

Associated Laboratory – ISR: Report 2003
Theme C: Sustainable Technologies and Environmental Systems

The research work under this theme has been aimed to develop and use advanced research methodologies for the analysis of complex systems and to promote the exchange of knowledge in advanced technologies for the optimisation of industrial processes and environmental systems. It involves 6 main topics, as follows.

1. Industrial Ecology Toolbox

The research work developed is aimed at demonstrating the need to prepare the evolution to a new “Industrial Ecology stage”. The requirements to step up to this new stage are classified at three levels, the need for an appropriate “environmental analysis methodologies toolbox”, the establishment of a structured set of indicators to support sustainable policies and priority setting at a regional level, and finally, the development of a new organization of infra-structures, technologies, sectors and firms to promote co-operation between the various actors involved within an Industrial Ecology framework

The following papers were developed in this context:

Design for Environment – DFE:

- Ferrão, P., J. Amaral and P. Silva. (2003).” Laying the foundations for a DfR tool for auto components”. 14TH International Conference on Engineering Design ICED 03, Sweden, Stockholm.

Hybrid Economic Input-Output Life Cycle Assessment – H-EIO-LCA:

- Ferrão, P., Nhambiu, J, and Suh, S. (2003) “Industrial Ecology of Portuguese Glass Products based on Hybrid Input-Output Analysis”. International Society of Industrial Ecology - Conference 2003: Industrial Ecology for a Sustainable Future. Ann Arbor, USA, June, 29th- July, 2nd, 2003.

2. Environmental Policy and Industrial Ecology Systems

The physical nature of the economy is emerging as a new paradigm, based on increasing public recognition of environment-economy interconnections. In this context, modern economies can be seen as ingesting raw materials, which are metabolised into products and services and also waste, in the form of materials/products without use and pollution. Environment-economy interconnections are dependent on economic activity fields or sectors, on the existing local infrastructures and future technological options, i.e. on the time and length scales imposed by the local-regional interactions at different levels (economic, regulatory, technological). The research developed concludes that innovation in environmental technologies may shift the spirit of product-oriented regulations and give rise to more efficient approaches if a transversal, Industrial Ecology perspective, integrating different products life cycles is adopted.

The following papers were developed in this context:

The environment and the automobile:

- Ferrão, P. (2003) “O ambiente e o sector automóvel”. Ambiente 21, rubrica de inovação científica. Nº 8, ano II, pp. 52-53.

Ecological economics:

- Canas, A., Ferrão, P. and Conceição, P. (2003) “A new environmental kuznets curve? Relationship between direct material input and income per capita: evidence

from industrialized countries”. Journal: Ecological Economics. Volume 46, Issue 2, September 2003 , Pages 217-229.

Energy and environment:

- P. Ferrão e M. Águas (2003) “Energia e Ambiente”, in: Engenho e Obra: Uma Abordagem à História da Engenharia em Portugal no Século XX., pp. 304-313. Dom Quixote.
- Ferrão, P., Jordão, M.F., Mendes, A.S. (2003). “ Uma bolsa de resíduos para Portugal”. Congresso sobre tecnologias de valorização de resíduos, organizado pela APEMETA com a colaboração do Instituto dos Resíduos. ExpoAmbiente 2003, FIL, Lisboa, 6 e 7 de Novembro de 2003.

3. Environmental Physics

The scientific activity in environmental physics has been developed within the framework of the project SAPIENS: POCTI/1999/CTA/35626 - Carbon Balance of Eucalypt Plantations in Portugal- the Kyoto Forest Problem. In the context of the Kyoto protocol, the activity developed is aimed at evaluating the magnitude, seasonality and repartition of the carbon fluxes and stocks in a Eucalyptus forest. Ultimately, the aim is to evaluate the potential of the eucalyptus forest to act as a carbon sink. The research performed is mainly experimental and, as a consequence, a significant effort has been dedicated to set up an experimental rig at the *Herdade da Espirra*, Pegões, and now, a set of data taken from different sensors, during 2002, is available.

