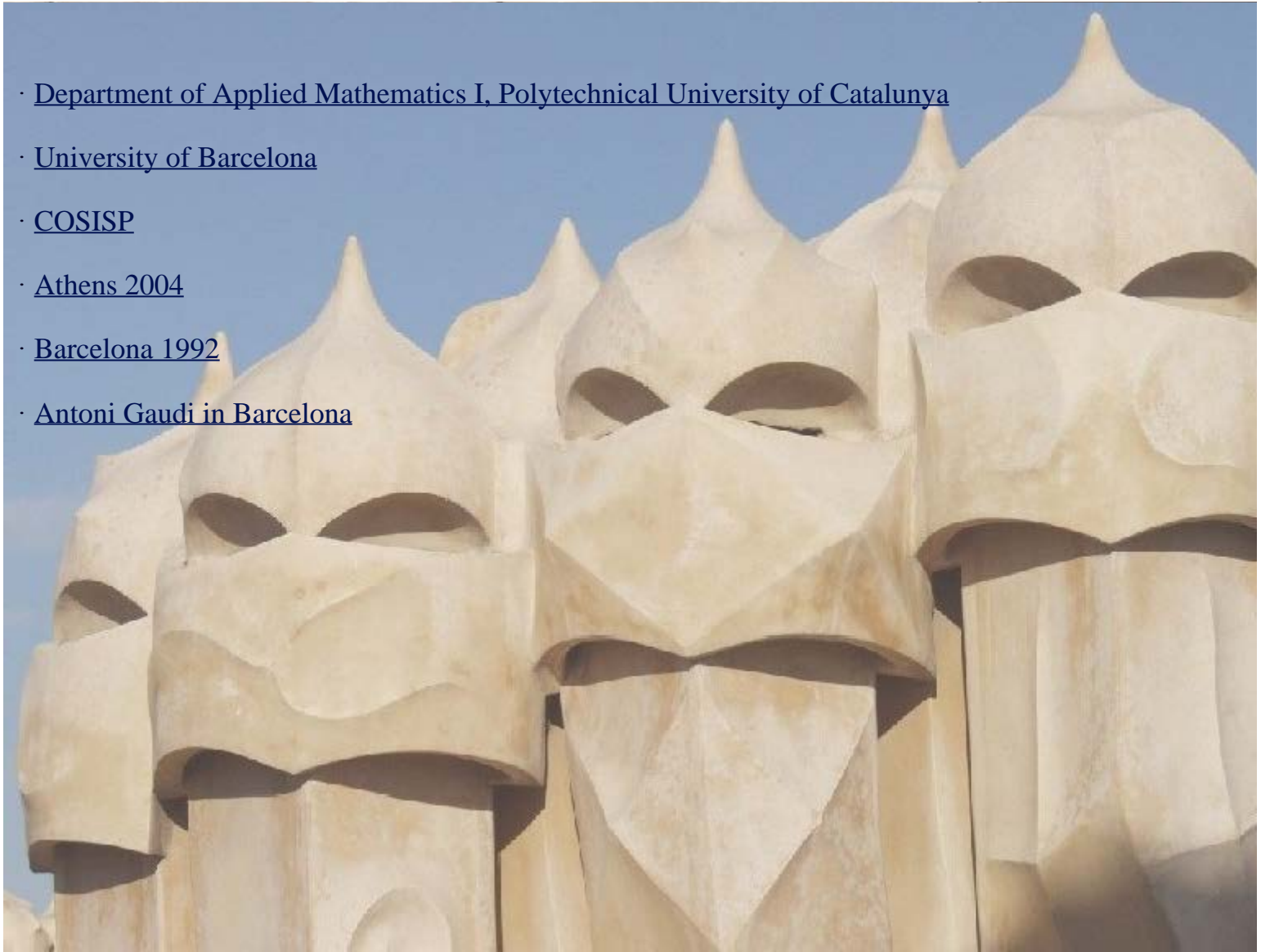
Lecturer	Affiliation
Yaneer Bar-Yam	New England Complex Systems Institute Harvard University, USA
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Keith Davids	School of Physical Education University of Otago, New Zealand
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Domenec Blazquez	Institut Nacional d'Educació Física de Catalunya Centre adscrit a la Universitat de Barcelona, Spain
Josep Escoda	Centre d'Alt Rendiment (CAR) Unitat de Tecnologia & Informàtica, Sant Cugat, Spain
Ulrich Hartmann	Faculty of Sport Science Technische Universität München, Germany
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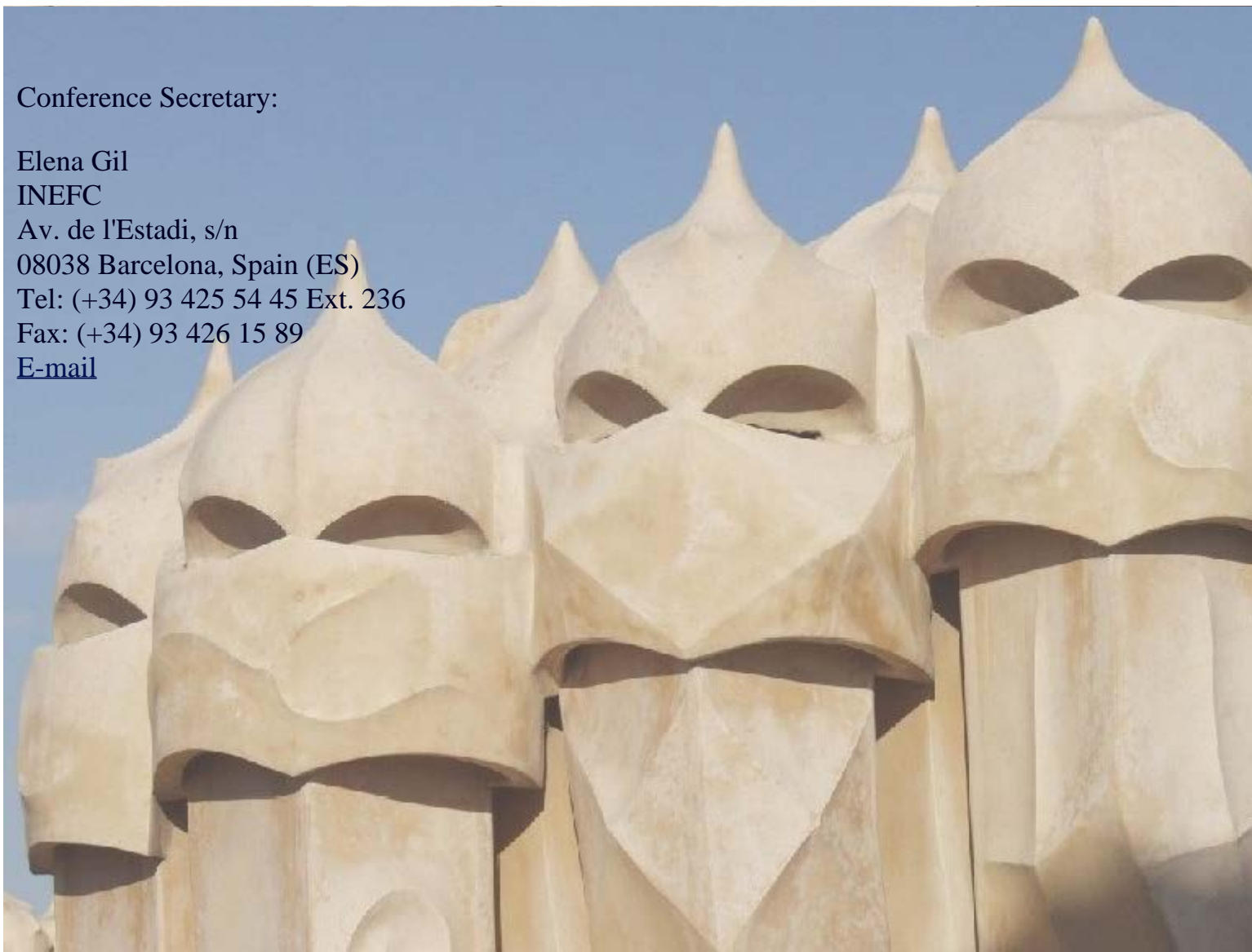
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Las 1^{as} Jornadas sobre Sistemas Complejos y Deporte y la
4a Conferencia Internacional sobre Ciencia Informática y Deporte
están presentadas por el

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Este acontecimiento tiene la intención de ofrecer un marco común a todos los científicos de diferentes disciplinas incluyendo las ciencias del deporte, matemáticas, informática, fisiología del ejercicio, biomecánica, entrenamiento, medicina, fisioterapia, psicología, entre otras áreas.

El **COM & COM** es reconocido con 3 créditos de libre elección por la Universidad de Barcelona.

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Last modified: 08/05/2003
Maria Zakyntinaki

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Les **1es Jornades sobre Sistemes Complexos i Esport** i la
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Universitat Politècnica de Catalunya (UPC) .

Aquest esdeveniment té la intenció d'oferir un marc comú a tots els científics de diferents disciplines incloent les ciències de l'esport, matemàtiques, informàtica, fisiologia de l'exercici, biomecànica, entrenament, medicina, fisioteràpia, psicologia, entre altres àrees.

El **COM & COM** és reconegut amb 3 crèdits de lliure elecció per la Universitat de Barcelona.

Oral Presentations,
1st Meeting of Complex Systems and Sport

Authors	Title
Anguera Argilaga, M.T.; Jonsson, G.K.	DETECTION OF REAL-TIME PATTERNS IN SPORTS: INTERACTIONS IN FOOTBALL
Araújo, D.; Davids, K.; Rocha, L.; Serpa, S.; Fernandes, O.	DECISION MAKING IN SPORT AS PHASE TRANSITIONS
Bertollo, M.; Comani, S.; Caulo, M.; Tartaro, A.	AN FMRI STUDY ON AUTO- DETERMINED AND ETERO- DETERMINED FINGER MOVEMENTS
Castañer i Balcells, M.; Camerino i Foguet, O.	A SYSTEMIC VIEW OF THE ASPECTS THAT CONSTITUTE HUMAN MOTRICITY
Felici, F.; Fattorini, L.; Filligoi, G.C.; Sbriccoli, P.; Bazzucchi, I.; Rosponi, A.;	MYOELECTRIC SIGNS OF FATIGUE DURING CONSTANT AND RHYTHMIC ISOMETRIC CONTRACTIONS
Filligoi, G.; Felici, F.; Sbriccoli, P.; Fattorini, L.; Bazzucchi, I.; Rosponi, A.	MIXING LINEAR AND NON-LINEAR APPROACH TO SURFACE EMG ANALYSIS TO INFER MOTOR CONTROL STRATEGIES
Hellard, P.; Avalos, M.; Menaut, A.	FROM DETERMINISTIC TO CONSTRUCTIVIST PARADIGM: AN OVERVIEW OF THE F.S.F. RESEARCH PROGRAM
Hiley, M.J.; Yeadon, M.F.	DETERMINATION OF THE MARGIN FOR ERROR WHEN DISMOUNTING FROM THE ASYMMETRIC BARS
King, M. A.; Wilson, C.; Yeadon, M.F.	DETERMINATION OF KNEE JOINT MOMENTS DURING RUNNING JUMPS USING A CONSTRAINED FORWARD DYNAMICS SIMULATION MODEL
Pavičić, L.	WHY TEAM SPORT GAME IS COMPLEX SYSTEM?
Stefani, R.	A QUANTITATIVE EXPLANATION OF DIFFERENCES BETWEEN MALE AND FEMALE WORLD AND OLYMPIC CHAMPIONSHIP PERFORMANCES USING PHYSIOLOGY AND PHYSICS
Rosponi, A.; Felici, F.; Bazzucchi, I.; Sbriccoli, P.; Fattorini, L.; Filligoi, G.C.	MYOELECTRIC SIGNS OF FATIGUE AND FORCE FAILURE DURING ENDURED ISOMETRIC CONTRACTIONS IN ELDERLY
San i Molina, J.; Esteba- Castillo, S.	COMPLEX SYSTEMS AND FUNCTIONAL DYNAMIC PROCESSES OF BRAIN ACTIVITY
Torrents, C.; Balagué, N.	IMPROVING TRAINING METHODS BY MEANS OF DYNAMIC SYSTEMS RESEARCH BACKGROUND
Torrents, C.; Ferro, A.; Balagué, N.; Ferreruela, M.; Floría, P.; Rivera, A.	TIME AND FREQUENCY DOMAIN ANALYSIS OF GROUND REACTION FORCES IN JUMPING WITH ELITE RHYTHMIC GYMNASTS
Wiemeyer, J.	FUNCTION AS CONSTITUTIVE FEATURE OF MOVEMENTS IN SPORT
Yeadon, M.F.; Wilson, C.; King, M.A.;	MODELLING DIFFERENTIAL ACTIVATION OF KNEE JOINT EXTENSORS

