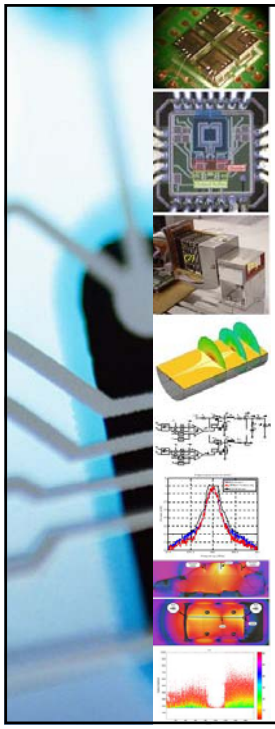


1st Barcelona Forum on Ph.D. Research in Electronic Engineering

16th October 2009

Panel session:

"The role of the Ph.D. graduated students and the international R+D priorities."

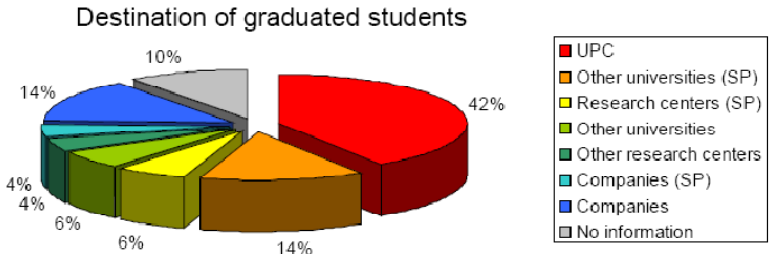
Electronic Engineering Department
Universitat Politècnica de Catalunya

Panelists

- Patrick Cogez , STMicroelectro nics
- Christian Gamrat, CEA-LIST
- Jorgen Christiansen, CERN
- Thomas Kirk , VESTAS.
- Jordi Aubert , FICO
- **Moderator**: Pere Losantos, Parc UPC

Statement:

"UPC Ph.D. graduates, included Electronic Engineering Doctoral Program, mainly go into academic positions at UPC or other universities"

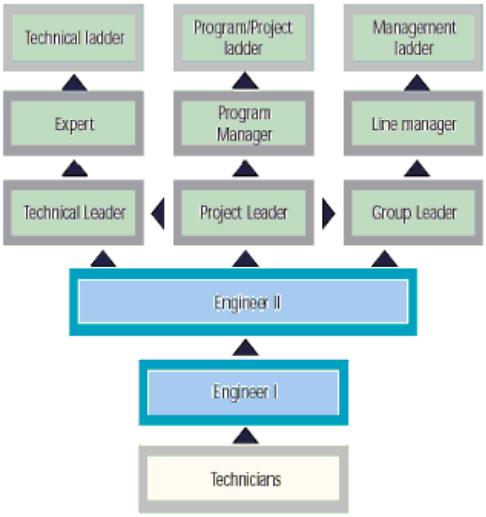


The goal of this meeting is to start changing this trend

Question 1:

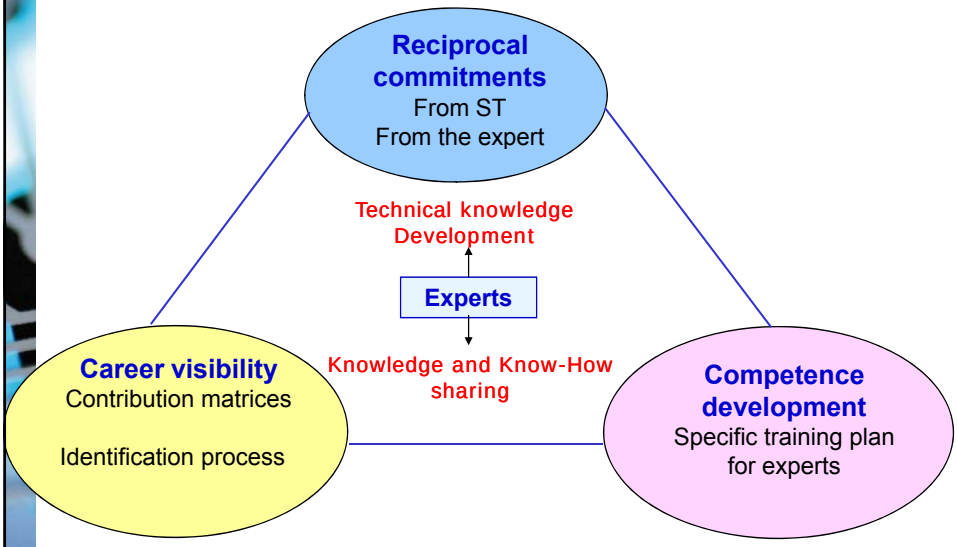
What are the responsibilities and job positions of young (and senior!) Ph.D. graduates in your company/research center?

