

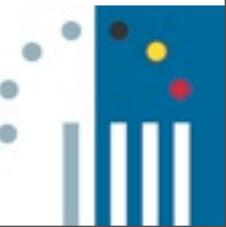
Dynamical systems, control, and optimisation DYSCO

1987 - 2011

24 years in the IAP programme

Michel Gevers

Leuven, 29 November, 2011



Our history in the IAP programme

IAP II/17 in “systems and control” : 1990 - 1996

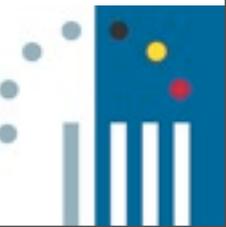
UCL, KUL1, UGent, KUL2, FUNamur

- 14 academics and about 40 PhD students, 5 teams
- Few international leaders
- But we knew each other well
- From the start: trust and pleasure of working together

IAP VI/4 - DYSCO : 2011

UCL, KUL1, UGent, VUB, KUL2, ULg, ULB, UMONS

- 55 academics, 160 PhD students, 50 post-docs, 8 teams
- Many are world leaders
- Trust and pleasure are still there



Our areas of excellence

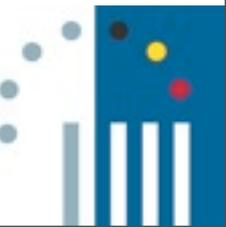
Theory and methodology

- ★ Modeling and identification of systems (WP1)
- ★ Control and optimisation of systems and networks (WP2)
- ★ Efficient computational methods for dynamical systems (WP3)

Our main application domains

- ★ Chemical and bio-chemical processes (WP4)
- ★ Bio-medical engineering (WP5)

Our specificity: cross-fertilisation between system aspects (modeling, prediction, control) and computational aspects.



