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Lezioni di Tecnologie e Materiali per l'Elettronica

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Curriculum

Danilo Manstretta was born in Broni, Italy, in 1973.

1998 Laurea degree (*summa cum laude*) Università degli Studi di Pavia

2002 Ph.D. degree in Electrical Engineering and Computer Science from Università degli Studi di Pavia

- CMOS RF front-end circuits for wireless applications.

2001-2003 Agere Systems, NJ-PA,USA - Member of Technical Staff

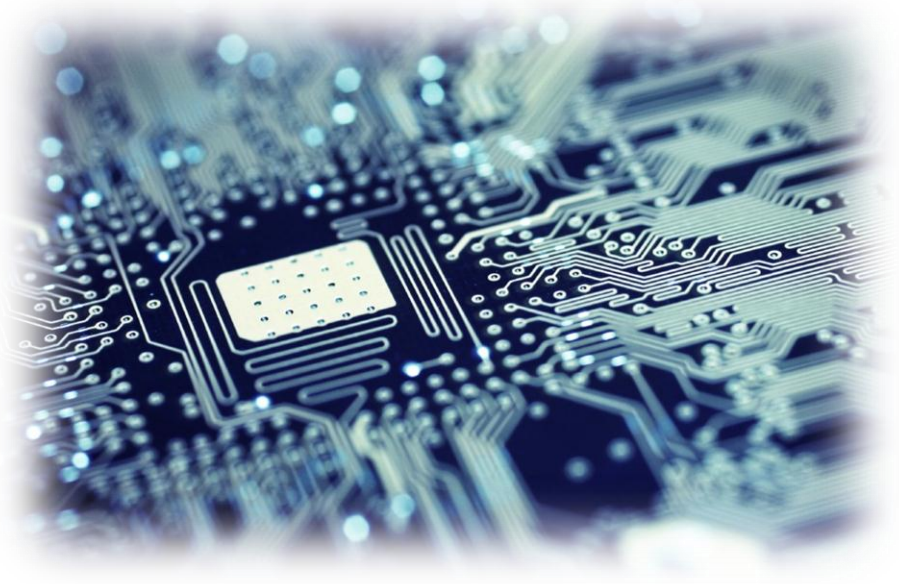
2003-2005 Broadcom Corporation, Irvine, CA – Staff Scientist

2005 – pres Università degli Studi di Pavia, Pavia, Italy, as an Assistant Professor and was granted tenure in 2008.

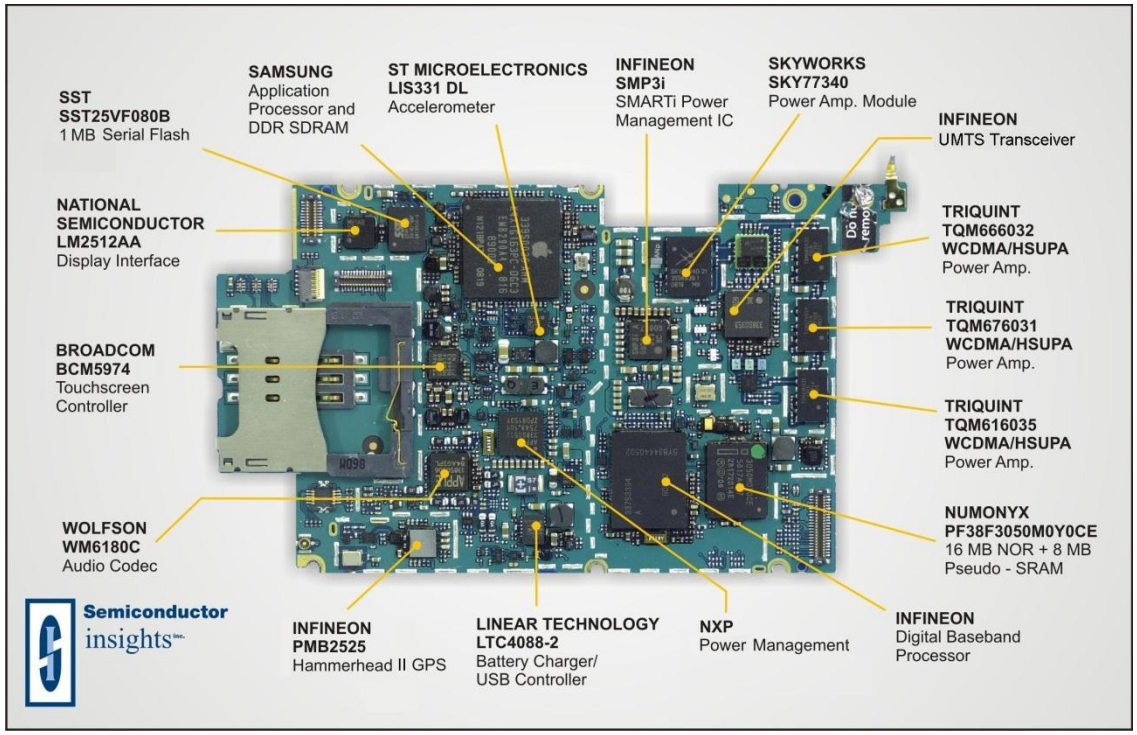
- Research interests: analog, RF and millimeter-wave IC design.
- 2003 IEEE Journal of Solid-State Circuits *Best Paper Award*.
- Member of the Technical Program Committee of the IEEE RFIC Symposium.

