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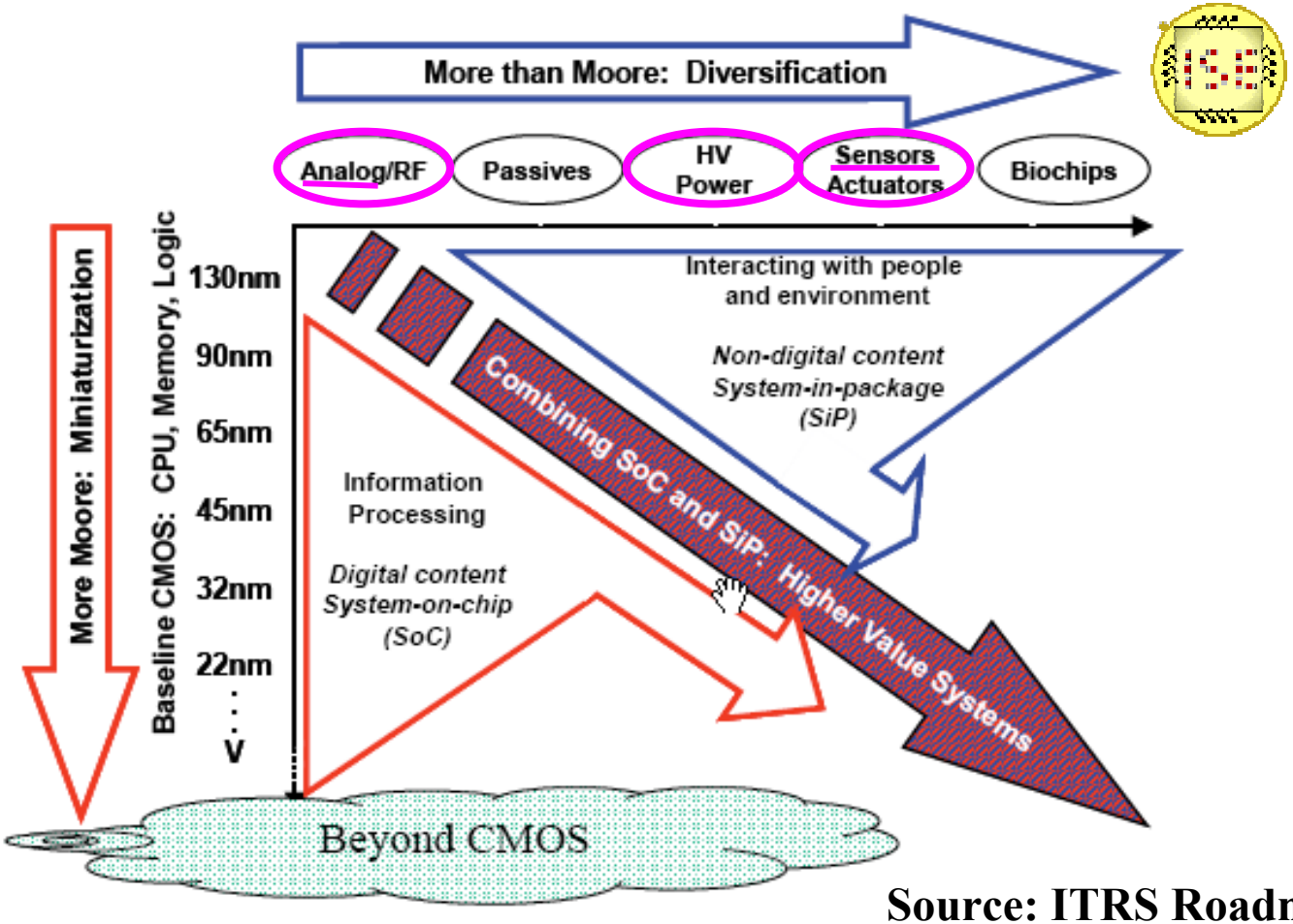

Source: ITRS Roadmap

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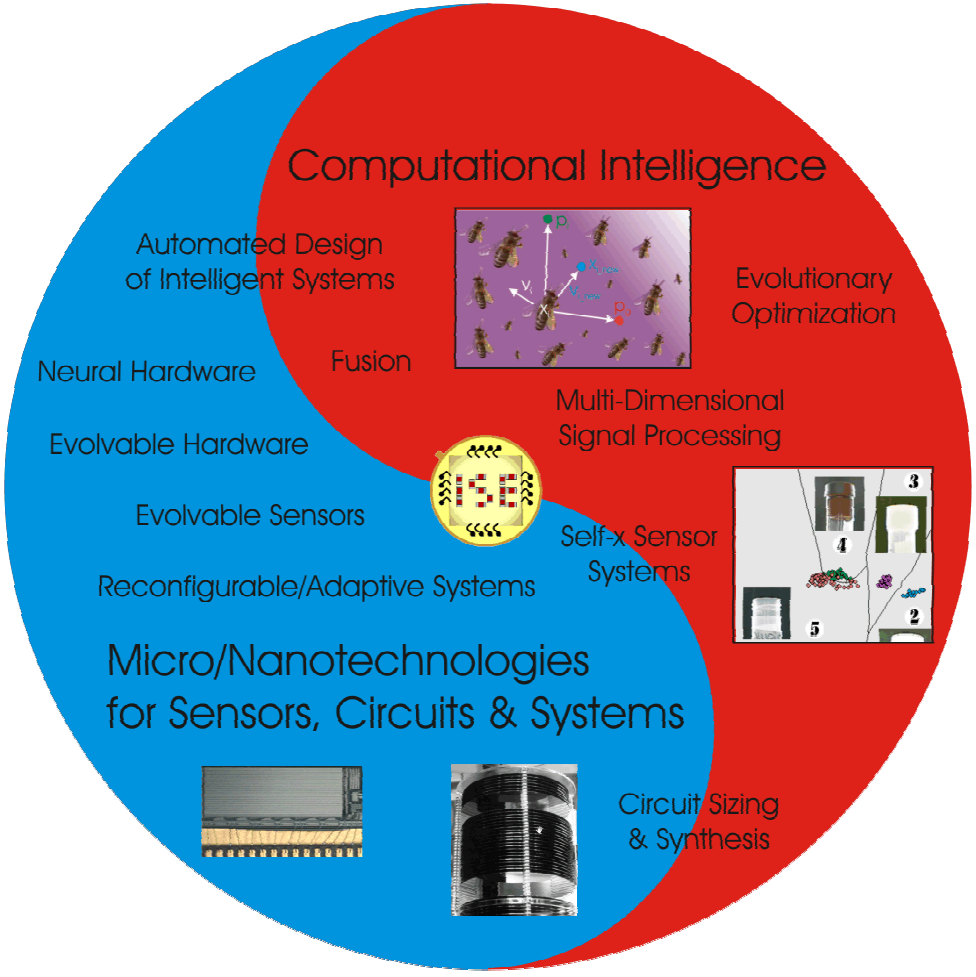