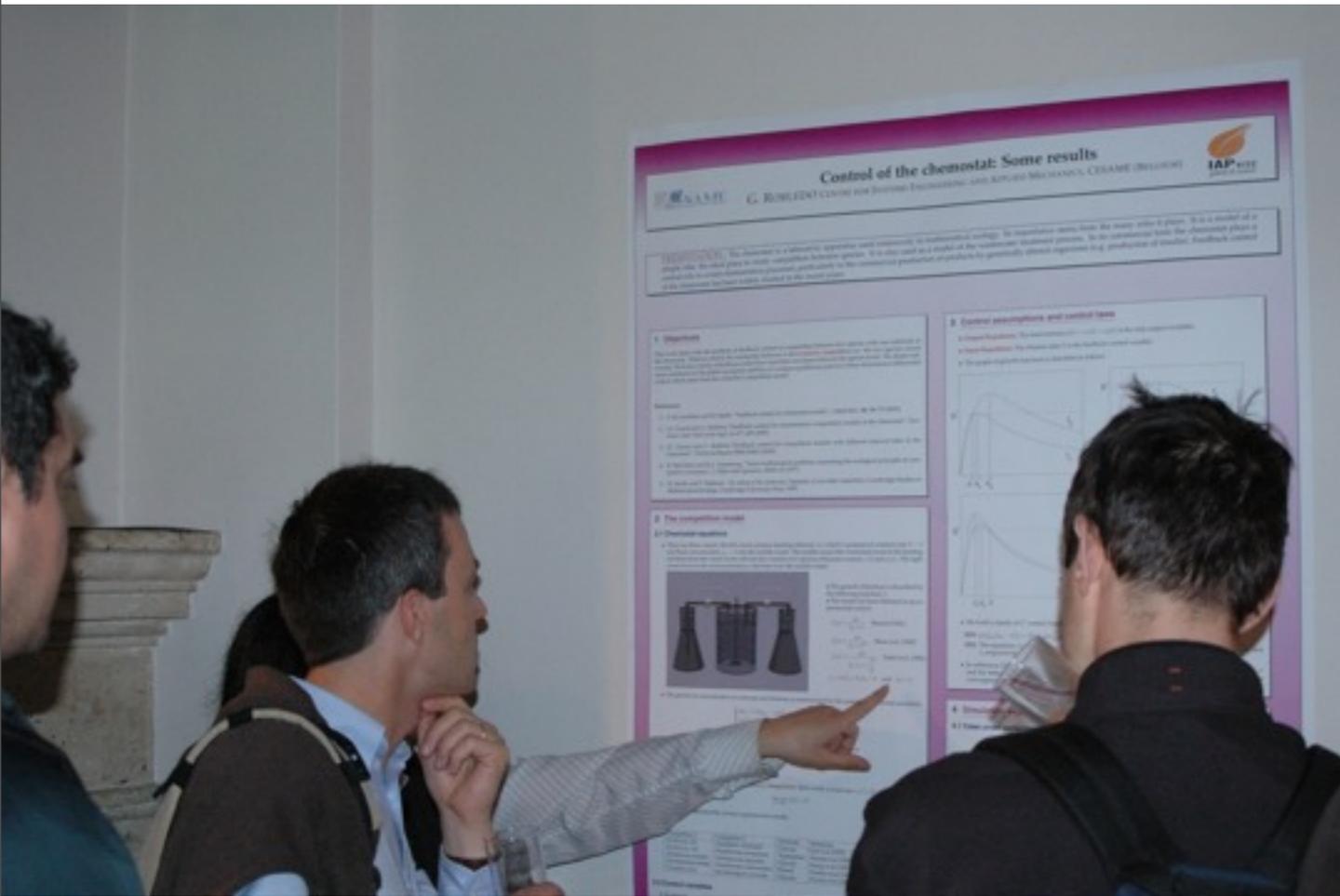
The DYSCO environment

All our PhD students participate in DYSCO,
not just those funded by the IAP programme !!!

- ★ Graduate school created in 1992: about 4 courses per year
- ★ Participation of our PhD students in international conferences
- ★ Co-supervision of theses by members from different teams
- ★ Study days of the whole network (approx. 150 participants)
- ★ Targeted invitation of foreign researchers
- ★ Exchange of PhD students when a supervisor goes on sabbatical
- ★ Joint research activities within the WP's
- ★ Joint experiments
- ★ Joint organization of international conferences (about 15)

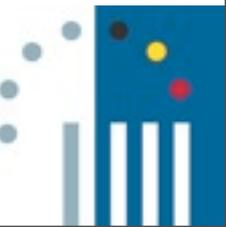
➔ During their thesis, our PhD students will have met the best experts in their domain. It's good for the quality of their work and for their confidence !!

A DYSCO study day



The DYSCO environment: some specifics

- ★ Graduate school:
 - 76 courses so far with more than 2200 attendees
 - Instructors with international reputation (about 50% foreigners)
 - Mixture of broad spectrum and specialized courses
 - About 35% take the courses with evaluation
 - Serves a larger community than the IAP students
- ★ Co-supervision of doctoral theses:
 - 140 PhD students have graduated since 2007
 - 39 of those theses had involvement from another partner (co-promotor or assessor)



Added value for Belgium

- ★ IAP is for fundamental research, but we build a know-how that benefits applied research with large societal impact
- ★ All members of the 8 teams benefit from the IAP environment, not just the small number paid by the IAP budget
 - The IAP money has a huge multiplier effect, in terms of training and research (it pays 18 researchers out of approx 200)
- ★ Today our network of DYSCO alumni provides technology transfer to large number of companies
- ★ They stay in close contact with DYSCO
- ★ We collaborate with a very large number of companies and public administrations

Added value for Belgium: 104 collaborations

ACO Passavent (Wastewater treatment)
AGFA (Wastewater treatment)
Alcatel Bell Belgium (Internet routing)
Alcatel Lucent (Identification of telephone lines)
Agilent (Cognitive radio)
Aquafin (Wastewater treatment)
Arcelor (Process industry)
Artelis (Disposable solutions for cell culture)
BASF Antwerp (Advanced chemical control)
BASF (Wastewater treatment)
Bauknecht (Washing machine oscillations)
Beldem (Food ingredients)
Beldem-Puratos (Design of modified proteins)
Belgacom
Belgian Federal Police (Graph-based search)
Belgian Quality Fish (Control of aquaculture)
Belsim (Process optimisation)
Biotech (wastewater treatment)
BioXpr (Bioinformatics software)
BNP Paribas Fortis (Evaluation of financial data)
Borealis (Torsion oscillations in extrusion process)
Campbell Foods (Predictive microbiology)
Citrique Belgium (Production process optimization)
CNH Case New Holland (Anti-slip Control on Harvesters)
Cochlear ltd (Signal processing for cochlear implants)
CMI - Cockerill (Process monitoring and intelligent maintenance)
Cytec Belgium (Batch process control)
Diamant Drilling Services (Services for oil industry)
Dow Corning (Dispersing mixing of calcium carbonate)
Dredging (Torsion oscillations on ships)
Dumoulin Belgian Quality Fish (Control of aquaculture)
Electrabel (Monitoring and fault detection)
Electricité de France - EDF (IFT Method)
ELIA (Voltage security margin assessment)
ELIA (Data mining EOLI (Ibtech))
Endo Tools Therapeutics (Feedback control for medical instruments)
Enrotech (Wastewater treatment)
Erasmus University Medical Center (neonatal brain monitoring)
Essenscia ((Bio)chemical process control – Safety Management)
Europay (Data mining)
European Southern Observatory (Astrophysics)
European Space Agency (ESA)
Febeltex (Permeability of textiles)
Fenavian (Predictive microbiology)
Flanders Mechatronic Technology Center
Free Field Technologies
France Telecom (Graph analysis of users and their mobility)
GalvaPower
Gamax Kft (Graphical User Interface)
Genencor-Danisco (Bioprocess (quality) control)