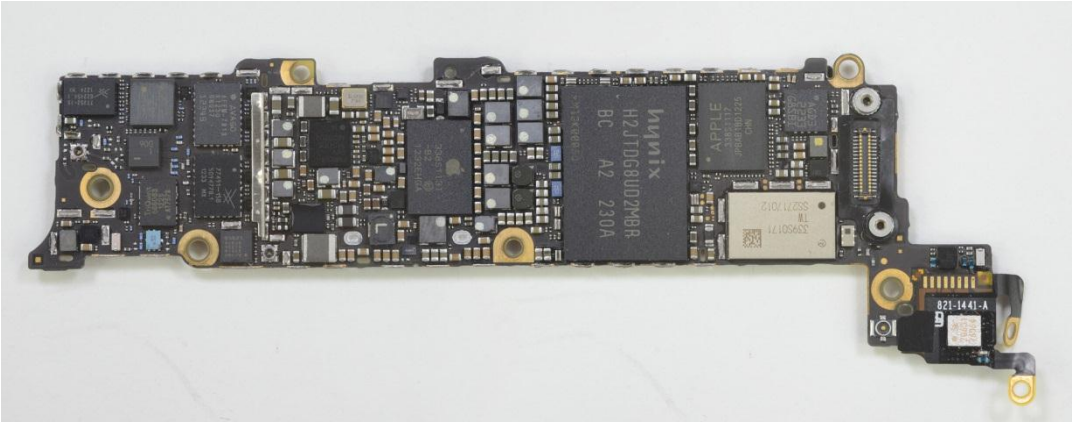
Technology…

Technology is a broad concept that deals with a species' *usage and knowledge of tools and crafts*, and how it affects a species' *ability to control and adapt to its environment*.