Poster Presentations,
1st Meeting of Complex Systems and Sport

Authors	Title
Atchy-Dalama, P.; Zanone, P.G.; Peper, C.E.; Beek, P.J.	EFFECTS OF SYMMETRY BREAKING ON LEARNING A BIMANUAL COORDINATION PATTERN
Ferreira, A.P.; Volossovitch, A.; Gonçalves, I.	METHODOLOGICAL AND DYNAMICAL PERSPECTIVE TO DETERMINE CRITICAL MOMENTS ON SPORT GAME
Huertas Olmedo, F.; Castellote, J.M.; Lupiañez, J.; Sanchez-Alarcos, J.V.; Sanegre, M.T.	EFFECT OF INHIBITION OF RETURN ON DIFFERENT COMPONENTS OF ACTION IN TWO VISUALLY GUIDED TASK(RECHING VS GRASPING)
Li, X.; Wang, T.; Zhou, P.; Feng, H.Q.;	THE ELECTROCARDIOGRAM SIGNAL AUTOMATIC ANALYSIS: FIDUCIAL POINTS DETECTION AND CHANGE REPRESENTATION OF THE ST SEGMENT
Oullier, O.; de Guzman, G.C.; Jantzen, K.J.; Scott Kelso, J.A.;	THE ROLE OF SPATIAL CONFIGURATION AND HOMOLOGOUS MUSCLE ACTIVATION IN COORDINATION BETWEEN TWO INDIVIDUALS
Pain, M.T.G.	IDENTIFYING REACTION TIMES IN SPRINT STARTS: A COMPARISON OF WAVELET ANALYSIS AND CUSTOM ALGORITHMS
Palut, Y.; Zanone, P.G.	TENNIS INVESTIGATION AS A NON-LINEAR COMPLEX SYSTEM
Rein, R.; Simon, C.	INFLUENCE OF TECHNIQUE VARIATION TRAINING ON TECHNIQUE VARIABILITY IN LONG DISTANCE RUNNING
Sanegre, M.T.; Valls-Solé, J.; Castellote, J.M.; Contreras, R.	HOW THE VELOCITY AND THE FOREWARNING OF A TARGET, CAN AFFECT THE RELATION OF EYE AND HAND REACTION TIMES.
Siupsinskas, L.; Vainoras, A.; Pilkauskaitė, G.; Zumbakyte, R.	COMPLEX ASSESSMENT OF EUROFIT TESTS FOR STUDENTS
Vass, Z.	MOTOR SKILL ACQUISITION: SPECIFICITY OR GENERAL RULE LEARNING?
Vass, Z.	THE RELATIONSHIP BETWEEN EXPERT AND NON-EXPERT IN INFORMATION PROCESSING IN DARTS THROWING
Vass, Z.	THE ROLE OF THE GENERALIZED MOTOR PROGRAM AND FORWARD MODELING AT THE CONTROL OF QUICK DISCRETE MOVEMENT
Volossovitch, A.; Ferreira, A.P.; Gonçalves, I.	THE USE OF BINOMIAL LOGISTIC REGRESSION IN PERFORMANCE ANALYSIS IN HANDBALL

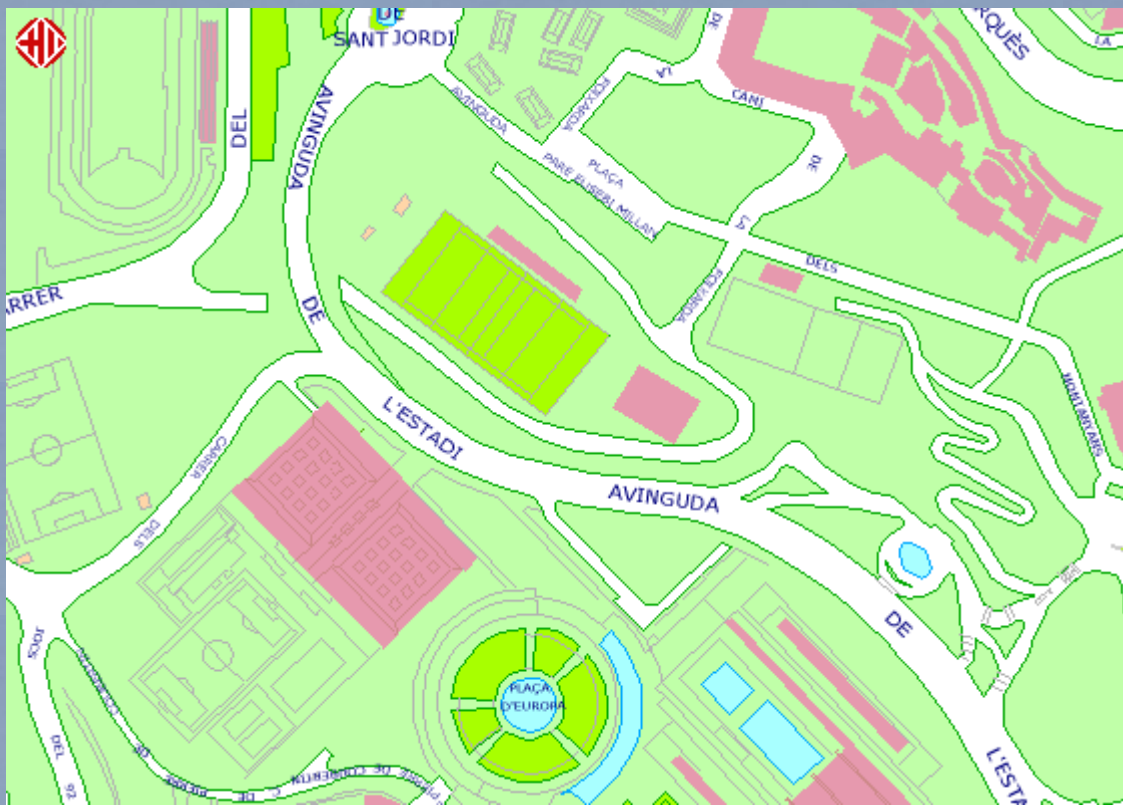
Oral Presentations,
4th International Conference of Computer Science in Sport

Authors	Title
Anguera Argilaga, M.T.; Blanco Villaseñor, A.; Losada López, J.L.; Ardá Suárez, T.; Camerino Foguet, O.; Castellano Paulis, J.; Hernández Mendo, A.; Jonsson, G.K.	MATCH & PLAYER ANALYSIS IN SOCCER: COMPUTER CODING AND ANALYTIC POSSIBILITIES
Böhm, H.; Senner, V.	COMPUTER SIMULATION OF MUSCLE ELASTIC BEHAVIOUR IN DROP JUMPING
Carraro, A.; Bertollo, M.; Zocca, E.	E-LEARNING TRAINING FOR PHYSICAL EDUCATION TEACHERS IN ITALY: THE EXPERIENCE OF THE VENETO SSIS
Eder, C.; Strubreither, O.; Kornfeind, P.; Baca, A.	AN INFORMATION SYSTEM FOR THE SPORT SCIENTIFIC THEORY OF SELECTED SPORT DISCIPLINES
Kornfeind, P.; Baca, A.; Tutz, M.	A METHOD FOR DETECTING THE IMPACT POSITION IN TABLE TENNIS
Levy, R.M.; Katz, L.; Morey Sorrentino, R.; Peng, X.	VIRTUAL REALITY: VISUALIZATION FOR ATHLETIC COMPETITIONS
Link, D.; Lames, M.	APPLICATION OF AN INTERNET BASED, COLLABORATIVE SOFTWARE ENVIRONMENT IN TRAINING AND COMPETITION OF TOP LEVEL BEACH VOLLEYBALL TEAMS
Muresan, E.; De Moor, B.	SOCCER AND DATA MINING
Rahnama, N.; Lees, A.; Reilly, T.	A NOVEL COMPUTERISED NOTATION AND ANALYSIS SYSTEM FOR ASSESSMENT OF INJURY AND INJURY RISK IN FOOTBALL
Seifriz, F.; Mester, J.	MODELLING IN SPORTS: FROM MATHEMATICAL FUNDAMENTALS TO APPLIED USE IN MASS MEDIA
Skarbalius, A.; Krušinskienė, R.	HANDBALL MATCH ANALYSIS: COMPUTERIZED NOTATION SYSTEM
Soons, B.; de Belder, C.; Colman, V.; Ulrik, P.	KINESIOLOGY IN SWIMMING VIA MULTIMEDIA
Weber, S.; Platen, P.	MODELING OF THE ENERGY METABOLISM IN CYCLIST USING ERGOMETER TESTS
Wigger, U.	INTELLECTUAL CAPITAL AND ELECTRONIC RIGHTS MANAGEMENT
Wilson, C.; Yeadon, M.R.; King, M.A.	DETERMINING SUBJECT-SPECIFIC PARAMETER VALUES USING AN ANGLE-DRIVEN SIMULATION MODEL

Poster Presentations,
4th International Conference of Computer Science in Sport

Authors	Title
Albert, F.; Ortega, F.; Ruiz, J.; Gutiérrez, A.; Castillo, M.;	SOFTWARE FOR ANTHROPOMETRIC ASSESSMENT PROVIDING INDEXES OF INTEREST FOR HEALTH AND SPORT
Antoniou, P.; Mastroyannis, I.	TEACHING VOLLEYBALL USING EXPLORATORY ANIMATION SOFTWARE: “DEFENSE POSITIONS DURING THE RECEPTION OF SERVICE WITH 4-2 DEFENSE FORMATION AND 6 AT THE FRONT”
Barbero Alvarez, J.C.; Granda Vera, J.; Maanan, N.M.	VALORACIÓN Y ENTRENAMIENTO DE LAS MANIFESTACIONES DE LA VELOCIDAD Y LA REALIZACIÓN DE ESFUERZOS INTERMITENTES DE ALTA INTENSIDAD MEDIANTE UN SISTEMA TECNOLÓGICO
Blanco, A.; Ensenyat, A.	MATCH-PLAY LOAD IN ROLLER HOCKEY
Coelho Bortoleto, M.A.	THE PUNCTUATION SYSTEM OF THE MEN’S ARTISTIC GYMNASTICS (MAG) – GRAPHICS AND MATHEMATICAL MODELS
Damas, J.S.; Moreno, F.J.; Reina Vaíllo, R.; Luis, V.; Sabido, R.	DEVELOPMENT OF SYSTEMS FOR ANALYSIS OF THE REACTION RESPONSE AND THE PERCEPTIVE ABILITY OF VOLLEYBALL PLAYERS
Granda Vera, J.; Barbero Alvarez, J.C.; Hinojo Muñoz, D.; Manan, N.M.; Reyes Domínguez, M.T.; Mingorance Estrada, A.;	EL SISTEMA INFORMÁTICO “REFLEX” COMO RECURSO PARA LA EVALUACIÓN, ESTUDIO Y MEJORA DE LA CAPACIDAD DE ANTICIPACIÓN PERCEPTIVA
Hannola, H.; Pahtaja, V.; Niemi, K.; Rintala, H.	THE OCCUPATIONAL PHYSICAL CONDITION AND MUSCLE BALANCE OF AIR FORCE PILOTS
Ibañez Godoy, S.; Pérez Toledano, M.A.; Macías García, M.; Feu Molina, S.;	PLANNING AND CONTROL SOFTWARE INSTRUMENT FOR BASKETBALL TRAINING EDUCATIONAL RESOURCES
Kuliev, R.G	REMOTE TACTICAL TRAINING OF NATIONAL TEAMS
Kuliev, R.G.	SEMI-REAL SIMULATION IN THE TACTICAL TRAININGS
Moreno, R.; González-Haro, C.; Romero, A.; Valle, J.; Elvira, J.; González-De-Suso, J.M.; Escoda, P.; Drobnic, F.	MARES (MUSCLE ATROPHY RESEARCH AND EXERCISE SYSTEM): POPULATION TEST
Muftić, O.; Baksa, S.; Baksa, I.	SCIENTIFIC 3D VISUALISATION OF BODY DURING HURDLE RACING
Ortega, F.; Ruiz, J.; Rodriguez, G.; Gutierrez, A.; Castillo, M.	PHYSICAL FITNESS EVALUATION-INTERPRETATION SOFTWARE
Papadimitriou, K.; Aggelousis, N.; Antoniou, P.; Mellas, S.; Taxildaris, K.	VIDEO ANALYSIS IN THE ASSESSMENT OF THE VOLLEYBALL SETTER’S COMPETITIVE BEHAVIOR
Sobreiro, P.	PRIVATE REGISTRY’S: NEW OPORTUNITIES FOR SPORT ORGANIZATIONS
Pérez, J.; Refoyo, I.; Navarro, E.; Sampetro, J.	COMPUTER – AIDED MEASUREMENTS OF WHEELCHAIR BASKETBALL PLAYERS DISPLACEMENTS: GUIDELINES FOR TRAINING MODELIZATION.

Quevedo i Junyent, L.; Solé i Fortó, J.; Aznar Casanova, J.A.;	DINVA SOFTWARE TO MEASURE DYNAMIC VISUAL ACUITY IN ATHLETES.
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Viciana Ramírez, J.; Requena Sánchez, B.; Zabala Díaz, M.; Lozano Moreno, L.	PROPOSAL OF AN OPEN TELEMETRIC SYSTEM FOR SEQUENTIAL OBSERVATIONAL ANALYSIS IN PHYSICAL EDUCATION AND SPORT
Weber, S.; Schuhwirth, A.; Huff, C.B.; Platen, P.	DEVELOPMENT OF SOFTWARE FOR AUTOMISED CYCLING TRAINING PROGRAMS
Zumbakyte, R.; Kajeniene, A.; Vainoras, A.	COMPUTERIZED EVALUATION OF RECOVERY PHASE IN WOMEN AFTER BICYCLE TEST
González Villarón, M.	SISTEMA AMISCO







By plane

The airport is located in El Prat de Llobregat (western Barcelona), about 10 km away from Barcelona. There are three different ways to arrive in the city:

- a) By taxi: from the airport to the center of Barcelona: about 20 Euros.
- b) By train (Renfe): there are trains every 30 minutes from 6:13 to 23:13. They run to the main railway station (Sants-Estació) and to the city centre (Plaça Catalunya). From both stations you can take the metro (Line 3 to Plaça Espanya).
- c) By bus (Aerobús): from Monday to Friday, there are buses every 15 minutes from 6:00 to 23:00, and at weekends and bank holidays from 6:30 to 22:50. They run from the airport as far as the main station (Sants Estació) or Plaça de Catalunya, where you can take the Metro (Line 3 to Plaça Espanya).

By train

Trains from the other spanish cities arrive in Barcelona at the Barcelona-Sants railway station. At the same station you can take the underground (Line 3 to Plaça Espanya). International arrivals are at the Barcelona-França railway station. For more information about urban transportation in Barcelona you can visit the [Barcelona Metropolitan Transportation](#) web site.