The following papers were developed in this context:

- Full carbon balance in an eucalypt plantation in Portugal. [P7.23] The Carbon Balance of Forest Biomes, University of Southampton during the annual meeting of the SEB from the 1st to 4th of April 2003. J.S. Pereira (Instituto Superior de Agronomia, Lisbon); G. Pita, J. Silva (Instituto Superior de Técnico, Lisbon); A. Fabião, M. Carneiro, C. Nogueira (Instituto Superior de Agronomia; A. Rodrigues (Instituto Nacional de Investigação Agrária) & E. Ribeiro (Instituto Superior de Agronomia, Lisbon).
- Fluxos de Massa e Energia na Camada Limite Atmosférica em Montado de Sobro, Abel Martins Rodrigues, Gabriel P.A. Pita, Silva Lusitana 11(1) 31-60, 2003
- Caracterização do Escoamento e Fluxo Atmosférico de Calor Latente em Montado de Sobro, Abel Martins Rodrigues, Gabriel P.A. Pita, Silva Lusitana 11(2) 165-184, 2003

4. Low-Power burning Systems

Current understanding of turbulent combustion identifies turbulence / chemistry interactions and the role of different turbulent scales on the flame surface as crucial for the future development of combustion technologies and play a major role in the definition of turbulent combustion regimes. In addition, these interactions influence the scalar dissipation and, for example, turbulent heat fluxes, as counter-gradient diffusion occurs when the flow field near the flame is dominated by thermal dilatation due to chemical reaction.

Unsteady Flows and Flames

Experimental work in progress at IN+ emphasises the use of sophisticated laser diagnostics with high spatial and temporal resolution, which can provide innovative results on the characterisation of scalar dissipation, turbulent heat fluxes and vorticity

near the flame front. This includes the quantification of scalar-dissipation based on the combination of a Laser Doppler Anemometer with a LRS (Laser Rayleigh Scattering); the characterisation of eddy length scales and of vorticity distribution with a Particle Image Velocimetry; or the characterization of the acoustic field induced by combustion based on purposed built optical and sound probes.

Sample publications in 2003 include:

- Anacleto, P. M., Fernandes, E. C., Heitor M. V. and Shtork, I, (2003). "Swirl flow structure and flame characteristics in a model lean premixed combustor", *Combust. Sci. and Tech.*, 175, pp.1369 - 1388.
- Cala C.E., Fernandes E.C., Heitor M.V., Shtork S.I. (2003) Characterization of unsteady swirling flow based on phase averaging of pressure and LDA probe signals. 5th Euromech Fluid Mechanics Conference, EFMC-2003, August 24-28, 2003, Toulouse, France.
- V. Sivadas, E.C. Fernandes and M.V. Heitor (2003) Acoustically excited air-assisted liquid sheets. *Exp. In Fluids*, 34, pp.736-743.

Liquid disintegration and spray formation

The impact of droplets onto solid surfaces occurs in a variety of technological and environmental processes. Improved understanding requires a better knowledge of the thermo-fluid-dynamic mechanisms of interaction between the impacting droplet and the surface.

Studies have considered the dynamic behaviour of droplets of different liquids impacting on flat, horizontal and dry commercial surfaces. The studies are being developed on a fundamental basis and are aimed at analyze the various outcomes of droplet impact and establish the influencing parameters. In this context, since the nature of the target surface plays a vital role, special attention has been given to its characterization. The nature of the surface is characterized by the wettability, as defined by the equilibrium contact angle and by its topography (surface roughness). The topography is characterized by roughness amplitude (quantified with the mean roughness, Ra and the mean peak-to-valley roughness, Rz) and its fundamental wavelength.