The career tracks at ST



Answers from Patrick Cogez ST Microelectronics

Technical ladder model



Answers from Patrick Cogez ST Microelectronics

Training Plan

Kick off training
Knowledge sharing through cooperation
Tools and Methods for Knowledge Management
Business Acumen
Innovation
Debriefing

Answers from Patrick Cogez ST Microelectronics

Question 1:

What are the responsibilities and job positions of young (and senior!) Ph.D. graduates in your company/research center?

It really depends on their experience level and background. All PhD graduates have the position of “Chercheur”. A junior will be included in a research team with the typical responsability of a task and associated R&D deliverables. A senior will typically have the responsibility of project manager or research group manager. However this really depends on background and research area.

In our organization research is organized along strategic themes which are implemented and funded by projects.

A project not only includes the R&D activities but also its associated management, financial and IP activities that are the typical responsability of a Senior PhD graduate at CEA-LIST.

Answers from Christian Gamrat from CEA-LIST

Question 1:

What are the responsibilities and job positions of young (and senior!) Ph.D. graduates in your company/research center?

CONCLUSION

Although PhD students seem to have developed more technical skills, the role they carry out at the firms is not necessarily related only to this competences.

They usually move from the technical career path to the manegement one as a career natural evolution or as a way to train and provide the PhD with new skills that will be useful in the future.

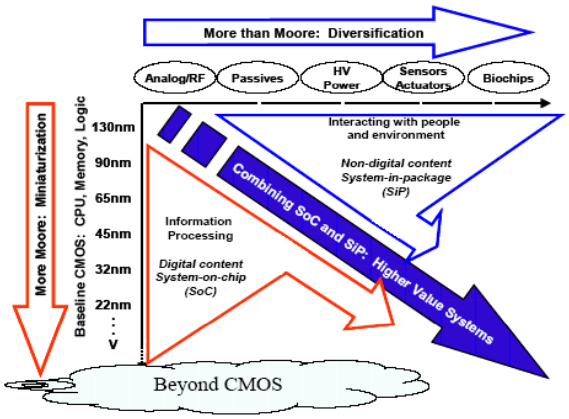
At some institutions the PhD can remain at the technical side, but he/she will have to lead projects and teams anyway.

Question 2:

What different skills (both technical and non technical) would you ask to a recently master and a Ph.D. graduated you plan to incorporate in your company/team?

Value added derivative technologies

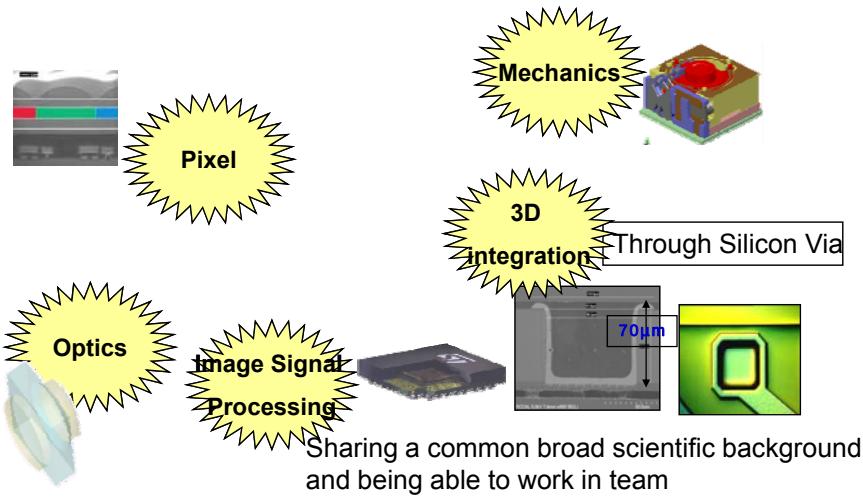
Plenty of exciting markets beyond micros and memories



High growth with 'More than Moore' technologies, but they require **expertise** in all technical domains and in-depth knowledge of the targeted markets