By car

- a) From the North: Highway A7 from France (La Jonquera). Take the highway A18 (Manresa-Barcelona) if you plan to arrive in Barcelona from the North-east (Nus de la Trinitat). Take the highway A2 from Madrid and Zaragoza if you plan to arrive in Barcelona from the South-east (Diagonal Av.).
- b) From the West: Highway A2 from Madrid and Zaragoza. It ends at Diagonal Av.
- c) From the South: Highway A7 from Alicante and Valencia, get on highway A2 which ends at Diagonal Av.

From Plaça Espanya

You can take the bus (Line 50) from Plaça Espanya - Av Reina Maria Cristina. Stop at the Piscines Bernat Picornell.



Prof. Dr. Jürgen Perl
Director of the Computer Science Institute
Head of the Computer Science in Sport
Working Group
University of Mainz, Germany

✉ perl@informatik.uni-mainz.de

Lecture: “On the long-term behaviour of the performance-potential-metamodel PerPot: New results and approaches”

Prof. Perl started his studies in Mathematics in Berlin in 1963, received his Ph.D. in 1971, and became an Associate Professor for Computer Science in 1973. After a Professorship for Applied Computer Science in Osnabrück from 1975 to 1984 he became a Full Professor for Computer Science at the University of Mainz in 1984. In 1989 he established a working group and organized a bi-annual workshop-series on Computer Science in Sport in Germany. In 1995, Computer Science in Sport was founded as a section in the German Society of Sport Science, which he chaired from 1995 to 2002. He started the bi-annual international symposium-series on Computer Science in Sport in co-operation with Prof. Mester, president of the German University of Sport Science, in Cologne in 1997.

Prof. Perl's main working areas are Software Engineering and Modelling & Simulation. His main research areas are Computer Science in Sport and Computer Science in Medicine.

In the field of Computer Science in Sport, Prof. Perl started with sport games in order to analyse strategies and model the structure of interaction processes. As one of the developed tools, the tennis simulation system TeSSy has been a platform for other applications as well as for conceptual analyses. Since 1997 he has been studying models of adaptation processes. The basic idea behind the developed performance potential model (PerPot) is the antagonistic interaction between strain and response components. PerPot has been used for the analysis of various adaptation processes in Sport, Biology, and Medicine. Basing on the fact that learning also is an adaptation process, he applied PerPot to artificial neural networks and so introduced a dynamically controlled network (DyCoN), which is able to learn continuously and so allow for studying learning processes and strategies. In the area of Sport, DyCoN has mainly been used to analyse strategic structures of games on the one hand and structures of motions and motor learning on the other hand.

Prof. Perl is author respectively co-author of over a hundred scientific articles and, besides others, three textbooks dealing with Computer Science and Modelling in Sport. He is editor respectively co-editor of about ten proceedings and is member of the editorial board of the International Journal of Computer Science in Sport.

Web Page: <http://www.informatik.uni-mainz.de/deutsch/institute/inform/personen/Perl.html>



Prof. Bengt Saltin
Copenhagen Muscle Research Centre
University of Copenhagen, Denmark

✉ cmrc@rh.dk

Lecture: **“Overview of open non-linear problems in exercise physiology”**

M.D. Stockholm 1962; Ph.D. (Medicine) Stockholm, 1964; Assistant professor; Exercise Physiology, Karolinska Institute (KI) Stockholm 1965-68; Associate Professor; Applied Physiology, KI Stockholm 1968-73; Professor, Human Physiology, August Krogh Institute, University of Copenhagen (UC) 1973-90; Professor of Physiology (invited appointment) KI Stockholm 1990-93; Professor of Human Physiology UC 1994-97; Director of the Copenhagen Muscle Research Centre, Copenhagen 1993-; Adjunct Professor, UC 1998-.

A traditional exercise physiologist using unique human experimental models to elucidate roles of heart and skeletal muscle in limiting the human maximal aerobic power and to what extent phenotype expression is modulated by physical activity and training.

Docent in exercise physiology, KI, Stockholm, 1964; Member of the Royal Danish Academy of Sciences and Letters, 1984; American College of Sport Science: Citation Award, 1976, Honor Award, 1990; Ridder af Dannebrog, 1995; The Novo Nordisk Award, 1999, The IOC Olympic Prize on Sport Sciences, endowed by Pfizer, 2002, The Danish Heart Foundation Research Prize, 2002.

Doctor Honoris Causa at University of Paris, France, 1990, University of Athens, Greece, 1994, University of Guelph, Canada, 1997, Aristotle University, Thessaloniki, Greece, 1998, Norwegian University of Physical Education, Oslo, Norway, 1998, University of Tartu, Estonia, 1998, University of Jyväskylä, Finland, 2000.

Author of more than 300 original articles and 150 reviews or chapters in books. Editor of a number of scientific books including several textbooks in physiology for medical and post graduate students.

Web Page: <http://www.cmrc.dk>



Dr. James Stirling
Centre de Recerca Matemàtica (CRM)
Institut d'Estudis Catalans, Barcelona,
Spain

✉ j.r.stirling@mailcity.com

Lecture: **“Mathematical modelling of the physiological response to exercise”**

Dr. James Stirling has obtained his PhD in Applied Mathematics from Loughborough University, UK. His thesis was on the use of tools from nonlinear dynamics to understand the movement of pollution in chaotic and turbulent fluid flows. After having obtained his PhD he was a postdoc at CALTECH (California Institute of Technology, Department of Control and Dynamical Systems) working on chaos in fluids. Following this he was a postdoc at the Institute of Mathematical Modelling, Technical University of Denmark, working on chaos in non-linear optics. This was followed with a postdoc in the Department of Physics, University of Crete and the Institute of Electronic Structure and Laser, FORTH, where he worked on chaotic breathers in solid state physics. He then was a visiting professor in the Departament de Matemàtica Aplicada I, Universitat Politècnica de Catalunya, Barcelona, where he worked on non-linear dynamics in exercise physiology and biomechanics.

Currently he is a visiting professor at the CRM, Centre de Recerca Matemàtica, where he continues his work on non-linear dynamics in exercise physiology and biomechanics. This research in exercise physiology is done in collaboration with Professor Bengt Saltin at the Center for Muscle Research, in Copenhagen and Maria Zakyntinaki in UPC, Barcelona. The aim of the research is to model the physiological responses to exercise, using tools from dynamical systems and apply the findings to training methodology and testing.

Web Page: <http://www.geocities.com/jamesrstirling/>



Professor Susan A. Ward, MA, DPhil
Centre for Exercise Science and Medicine,
University of Glasgow, Glasgow, UK

✉ S.A.Ward@bio.gla.ac.uk

Lecture: **“Dynamic control models of
ventilation during exercise”**

Professor of Exercise Science and Medicine, University of Glasgow, Glasgow, UK

Professor Ward gained her DPhil in Physiology from Oxford University in 1974. Following two years as a Lecturer in the Department of Physiology at Liverpool University, she moved to the University of California at Los Angeles, becoming Professor of Anesthesiology and Physiology in 1988. She returned to the United Kingdom in 1993, first to the Department of Physiology at the University of London's St George's Hospital Medical School and then to South Bank University, as Chair of Sports Science. In 1998, she was appointed Director of the Centre for Exercise Science and Medicine at the University of Glasgow. Her research interests include the control of ventilation, pulmonary gas exchange and muscle energetics during exercise in health and disease, and she has over 110 publications on these topics. She is a Fellow of the American College of Sports Medicine and of the European College of Sports Science, and is a Principal Editor of the "European Journal of Applied Physiology" and "Experimental Physiology". She currently serves as Treasurer of the European College of Sports Science, and Secretary of the Pulmonary Circulation, Gas Exchange and Exercise Group of the European Respiratory Society.

Web Page: <http://www.gla.ac.uk/ibls/NBS/Staff/sward/index.html>



Prof. Arnold Baca
Institut für Sportwissenschaft der
Universität Wien, Austria

✉ arnold.baca@univie.ac.at

**Lecture: “Computer Science-Based
 Feedback Systems on Sports Performance”**

Professor Arnold Baca is head of the Section of Biomechanics, Kinesiology and Applied Computer Science of the Department of Sport Science at the University of Vienna, Austria. He received the Engineering Diploma in Computer Science in 1984 (summa cum laude) and the Ph.D. (Thesis: “Variance-reducing techniques for simulation methods in system reliability analysis” in 1986 (summa cum laude) from the Technical University Vienna. In 1998 he received the Habilitation in “Applied Computer Science in Biomechanics and Kinesiology” from the University of Vienna.

Since 1998 Prof. Baca is Associate Professor at the Section of Biomechanics, Kinesiology and Applied Computer Science (Department of Sport Science) at the University of Vienna.

He is Editor in Chief of the e-Journal "International Journal of Computer Science in Sport" and reviewer of several national and foreign scientific journals, such as Journal of Biomechanics, Medicine and Science in Sports and Exercise, European Journal of Applied Physiology and IEEE Transactions on Reliability. In 1999, he organised the 2nd International Symposium on Computer Science in Sport in Vienna, Austria.

Current research activity:

Computer Science Applied to Biomechanics
 Feedback Systems in Sports
 Multimedia and Information Systems in Sports
 Biomechanics of Rowing
 Game Analysis in Table Tennis

Web Page: <http://mailbox.univie.ac.at/Arnold.Baca/>



Prof. Dr. Martin Lames
Sportzentrum
Universität Augsburg, Germany

✉ martin.lames@sport.uni-augsburg.de

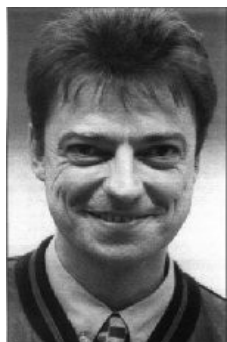
Lecture: “Computer Science for top level team sports”

Professor Dr. Martin Lames is a board member of Germany's Society for Computer Science in Sport. He received his Ph.D. from Mainz University in Sport Science in 1990. He finished his postdoctoral studies with his habilitation at Kiel University in 1996. From 1997 he was director of the sport science institute of Rostock University. He left Rostock University in 2002 to become Professor for Movement Science and Training Science at Augsburg University.

Prof. Lames is interested in the methodological question of how to support sport practice by scientific work. His main fields are game analysis, model-building and simulation in sports, and dynamic systems modeling in sports. This includes a broad range of activities, e.g. support in preparation and competition of Olympic athletes, conducting a major health promotion project, investigations of motor learning in field settings, modeling and simulation of game sports with Markov chains, and applying chaos theory to understand the genesis of goals in soccer.

Prof. Lames has made contributions to: the methodology of game observation, the performance analysis in sports games, the applications of computer science in sport, the role of model-building in the behavioral disciplines of sport science, and to training science.

Prof. Lames is author of many scientific articles and co-author of the textbooks "Introduction to training science" (2002), "Handbook Computer Science in Sport" (1997), "Systematic Game Observation" (1994), and "Model-building in Sport Science" (2002). He is a member of the board in Germany's association for training science and computer science in sport. He is a member of the editorial board of the German journal "Sportwissenschaft".



Prof. Dr. Josef Wiemeyer
Institut für Sportwissenschaft
Technische Universität Darmstadt
(Germany)

✉ wiemeyer@ifs.sport.tu-darmstadt.de

Lecture: **“Learning with multimedia - more promise than practice?”**

- 1985 First state examination as a teacher for Physical Education and ancient Latin (University of Münster)
Promotion as Dr. rerum medicinalium (Dept. of Sport Medicine, Münster)
- 1989 Title of dissertation: Measuring central nervous activation level by means of an improved procedure to assess the critical flicker-fusion frequency
- 1996 Habilitation for Sport Science with specific emphasis on movement sciences
Title of habilitation thesis: Coordinative, cognitive and emotional aspects of motor learning in sports
- since 1996 Professor of Sport Science at the Dept. of Sport Science of Darmstadt University of Technology

Current research activities (sample)

1. Motor control and learning:

- Internal representations
- Selected issues of motor learning: Contextual interference, distribution of practice, feedback, instruction, and conscious awareness
- Stretching and motor performance

2. Development and evaluation of multimedia learning programs for education in sport and sport science

- Project “BioPrinz” (Biomechanical principles)
- Project “BWS-CBT” (Basics of movement science)
- Several multimedia prototypes

3. Application of soft-computing paradigms to problems of sport and sport science

- Project “Improving reaching movements by means of Genetic Algorithms”
- Project “Simulation of selected learning conditions by means of artificial neural networks”
- Project “Fuzzy-Logic and tactical positions in soccer”

Functions - Vice-president of the German Society of Sport Science (since 1999)

- Vice-president of the Research group for educational media in sport (since 1999)
- Speaker of the section Computer Science in Sport (since 2002)
- Provisional director of the institute of Sport Science (since 2000)
- Referee of several journals
- Referee for the DFG (German Research Community) - area: Computer science in sport

Web Page: <http://www.sport.tu-darmstadt.de/personal/wiemeyer/index.html>



Dr. Maria Zakynthinaki
Departament de Matemàtica Aplicada I,
Universitat Politècnica de Catalunya, Barcelona, Spain

✉ marzak@mailcity.com

Lecture: **“Mathematical Modelling in Biomechanics”**

Dr Maria Zakynthinaki has obtained her Ph.D in applied and computational mathematics from the Faculty of Mathematics, Department of Science, Technical University of Crete, Greece. She has a first degree in Physics, an MSc on Computational Mathematics, an MPhil on Dynamical Systems and an MSc on Artificial Intelligence. Currently she is a visiting professor at the Departament de Matemàtica Aplicada I, Universitat Politècnica de Catalunya (UPC). Her current research interests include: application of non-linear dynamics to modelling in exercise physiology (model physiological responses to varying exercise intensities using tools from dynamical systems and apply the findings to training methodology and testing), dynamic animation (application of a physically based animation to modelling problems in biomechanics), modelling in biomechanics (use tools from dynamical systems to investigate and model a variety of non-linear problems in biomechanics and apply the findings to training methodology and testing) . She has also worked on various mathematical applications, such as stochastic optimisation algorithms with applications to adaptive optics, cognitive science / artificial intelligence / neural networks, numerical solution of differential equations and dynamical systems.