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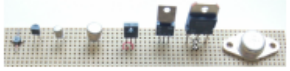
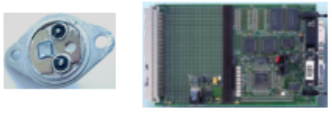
Electronics I/II:
(Discrete) devices, circuits, PCB-level and low-complexity chip integration

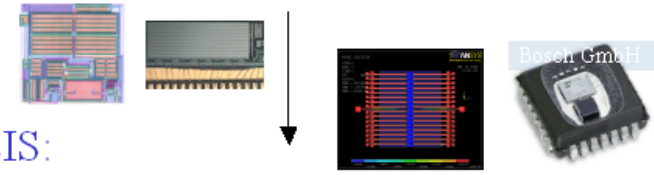


Measurement & Instr. I/II:
Measurement principles, analog/digital instruments, systems, sensors, testing



Integrated Systems

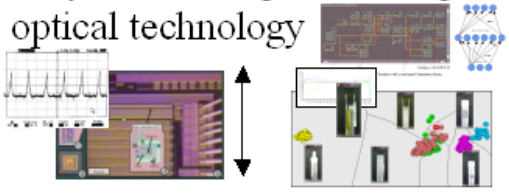
TESYS (former Sensorelectronics):
Microelectronic technologies, layout, simulation, and design for mixed-signal circuits, cell-level (OPA, filter, AD/DAC, …)



HEIS:
Microsensors and –systems, technological extensions, layout, simulation, and design (vision, NIR, Hall, …), MEMS technologies and enhanced sensor spectrum, system integration technologies, sensor architectures

Intelligent Systems

Neurocomputing:
Bio-inspired algorithms, circuits & systems in digital, analog, optical technology



Sensor Signal Processing:
Bio-inspired and conventional algorithms for hybrid intelligent integrated sensor system design. Fusion/Automation aspects.

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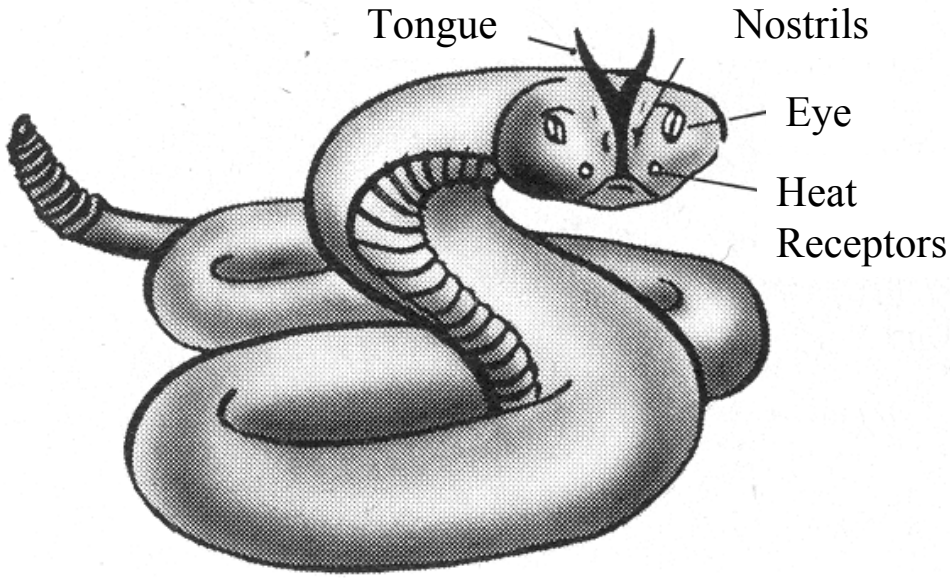
Anwendungsspezifische Akquisition & Verarbeitung multisensorischer Daten

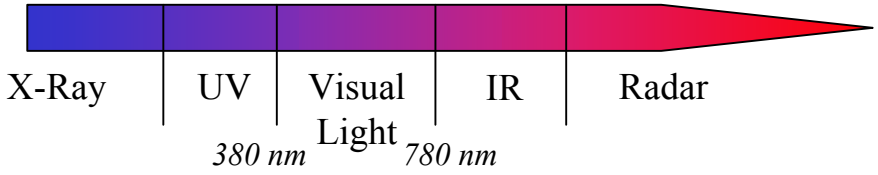
Senses of Living Beings

Sense of Taste
Olfaction
Sense of Touch
Audition
Vision

Technical Models

Sensor Technology
MEMS
Microelectronics





Most Complex Sense: Vision

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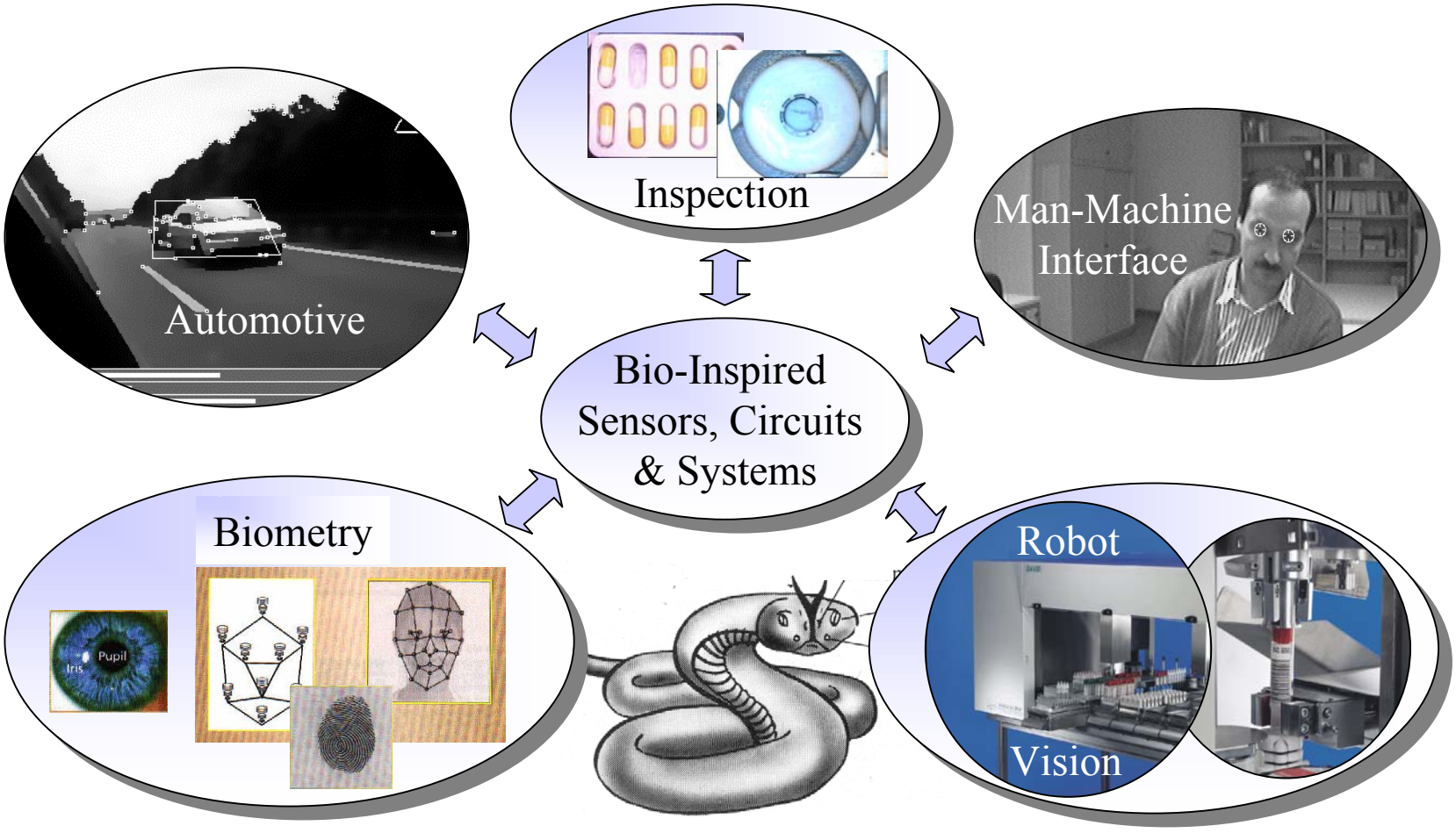
Beispielhafte Anwendungen aus durchgeführten Projekten