Answers from Patrick Cogez ST Microelectronics

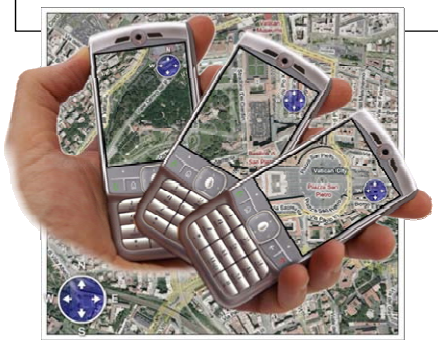
More than Moore requires multiple know-how
Imager example



Sharing a common broad scientific background and being able to work in team is mandatory

Answers from Patrick Cogez ST Microelectronics

ST sensors: latest applications



On-screen map readjustment in Mobile Phones

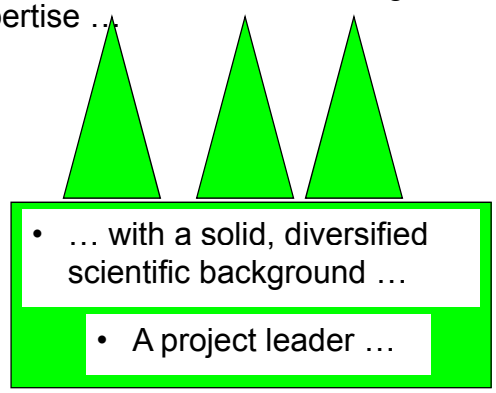
MEMS puts players into the action with Nintendo Wii™

These objects didn't exist 10 years ago…Yet people designed them, without the corresponding initial training

Answers from Patrick Cogez ST Microelectronics

Expected profile

- … complemented by an initial expertise …
- … that will be enriched by life-long learning …
- … thanks to her/his ability to work, share and communicate with others



Answers from Patrick Cogez ST Microelectronics

Question 2:

What different skills (both technical and non technical) would you ask to a recently master and a Ph.D. graduated you plan to incorporate in your company/team?

The major skills that are welcome at CEA-LIST:
S&T Excellence (a postdoc in a major team related to our R&D fields is a must)

- Electrical Engineering (digital), Mixed signal
- Software Engineering
- System Engineering
- Applied mathematics for data processing
- Micro-mechanical engineering

Willingness to apply innovation to real applications
A multi-disciplinary background is a plus (EE + physics, EE+biology, etc..)
Initiative and team-spirit
Open-mindness

Answers from Christian Gamrat from CEA-LIST

Question 2:

What different skills (both technical and non technical) would you ask to a recently master and a Ph.D. graduated you plan to incorporate in your company/team?

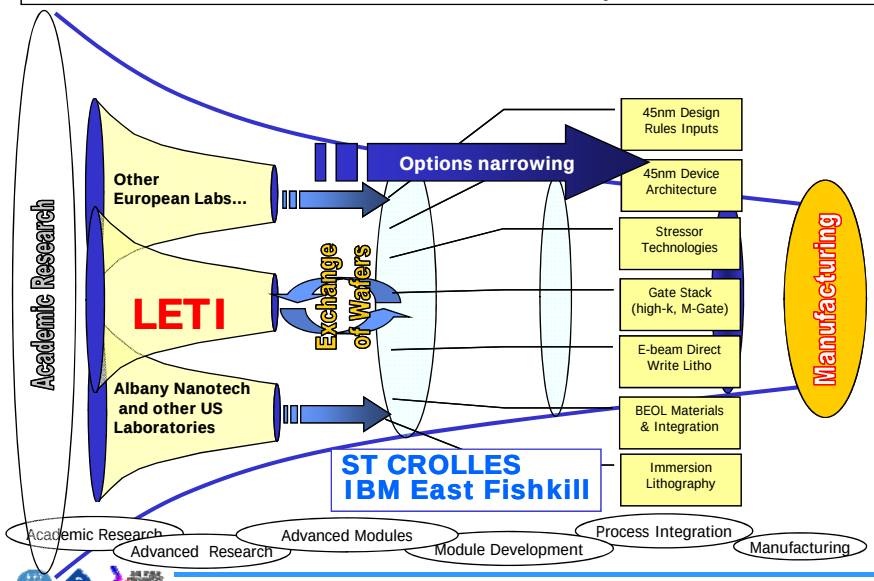
CONCLUSIONS:

Concerning the competences and skills, the PhD comes with a technical toolbox full of skills that he/she should have, but that are not the most relevant. It is much more necessary to develop skills to know how to use this toolbox. These social skills are related to entrepreneurship and initiative, be able to socialize the knowledge and to apply open innovations processes, will to establish a long life learning (L3) program, curiosity, and open minded people, and finally learn how to work in teams.