Web Page: <http://www.ma1.upc.edu/~maria/>



Prof. Yaneer Bar-Yam
President of the New England Complex Systems Institute
Harvard University, USA

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Lecture: **“Complexity and teamwork in sports”**

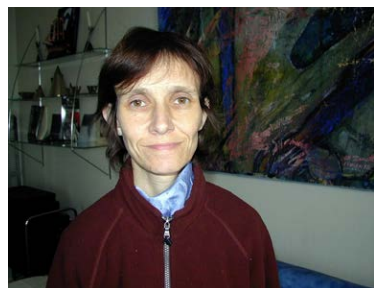
Professor Yaneer Bar-Yam is founding president of the New England Complex Systems Institute. He received his Ph.D. from MIT in Physics in 1984. He was a Bantrell PostDoctoral Fellow, and a joint postdoctoral fellow at MIT and IBM. After a junior faculty appointment at the Weizmann Institute, he became an Associate Professor of Engineering at Boston University in 1991. He left Boston University in 1997 to become president of the New England Complex Systems Institute. He is also Associate of the Department of Molecular and Cellular Biology of Harvard University.

Prof. Bar-Yam studies the unified properties of complex systems as a systematic strategy for answering basic questions about the world. His research is focused both on formalizing complex systems concepts and relating them to everyday problems. In particular, he studies the relationship between observations at different scales, formal properties of descriptions of systems, the relationship of structure and function, the representation of information as a physical quantity, and quantitative properties of the complexity of real systems. Applications have been to physical, biological and social systems.

Prof. Bar-Yam has made contributions to: the theory of the structural and electronic dynamics of materials; the theory of polymer dynamics and protein folding; the theory of neural networks and structure-function relationships; the theory of quantitative multiscale complexity; and, the theory of evolution.

Prof. Bar-Yam is author of over a hundred scientific articles and the textbook "Dynamics of Complex Systems" (1997) addressing the entire field of complex systems. He is Chairman of the International Conference on Complex Systems and Managing Editor of InterJournal – an on-line electronic journal. He has consulted and given courses for: the World Bank, MITRE, and the US military and intelligence communities. He has taught about complex systems in Canada, China, Columbia, France, Italy, Japan, Korea, Portugal, Russia and many places in the U.S.

Web Page: <http://necsi.org/faculty/bar-yam.html>



Prof. Véronique Billat
Applied Sport and Exercise Science Department
Université d'Evry Val d'Essonne, France

✉ veronique.billat@wanadoo.fr

Lecture: “The multi-fractal approach of middle and long-distance running”

PhD. (Science) Grenoble (France) 1988; Assistant Professor, Faculty of Sport Science, University of Grenoble 1989-1992; Associate Professor, Department of Sport Science, University Paris-Créteil 1992-1998; Professor Faculty of Sport Science University of Lille 1998-2002; Professor Faculty of Sciences in the Department of Applied Sport and Exercise Science at the University of Paris-Evry and Director of the Laboratory of the interaction genes and training.

She wrote two books and 50 papers on the physiology applied to exercise and training. She is Fellowship of the American College of Sports Medicine, member of the American Physiology Society and of the European College of Sport Science.

The purpose of her work is to understand better the validity of training response with object of improving performance with good mental and physical health. She is specially interested by middle and long-distance running and is studying the optimisation of training and race running with different types of run pattern (intermittent, constant or variable).

She is looking after the reasons why an athlete stops when he (she) runs over 3000-10,000m race when reaching his (her) maximal oxygen uptake.

She has been working on the physiological responses during exercises performed until exhaustion at constant (according the intensity) and variable (stochastic or square wave) speed or power output. After having shown that the time to exhaustion at the maximal oxygen uptake had a great inter-individual variation independent of the $VO_2\text{max}$ value, she focused on the power output –time sustained at $VO_2\text{max}$.

Her future approach is to characterise more precisely the relationship between the physiological responses and the variation of speed during races from 800m to the 100-Km.

From this point of view, she is comparing the effect of free vs. constant pace on the improvement of the aerobic and anaerobic capacities and the variability of the physiological signals as heart rate and respiratory frequency in high level athletes and children during endurance training.

She is in charge of the scientific aspects of training in long and middle-distance running of the French Athletics Federation since 1998.



Professor Keith Davids
Dean, School of Physical Education,
University of Otago, New Zealand

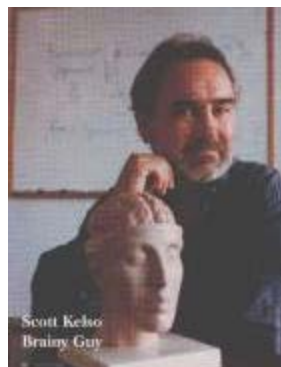
✉ kdavids@pooka.otago.ac.nz

Lecture: “Acquiring Skill in Sport: A Constraints-Led Perspective”

Professor Keith Davids is Dean of the School of Physical Education at the University of Otago, NZ. He received his Ph.D. in Physical Education from University of Leeds, UK in 1986. He became a Research Fellow for the Medical Research Council at Sheffield University in the UK in 1989, was appointed as a Reader in Motor Control at Manchester Metropolitan University, UK in 1994, and received a personal chair there in 1998. In 2002 he moved to University of Otago, NZ and also holds a Visiting Senior Research Fellowship at Sheffield Hallam University, UK.

Professor Davids research interests include the application of concepts, ideas and tools emerging from dynamical systems theory, and analyses of chaotic and complex systems, to the study of processes of coordination, control, and their acquisition in human movement systems. Of special concern are the implications of these theoretical ideas for understanding the design of practice programmes, the structure of learning activities in sport and exercise settings, and the role of the pedagogist. His main focus has been on investigating the influence of personal, task and environmental constraints on motor performance and learning in a number of sports and physical activities, including interceptive actions and team ball games.

Professor Davids has produced a number of scientific articles in journals related to sport science, psychology and human movement science over the past decade, as well as 3 books on visual perception and action in sport, performance of interceptive actions and motor development since 1999. He is currently working on two books on coordination, control and their acquisition, and a multidisciplinary perspective on variability in human movement systems, due to be published by Human Kinetics in 2004. He has held seminars/colloquia on application of dynamical systems theory to the study of motor behaviour in sport in Sweden, Netherlands, Portugal, Australia and many institutions in Spain and the UK.



Prof. Dr. J.A. Scott Kelso
Centre for Complex Systems and Brain Sciences
Florida Atlantic University, Boca Raton, USA

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Lecture: **“Understanding human motor behaviour: Coordination dynamics”**

Professor Dr. Scott Kelso holds the Glenwood and Martha Creech Chair in Science at Florida Atlantic University (FAU) and is the founder and director, since 1985, of FAU’s Center for Complex Systems and Brain Sciences. He is also Professor of Psychology, Biological Sciences and Biomedical Sciences and directs the National Institute of Mental Health’s National Training Program in Complex Systems and Brain Sciences at FAU. Professor Kelso received his PhD degree in Kinesiology with a minor in Experimental Psychology from the University of Wisconsin, Madison in 1975. He was Assistant Professor and Director of The Motor Behaviour Laboratory at the University of Iowa from 1976 to 1978. Between 1978 and 1985 he was Senior Research Scientist at Haskins Laboratories at Yale University and Professor of Psychology and Biobehavioural Sciences at The University of Connecticut.

Professor Kelso's longstanding goal is to understand how human beings (and human brains)—singly and together—coordinate their behaviour. Over the last 20 years or so, due to the efforts of scientists from many fields in institutes and universities around the world, a science of coordination has emerged that is aimed at providing a lawful basis for coordination called coordination dynamics. Coordination dynamics is a set of ideas that describes, explains, and predicts how patterns of coordination form, persist, and change in different kinds of system and at different levels of description. Although grounded in the concepts of self-organization and the tools of coupled nonlinear dynamical systems, coordination dynamics specifically incorporates essential informational aspects of human cognitive and social function, including anticipation, intention, attention, and learning. In coordination dynamics, the real-life coordination of neurones in the brain and the real-life coordinated actions of people and animals are cut from the same dynamic cloth. Prof. Kelso’s current work focuses on how the brain, by using a subtle blend of integration among, and segregation between its functioning parts, creates meaningful information that may then be stabilised over time and used to direct ongoing activity.

Scott Kelso has published over 300 research articles, chapters and books including *Dynamic Patterns: The Self-Organization of Brain and Behaviour*, MIT Press (1995) now in its third printing. He is the recipient of numerous awards including the Distinguished Scholar Scientist Award from the North American Society for the Psychology of Sport and Physical Activity (1999) the Senior Scientist Award from the National Institute of Health (1997) and the Distinguished Alumni Research Award from the University of Wisconsin (1990). He is an elected fellow of the American Psychological Association (1986) and the recent recipient (2001) of a Docteur Honoris Causa Degree from the Republic of France and the University of Toulouse (Paul Sabatier). As a young man, he played international rugby football, representing the US National Team (the Eagles) on six occasions and has coached and captained a number of successful teams.



Prof. Dr. Joachim Mester
Information and Communication Center
Institute for Training and Movement Science
Deutsche Sporthochschule Köln, Germany

✉ mester@dshs-koeln.de

Lecture: **“Integrated Scientific Information Asset Management: A Perspective for Education and Research”**

Born in 1948; university studies in Sport Science, English, Biology, Pedagogy; State Examination for Schools; 1974 – 1985 education at the Institute for Sports Medicine at the University of Bochum; research and teaching areas exercise physiology, sensory physiology, perception, motor control; practical sports teaching in skiing, tennis, rowing, basketball; programming services

1978 Dr. degree in sensory perception, motor learning, motor control; 1985 Habilitation in diagnosis of human performance, technique in sports

1986 full professorship, chair for "Human Performance" and Director of the Institute for Training- and Movement-Science at the German Sport University Cologne; research in theoretical and empirical analysis of human adaptation to training; scientific support in top performance sports; national teams in alpine skiing, tennis, ski-jumping, fencing, track and field; human performance and adaptation under normal conditions and mg; development of digital techniques for measurement and feedback in sport performance; biomathematical and -statistical solutions;

1989 Vice-President for education and curriculum and 1991 – 1999 President of the German Sport University Cologne; 1994 Dr. h.c. of the Sport University Budapest; 1987 board member of German Association of Sport Science; Head of scientific committee of the German Tennis Federation; Scientific advising committee of German National Alpine Skiing Team; head of the conference of deans of the German Sport Science Faculties; member of Advisory Board of the International Council of Sport Science and Physical Education; founding member of the European College of Sport Science; 1999 – 2001 President of the European College of Sport Science

Research in technical development (data bases, retrieval engines, right management) of digital services for scientific information in EU-projects; computer science; development of e-Learning modules (media); head of Digital Media Center at the German Sport University Cologne

Web Page: <http://www.dshs-koeln.de/ecss/HTML/Persons/Mester.htm>



Prof. Dr. Wolfgang I. Schöllhorn
Chair for Training and Movement Science
University of Münster, Germany

✉ schoell@uni-muenster.de

Lecture: **“Coordination dynamics and its consequences on sport”**

Professor Schöllhorn studied Physics, Sports and Psychology in Mainz, Frankfurt and Cologne. He received his Ph.D. from the University of Frankfurt in Biomechanics 1990. He was a Post Doctoral Fellow of the German Research Community DFG. His *venia legendi* he received from the Deutsche Sporthochschule Cologne. After an assistant professor ship at the former German University for Body Culture (DHFK) in Leipzig 1997, he got the Chair for Training and Movement Science at the University of Münster 2000. From 1995 until 2000 he was Guest Professor in Austria, Canada, Taiwan and Spain. With his differential learning approach he won the Performance Award 1999 of the International Society of Biomechanics.

Prof. Schöllhorn studies the structural bases of human and animal movement. His research is focused both on the recognition of complex movement patterns and the practical consequences of specific movement structures. In particular, he studies the epistemological bases of theories on movement learning and teaching.

Prof. Schöllhorn has made contributions to the recognition of persons by their movement, to the relevance of the systems dynamic approach on grossmotor and ballistic movements, feedback training, the recognition of teams by their tactical moves, the individuality of movement and the individuality of system interactions.

Prof. Schöllhorn is author of the book “teaching to sprint and run in all kinds of sports” and editor of the series “Differential learning in sports”. He has taught about complex movement systems and pattern recognition in Canada, Taiwan, Switzerland, Austria, Italy, Spain and many places in the US.

Beside his theoretical background Prof. Schöllhorn has numerous practical experience. He was member of the junior state handball team and the state decathlete team. He performed Karate (1Kyu) and won German and Vice-European Junior championships in bobsledding and track and field. As a track and field coach he led several junior and adult athletes to german championships and to international competitions. Prof. Schöllhorn is advising several german national teams for more than 20 years.