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- Querschnittsdisziplin (EIT/MB/Ph/Ch/Inf)
- Hohes wirtschaftliches Potenzial
- Erhebliche Wachstums-perspektive
- Industrielles Interesse und substanzielle Förderung
- Bedarf an entsprechend ausgebildetem Personal

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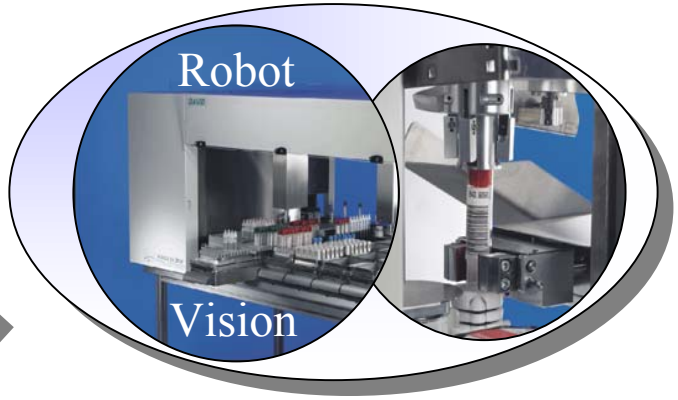

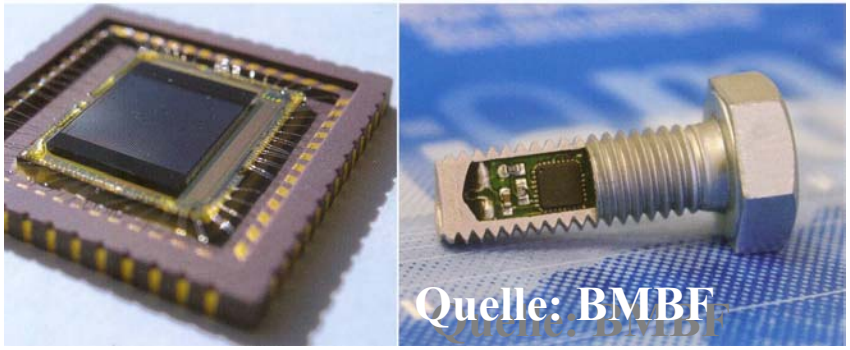

- Integration von Sensoren, Aktoren, Elektronik & intelligenter Signalverarbeitung
- Ausnutzung bzw. Verbindung/Erweiterung von Prozessen der Mikroelektronik
- Besondere Anforderungen an Robustheit und Energieversorgung (Autarke MS)

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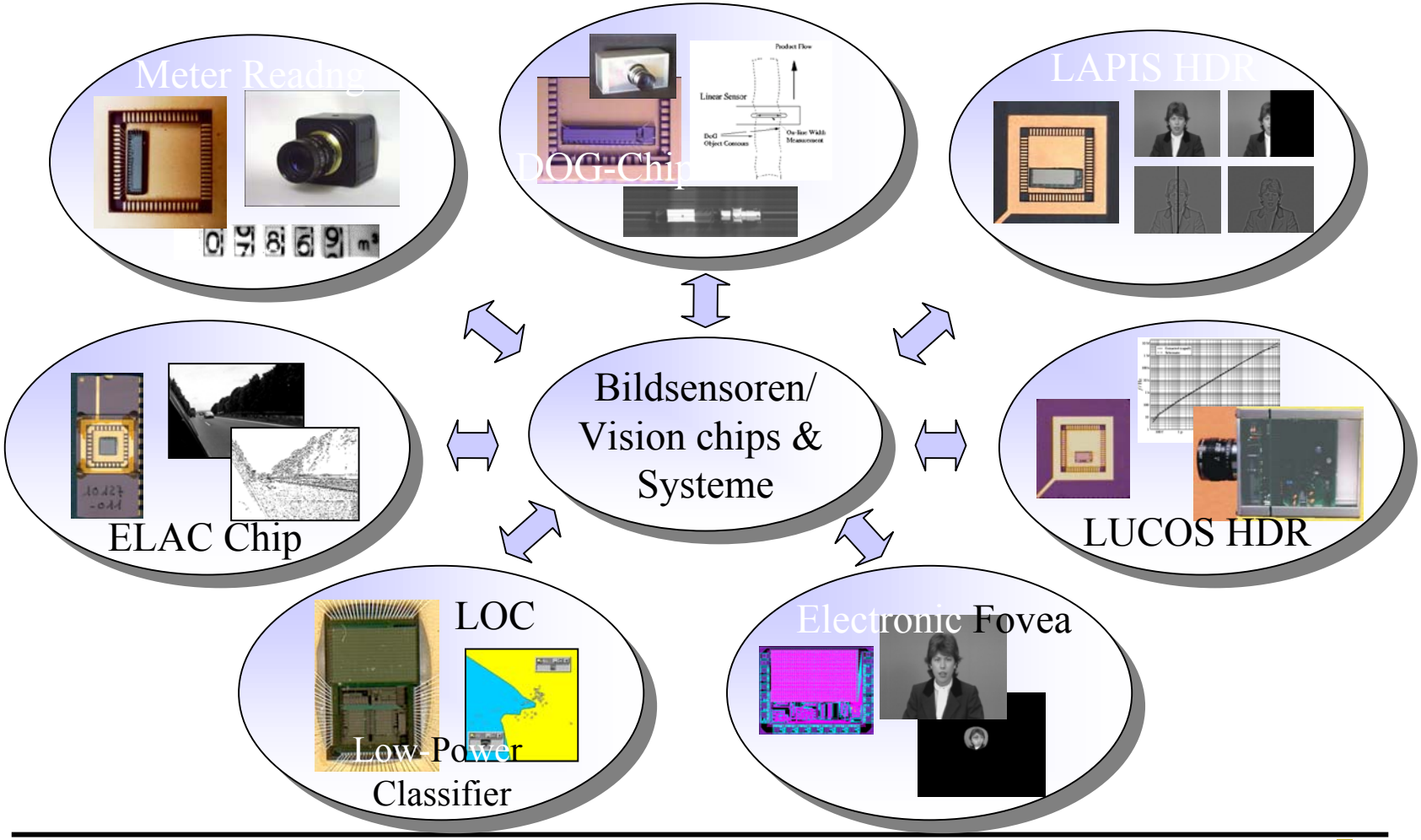
Spezielle CMOS-Bildsensoren mit Signalverarbeitung/Klassifikation