Sample publications in 2003 include:

- "Experiments on impinging intermittent sprays: dynamic behaviour of impact", A. L. N. Moreira, A. S. H. Moita and M. R. Panão, III Congresso Luso – Moçambicano de Engenharia, Maputo, Moçambique, 19 – 21 Agosto, 2003.
- "Influence of Surface Properties on the Dynamic Behaviour of Impacting Droplets", 2003, A. S. H. Moita and A. L. N. Moreira, 9th International Conference on Liquid Atomization and Spray Systems

Fluid – dynamics of spray-wall impingement

When a spray impacts on a solid surface, different phenomena may occur depending on the kinetic energy and angle of impact of individual droplets, liquid properties and nature of the surface: droplets may adhere to the target surface, the resulting liquid film deform periodically up to all the energy at impact is dissipated, eventually causing radial instabilities which may grow and disrupt to give rise to secondary smaller droplets, which detach from the surface; re-atomization may also occur due to other mechanisms such as rebound or film stripping.

A basic picture of the impingement process is usually constructed based on single droplet impingement, either on dry or wetted surfaces. However, in a poly-disperse spray, different phenomena occur simultaneously due to impact of multiple droplet sizes, which interact in a complex manner and the spray cannot be described as a summation over the entire droplet size range. In addition, when the spray is intermittent and the interposed surface is cold, the dynamic behaviour of the re-atomized droplets also depend on the transient formation of a liquid film; local temporal variations of its height and velocity associated with multiple drop impact; interaction between crowns of splashing drops and tiny bubble formation; secondary airflows induced by momentum transfer between the spray front and the surrounding air.

Those are the important phenomena determining features such as mixing and combustion in reciprocating and gas turbine engines, heat transfer rates in spray cooling systems, or the quality of the surface in surface treatment applications. A better knowledge of those mechanisms is therefore needed to improve the performance of practical devices, but still depends on the availability of detailed experiments in laboratory configurations.

Sample publications in 2003 include:

- M. R. O. Panão and A. L. N. Moreira (2003), “Experimental characterization of spray-wall interaction under cross-flow conditions”, 9th International Conference on Liquid Atomization and Spray Systems

5. Technical Change and Systems of Innovation

The work has drawn on recent conceptual approaches to economic growth, in which the accumulation of knowledge is the fundamental driving force behind growth. This fact is reflected in the trend in developed economies towards an increasing investment in advanced technology, research and development, education, and culture. Concepts such as learning ability, creativity and sustained flexibility gain greater importance as guiding principles for the conduct of individuals, institutions, nations and regions. It is thus legitimate to question the traditional way of viewing the role that contemporary institutions play in the process of economic development and to argue for the need to promote *systems of innovation and competence building* based on learning and knowledge networks. Under the broad designation of “learning and knowledge networks”, the research results discuss the necessary balance between the creation and diffusion of knowledge and contribute to improve our understanding of the dynamics of the process of knowledge accumulation, which drives a learning society.

- Systems and Policies for Knowledge Creation, Diffusion and Usage
 - Higher Education Policy and Management
 - S&T and Innovation
- Learning Economy
 - Towards a "Learning Society"
 - Technology and Economic Inequality
- Management of Technology and Policy Implications
 - Globalization, diversification and technology capacity in the auto parts sector

- Mobilizing information and communication technologies: implications for regional development
- New energy systems: fotovoltaic
- Strategy, Entrepreneurship and Technical change
 - Collaborative Learning and Virtual Teaming
 - Fostering entrepreneurship at the University

Main publications:

Books (edited):

- D. Gibson, C. Stolp. P. Conceição, and M. V. Heitor (eds.), (2003), *Systems and Policies for the Global Learning Economy*. Westport and London: Praeger.
- M. Heitor, J.M.B. Brito, M.F. Rollo, H. Cayatte, J. Pessoa, R. Trindade (eds), (2003), *“Engenho e obra: memória de uma exposição”*, Lisboa: Dom Quixote
- P. Conceição, M. V. Heitor, B.-A. Lundvall (eds.), (2003), *Innovation, Competence Building, and Social Cohesion in Europe- Towards a Learning Society*, London: Edward Elgar.