Professor Brian J Whipp, PhD, DSc
Division of Respiratory & Critical Care
Physiology & Medicine,
Harbor-UCLA Medical Center, Torrance,
California, USA

✉ bwhipp@rei.edu

Lecture: “Intensity-dependent limitations to exercise tolerance: clues from dynamic analysis of pulmonary gas exchange”

Professor Emeritus of Physiology and Medicine, Harbor-UCLA School of Medicine, Torrance, California, USA

Professor Whipp gained his PhD in Physiology at Stanford University in California, as a Danforth Fellow, under the tutelage of Karl Wasserman and with whom he continued as an NIH Post-Doctoral Research Fellow at the Harbor-UCLA Medical Center in Torrance, California. Following one year as a Lecturer at University College, Cardiff (Wales), he returned to Harbor-UCLA where he proceeded through the academic ranks to become Professor of Physiology and Medicine and Vice-Chairman of UCLA’s Department of Physiology. During this period, he was awarded an Established Investigatorship of the American Heart Association and was a Visiting Research Scientist at Oxford University. In 1992, he returned to the United Kingdom to become Professor and Chairman of the Physiology Department at the University of London’s St George’s Hospital Medical School. In 2001, he was appointed to a Professorial Research Fellowship at the Centre for Exercise Science and Medicine at the University of Glasgow. His research interests center on the control of ventilation and pulmonary gas exchange during exercise, with special reference to the non-steady state. In addition to more than 270 publications on these topics (including principal authorship on the first continuous breath-by-breath computation and display of O₂ uptake transients and also the simultaneous determination of O₂ uptake and intramuscular high-energy phosphate profiles during exercise in humans), he is author or co-author on nine books or monographs. Among his academic honours: he was awarded a DSc by Loughborough University in England in 1982, a Citation Award of the ACSM in 1990, Fellowship of the Japan Society for the Promotion of Science, the 2002 American College of Sports Medicine Joseph B. Wolffe Memorial Lecturship; and served as Chairman of the Respiratory Commission of the International Union of Physiological Sciences from 1997-2002.



Dr. Raúl Arellano
Facultad de Ciencias de la Actividad Física y el Deporte
Universidad de Granada, Spain

✉ arellano@ugr.es

**Lecture: “Complex systems applied to competitive swimming:
analysis of swimming performance and fluid mechanics”**

Prof. Raúl Arellano teaches “Biomechanics and Training applied to Swimming Sport” and “Analysis and Evaluation of Sport Technique”. He received his Ph.D. from University of Granada in Physical Education in 1992 studying swimming propulsion. He became a tenured lectured (Assoc. Prof.) of the previous subjects at University of Granada in 1993. In 1995 he developed the Laboratory of Analysis of Sport Techniques and organized the advanced technological training and recording facilities of the swimming pool at High Altitude Elite Training Centre of Sierra Nevada (Granada, Spain), enabling the evaluation of thousands of swimmers of every ability level and age.

He participated in the Analysis of Swimming Competition International Projects developed during the 1992 and 2000 Olympic Games. Nearly two thousand participants were analyzed in both competitions and statistical models based on these analyses of race swimming performances were developed subsequently. This methodology was applied in Spain on 12 occasions extending the model to different levels of performance and ages.

He has made contributions to the knowledge of fluid mechanics applied to swimming sport developing new systems of fluid visualization, showing how the water interacts with the body and propulsive segments while the vortices are generated. Deep analysis of underwater undulating swimming reveals the relation of the body movements of the human being with those aquatic animals.

Prof. Arellano is the author of several scientific papers and conference contributions on swimming biomechanics: technique evaluation, vortices production, swimming start force recording, propulsive force recording, flow visualization, race analysis, training testing and so on.



Prof. Josep Escoda
IT Manager
Centre d'Alt Rendiment Sant Cugat, Barcelona (Spain)

✉ jescoda@car.edu

Lecture: **“Technological projects: MARES - DTL - GEST”**

Graduated at INEFC (University of Barcelona) in 1982. He followed studies developing the first tools for Biomechanical Analysis at that university. From that time on 2D Capture, process and graphical representation and calculations were used by students and teachers. He received grants from the General Secretariat of Sport of Catalonia for the development of human performance analysis software.

Former athlete in Freestyle Skiing received awards at Catalan and National level and competed in the World Cup in 1986. He has organised some sponsored international events in freestyle skiing in 1987 and 1988.

In 1987 Josep Escoda started with the Olympic Training Centre project, CAR Sant Cugat, under the direction of Juan A. Prat. Since then, he has been strongly involved directing the Research and Sports Sciences Units of the CAR-Sant Cugat. Along this time several International research projects are being handled during Olympics Games and other International events.

1992 Summer Olympic Biomechanics Projects.

1996 Atlanta Olympic Games – Canal + France – Biomechanical TV Reports

1998 MARES – ESA and NASA experts group meeting for MARES Development CDR

1999 DTL – Testing a new touchdown zone in IAAF events

Josep Escoda was the initiator of the 3D Modelling Biomechanical Analysis by 1988 in Spain with the partnership of CEIT University from the Basque Country, that starting group is nowadays a renowned New Technologies Company called STT (Sports Training Technologies). You can find their advanced skills at www.simtechniques.com

Other point of interest is the International promotion of CAR World Wide and the creation of an International Association of High Performance Training Centres, conducted by CAR from 2001 during the 2nd Forum on Elite Sport. A web site was created to enhance relationship between High Performance Training Centres at www.forumelitesport.org.

International relationships offered him the opportunity to collaborate with Olympic Solidarity programs of the International Olympic Committee giving sporting advise to under developed countries.

Josep Escoda has had the chance to attend international conferences and meetings to communicate the CAR Experience and the Technological Projects in Australia, Austria, France, UK, Canada, USA among others.



Prof. Dr. Ulrich Hartmann
Head of the Department of Theory and
Practice in Sport
Technical University of Munich, Germany

✉ hartmann@sp.tum.de

Lecture: “Computer based modelling – a chance to increase validity and reliability in performance diagnostics”

Ulrich Hartmann studied biology and physical education at the universities of Bonn and Cologne and received his Ph.D. from the German Sport University Cologne in 1985.. He awarded for extraordinary graduation 1985/86 in the subject "Medicine/Natural Science" at the German Sport University and received 1988 an award for the best lecture in "Sportsphysiology / Cardiology" at the "V. European Congress of Sportsmedicine" in Barcelona, Spain.

He worked at the Bonn University and the German Sport University in the Institute for Cardiology and Sports Medicine and the Institute for Theory and Practice of Training and Movement. He has a strong interest in physiological aspects; specific fields are focused in the area of training scientific issues in connection with practical performance diagnosis, computer-aided interpretations as well as the occurring relevant questions concerning this subject.

From 1995 until 2000 he was Provisional Head and Assistant Professor of the Institute for Theory and Practice of Training and Movement at the German Sport University. Since 2000 he has a full Professorship at the Technical University Munich and is Head of the Department for Theory and Practice in Sport. In March 2002 he received a honorary appointment as Visiting Professor at the Tsinghua University of Beijing, China.

He lectures stretch across areas like “energy supply mechanisms”, “exercise physiology”, “diagnostics and training control of human performance”, “general and specific bases of the theory and practice of training science” and his seminars range in a wide spectrum of Sport Science. He is a member of the Coaches Academy in Cologne and monitored several years German National Teams, also in the preparation for different Olympic Games.

Ulrich Hartmann is author of about 50 papers as 1st author, and another 50 as 2nd and co-author. He is head of different scientific projects for official and commercial institutions. Until today he has taken care and giving an expert opinion to about 155 diploma works and about 10 doctoral thesis. He is member of the editorial board of different scientific papers, reviewer for different international journals and was multiple involved within the framework of scientific congresses. For many years he is invited speaker in Germany and also outside in Austria, Belgium, Brazil, Bulgaria, PR China, Colombia, Ecuador, Great Britain, India, Indonesia, Italy, Israel, Malta, Mexico, Portugal, Switzerland, Singapore, Spain, Turkey, Thailand, Uruguay and United States of America.



Dipl. Sportwiss. Univ. Christian Holzer
Department of Theory in Practice in Sport
Technical University Munich, Germany

✉ christian.holzer@alumni.tum.de

**Lecture: “Match analysis by transmitter
position measurement”**

Christian Holzer, a former professional soccer player in Germany, received his Diploma of Sport Science at the Technical University of Munich in 2002. His special field of interest is match and performance analysis in sport games.

Christian Holzer worked for different companies, which are providing software and service solutions for performance analysis (SIMI Reality Motion Systems & Sports Analytics).

He has a three year experience in work with different German first division teams and the German National Team, which he supported in cooperation with Television Companies during World Cup 2002.

In his diploma he examined different software architectures for match analysis. After that he came in touch with Cairos technologies, which are developing a new kind of performance analysis system.

Christian Holzer is now working on his doctoral thesis. Main request in his work is the development of an theoretically model to interpret player's position data for tactical match analysis.

As an UEFA A Level Coach and as a former German Youth National Team player he is in contact with many professional coaches in Germany to optimize his work.

He had several invitations from different organisations to present match analysis concepts in Germany, Austria, Switzerland and the USA.



Dr. Mike Hughes
Centre for Performance Analysis
University of Wales Institute Cardiff
(UWIC), UK

✉ mhughes@uwic.ac.uk

Lecture: “Reliability of using computers to analyse performance in large events -the 2002 World Cup for Soccer”

Dr. Mike Hughes is Director of the Centre for Performance Analysis in University of Wales Institute Cardiff (UWIC), Cardiff. He received his Ph.D. from Manchester University in Mechanics of Fluids in 1971. He has lectured in Maths, Computer Programming, Research Methods and Performance Analysis at Salford University, Liverpool Polytechnic (later Liverpool John Moores University) and UWIC. Dr. Hughes has also worked in community work, in adventure play with children and as a training officer with old people’s voluntary organisations. He is a Level IV squash coach and has worked with national squads in both England and Wales. Although he has played squash competitively now for over 25 years (still going!), his background is also soccer, (5th generation Evertonian!), skiing and rugby union.

Dr. Hughes’ research interests embrace notational analysis of sport, the effect of fluid dynamics in sport, the physiological demands of squash, computer aided learning, skiing, analysis of coaching behaviour and developing methodologies in notational analysis. Most of his work has been in analysis of sport where he has pioneered computerised analyses of this complex interaction of variables. He has defined conceptual models so that this methodology of gathering data can be rigorously applied and these data consistently analysed. His work has been recognised by the facts that he was co-opted onto the British Olympic Association Steering Committee, registered as a Performance Analyst working with elite performers (BOA Steering Group), accredited by BASES and formally recognised as a world expert by SportUK World Class Performance Plan.

Dr. Hughes is author of over a hundred scientific articles and the textbook "Notational Analysis of Sport" (1997) addressing the entire field of analysis of sport. A second and expanded edition of this book will appear later this year. He has also edited or co-edited seven books of proceedings of conferences, having organised thirteen international conferences. He is Chairman of the International Society of Performance Analysis and Managing Editor of the International Journal of Performance Analysis of Sport (eIJPAS) – an on-line electronic journal. He has consulted with many professional clubs and national governing bodies in sport. Dr. Hughes has supervised the Performance Analysis element of the sports science support for the World Class Performance Plan of the Squash Rackets Association (England), the Badminton Association of England and also the Football Association of Wales. In addition, he has had shorter contracts with Blackburn Rovers, the Lawn Tennis Association, England Ladies’ Hockey, GB Ladies Hockey and Squash Wales.

Dr. Hughes feels that his academic work is influenced in a practical way because of his experience as an elite coach. This too has enabled him to gain more confidence from all practitioners of coaching and

sports science. As an elite professional squash coach, he has worked with international squads from England Squash, Squash Wales, Welsh Universities and also Great Britain Universities. In addition he has elevated UWIC Academy of Squash (women and men) to unprecedented levels of performance.



Prof. Antonio Rivas
Instituto Nacional de Educación Física de
Galicia
Universidade da Coruña, Spain

✉ antonio@udc.es

Lecture: “**Computer Science for planning, programming and balance process in sport coaching**”

- Ingeniero en Informática. Universidad de A Coruña
- Entrenador Superior en Natación
- Master en Alto Rendimiento Deportivo. Centro Olímpico de Estudios Superiores. Universidad Autónoma de Madrid
- Profesor de Informática Aplicada en el Instituto Nacional de Educación Física de Galicia
- **Tesis doctoral en realización:** Contribuciones de la perspectiva de los sistemas expertos y las redes neuronales al reconocimiento de patrones visuales. Aplicación específica a la automatización del registro de coordenadas en al análisis biomecánico.
- **Temas de investigación adicionales:**
 - Estudio de la percepción de la carga interna según diferentes zonas de entrenamiento en nadadores.
 - Desarrollo de software aplicado a la planificación y control del entrenamiento en natación
- **Publicaciones recientes:**
 - “Planificación y Control del Entrenamiento de Natación: AETN-SpyCE v 1.0. Ed Gymnos. 2001”.
 - “Planificación y Control del Entrenamiento de Natación”. Ed Gymnos. 2001.
 - “Redes de Retropropagación” en “ Redes de Neuronas Artificiales y Algoritmos Genéticos”. Colección: Cursos, Congresos e Simposios. Ed. Universidade da Coruña. 1996.
 - “Reconocimiento de Patrones Humanos de Movimiento” en Biomecánica Aplicada al Deporte I”. Universidad de León 1998.



Dr. Jordi Serrallach i Carulla
AnalySports, Palmerston North, New Zealand

✉ George.Serrallach@nzrugby.co.nz

Lecture: **“Key factors in influencing the outcome of games”**

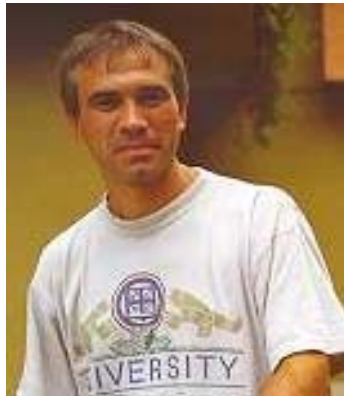
Dr. Serrallach was born in Barcelona in 1936. He obtained his Secondary School qualifications in EGLV and Perez Iborra in 1953. From 1953 to 1958 he obtained a masters degree in chemistry from the University of Barcelona. In 1959 he went to Zurich where in 6 years he obtained a degree in Chemical Engineering and a Ph.D. in Chemical Technology from the Eidgenössische Technische Hochschule.