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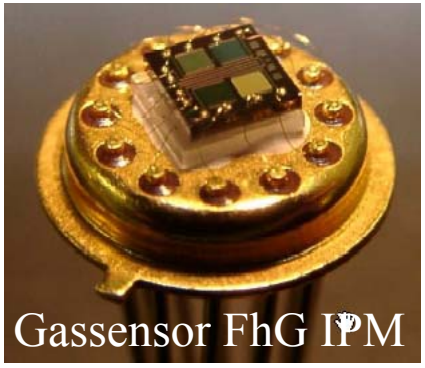
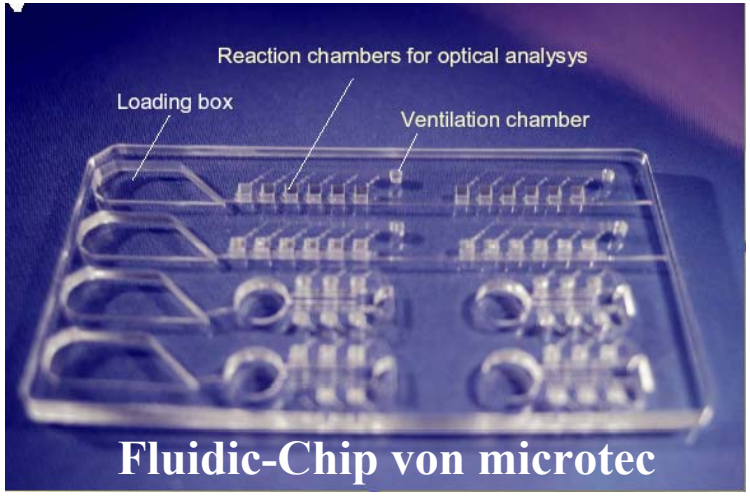
MEMS-Beispiele aus der Literatur

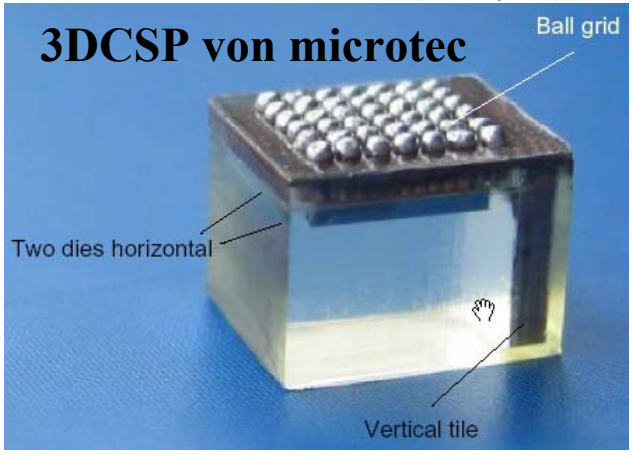


Gassensor FhG IPM

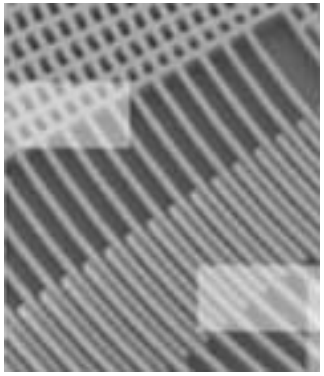
Komponente Planetengetriebe (828 µm) von microtec



Fluidic-Chip von microtec



3DCSP von microtec



Bosch GmbH

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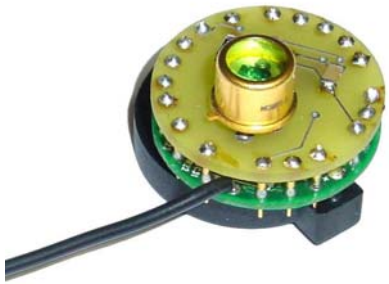
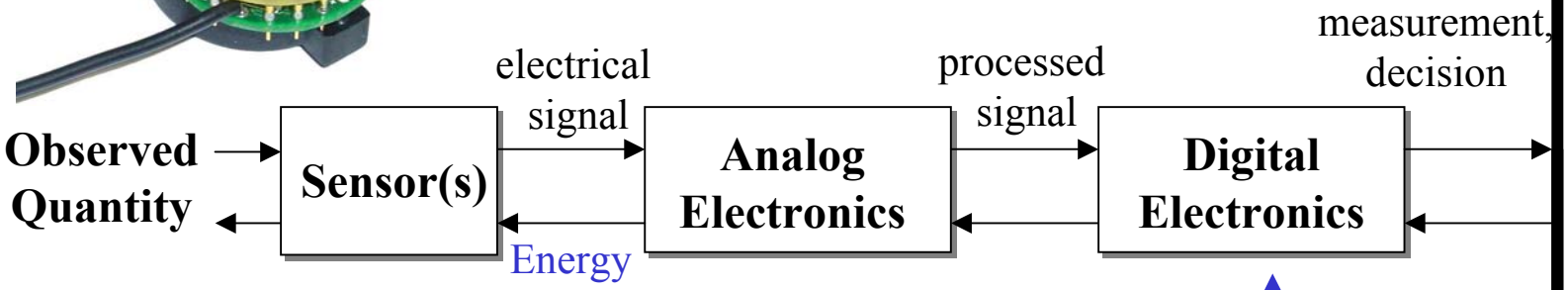
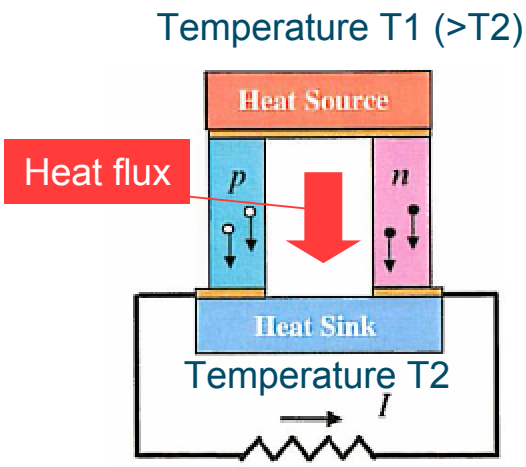
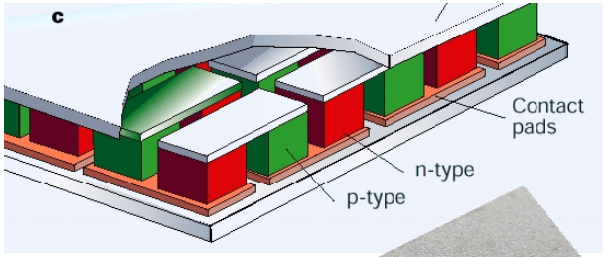
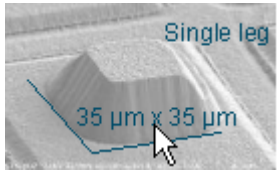
Wireless-Sensor-Networks und Energy Harvesting