Books in preparation:

- P. Conceição, M. V. Heitor (forthcoming), *Innovation for All? Learning from the Portuguese path to technical change and the dynamics of innovation*. Westport and London: Praeger.
- M. Heitor, J.M.B. Brito e M.F. Rollo (eds), (forthcoming), *“Momentos de Inovação e Engenharia em Portugal no seculo XX”*, Lisboa: Dom Quixote

Technical papers in journals and books (international referee):

- P. Conceição, M. V. Heitor, G. Sirilli and R. Wilson (2003), “The Swing of the Pendulum from Public to Market Support for Science and Technology: Is the US Leading the Way?”, *Technological Forecasting and Social Change*, 71(5).
- C. Costa, M. Fontes and M. Heitor (2003), “A Methodological Approach to the Marketing Process in the Biotechnology-based Companies”. *Industrial Marketing Management Journal*
- M. Heitor and J. Moutinho (2003) “Digital Cities and the opportunities for mobilizing the information society: case studies from Portugal”, in M. Tanabe, P. van den Besselaar and T. Ishida, Eds., *Digital Cities III – Computational and sociological approaches*. Springer Verlag.
- P. Conceição, M. V. Heitor, F. Veloso (2003), “Infrastructures, Incentives and Institutions: fostering distributed knowledge bases for the Learning Society”, *Technological Forecasting and Social Change*, 70, pp.583-617.
- P. Conceição, and M. V. Heitor (2003), “Technological Innovation and Productivity Growth: A Perspective after the IT Bubble’s burst”, *International Journal of Technology, Policy and Management*, 3(2), pp. 113-126.
- Conceição, P. and Heitor, M. (2003). “Systems of innovation and competence building across diversity: Learning from the Portuguese path in the European context” in Larisa V. Shavinina (Ed.). In “*International Handbook on Innovation*”, Elsevier, pp.945-975.
- Conceição, P. and Heitor, M. (2003). “Techno-economic Paradigms and Latecomer Industrialization” in UNESCO Encyclopedia of Life Support Systems (EOLSS), Eolss Publishers, Oxford, UK

- F. Santos and M. Heitor (2003). "The cognocratic organization: toward a knowledge theory of the firm", in D. Gibson, C. Stolp, P. Conceição, and M. V. Heitor (eds.), *Systems and Policies for the Global Learning Economy*. Westport and London: Praeger, pp. 465-481.
- P. Conceição, D Gibson, M Heitor and C. Stolp (2003). "Knowledge and Innovation for the Global learning Economy: building capacity for development", in D. Gibson, C. Stolp, P. Conceição, and M. V. Heitor (eds.), *Systems and Policies for the Global Learning Economy*. Westport and London: Praeger, pp. 11-43.

6. Engineering Design: The *IST Design Studio*

The importance of designing discovery approaches that go beyond scientific method has been widely discussed, and the strategy of the *IST Design Studio* is focused on stimulating a creative attitude towards innovation. In general, the analysis shows that in the emerging learning economies, the secret of success is a combination of expertise in a productive manner. This breaks with existing concepts of time, space, mass and behaviour. In fact, current technological systems are complex, and carry many levels of cultural meaning, which per se brings new challenges and opportunities for innovative product development.

The building-up of design capabilities involves multiple learning routes, including formal and informal processes, where the roles of design development and production experience are simultaneously important. In this context, the *IST Design Studio* agenda was launched in 2003 based on a matrix of strategic scientific areas and integrating projects. While the scientific areas represent disciplinary-based knowledge in the way traditionally developed in engineering schools, the integrating projects are the actual cross-functional tools to achieve the required practical relevance of the research agenda. These projects will appear in clusters and should allow the clear implementation of industry-science relationships.

The research agenda in engineering design has been implemented by integrating expertise in eight different groups of scientific areas, including:

- Materials and Manufacturing Technologies
- Mechanics
- Electronics and Microsystems
- Sustainability
- Simulation and virtual prototyping
- Systems & design methods
- Management of technology and business innovation
- Design

The projects considered of strategic value for Portugal by the time of the definition of the *IST Design Studio* are grouped in the following topics:

- Autoparts for the future
- Train applications
- Sustainable mobility
- Design for citizenship
- Collaborative design

Annex 1: Indicators (as required by Portuguese Science and Technology Foundation, FCT)