General Electric (Power plant control)
Glaxo Smith Kline (Bioprocess estimation and control)
Hoerbiger (Compression technology)
HTSO – Greek transmission system operator
(Implementation of real-time voltage security assessment)
Hydro-Quebec (Fast simulation of long-term dynamics and emergency control against voltage instability)
IMEC (Integrated circuits)
Intel (High performance computing)
Ion Beam Applications (Biomedical engineering)
IPCOS (Process control)
Item Solutions (Analysis of key performance indicators)
Keppel-Seghers (Wastewater treatment)
LILLY
LIN (Traffic control)
LMS (Fuzzy finite element methods)
LMS (Flutter analysis, identification)
Macq Electronique (Temperature forecasting system)
Mastercard (Data mining)
Materialise (Point cloud processing)
Mentor Graphics, USA (fast gradient methods)
Metris (Reverse engineering)
Mobistar (Cellular phone network – traffic analysis)
Monsanto (Wastewater (sludge) treatment)
NIKO Lighting Equipment (Control of Office Lighting)
NIST – USA (High frequency devices)
Nofima (Predictive microbiology)
NXP-Semiconductors
NXP-Software (Speech processing)
Optimor HRM Consultants (Function evaluation)
Philips medical systems - NL (MRS)

Phonak (Hearing Aids)
Probabilitas (Fuzzy finite element methods)
QinetiQ: signal processing (feedback cancellation)
Radboud University Medical Center Nijmegen (brain tumor recognition)
RTE – French Transmission system operator (voltage stability and security analysis)
SABIC Europe (Chemical process design and control)
Samtech (Robust optimization)
SCIA Group (Fuzzy finite element methods)
Segal (Steel galvanization)
SETHY (Riverflow forecasting, flow control)
Schneider-Toshiba Inverter s.a. (Electrical drives)
Siemens (Level and flow control in open channels)
Siemens Paper and Pulp (Grade Change Control in Paper Machines)
Solvay
TELEMAC (Domecq)
Televic NV (PA systems)
Thales Alinea Space ETCA (Control of power systems for satellites)
The Mathworks Inc. USA (Toolbox)
Total
Tractebel Engineering (Time domain simulation)
TRITEL (Counseling on traffic)
Usinor-Carlam (Cooling process in hot rolling mills)
Verhaert : Control system design for satellite (PROBA)
Verhaert Space (Spatialisation of our complete setup for the International Space Station)
VSN Systemen (VoIP signal processing)

20 years of DYSCO activity

Some facts

- 45 books, about 5000 published papers
- 250 PhD students have graduated in our network
- Hundreds of post-docs have stayed with us
- This creates a large network of alumni
- Most of the leaders in our discipline have visited DYSCO
- We collaborate with the best universities in our field
- Thanks to the DYSCO environment, some top people in our field have taken academic positions in our universities



Some prestigious awards

The IEEE Antonio Ruberti Prize:

Initiated in 2005 by the Systems and Control Society of IEEE, awarded annually to the best young (<40 years) researcher in systems and control in the world.