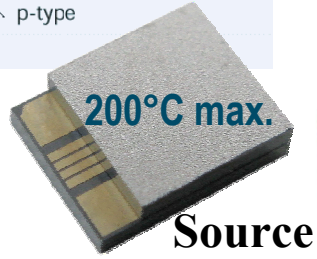


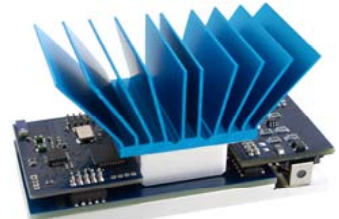












BUS/ RF-Ifc.

Source: Micropelt GmbH

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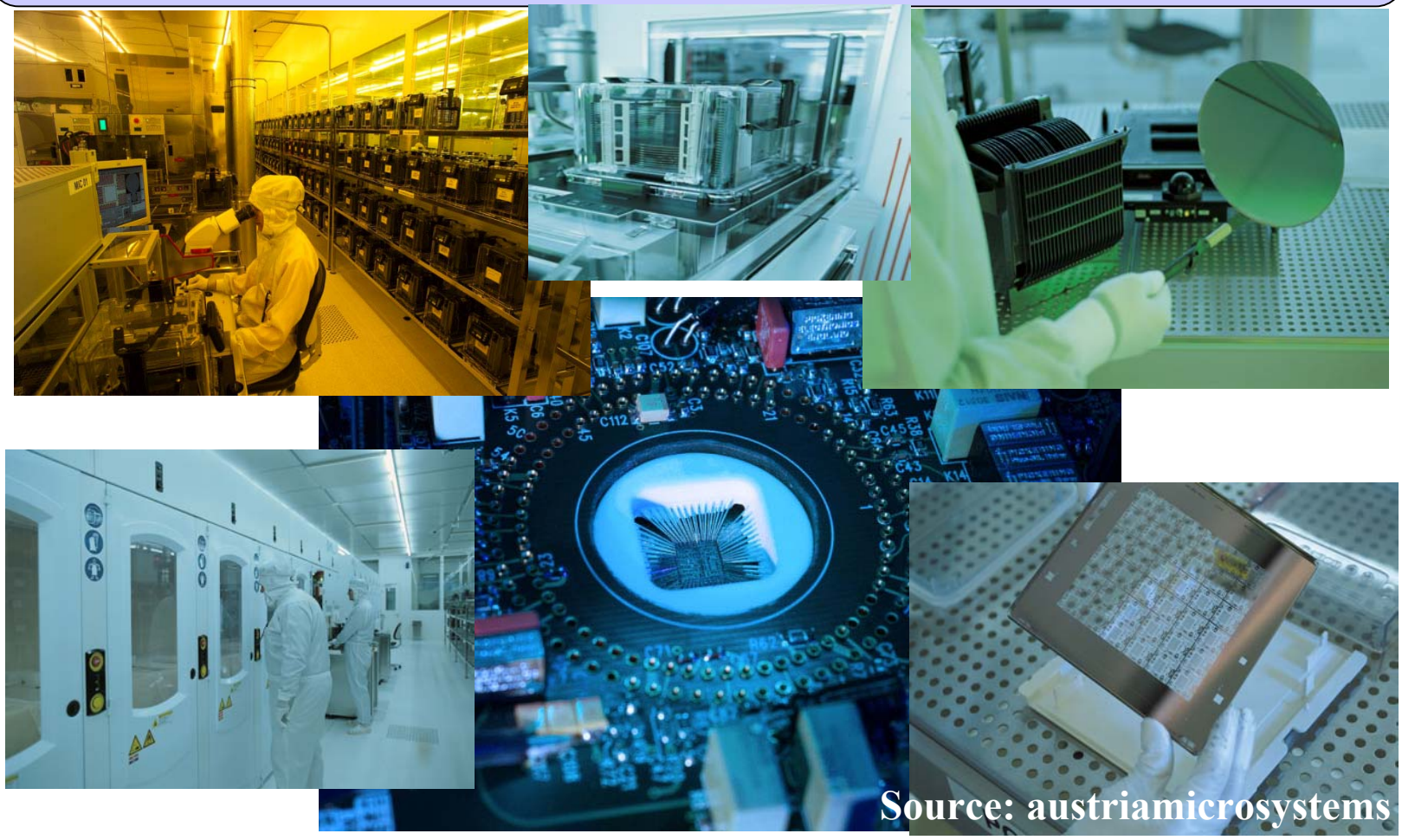
Reinraum und Testlabor