	Previsto	Realizado
Livros	4	3
Artigos em Revistas Internacionais	16	14
Artigos em Revistas Nacionais	8	6
Comunicações em Encontros Científicos Internacionais	18	17
Comunicações em Encontros Científicos Nacionais	-	1
Relatórios	-	-
Organização de Seminários e Conferências	10	10
Teses de Doutoramento	1	-
Teses de Mestrado	5	5
Outras		
Modelos		
Aplicações Computacionais		
Instalações Piloto		
Protótipos Laboratoriais		
Patentes		
Outros		

Annex 2. List of Main Publications in 2003

Books

- D. Gibson, C. Stolp, P. Conceição, and M. V. Heitor (eds.), (2003), *Systems and Policies for the Global Learning Economy*. Westport and London: Praeger.
- M. Heitor, J.M.B. Brito, M.F. Rollo, H. Cayatte, J. Pessoa, R. Trindade (eds), (2003), “*Engenho e obra: memória de uma exposição*”, Lisboa: Dom Quixote
- P. Conceição, M. V. Heitor, B.-A. Lundvall (eds.), (2003), *Innovation, Competence Building, and Social Cohesion in Europe- Towards a Learning Society*, London: Edward Elgar.

Technical papers in International Journals and books

Thermofluids, Combustion and Energy Systems

- Anacleto, P. M., Fernandes, E. C., Heitor M. V. and Shtork, I, (2003). "Swirl flow structure and flame characteristics in a model lean premixed combustor", *Combust. Sci. and Tech.*, 175, pp.1369 - 1388.
- V. Sivadas, E.C. Fernandes and M.V. Heitor (2003) Acoustically excited air-assisted liquid sheets. *Exp. In Fluids*, 34, pp.736-743.
- Mendes-Lopes J M C, Ventura J M P, and Amaral J M P: "Flame characteristics, temperature-time curves, and rate of spread in fires propagating in a bed of Pinus pinaster needles", *Int. J. Wildland Fire*, Vol. 12, N. 1, pp. 67-84, 2003

Environmental Systems

- Canas, A., Ferrão, P. and Conceição, P. (2003) “A new environmental kuznets curve? Relationship between direct material input and income per capita: evidence from industrialized countries”. *Journal: Ecological Economics*. Volume 46, Issue 2, September 2003 , Pages 217-229.

Technology Policy and Management of Technology

- P. Conceição, M. V. Heitor, G. Sirilli and R. Wilson (2003), “The Swing of the Pendulum from Public to Market Support for Science and Technology: Is the US Leading the Way?”, *Technological Forecasting and Social Change*, 71(5).
- C. Costa, M. Fontes and M. Heitor (2003), “A Methodological Approach to the Marketing Process in the Biotechnology-based Companies”. *Industrial Marketing Management Journal*
- M. Heitor and J. Moutinho (2003) “Digital Cities and the opportunities for mobilizing the information society: case studies from Portugal”, in M. Tanabe, P. van den Besselaar and T. Ishida, Eds., *Digital Cities III – Computational and sociological approaches*. Springer Verlag.
- P. Conceição, M. V. Heitor, F. Veloso (2003), “Infrastructures, Incentives and Institutions: fostering distributed knowledge bases for the Learning Society”, *Technological Forecasting and Social Change*, 70, pp.583-617.
- P. Conceição, and M. V. Heitor (2003), “Technological Innovation and Productivity Growth: A Perspective after the IT Bubble’s burst”, *International Journal of Technology, Policy and Management*, 3(2), pp. 113-126.
- Conceição, P. and Heitor, M. (2003). “Systems of innovation and competence building across diversity: Learning from the Portuguese path in the European context” in Larisa V. Shavinina (Ed.). In “*International Handbook on Innovation*”, Elsevier, pp.945-975.
- Conceição, P. and Heitor, M. (2003). “Techno-economic Paradigms and Latecomer Industrialization” in UNESCO Encyclopedia of Life Support Systems (EOLSS), Eolss Publishers, Oxford, UK