2006: Vincent Blondel

2008: Rodolphe Sepulchre

John von Neumann Theory Prize:

Yurii Nesterov, 2009

Doctor Honoris Causa, Linköping University, Sweden:

Michel Gevers, 2010

5-year Prize FWO:

Bart De Moor, 2010

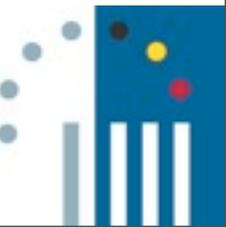
The successive evaluations

Excerpts from evaluation reports:

- 2001:** *It is our opinion that the IAP network on Modelling, Identification, Simulation and Control of Complex Systems, in international comparison, is the strongest coordinated research structure in the systems/control area.*
- 2005:** *In terms of numbers of prominent researchers, and in terms of the significance and the volume of its research, the Network remains the pre-eminent research grouping in systems and control, certainly in Europe, and probably in the world.*
- 2010:** *DYSCO is a very large and impressive network that is the leading research constellation in Systems and Control in the world.*

A trademark of our network

- For about 10 years, the 6 major universities had engineering Rectors
- 3 came from our IAP network:
 - ◆ Jacques Willems
 - ◆ Marcel Crochet
 - ◆ André Oosterlinck
- This gave some people the idea that it is one of the obligations of our IAP network to produce rectors



Two hallmarks ...

European Control Conference (ECC 97) in Brussels

- 800 participants
- 3 years of preparation
- IAP network was the backbone of the FOC
- The first major conference in our field to have a CD-Rom
- Timshel conference services

Quote from Stefaan Hendrickx (head of Timshel):

«You guys are a crazy bunch of people. You never seem to take things seriously, but in the end things get done anyway.»