Familiar Examples





Outline

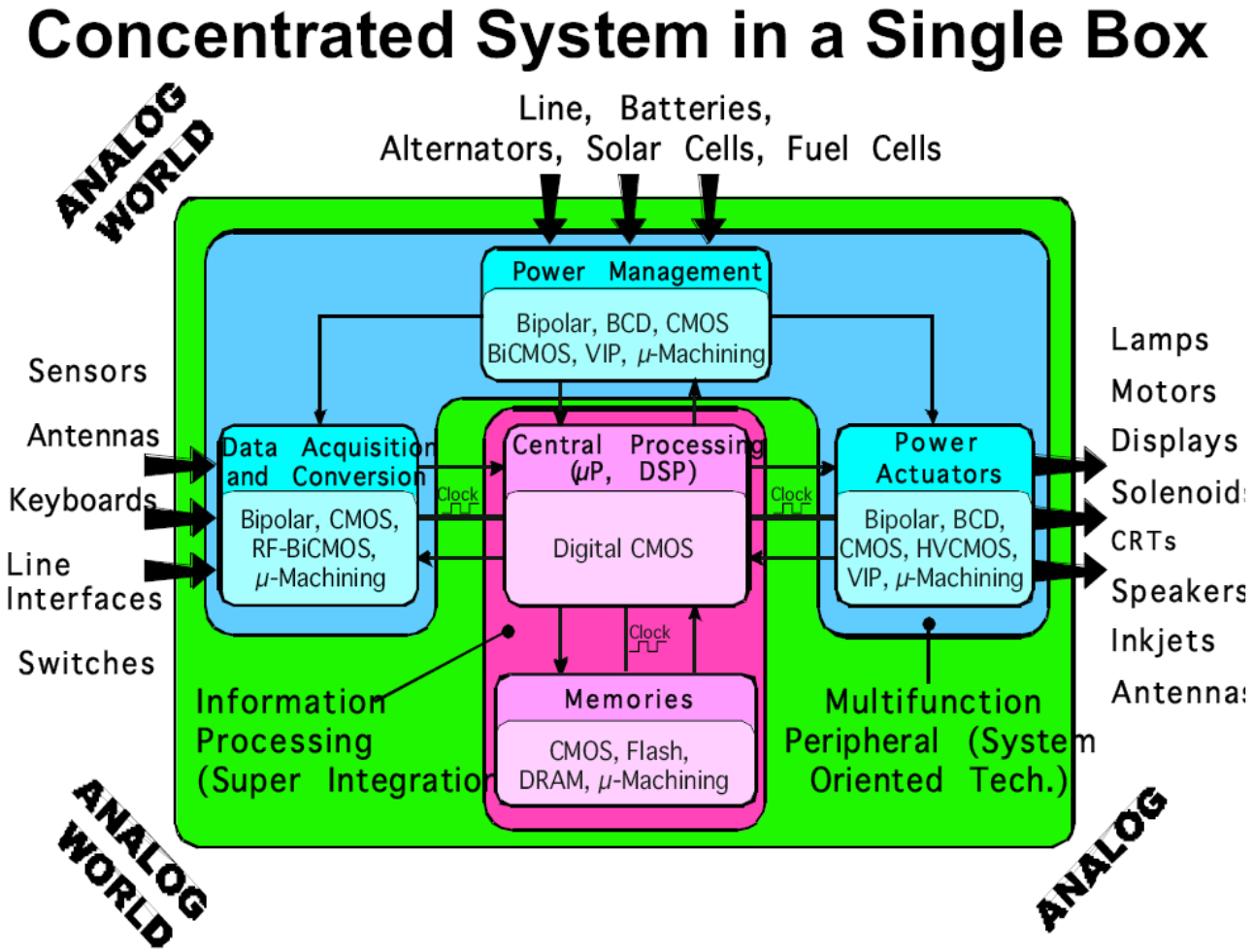
- **Passive components**
  - Resistors
  - Capacitors
  - Inductors
- **Printed circuits technologies**
  - Materials and fabrication steps
  - Assembling
- **Monolithic IC technologies**
  - Fabrication steps (thermal oxidation, thermal diffusion, …)
  - IC technologies (CMOS, BiCMOS)
  - Packaging and thermal design

Introduction

IC technologies, passives, MEMS, …

- Why many different technologies and not just one?
  - Technological feasibility
  - Performance- cost trade-off
  - Feasibility and trade-offs change with time