In 1965 he joined Lainco SA where he worked as director of production and specialist research. In 1971 he immigrated to New Zealand where he worked for two years in the Dairy Research Institute in Palmerston North as a research officer and finally joined the Biotechnology Department of Massey University (Palmerston North) as a Senior Lecturer where he continued his research. He retired in 1996 to establish the group of companies that he is the Director of.

As a child he was bed-stricken with tuberculosis in Tona (Barcelona). To break his boredom his father used to film the FC Barcelona games (1945-1947). Through the careful study of these games he started to develop a systematic approach to the analysis of soccer. Later on he played 3 years as a junior for FC Barcelona (under Llorens) and two years as an amateur for CD Sabadell (under Linares). He took his hobby to Zurich and later on to New Zealand where he continued playing and coaching soccer at junior and senior levels. During all this time he continued to improve his analysis system.

In 1985 he was asked to apply his system to the NZ Soccer national team during the WC campaign. In 1999 his system (developed for Rugby) was used by the All Blacks (the Rugby National Team) for the WC in Wales. In both cases he was part of the travelling party. At present his company is employed by the NZ Rugby Football Union to provide all statistical analysis and video links of all games played in the major competitions in New Zealand and overseas including international games of other countries to see game tendencies and help the coaches of the NZ based teams improve their performances.

In 2003 he has been invited to present his ideas in the inaugural William Pickering series (in honour of W. Pickering, a New Zealander who was NASA director during the Apollo flights). This series have been instituted to reward original ideas by New Zealand leading figures.



Prof. Dr. Antonio Susin Sánchez
Departament de Matemàtica Aplicada I
Universitat Politècnica de Catalunya,
Barcelona, Spain

✉ susin@ma1.upc.edu

**Lecture: “Software dynamic tools for
analysing human motion”**

Professor Antonio Susin achieves his PhD. in applied Mathematics from the University of Barcelona in 1993. His early research starts in the fields of Dynamical Systems and Celestial Mechanics, more precisely, in the triple collision problem. Since 1997 he moves to the Physically-based Animation problems with applications to a wide variety of different environments ranging from simulators of virtual clothes or solid rigid bodies to medicine and human motion. Presently he is mainly focused in grouping all these activities inside the LABSID (Dynamic Simulation Laboratory), which aims to be a shared environment for developing software tools. More information about his research and publications can be found at the URL address: <http://www.ma1.upc.edu/~susin/>

Las **1^{as} Jornadas sobre Sistemas Complejos y Deporte** y la
4a Conferencia Internacional sobre Ciencia Informática y Deporte
están presentadas por el
Institut Nacional d'Educació Física de Catalunya (INEFC Barcelona)
en cooperación con
Centre de Recerca Matemàtica (CRM)
y
Universitat Politècnica de Catalunya (UPC) .

Este acontecimiento tiene la intención de ofrecer un marco común a todos los científicos de diferentes disciplinas incluyendo las ciencias del deporte, matemáticas, informática, fisiología del ejercicio, biomecánica, entrenamiento, medicina, fisioterapia, psicología, entre otras áreas.

El **COM & COM** es reconocido con 3 créditos de libre elección por la Universidad de Barcelona.

La naturaleza compleja y no lineal de la respuesta humana al ejercicio se encuentra pobremente explicada por los modelos tradicionales utilizados habitualmente por las ciencias de la actividad física y el deporte. Estos modelos tradicionales funcionan mejor modelando la respuesta de situaciones lineales y aisladas. No obstante, éstas suponen tan sólo una pequeña parte de las probables o posibles respuestas que se pueden manifestar.

El desarrollo y aplicación de nuevos modelos e instrumentos complejos y no lineales tendrán una gran repercusión en los convencionales métodos de aprendizaje, entrenamiento o valoración utilizados en la actividad física y el deporte. Nos permitirán captar más estrechamente tanto la naturaleza no lineal de la respuesta al ejercicio como las complejas interacciones que se llevan a cabo en la práctica.

Las **1as Jornadas sobre Sistemas Complejos y Deporte** intentan aglutinar las contribuciones de reconocidos científicos internacionales, que trabajan en diferentes ámbitos, con el objetivo de aplicar sus conocimientos a la actividad física y el deporte. La principal finalidad es presentar sus recientes resultados y plantear nuevas cuestiones, así como generar interesantes ideas respecto un planteamiento alternativo no lineal y complejo para la modelización, los métodos de aprendizaje, de valoración y entrenamiento. Además de presentar los principales conceptos y aplicaciones de las matemáticas de la complejidad y no lineales, las jornadas también intentan generar proyectos de investigación interdisciplinares y enriquecer la práctica diaria de los profesionales que trabajan en la actividad física y el deporte.

Durante los últimos años, la ciencia informática ha sido una disciplina que se ha colaborado con numerosas ciencias tradicionales. Esto a sido debido a que el uso de bases de datos y multimedia, el diseño de modelos, el análisis de sistemas, etc., requieren cada vez más del soporte de herramientas y conceptos adecuados, que están desarrollados y disponibles en la ciencia informática. Por esta razón y debido a la necesidad de cooperación internacional en este campo, el primer Simposio Internacional de Ciencia Informática y Deporte fue organizado en Colonia (1997). Desde entonces, cada dos años, el simposio ha sido organizado con éxito en diferentes ciudades europeas (Viena, Cardiff). La intención es proporcionar una plataforma para el intercambio de las últimas experiencias e ideas respecto al uso de la informática en el deporte y ayudar al desarrollo de la teoría y la práctica del mismo.

Esta 4a edición de la Conferencia Internacional sobre Ciencia Informática y Deporte, tiene previsto resaltar las conexiones entre los sistemas complejos y la ciencia informática, y presentar las herramientas necesarias para su estudio. Se hará especial énfasis en las técnicas de modelización y en los conceptos informáticos aplicados a las ciencias del deporte. Se pretende que estas herramientas permitan estudiar los procesos de aprendizaje y entrenamiento como sistemas complejos dinámicos, al mismo tiempo que contribuyan a desarrollar un paradigma científico alternativo al vigente en el deporte. Finalmente, la conferencia presentará otras contribuciones recientes de la ciencia informática a la actividad física y el deporte, destacando especialmente el tema de educación y multimedia.

RESOLUCIÓN DE LAS BECAS

Relación de beneficiarios, exentos de pagar la cuota de inscripción al
1st Meeting of Complex Systems and Sport & al
4th International Conference of Computer Science in Sport.

Name	Surname	Institution	Awarded by:
Albert	Gil Galve	INEFC-Centre de Barcelona	CRM-UPC
Javier	Rodríguez Navarro	Universitat de Barcelona - Facultat de Matemàtiques	CRM-UPC
José Pablo	Sanchez Casas	Universitat Politècnica de Catalunya - Facultat de Matemàtiques	CRM-UPC
Gonzalo Marcelo	Ramírez Avila	Université Libre de Bruxelles	CRM-UPC
Cassie	Wilson	Loughborough University	CRM-UPC
Olivier	Oullier	Center for Complex Systems and Brain Sciences - FAU	CRM-UPC
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Rafael	Peinado	University of Limerick	CRM-UPC
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María Teresa	Sanegre Llopis	Universidad de València - Dpt. d'Educació Física i Esportiva	CRM-UPC
Renata	Zumbakyte	Lithuanian Academy of Physical Education	CRM-UPC
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Mikel	Zabala Díaz	Universidad de Granada - FCCAFD	CRM-UPC
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Raquel	Mirabet Agulled	INEFC-Centre de Barcelona	INEFC
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PROGRAM

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1st Meeting of Complex Systems and Sport

WEDNESDAY, MAY 14TH / DIMECRES, 14 DE MAIG / MIÉRCOLES, 14 DE MAYO

MORNING / MATI / MAÑANA

10.00-14.00

REGISTRATION

INSCRIPCI

INSCRIPCION

AFTERNOON / TARDA / TARDE

15.00-15.25

OPENING/ OBERTURA/ APERTURA

15.30-16.15 [Scott Kelso](#)

Understanding human motor behaviour: Coordination dynamics

Comprentent el comportament motor humà: Dinàmica de la coordinació

Comprendiendo el comportamiento motor humano: Dinámica de la coordinación

16.15-17.00 [Wolfgang Schöllhorn](#)

Coordination dynamics and its consequences on sports

Dinàmica de la coordinació i les seves conseqüències en l'esport

Dinámica de la coordinación y sus consecuencias en el deporte

17.00-17.15 *Coffee break/ Pausa cafè/ Pausa cafè*

17.15-18.00 [Francisco Seirul-lo](#)

Dynamic systems and performance in team sports

Sistemes dinàmics i rendiment en esports d'equip

Sistemas dinámicos y rendimiento en deportes de equipo

18.05-19.00 ROUND TABLE/

TAULA RODONA/ MESA REDONDA

Chair/Moderador: [Wolfgang Schöllhorn](#)

Training and practice in individual and team sports from a dynamical systems perspective

Entrenament i pràctica d'esports individuals i col·lectius des de la perspectiva dels sistemes dinàmics

Entrenamiento y práctica de deportes individuales y colectivos desde la perspectiva de los sistemas dinámicos

1st Meeting of Complex Systems and Sport

THURSDAY, MAY 15TH / DIJOURS, 15 DE MAIG/ JUEVES, 15 DE MAYO

MORNING/ MATI/ MAÑANA

08.30-09.15 [Susan Ward](#)

Dynamic control models of ventilation during exercise

Models de control dinàmic de la ventilació durant l'exercici

Modelos de control dinámico de la ventilación durante el ejercicio

09.15-10.00 [Brian Whipp](#)

Intensity-dependent limitations to exercise tolerance-

Clues from dynamic analysis of pulmonary gas-exchange

Limitacions de la tolerància a l'exercici en funció de la intensitat-

Indicacions de l'anàlisi dinàmica de l'intercanvi pulmonar de gasos

Limitaciones de la tolerancia al ejercicio en función de la intensidad-

Indicaciones del análisis dinámico del intercambio pulmonar de gases

10.00-10.15 *Coffee break/ Pausa cafè/ Pausa cafè*

10.15-11.00 **Parallel Session**

Sessió Paral·lela/ Sesión Paralela

ORAL COMMUNICATIONS

COMUNICACIONS ORALS

COMUNICACIONES ORALES

11.00-11.45 [Veronique Billat](#)

The multi-fractal approach of middle and long-distance running

Enfocament multifractal de les carreres de mitjana i llarga distància

Enfoque multi-fractal de las carreras de media y larga distancia

11.45-12.30 [James Stirling](#)

Mathematical modelling of the physiological response to exercise

Modelització matemàtica de la resposta fisiològica a l'exercici

Modelización matemática de la respuesta fisiológica al ejercicio

12.30-13.15 ROUND TABLE/

TAULA RODONA/ MESA REDONDA

Chair/Moderador: [Joachim Mester](#)

Complex Systems and Exercise Physiology. *Sistemes Complexos i Fisiologia de l'Exercici. Sistemas Complejos y Fisiología del Ejercicio*

13.15-14.15 Lunch/ Dinar/ Almuerzo

AFTERNOON/ TARDA / TARDE

14.15-14.30 POSTER SESSION

SESSIÓ PÓSTERS/ SESIÓ POSTERS

14.30-15.15 Parallel Session

Sessió Paral·lela/ Sesión Paralela

ORAL COMMUNICATIONS

COMUNICACIONS ORALS

COMUNICACIONES ORALES

15.15-16.00 [Maria Zakynthinaki](#)

Mathematical modelling in biomechanics

Modelització matemàtica en biomecànica

Modelización matemática en biomecánica

16.00-16.45 [Keith Davids](#)

Acquiring skill in sport: a constraints-led perspective. *Aprenentatge d'habilitats esportives en funció dels factors que condicionen cada situació*. Aprendizaje de habilidades deportivas en función de los condicionantes de cada situación.