Question 3:

How do you consider the contribution of young Ph.D. graduated individuals to the success and innovation of your company/research center?

Advanced process research : The road from academic ideas to industrial implementation



Answers from Patrick Cogez ST Microelectronics

University Collaboration Tools

- Research contracts
- PhD thesis
  - 80% of ST direct financing to academic labs in France
- Common Labs
  - Common research programs
  - Direct grants + PhD students
  - Steering committee and technical workshops

Answers from Patrick Cogez ST Microelectronics

Public research and Industry
A win-win cooperation

- Benefits for research institutes and universities
  - Access to state-of-the-art tools and technologies
  - Enhance the relevance, selectivity and visibility of R&D activity
  - Strengthen industrial exploitation of R&D results
- Benefits for ST
  - Breadth of knowledge
  - Science behind technology
  - Hiring PhDs :
    - Most effective way of transfering knowledge
    - Source of bright minds

Answers from Patrick Cogez ST Microelectronics

Question 3:

How do you consider the contribution of young Ph.D. graduated individuals to the success and innovation of your company/research center?

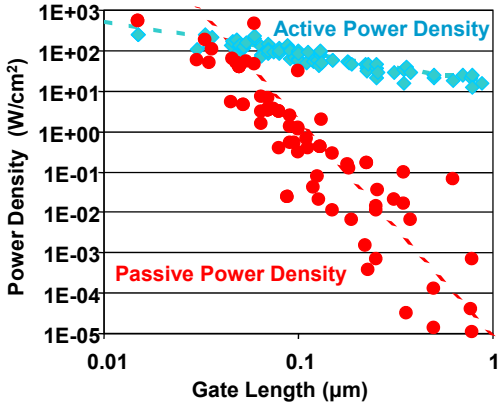
PhD graduates are key to the success of CEA-LIST. They represent approximately 40% of the 600 research staff
Young researchers with a novel approach (specifically with a multi-disciplinary, multi-cultural approach) are key to the success of future project and innovations
PhD students and Post-Docs represent approximately 20% of the CEA-List research staff

Answers from Christian Gamrat from CEA-LIST

Question 4:

From the particular point of view of the activities of your company/research center, what are the most important research challenges and priorities for the next 10 years?

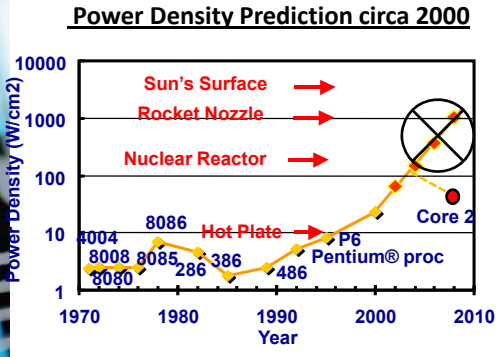
CMOS is Scaling, Power Density is Not



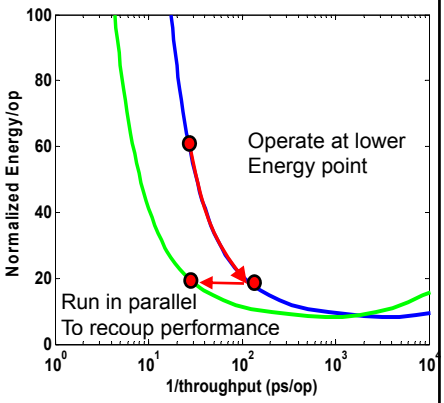
Source: B. Meyerson (IBM) Semico Conf., January 2004

Answers from Patrick Cogez ST Microelectronics 23

Parallelism to Recover Performance



Source: S. Borkar (Intel)

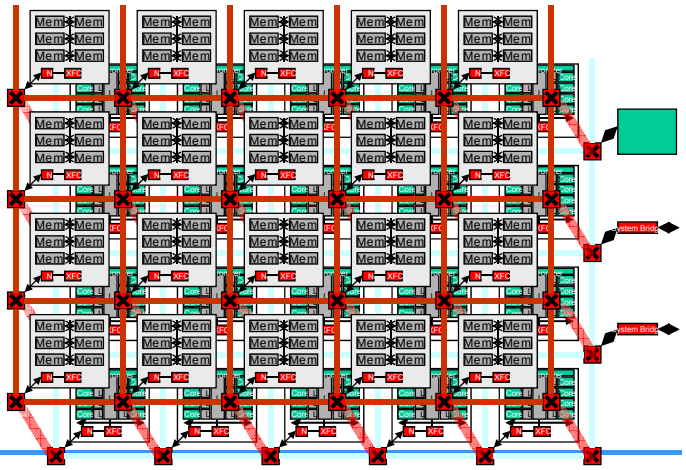


- **Computing performance is now limited by power dissipation. This has forced the move to parallelism as principal means of increasing performance without increasing energy per operation.**