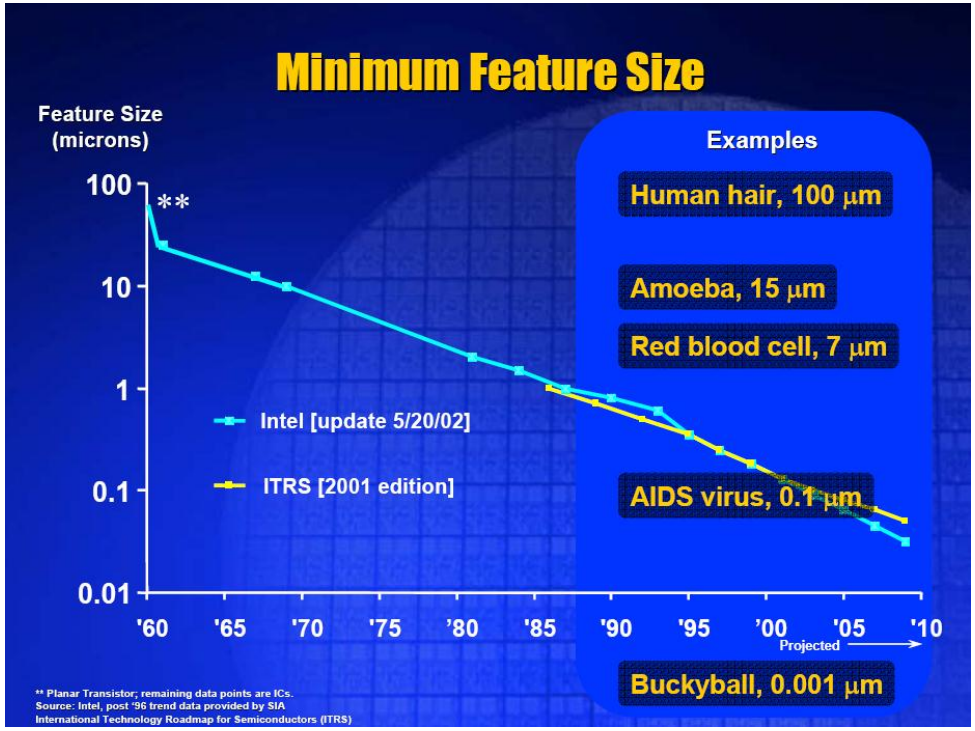
The Generic System

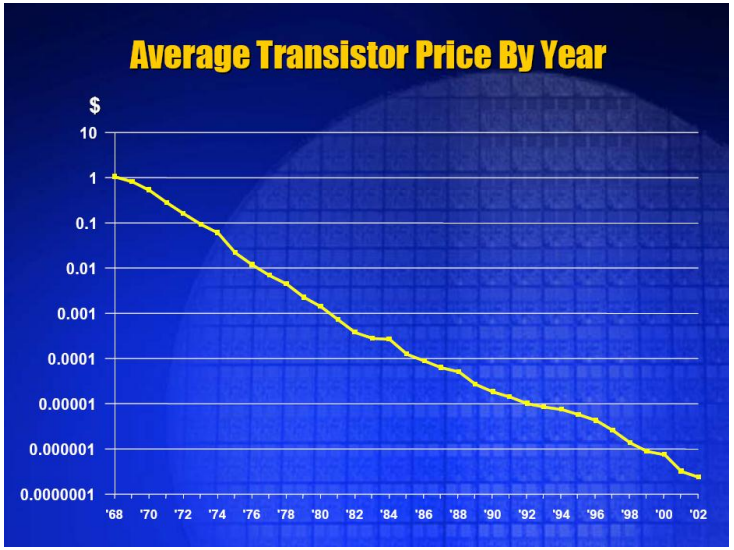


B. Murari, "Bridging the Gap Between the Digital and Real World: the Expanding Role of Analog Interface Technologies", International Solid-State Circuits Conference 2003, *San Francisco, February 10, 2003*