- F. Santos and M. Heitor (2003). "The cognocratic organization: toward a knowledge theory of the firm", in D. Gibson, C. Stolp, P. Conceição, and M. V. Heitor (eds.), Systems and Policies for the Global Learning Economy. Westport and London: Praeger, pp. 465-481.
- P. Conceição, D. Gibson, M. Heitor and C. Stolp (2003). "Knowledge and Innovation for the Global learning Economy: building capacity for development", in D. Gibson, C. Stolp, P. Conceição, and M. V. Heitor (eds.), Systems and Policies for the Global Learning Economy. Westport and London: Praeger, pp. 11-43.
- Nuno Arantes-Oliveira, Jennifer Berman and Cynthia Kenyon (2003). "Modulation of the Insulin Pathway by the Gonad in C. Elegans: Animals that Live Six Times as Long as Normal". Science 302: 611.

Technical papers in National Journals and books

Environmental Systems

- Ferrão, P. (2003) "O ambiente e o sector automóvel". Ambiente 21, rubrica de inovação científica. Nº 8, ano II, pp. 52-53.
- P. Ferrão e M. Águas (2003) "Energia e Ambiente", in: Engenho e Obra: Uma Abordagem à História da Engenharia em Portugal no Século XX., pp. 304-313. Dom Quixote.
- Fluxos de Massa e Energia na Camada Limite Atmosférica em Montado de Sobro, Abel Martins Rodrigues, Gabriel P.A. Pita, Silva Lusitana 11(1) 31-60, 2003
- Caracterização do Escoamento e Fluxo Atmosférico de Calor Latente em Montado de Sobro, Abel Martins Rodrigues, Gabriel P.A. Pita, Silva Lusitana 11(2) 165-184, 2003

Technology Policy and Management of Technology

- P. Conceição, M. Heitor e H. Horta (2003). "Reflexões sobre o ensino superior em Portugal: perspectivas para o desenvolvimento institucional", em A. Amaral (ed.), "Avaliação, revisão e consolidação da legislação do ensino superior", CIPES, Fundação da Universidades Portuguesas, pp. 175-195.
- M. Heitor (2003). "Bases de conhecimento e parcerias para a inovação", em M.J. Rodrigues, A. Neves e M.M. Godinho (eds), "Para uma Política de Inovação em Portugal", Lisboa: Dom Quixote, pp.183-210.

Technical papers and communications in International Conferences

Thermofluids, Combustion and Energy Systems

- Cala C.E., Fernandes E.C., Heitor M.V., Shtork S.I. (2003) Characterization of unsteady swirling flow based on phase averaging of pressure and LDA probe signals. 5th Euromech Fluid Mechanics Conference, EFMC-2003, August 24-28, 2003, Toulouse, France.
- "Experiments on impinging intermittent sprays: dynamic behaviour of impact", A. L. N. Moreira, A. S. H. Moita and M. R. Panão, III Congresso Luso – Moçambicano de Engenharia, Maputo, Moçambique, 19 – 21 Agosto, 2003.
- "Influence of Surface Properties on the Dynamic Behaviour of Impacting Droplets", 2003, A. S. H. Moita and A. L. N. Moreira, 9th International Conference on Liquid Atomization and Spray Systems
- M. R. O. Panão and A. L. N. Moreira (2003), "Experimental characterization of spray-wall interaction under cross-flow conditions", 9th International Conference on Liquid Atomization and Spray Systems

- M. N. Nina and O. S. Ferreira (2003), “Flame Stability and Dynamic Effects in Lean-Burn Well Stirred Reactor”, Published in the Book of Extended Abstracts available at the International Colloquium on Combustion and Noise Control, Cranfield University, UK, 11 – 14 August 2003
- M. Nina and O. Ferreira (2003), Modelling Pollutant Emission in a well-Stirred Reactor”, Clean Air 2003 – Seventh International Conference on Energy for Clean Environment, Lisbon, 7-10 July 2003.
- Silva C, Farias T, and Mendes-Lopes J: “Calculation of Tailpipe Emissions in Ecogest”, accepted for oral presentation at 7th International Conf. on Energy for a Clean Environment, Lisbon, July 2003
- Silva C, Farias T, and Mendes-Lopes J: “Calculation of Fuel Consumption and Engine-out Emissions in Ecogest”, accepted for oral presentation at 7th International Conf. on Energy for a Clean Environment, Lisbon, July 2003