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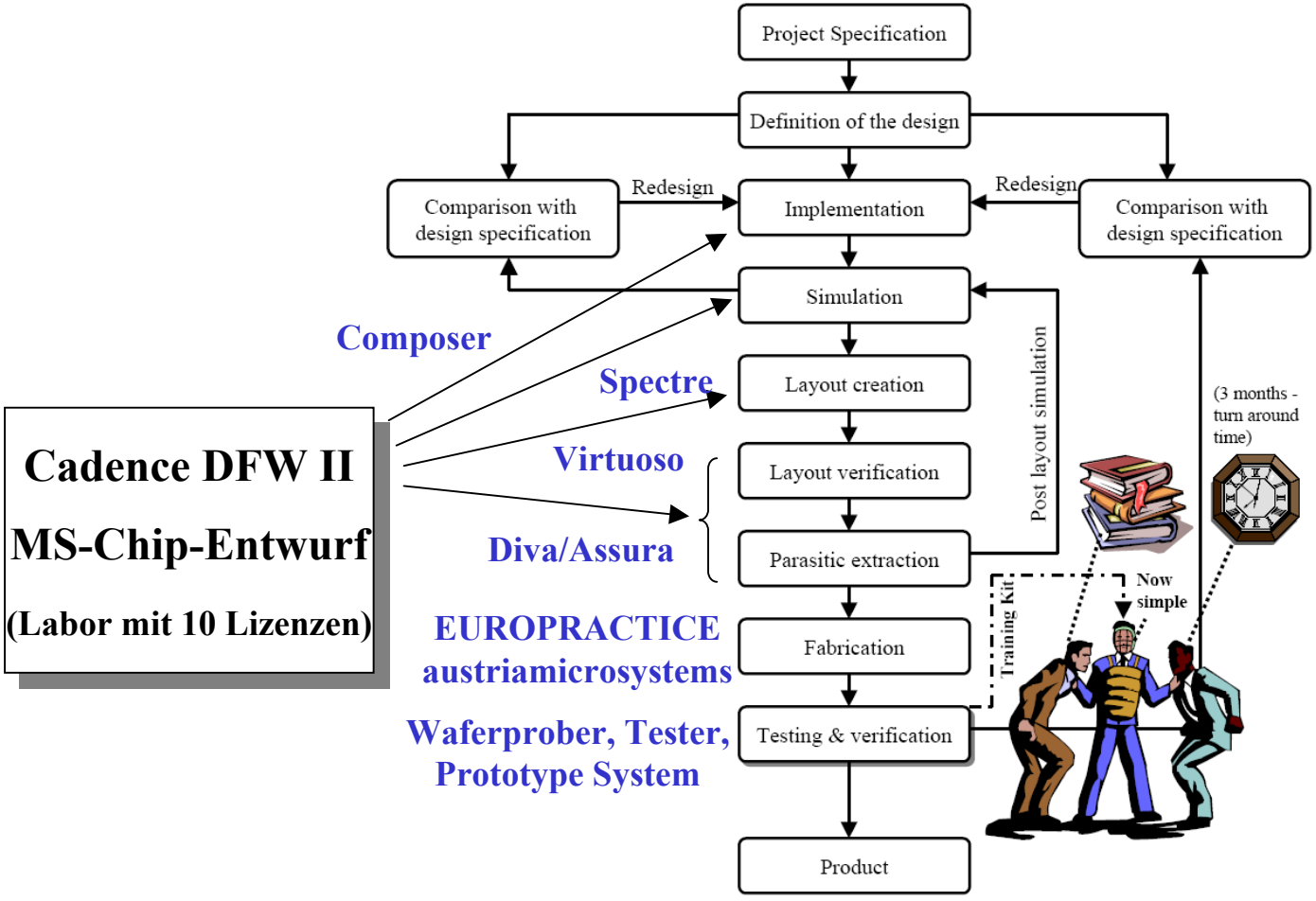
Entwurfausbildung und –infrastruktur im Bereich Mikroelektronik:



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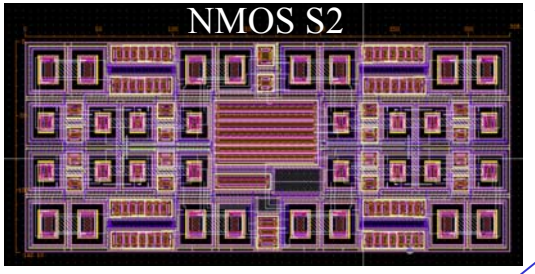
Hierarchischer Entwurf (Rekonfigurierbare Hochvoltschaltungen)

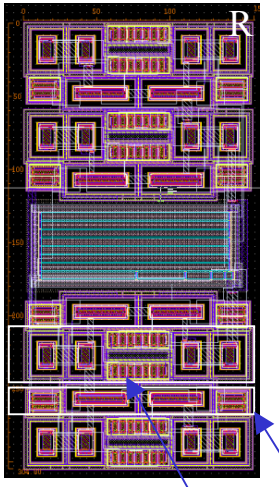
- Cell library for HV-DR-MS-Sensor Electronics:

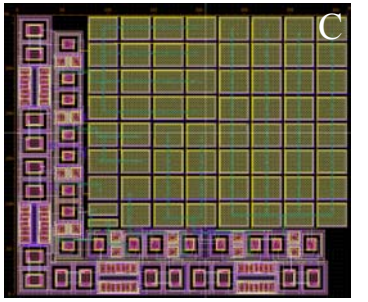
Application Circuit & System

Instrumentation Amp. (SC-)Filter ADC/DAC



Miller Folded-Cascode





(Matched) Scalable Transistors (Matched) Scalable R,C / *L ?*)

8 bit scale of C_{min}= 0.1 pF, R_{min}=1kΩ, $(W/L)_{min}$=1

2-Trans. Switch 3-Trans. Switch Voltage Level Shifter LV-Logic, Trans. chunks Level-Shifter Switch

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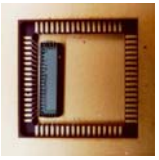
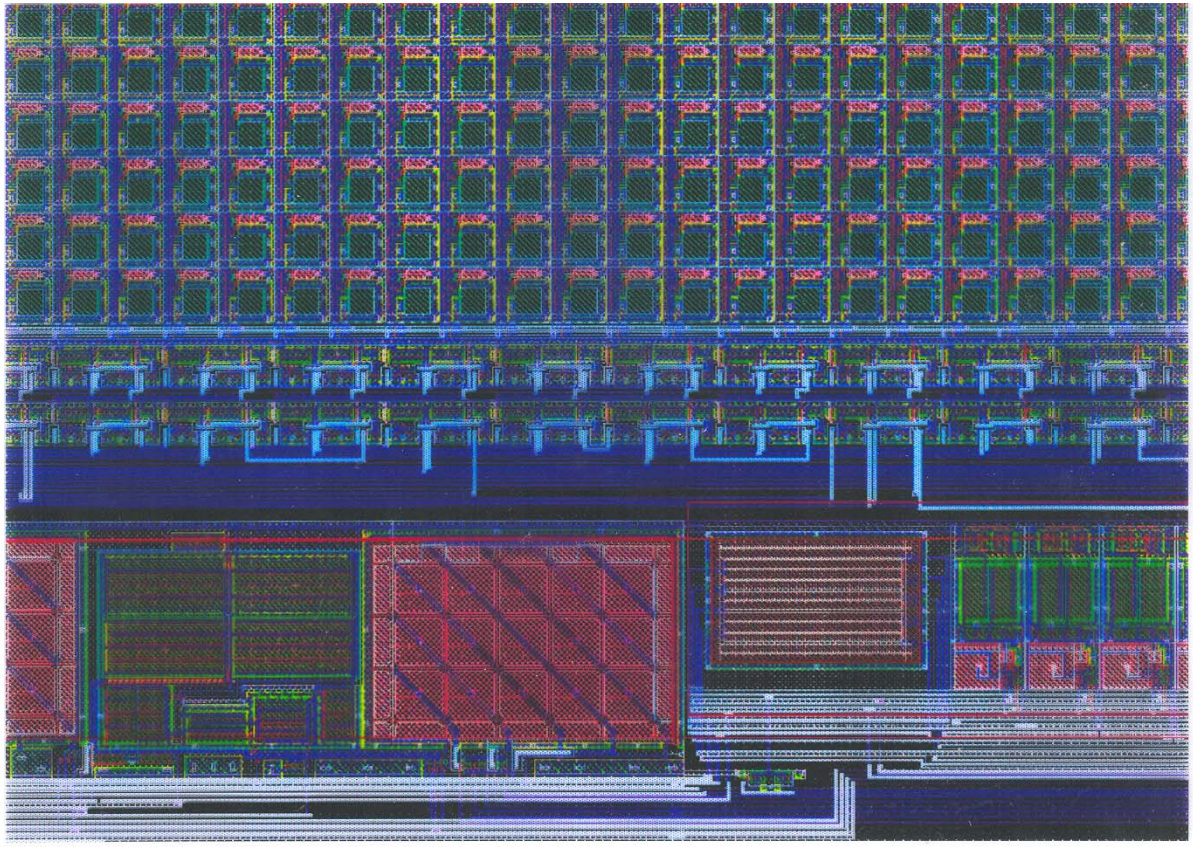
Entwurfausbildung und –infrastruktur im Bereich Mikroelektronik:

- Microsensor & Chip Design





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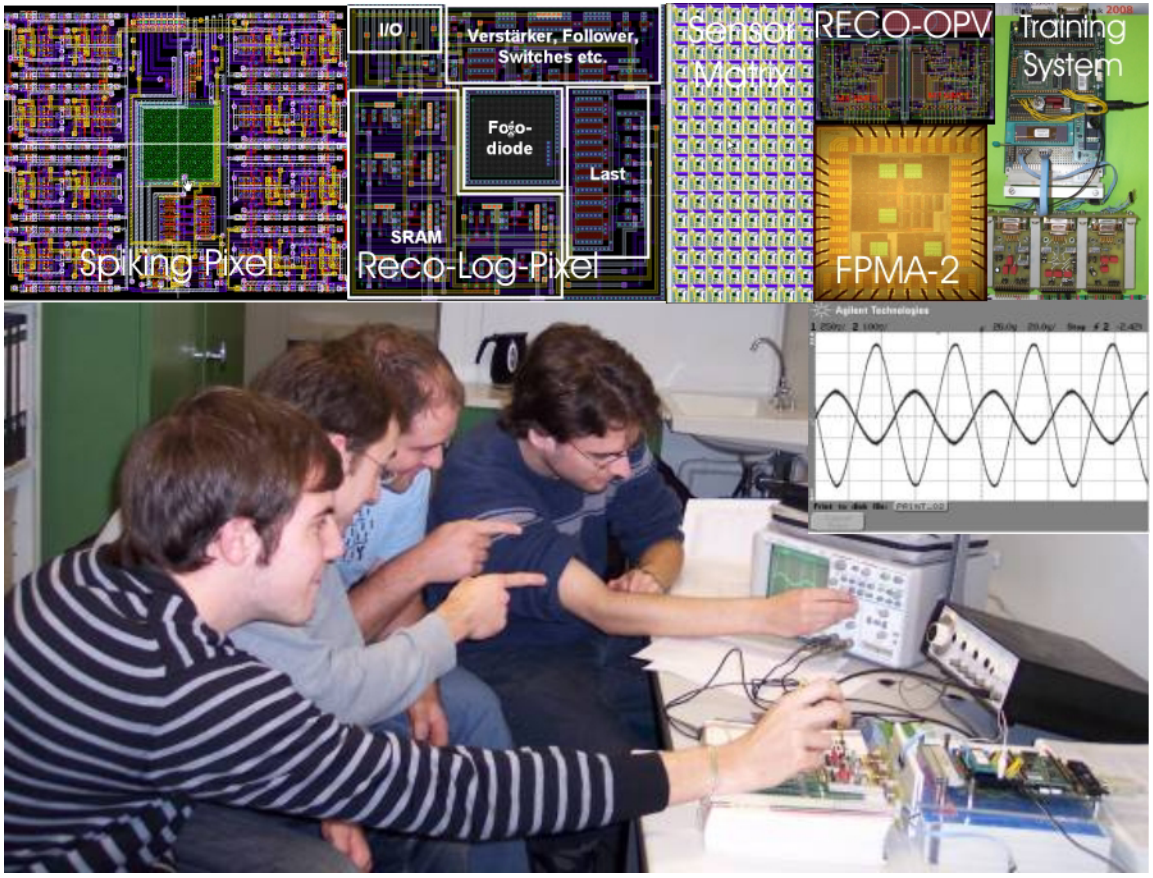
Entwurfausbildung und –infrastruktur im Bereich Mikroelektronik:



- CMOS Mixed-Signal Schaltkreis- und Mikrosensorentwurf
- Semesterprojekte zu Zellen und Multi-Projekt-Schaltkreisen/Wafern

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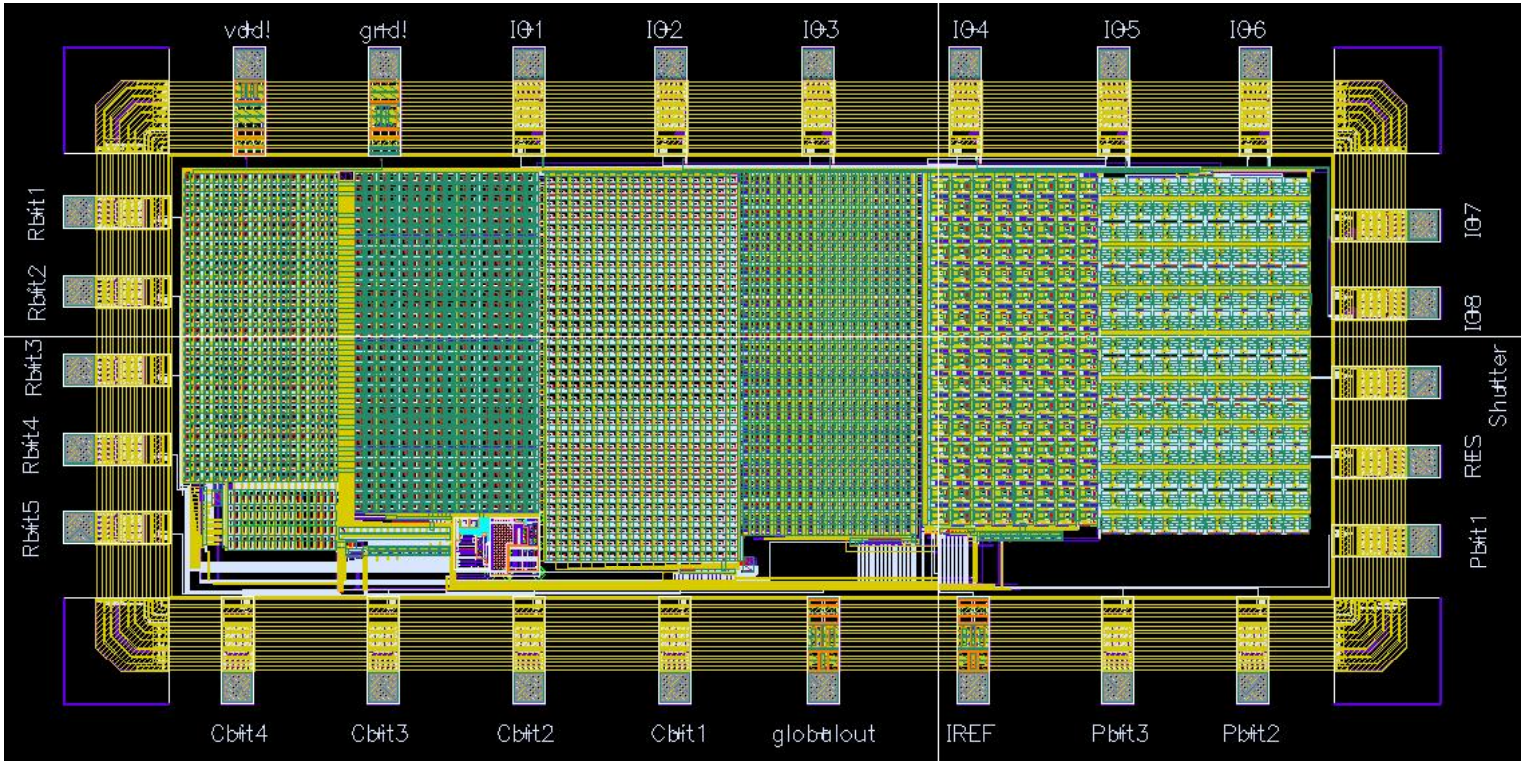
Entwurfausbildung und –infrastruktur im Bereich Mikroelektronik:

- Letzte Gruppenarbeit aus 2009, Multi-Projekt-Bildsensorchip:



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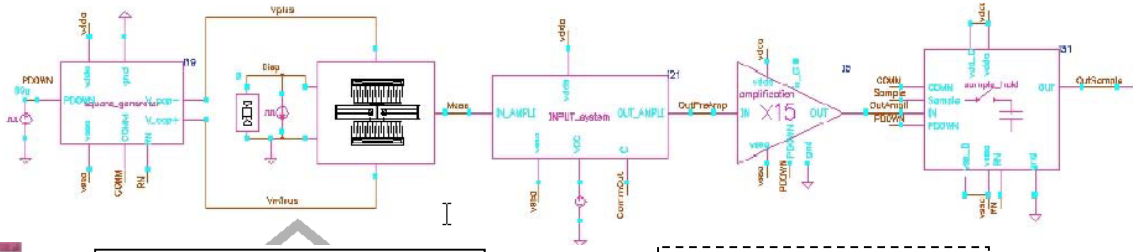
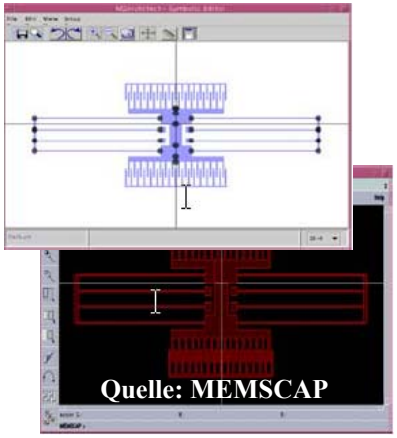
Entwurfausbildung und –infrastruktur im Bereich MST/Sensorik:





SoftMEMS

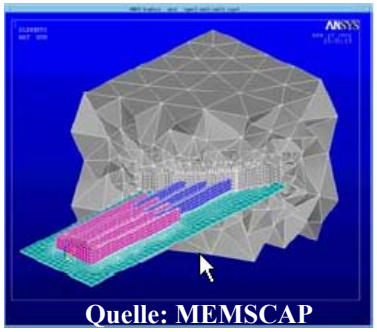
MEMS-Entwurf

(Labor mit 4 Lizenzen)

ANSYS

Multiphysics

(FEM, in Vorb.)



Herstellungstechnologie/Cadence

- Reine Verhaltensmodellierung: Tools, wie z.B. Modelica
- Physikalischer Entwurf: Coventor bzw. SoftMEMS Xplorer DS (Europractice)

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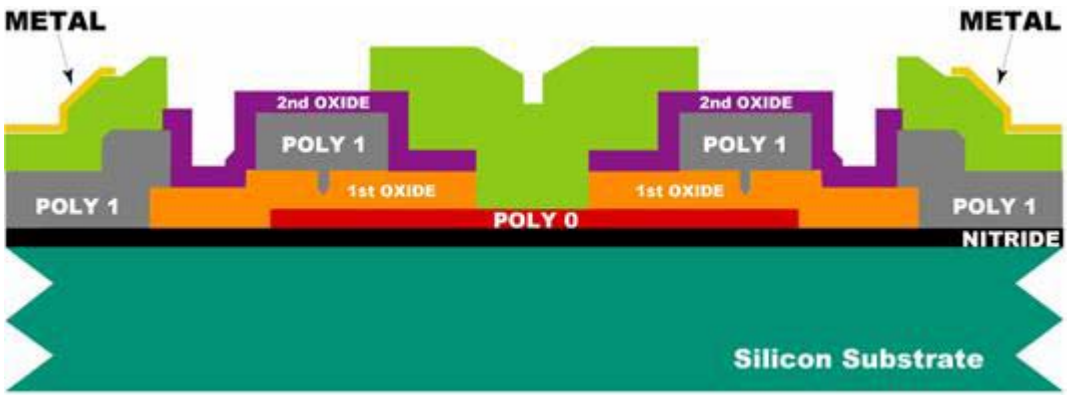
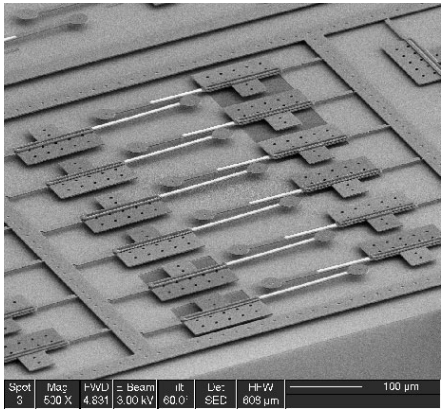
Dienstleistungen für MEMS

- Als *Fabless*-Fachbereich bietet es sich an für FuL Dienstleistungen zu nutzen
- Wie für die Mikroelektronik bietet EUROPRACTICE u.a. Multi-User-MEMS-processes (MUMPS)





- Z.z. werden PolyMUMPs, SOIMUMPs und MetalMUMPs angeboten
- PolyMUMPs: Dreilagen-Polysilizium *surface and bulk micromachining* Prozess, mit 2 Opferschichten und einer Metallschicht (8 Maskenebene, 7 physikalische Schichten).
- **Anwendungen:** Mikrophone, Beschleunigungssensoren, Mikrofluidik, u.a.

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