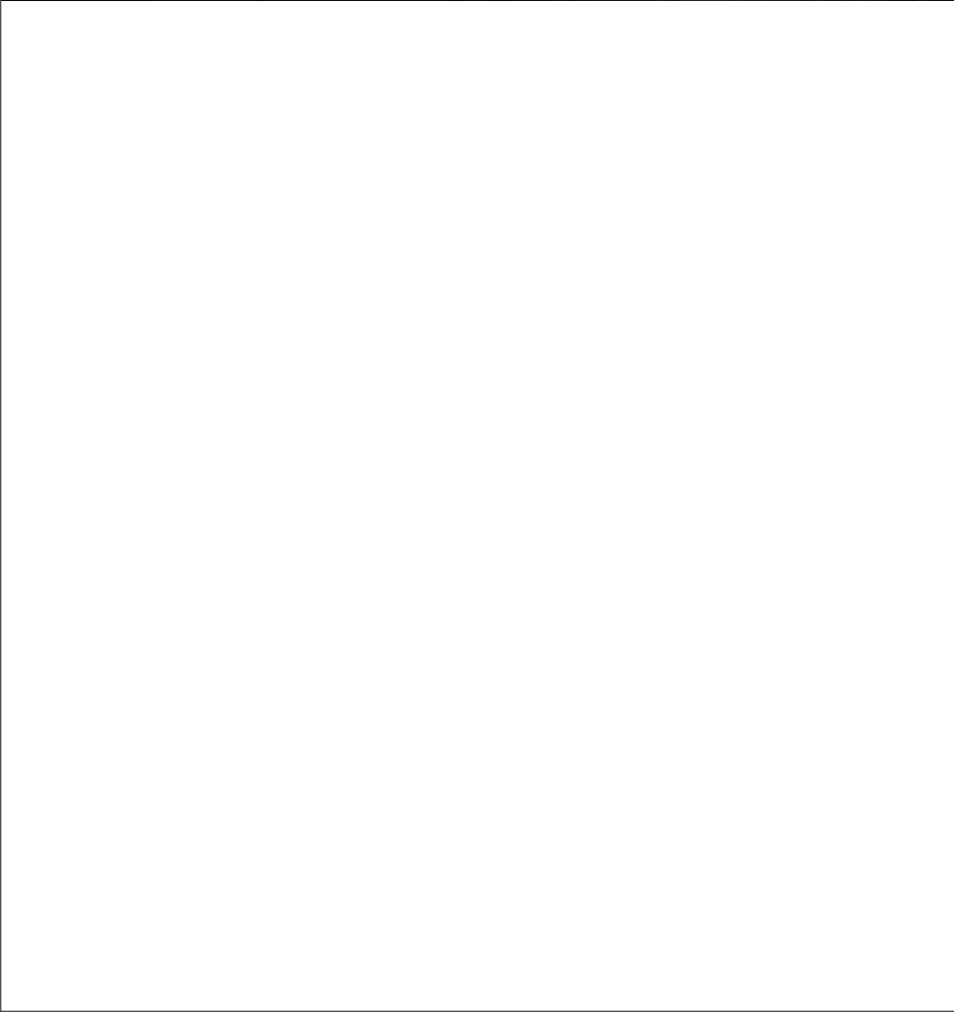
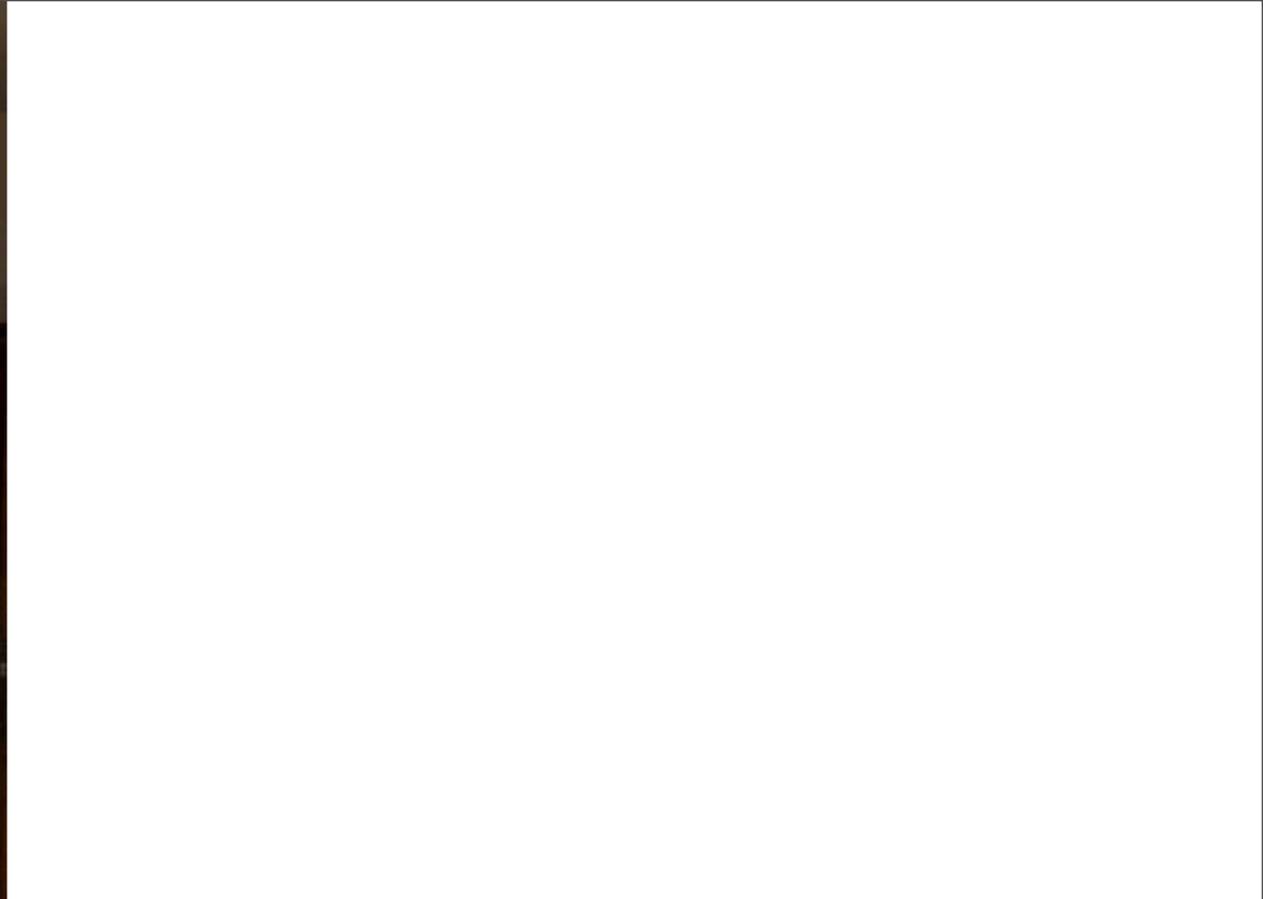


Two hallmarks ...

The King's visit to DYSCO
Louvain la Neuve, 1 October, 2009

An opportunity to convey a message
about fundamental research, but with fun









In conclusion

Thanks to

- the team of promoters: what a great team !!!
- in particular to Jojo, to Dirk and to Rik
- the VVP coordinators
- Paul Van Dooren
- Michèle Termolle, Isabelle Hisette, Nathalie Ponet
- all of you for your energy and commitment

Best wishes to

- the team of promoters
- to Vincent Blondel: a visionary and a hard worker, who will lead this network to new heights

Special thanks to Véronique Feys and Corinne Lejour
Dank u - Merci