Device Scaling

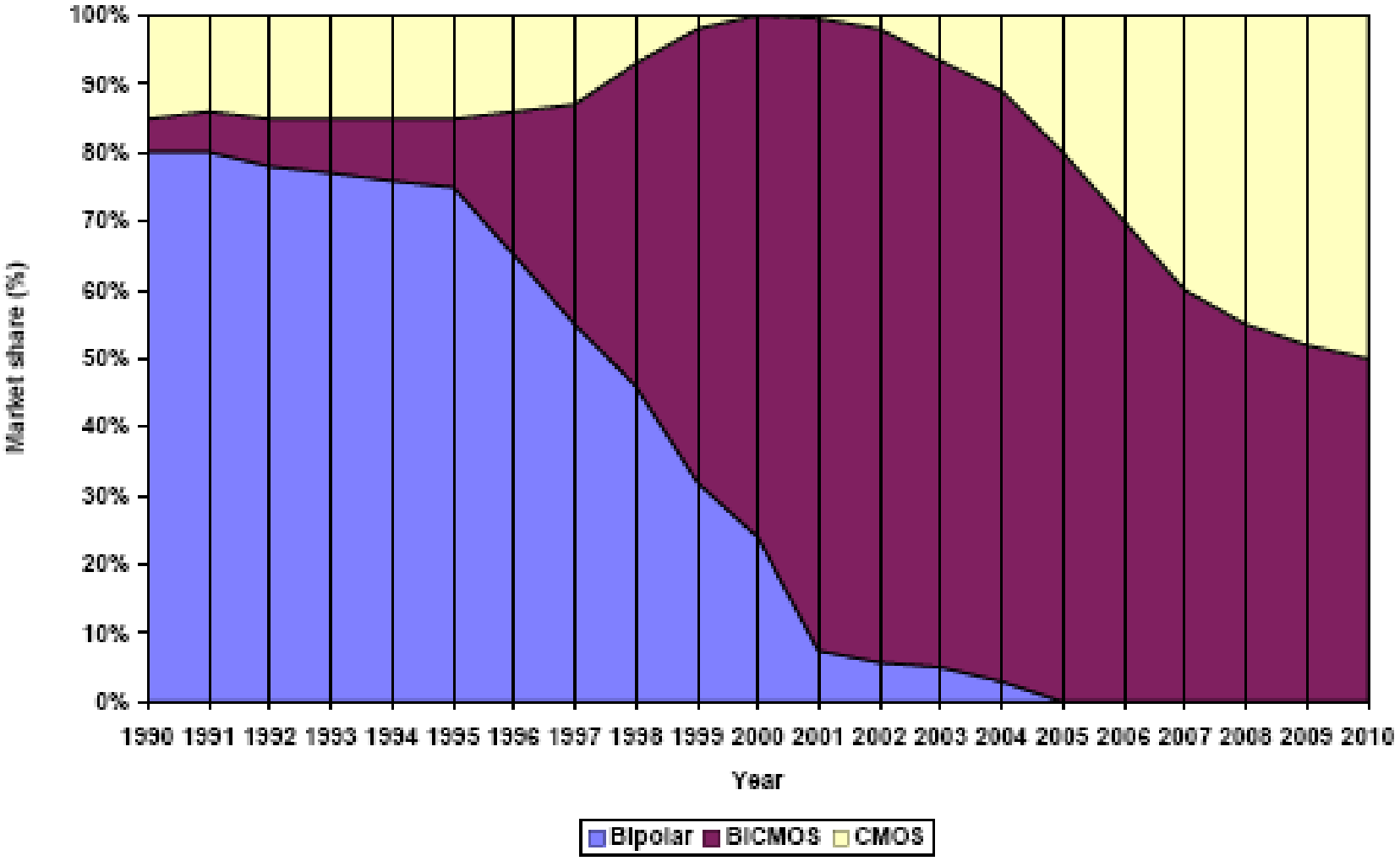
Declining Costs…



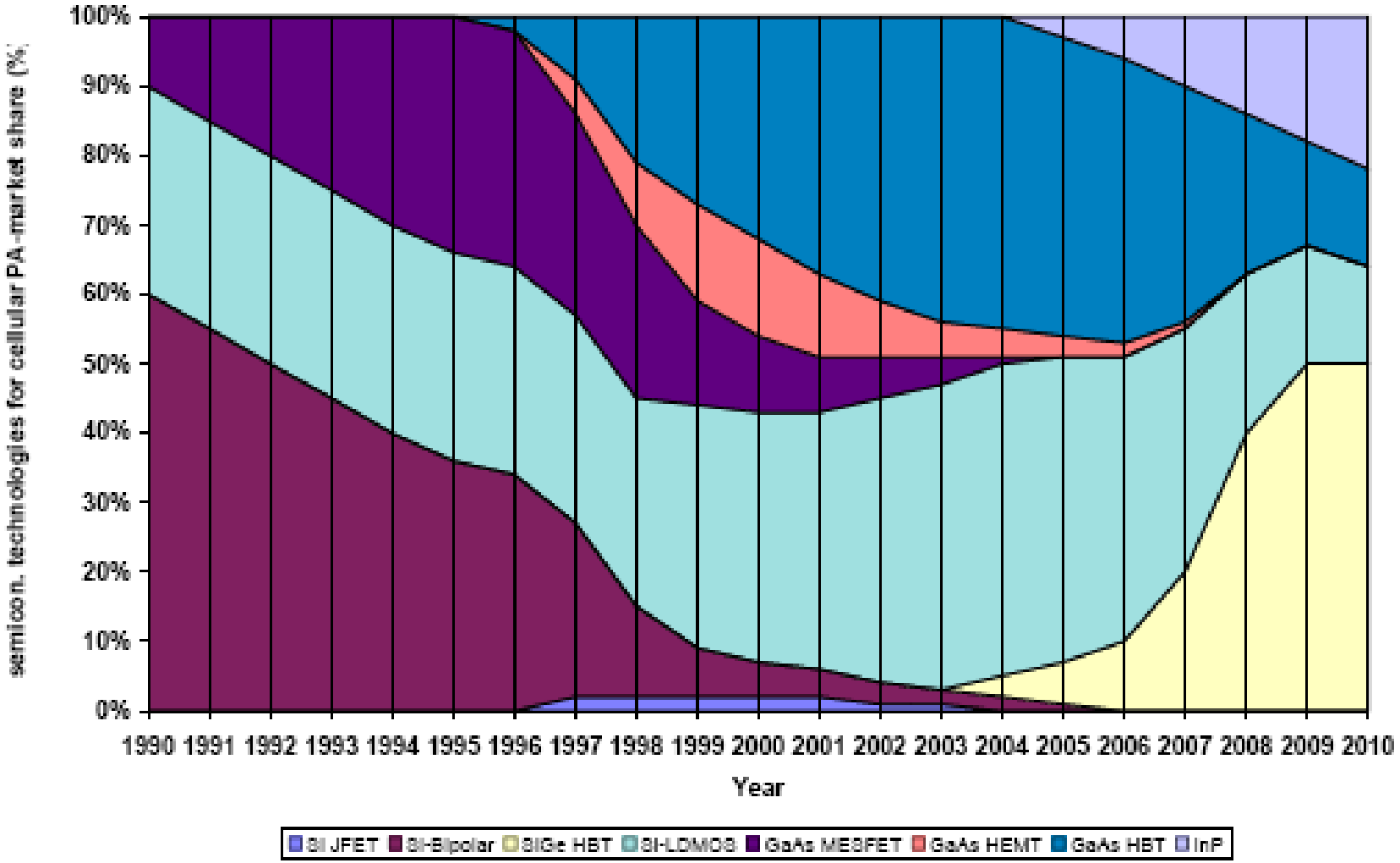


Increasing functionality!

Technologies in Cellular TRX



Technologies in Cellular PAs



Reading Material

- Reading Material:
  - G. Torelli, S. Donati, "*Tecnologie e Materiali per l'Elettronica*", a cura di M. Sozzi, Edizioni CUSL, Pavia,1999.
  - Dispense di G. Torelli, *"Introduzione alla tecnologia dei circuiti integrati su silicio*". 2006. (IC Technologies)

- Additional references:
  - C. F. Coombs, Jr.. Printed Circuits Handbook, Fourth Edition. McGraw Hill, 1996.
  - D. W. Hamer, J. V. Biggers. Thick Film Hybrid Microcircuit Technology. Wiley-Interscience.