16.45-17.00 Coffee break/ Pausa cafè/ Pausa café

17.00-17.45 [Yaneer Bar-Yam](#)

Complexity and teamwork in sports *Complexitat i treball d'equip en l'esport*

Complejidad y trabajo de equipo en el deporte

17.45-18.45 ROUND TABLE/

TAULA RODONA/ MESA REDONDA

Chair/Moderador: [Keith Davids](#)

The role of the coach/ teacher/ therapist in organising training and practice from a dynamical systems perspective

El paper de l'entrenador/ professor/ terapeuta en l'organització de l'entrenament i la pràctica des de la perspectiva dels sistemes dinàmics

El rol del Entrenador/ profesor/ terapeuta en la organización del entrenamiento y la práctica desde la perspectiva de los sistemas dinámicos

4th International Conference of Computer Science in Sport

FRIDAY, MAY 16TH/ DIVENDRES, 16 DE MAIG/ VIERNES, 16 DE MAYO

MORNING/ MATI / MAÑANA

08.30-08.40 [Jörgen Perl](#) & [A. Baca](#)

Introduction to the 4th International Conference of Computer Science in Sport

Introducció a la 4a Conferència Internacional sobre Ciència Informàtica i Esport

Introducción a la 4a Conferencia Internacional sobre Ciencia Informática y Deporte

08.40-09.20 [Jörgen Perl](#)

On the long-term behaviour of the performance-potential-metamodel PerPot: New results and approaches

Comportament a llarg termini del metamodel del potencial de rendiment PerPot: Nous plantejaments i resultats

Comportamiento a largo plazo del metamodelo de potencial de rendimiento PerPot: Nuevos planteamientos y resultados

09.20-10.05 [A. Baca](#)

Computer Science-based feedback systems on sports performance

Sistemes de feedback pel rendiment esportiu basats en la Ciència Informàtica

Sistemas de feedback para rendimiento deportivo basados en la Ciencia Informática

10.05-10.30 Coffee break/ Pausa cafè/ Pausa cafè

10.30-11.15 [Martin Lames](#)

Computer Science for top level team sports

Sistemes de feedback pel rendiment esportiu basats en la ciència informàtica

La Ciencia Informática en los deportes de equipo de alto nivel

11.15-12.00

ROUND TABLE/ TAULA RODONA/

MESA REDONDA

Chair/Moderador: [Jürgen Perl](#)

Modelling in sport

Modelització en l'esport

Modelización en el deporte

12.00-12.30 SESSION/SESSIÓ/ SESIÓN

International Association of Computer Science in Sport

-
-
-

12.30-13.00 POSTER SESSION

SESSIÓ DE POSTERS

SESIÓN DE POSTERS

13.00-14.00 Lunch/ Dinar/ Almuerzo

AFTERNOON/ TARDA/ TARDE

14.00-15.00 Parallel Session

Sesió Paral·lela/ Sesión Paralela

ORAL COMMUNICATIONS *COMUNICACIONES ORALES* COMUNICACIONES ORALES

15.00-15.45 [Mike Hughes](#)

Reliability of using computers to analyse performance in large events -the 2002 World Cup for Soccer

Fiabilitat de l'ús d'ordinadors per l'anàlisi del rendiment en competicions de llarga durada -Copa del Món de Futbol 2002-

Fiabilidad del uso de ordenadores en el análisis del rendimiento en competiciones de larga duración - Copa del Mundo de fútbol 2002

15.50-16.35 [Christian Holzer](#)

Match analysis by transmitter position measurement

Anàlisi de joc mesurant la posició de transmissors

Análisis del juego midiendo la posición de transmisores

16.40-16.55 Coffee break/ Pausa cafè/ Pausa cafè

17.00-17.45 [George Serrallach](#)

Key factors in influencing the outcome of games

Factors clau que influeixen en el resultat dels partits

Factores clave que influyen en el resultado de los partidos

17.50-18.45

ROUND TABLE/ TAULA RODONA/ MESA REDONDA

Chair/Moderador: [Mike Hughes](#)

Game analysis and performance

Anàlisi de joc i rendiment

Análisis de juego y rendimiento

◆

4th International Conference of Computer Science in Sport

SATURDAY, MAY 17TH/ DISSABTE, 17 DE MAIG/ SÁBADO, 17 DE MAYO

◆

MORNING/ MATI/ MAANA

08.30-09.15 **Parallel Session**

Sessió Paralela/ Sesió Paralela

- **Toni Susin**

Software dynamic tools for analysing human motion

Eines dinàmiques de software per l'anàlisi del moviment humà

Herramientas dinámicas de software para el análisis del movimiento humano

Parallel * Paralela * Paralela

- **Antonio Rivas**

Computer Science for planning, programming and balance process in sport coaching

Ciència informàtica per planificar i programar l'entrenament esportiu

Ciencia informática para planificar y programar el entrenamiento deportivo

09.15-10.00 **Parallel Session**

Sessió Paralela/ Sesió Paralela

- **Josep Escoda**

Technological projects: MARES - DTL - GEST

Projectes tecnològics: MARES - DTL - GEST

Proyectos tecnológicos: MARES - DTL - GEST

Parallel * Paralela * Paralela

- **Raül Arellano**

Complex systems applied to competitive swimming: analysis of swimming performance and fluid mechanics

Sistemes Complexos aplicats a la natació de competició: anàlisi del rendiment en natació i mecànica de fluids

Sistemas Complejos aplicados a la natación de competición: análisis del rendimiento en natación y mecánica de fluidos

10.00-10.15 **Coffee break/**

Pausa cafè/ Pausa cafè

10.15-11.00 **Ulrich Hartmann**

Computer based modelling -a chance to increase validity and reliability of performance diagnostics results

Modelització basada en la Ciència Informàtica -Una oportunitat per incrementar la validesa i la fiabilitat dels resultats del diagnòstic de rendiment

Modelización basada en la Ciencia Informática -Una oportunidad para incrementar la validez y la fiabilidad de los resultados del diagnóstico de rendimiento

11.00-12.00 **Parallel Session**

Sessió Paralela/ Sesió Paralela

ORAL COMMUNICATIONS COMUNICACIONS ORALS COMUNICACIONES ORALES

Parallel * Paralela * Paralela

WORKSHOPS

TALLERS

TALLERES

12.00-12.15 **Domènec Blázquez**

e-learning experience of the Campus Virtual de l'Esport - INEFC-Mèdia

Experiència e-learning del Campus Virtual de l'Esport - INEFC-Mèdia

Experiencia e-learning del Campus Virtual del Deporte - INEFC-Mèdia

12.15-13.00 **Joachim Mester**

Integrated Scientific Information Asset Management: A Perspective for Education and Research in Europe

Gestió dels fons d'informació científica integrada: una perspectiva per l'Educació i la Recerca a Europa

Gestión de los fondos de información científica integrada: una perspectiva para la Educación y la Investigación en Europa

13.00-13.45 **Joseph Wiemeyer**

Learning with multimedia - more promise than practice?

Aprenent amb multimedia - més promeses que resultats?

Aprendiendo con multimedia   s promesas que resultados?

13.45-14.00 CLOSING /CLOENDA/
CLAUSURA

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- [Jürgen Perl](#)
- [Bengt Saltin](#)
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- [Maria Zakyntinaki](#)

1^{as} Jornadas sobre Sistemas Complejos y Deporte:

Lecturer	Affiliation
Yaneer Bar-Yam	New England Complex Systems Institute Harvard University, USA
Veronique Billat	Université d'Evry Val d'Essonne, France
Keith Davids	School of Physical Education University of Otago, New Zealand
Scott Kelso	Center for Complex Systems and Brain Sciences Florida Atlantic University, USA
Joachim Mester	Institute for Training and Movement Science Deutsche Sporthochschule Köln, Germany
Bengt Saltin	Copenhagen Muscle Research Centre University of Copenhagen, Denmark
Wolfgang Schöllhorn	Training and Movement Science Department Westfälische Wilhelms Universität Münster, Germany
Francisco Seirul-lo	Institut Nacional d'Educació Física de Catalunya Centre adscrit a la Universitat de Barcelona, Spain
James Stirling	Centre de Recerca Matemàtica (CRM) Bellaterra, Spain
Susan Ward	Center for Exercise and Medicine Institute of Biomedical and Life Sciences, University of Glasgow, UK
Brian Whipp	Division of Respiratory and Critical Care Physiology & Medicine Harbor-UCLA Medical Center, Torrance, California, USA
Maria Zakyntinaki	Departament de Matemàtica Aplicada I Universitat Politècnica de Catalunya, Barcelona, Spain

4a Conferencia Internacional sobre Ciencia Informática y Deporte:

Lecturer	Affiliation
Raul Arellano	Facultad de Ciencias de la Actividad Física y del Deporte Universidad de Granada, Spain
Arnold Baca	Institut für Sportwissenschaft der Universität Wien, Austria
Domenec Blazquez	Institut Nacional d'Educació Física de Catalunya Centre adscrit a la Universitat de Barcelona, Spain
Josep Escoda	Centre d'Alt Rendiment (CAR) Unitat de Tecnologia & Informàtica, Sant Cugat, Spain
Ulrich Hartmann	Faculty of Sport Science Technische Universität München, Germany
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Secretaría de la Conferencia:

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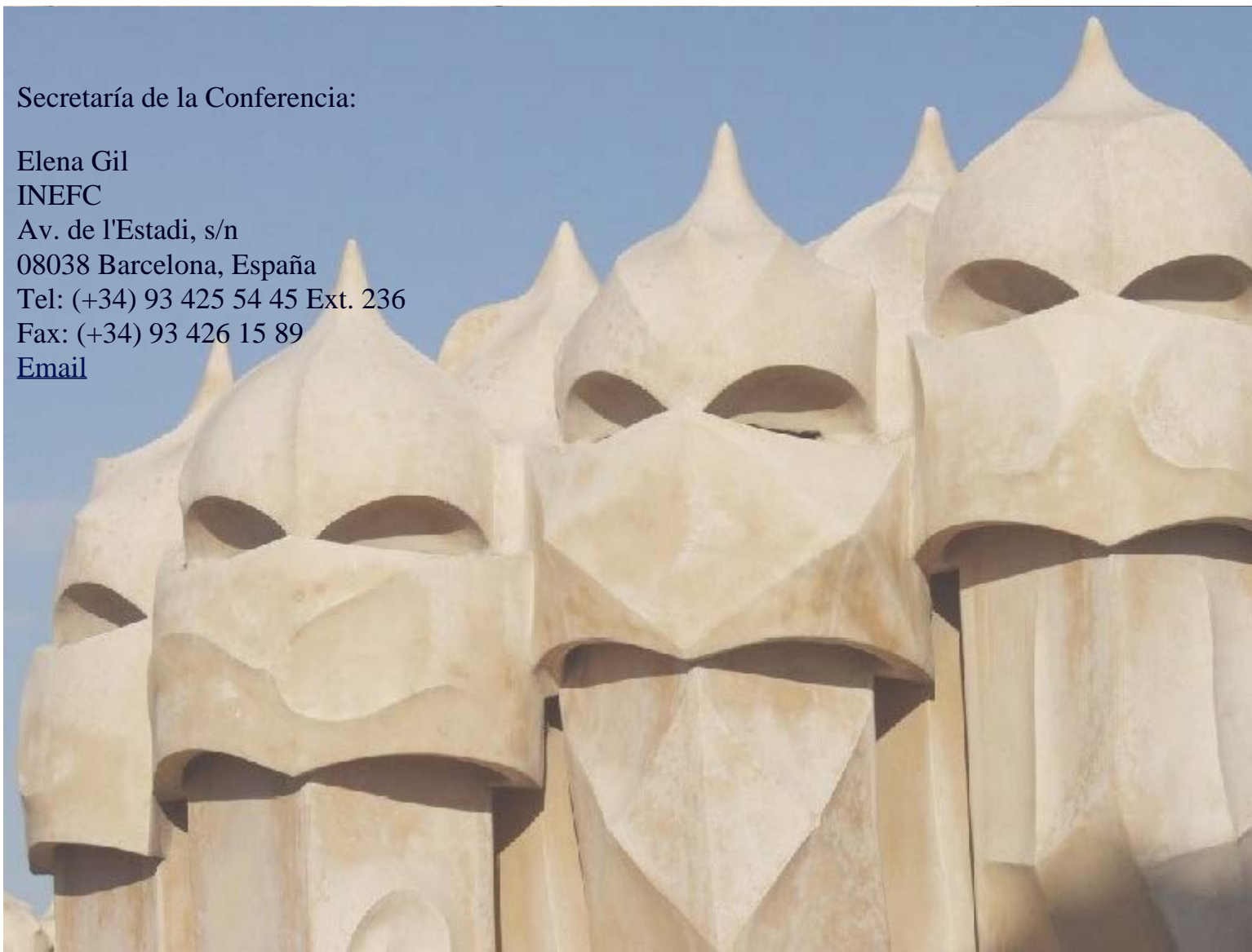
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1st MEETING OF
COMPLEX SYSTEMS
AND SPORT

COM & COM

4th International
CONFERENCE OF
COMPUTER
SCIENCE IN SPORT

Barcelona, May 14 - 17.

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**CENTRE DE RECERCA
MATEMÀTICA.**



**UNIVERSITAT POLITÈCNICA DE
CATALUNYA**

The **1st Meeting of Complex Systems and Sport** and the
4th International Conference of Computer Science in Sport
is organized by the
Institut Nacional d'Educació Física de Catalunya (INEFC Barcelona)
in cooperation with
Centre de Recerca Matemàtica (CRM)
and
Universitat Politècnica de Catalunya (UPC) .

The event has the intention of bringing together scientists from different
disciplines including sport science, mathematics, computer science, exercise
physiology, biomechanics, coaching, medicine, physiotherapy, psychology, as
well as other areas.

THE COM & COM IS RECOGNIZED WITH 3 FREE CHOICE CREDITS BY TI



Last modified: 08/05/2003
Maria Zakyntinaki

Les **1es Jornades sobre Sistemes Complexos i Esport** i la
4a Conferència Internacional sobre Ciència Informàtica i Esport
estan presentades per l'
Institut Nacional d'Educació Física de Catalunya (INEFC Barcelona)
en cooperació amb
Centre de Recerca Matemàtica (CRM)
i
Universitat Politècnica de Catalunya (UPC) .

Aquest esdeveniment té la intenció d'oferir un marc comú a tots els científics de diferents disciplines incloent les ciències de l'esport, matemàtiques, informàtica, fisiologia de l'exercici, biomecànica, entrenament, medicina, fisioteràpia, psicologia, entre altres àrees.

El **COM & COM** és reconegut amb 3 crèdits de lliure elecció per la Universitat de Barcelona.

La naturalesa complexa i no lineal de la resposta humana a l'exercici es troba pobrament explicada pels models tradicionals utilitzats habitualment per les ciències de l'activitat física i l'esport. Aquests models tradicionals funcionen millor modelant la resposta de situacions lineals i aïllades. No obstant, aquestes suposen únicament una petita part de les probables o possib

El desenvolupament i aplicació de nous models i eines complexos i no lineals tindran una gran repercussió sobre els convencionals mètodes d'aprenentatge, entrenament o valoració utilitzats en l'activitat física i l'esport. Ens permetran captar més estretament tant la naturalesa no lineal de la resposta a l'exercici com les complexes interaccions que es duen a terme durant la pràctica.