Environmental Systems

- Ferrão, P., J. Amaral and P. Silva. (2003).” Laying the foundations for a DfR tool for auto components”. 14TH International Conference on Engineering Design ICED 03, Sweden, Stockholm.
- Ferrão, P., Nhambiu, J, and Suh, S. (2003) “Industrial Ecology of Portuguese Glass Products based on Hybrid Input-Output Analysis”. International Society of Industrial Ecology - Conference 2003: Industrial Ecology for a Sustainable Future. Ann Arbor, USA, June, 29th- July, 2nd, 2003.
- J.S. Pereira, G. Pita, J. Silva, A. Fabião, M. Carneiro, C. Nogueira, A. Rodrigues, E. Ribeiro (2003) Full carbon balance in an eucalypt plantation in Portugal. [P7.23] The Carbon Balance of Forest Biomes, University of Southampton during the annual meeting of the SEB from the 1st to 4th of April 2003.

Technology Policy and Management of Technology

- Pedro Conceição, Beatriz Padilla, Pedro Faria, Miguel T. Preto and Pedro Ferreira (2003). Does Inequality Hinder the Diffusion of Technology? Preliminary Explorations, Presented at 7th International Conference on Technology Policy and Innovations, Monterrey, México, June 2003.
- Pedro Conceição, Pedro Faria (2003), Technology Diffusion of Modeling ICTs: Brief Overviews and Gaps. Presented at the “Clean Technologies Diffusion Workshop” IPTS, Seville, Spain November 2003.
- Pedro Conceição, and Manuel Heitor (2003). “The swing of the pendulum: from market to public funding of S&T?”, Presented at 7th International Conference on Technology Policy and Innovations, Monterrey, México, June 2003.
- M. Heitor, R. Nunes and P. Conceição (2003). “Technological Change and the challenges for Regional Development: Building ‘social capital’ in Less Favored Regions”, Presented in the Intl. Conference on “Social capital, innovation and regional development”, European Commission.
- P. Conceição, M. Heitor and F. Veloso (2003). “Innovative shocks and productivity”, Presented at the Conference “What do We Know About Innovation? A Conference in Honour of Keith Pavitt”, The Freeman Centre, University of Sussex, Brighton, U.K., 13th-15th November 2003.

Technical papers and communications in National Conferences

- Ferrão, P., Jordão, M.F., Mendes, A.S. (2003). “ Uma bolsa de resíduos para Portugal”. Congresso sobre tecnologias de valorização de resíduos, organizado pela APEMETA com a colaboração do Instituto dos Resíduos. ExpoAmbiente 2003, FIL, Lisboa, 6 e 7 de Novembro de 2003.

Master thesis

- A.L. Alves, 2003: Alternative transport solutions: on the use of high-speed boats. (IST; supervision: M. Heitor)

- N. Ávila, 2003: Industry-Science Relationships: evidence from Portugal. (IST; supervision: M. Heitor, P Conceição)
- M. Leocádio, 2003: “RAMS” – Reliability, Availability, Maintainability, Safety: Application to Railway Vehicles. (IST; supervision: M. Heitor)
- Pedro Faria, 2003: A Case Study on Environmental Policy and Innovation - The Portuguese Olive Oil Sector in the 1990’s. (IST; supervision: Paulo Ferrão)
- Letras, J. (2003) “Critical aspects in the design for plastics packaging: a design for environment and design for recycling perspective”. Dissertação de mestrado em Engenharia e Gestão de Tecnologia”. (IST; supervision: Prof. Paulo Ferrão).
- Oscar D.C. Silva Ferreira “ Combustão de Pré-Misturas Pobres em Reactor de Mistura Perfeita”, DEM-IST, Março de 2003, (IST; supervision: Prof. Mário Nina).