Answers from Patrick Cogez ST Microelectronics 24

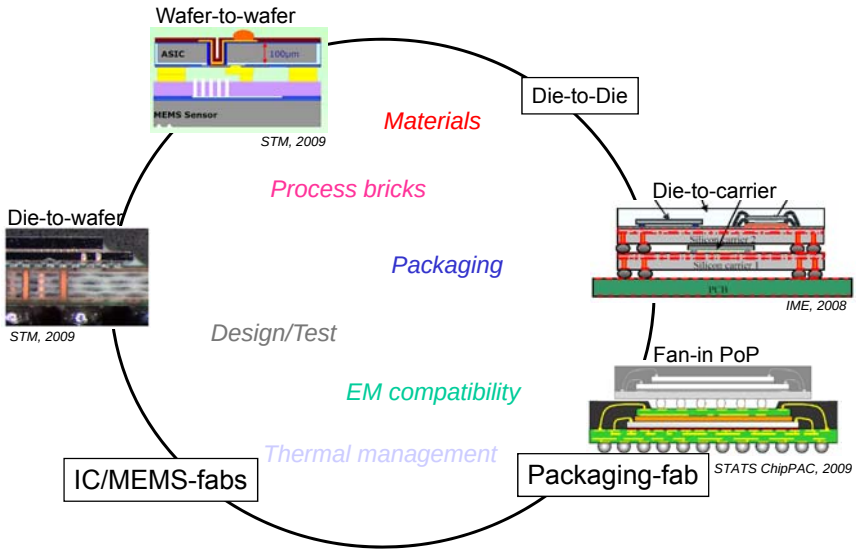
Computing Bandwidth/Memory Bandwidth

- Computing architecture bottleneck is :
  - computing to memory bandwidth ratio!



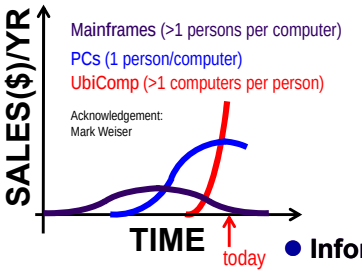
Answers from Patrick Cogez ST Microelectronics

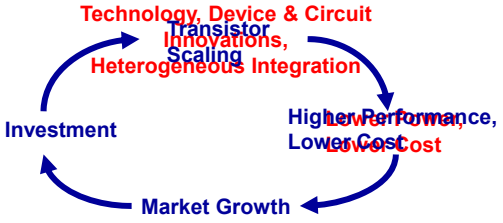
3D Heterogeneous integration challenges



Answers from Patrick Cogez ST Microelectronics

A Vision of the Future





- **Information technology will be**
  - pervasive
  - embedded
  - human-centered
  - solving societal-scale problems


Philips


Sensatex


Transportation


Energy


Health care


Environment

Answers from Patrick Cogez ST Microelectronics

Courtesy Prof. Tsu-Jae King-Liu (UCB)

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Question 4:

From the particular point of view of the activities of your company/research center, what are the most important research challenges and priorities for the next 10 years?

Energy
- Smartgrids, Intelligent management of Energy resources

Transport industry
- Aerospace and automotive industry safetiness
- Mobile energy sources management

Health
- BioSensors, robotics and cobotics

Security
- Videosurveillance, Threat identification

Transverse challenge: high-performance/low power embedded computing resources in the context of the post-CMOS era

Answers from Christian Gamrat from CEA-LIST

Question 4:

From the particular point of view of the activities of your company/research center, what are the most important research challenges and priorities for the next 10 years?

CONCLUSIONS:

The main topics related to Electronic Engineering are focused on Energy, transportation and Communication Technologies. The migration from thermal to electric cars will open up a large range of opportunities, not only from the engine but also as a way to store energy from other sources into the car batteries, from the security point of view with sensors and circuitry, and new materials. Also from the energy point of view the Smart Grid development and the decentralized production of energy is a priority for most of the research institutions and firms. Health is another relevant topic, and finally, the evolution of microelectronics reaching the physical limits and the strategies to overcome them such as stacking (more than Moore and 3D integration) and parallel processing.