Les **1es Jornades sobre Sistemes Complexos i Esport** intenten aglutinar les contribucions de reconeguts científics internacionals, que treballen en diferents àmbits, amb l'objectiu d'aplicar els seus coneixements a l'activitat física i l'esport. La principal finalitat és presentar els recents resultats i plantejar noves qüestions, així com generar interessants idees respecte a un plantejament alternatiu i complex per a la modelització, els mètodes d'aprenentatge, de valoració i entrenament. A més de presentar els principals conceptes i aplicacions de les matemàtiques de la complexitat i no lineals, les jornades també intenten generar projectes d'investigació interdisciplinaris i enriquir la pràctica diària dels professionals que treballen en l'activitat física i l'esport.

Durant els últims anys, la ciència informàtica ha estat una disciplina que ha col·laborat amb nombroses ciències tradicionals. Això és degut a que l'ús de bases de dades i multimèdia, el disseny de models, l'anàlisi de sistemes etc., requereixen cada vegada més del suport d'eines i conceptes adequats, que es troben desenvolupats i disponibles en la ciència informàtica. Per aquesta raó i a causa de la necessitat de cooperació internacional dins d'aquest camp, el primer Simposi Internacional de Ciència Informàtica i Esport fou organitzat a Colònia (1997). Des d'aquest moment, cada dos anys la conferència ha estat organitzada amb èxit a diferents ciutats europees (Viena, Cardiff). La intenció és proporcionar una plataforma per a l'intercanvi de les últimes experiències i idees respecte a l'ús de la informàtica i recolzar el desenvolupament de la teoria i la pràctica en l'esport.

Aquesta 4a edició de la Conferència Internacional sobre Ciència Informàtica i Esport, té previst ressaltar les connexions entre els sistemes complexos i la ciència informàtica, i presentar les eines necessàries per a l'estudi dels sistemes complexos en l'esport. Es farà especial èmfasi en les tècniques de model·lització i en els conceptes informàtics aplicats a les ciències de l'esport. Es pretén que aquestes eines permetin estudiar els processos d'aprenentatge i d'entrenament com a sistemes complexos dinàmics, alhora que contribueixin a desenvolupar un paradigma científic alternatiu al vigent en l'esport. Finalment, la conferència presentarà altres contribucions recents de la ciència informàtica a l'activitat física i l'esport, destacant especialment el tema de educació i multimedia.

RESOLUCIÓ DE LES BEQUES

Relació dels beneficiaris, exempts de pagament de la quota d'inscripció al
1st Meeting of Complex Systems and Sport & al
4th International Conference of Computer Science in Sport.

Name	Surname	Institution	Awarded by:
Albert	Gil Galve	INEFC-Centre de Barcelona	CRM-UPC
Javier	Rodríguez Navarro	Universitat de Barcelona - Facultat de Matemàtiques	CRM-UPC
José Pablo	Sanchez Casas	Universitat Politècnica de Catalunya - Facultat de Matemàtiques	CRM-UPC
Gonzalo Marcelo	Ramírez Avila	Université Libre de Bruxelles	CRM-UPC
Cassie	Wilson	Loughborough University	CRM-UPC
Olivier	Oullier	Center for Complex Systems and Brain Sciences - FAU	CRM-UPC
Brynja	Kohler	University of Utah	CRM-UPC
Alejandro	Ferrer San Juan	Universidad Europea de Madrid - FCCAFD	CRM-UPC
Rafael	Peinado	University of Limerick	CRM-UPC
António Paulo	Pereira Ferreira	Universidade Técnica de Lisboa	CRM-UPC
María Teresa	Sanegre Llopis	Universidad de València - Dpt. d'Educació Física i Esportiva	CRM-UPC
Renata	Zumbakyte	Lithuanian Academy of Physical Education	CRM-UPC
Daniel	Link	Univesity of Augsburg	CRM-UPC
Nader	Rahnama	Liverpool John Moore University	CRM-UPC
Xiaoyan	Li	Loyola University Chicago	CRM-UPC
Zoltán	Vass	Semmelweis University Budapest	CRM-UPC
Klaus	Tschismar	Westfälische Wilhelms-Universität Münster	CRM-UPC
Raúl	Reina Vaíllo	Universidad de Extremadura - FCCAFD	CRM-UPC
Christian	Eder	University of Vienna	CRM-UPC
Mikel	Zabala Díaz	Universidad de Granada - FCCAFD	CRM-UPC
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Francisco	Ortega Porcel	Universidad de Granada - FCCAFD	CRM-UPC
Helena	Ylla-Català Puigrefagut	Universitat Politècnica de Catalunya - Facultat de Matemàtiques	CRM-UPC
Daniel	Guimaran	Universitat Autònoma de Barcelona	CRM-UPC
Bart	Soons	Katholieke Universiteit Leuven	CRM-UPC
Susanna	Esteba Castillo	Hospital Santa Creu - UAB	CRM-UPC
Javier	Pérez Tejero	Instituto Nacional de Educación Física de Madrid - UPM	CRM-UPC
Robert	Rein	Johann Wolfgang Goethe-Universität Frankfurt	CRM-UPC
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Ana	Salinas Polo	INEFC-Centre de Barcelona	INEFC
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Helder	Rodrigues de Carvalho	INEFC-Centre de Barcelona	INEFC
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Francisco	Marin Sanchez	INEFC-Centre de Barcelona	INEFC
Arnau	Florit Castro	INEFC-Centre de Barcelona	INEFC
Irene	Pellicer Royo	INEFC-Centre de Lleida	INEFC
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Sergi	Pérez Pérez	INEFC-Centre de Lleida	INEFC
Igor	Bertol Cuesta	INEFC-Centre de Lleida	INEFC
Erica	Hernández López	INEFC-Centre de Lleida	INEFC
Patricia	Hernández López	INEFC-Centre de Lleida	INEFC
Natividad	Navarro Ariño	INEFC-Centre de Lleida	INEFC
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Com arribar



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1es Jornades sobre Sistemes Complexos i Esport:

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Secretaria de la Conferència:

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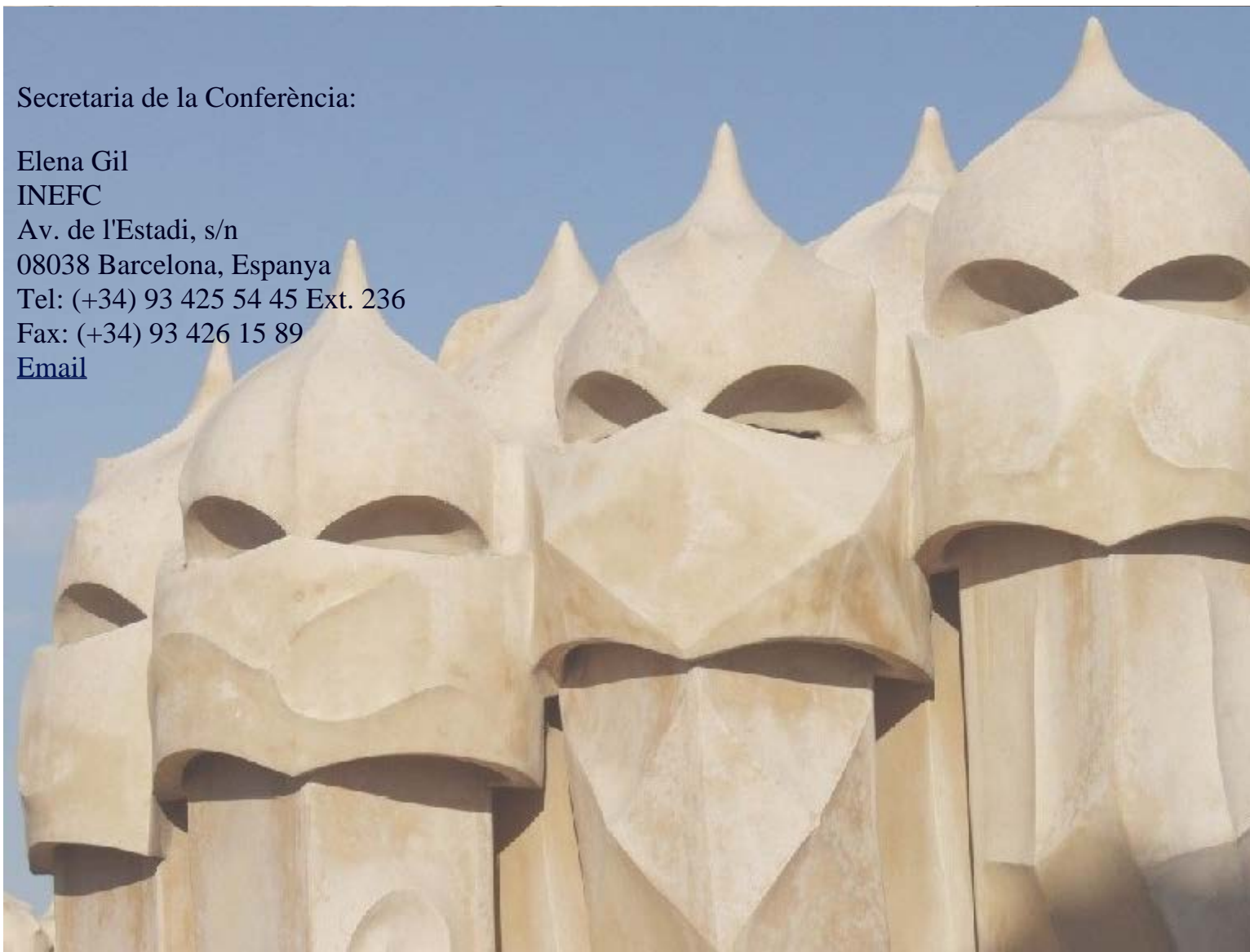
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El aeropuerto está situado en el Prat de Llobregat (al oeste de Barcelona), a unos diez kilómetros de la ciudad condal. Existen tres maneras diferentes de llegar:

- a) Con Taxi: desde el aeropuerto hasta al centro de Barcelona: aproximadamente unos 20 Euros.
- b) Con Tren (RENFE): hay trenes cada 30 minutos desde las 6:13H hasta las 23:13H. Estos pasan por la vía principal de la Estación de Sants hasta el centro de la ciudad (Plaza Cataluña). Desde ambas estaciones se puede coger el metro de la Línea 3 que llega hasta la Plaza España.
- c) Con Autobús: de lunes a viernes, hay autobuses cada 15 minutos desde las 6:00H hasta las 23:00H, y los fines de semana y vacaciones desde las 6:30H hasta las 22:50H. Estos salen desde el aeropuerto hasta la Estación de Sants o hasta Plaza Cataluña, donde se puede coger el metro de la Línea 3 que llega a Plaza España.

Con tren

Los trenes provenientes de otras ciudades españolas llegan a la Estación de Sants de Barcelona donde se puede coger el metro de la Línea 3 que llega hasta la Plaza España. Todas las llegadas internacionales se realizan en la Estación de Francia. Para más información sobre transportes urbanos de Barcelona se puede visitar la página web [Barcelona Metropolitan Transportation](#).

Con coche

- a) Desde el Norte: Autopista A7 desde Francia (La Jonquera). Coger la autopista A18 (Manresa-Barcelona) si se desea llegar a Barcelona desde el Nor-este (Nudo de la Trinidad). Coger la autopista A2 desde Madrid y Zaragoza si se desea llegar a Barcelona desde el sur-este (Avenida Diagonal).
- b) Desde el Oeste: Autopista A2 desde Madrid y Zaragoza que finaliza en la Avenida Diagonal.
- c) Desde el Sur: Autopista A7 desde Alicante y Valencia que se incorpora a la Autopista A2 y que finaliza en la Avenida Diagonal.

Desde Plaza España

Se puede coger el autobús de la línea 50 desde Plaza España - Avenida Reina María Cristina. Bajar en la parada INEFC-Avenida del Estadio.

Amb avió

L'aeroport està situat al Prat de Llobregat (a l'oest de Barcelona), a uns deu quilòmetres de la ciutat condal. Hi ha tres maneres diferents d'arribar:

- a) Amb Taxi: des de l'aeroport fins al centre de Barcelona: aproximadament uns 20 Euros.
- b) Amb Tren (RENFE): hi ha trens cada 30 minuts des de les 6:13H fins a les 23:13H. Aquests passen per la via principal de l'Estació de Sants fins al centre de la ciutat (Plaça Catalunya). Des d'ambdues estacions es pot agafar el metro de la Línia 3 que arriba fins a la Plaça Espanya.
- c) Amb Autobús: de dilluns a divendres, hi ha autobusos cada 15 minuts des de les 6:00H fins a les 23:00H, i els caps de setmana i vacances des de les 6:30H fins a les 22:50H. Aquests surten des de l'aeroport fins a l'Estació de Sants o fins a la Plaça Catalunya, on es pot agafar el metro de la Línia 3 que arriba fins a la Plaça Espanya.

Amb tren

Els trens prominents d'altres ciutats espanyoles arriben a l'Estació de Sants de Barcelona on es pot agafar el metro de la Línia 3 que arriba fins a la Plaça Espanya. Totes les arribades internacionals es fan a l'Estació de França. Per més informació sobre els transports urbans de Barcelona es pot visitar la pàgina web [Barcelona Metropolitan Transportation](#).

Amb cotxe

- a) Des del Nord: Autopista A7 des de França (La Jonquera). Agafar l'autopista A18 (Manresa-Barcelona) si es planeja arribar a Barcelona des del nord est (Nus de la Trinitat). Agafar l'autopista A2 des de Madrid i Saragossa si es planeja arribar a Barcelona des del sud est (Avinguda Diagonal).
- b) Des de l'Oest: Autopista A2 des de Madrid i Saragossa i que acaba a l'Avinguda Diagonal.
- c) Des del Sud: Autopista A7 des d'Alacant i València que s'incorpora a l'Autopista A2 i que finalitza a l'Avinguda Diagonal.

Des de la Plaça Espanya

Es pot agafar l'autobús de la línia 50 des de la Plaça Espanya - Avinguda Reina Maria Cristina. Baixar a la parada INEFC-Avinguda de l'Estadi.