



Trends in MDO and Emerging Areas

Fred van Keulen

A.vanKeulen@tudelft.nl

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Thematic Programmes

Research Themes within the Thematic Programmes of FP7

Within the specific programme "Cooperation" of FP7, you find ten thematic programmes (plus nuclear research as part of EURATOM). These cover a large spectrum of research and development. In all programmes the topics are predefined (top-down approach).

Depending on your interest and competences, you might find fields of interest in several thematic programmes. For example, you may find molecular biology themes in FAB, Biotechnology for non-food applications, as well as in the thematic programme Health.



Thematic Programmes

Budget FP7 (M Euro)

Contact

News

13.05.13 13:
[Role of SSH in](#)

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Face to Face

23.05.13 09:
[Energy Match](#)

19.06.13 09:
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Calls

15.05.13 11:
[...](#)

Thematic Programmes
<u>Health</u>
<u>Food, Agriculture, Biotech</u>
<u>Information and Communication Technologies (ICT)</u>
<u>Nanotech, Materials, Processes</u>
<u>Energy</u>
<u>Environment</u>
<u>Transport (incl. Air transport and Galileo)</u>
<u>Socio-economic Sciences and the Humanities</u>
<u>Space</u>
<u>Security</u>
<u>Nuclear research, EURATOM</u>

“Our home town”

Thematic Programmes
Health
Food, Agriculture, Biotech
Information and Communication Technologies (ICT)
Nanotech, Materials, Processes
Energy
Environment
Transport (incl. Air transport and Galileo)
Socio-economic Sciences and the Humanities
Space
Security
Nuclear research, EURATOM

virtually absent



Thematic Programmes	
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<u>Food, Agriculture, Biotech</u>	
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<u>Nuclear research, EURATOM</u>	

8

23

24

14

5

Health (8 papers)

- Stents (incl flow simulations)
- Implants (biocompatibility, u-motions, shape, topopt)
- Scaffolds for tissue growth
- Understanding nature
- **Surgical planning**

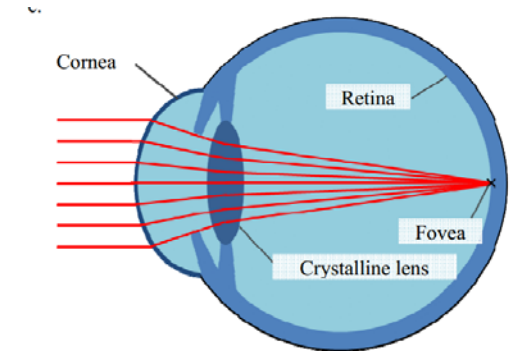
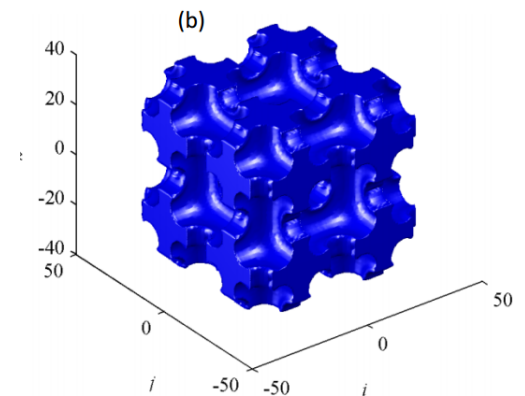
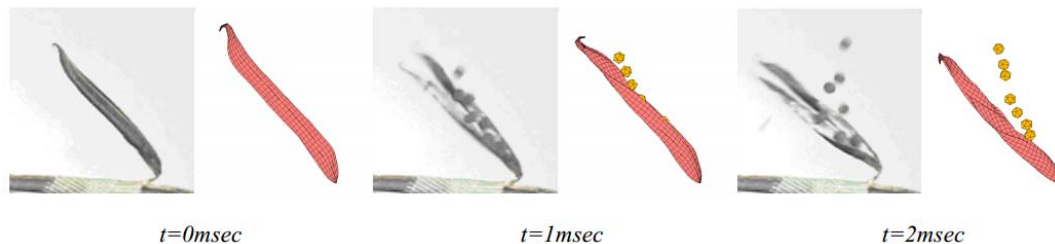


Figure 1: Normal refraction in human eye (Emmetropia)



ICT

- Thermal Management 7
- Nano-photonics 3
- More than Moore 13



Thermal management (7 papers)

- Cooling/heating/pumping
- System, SiP and device design
- Anisotropic material for heat flow
- Precision tools and instruments (only 1!)

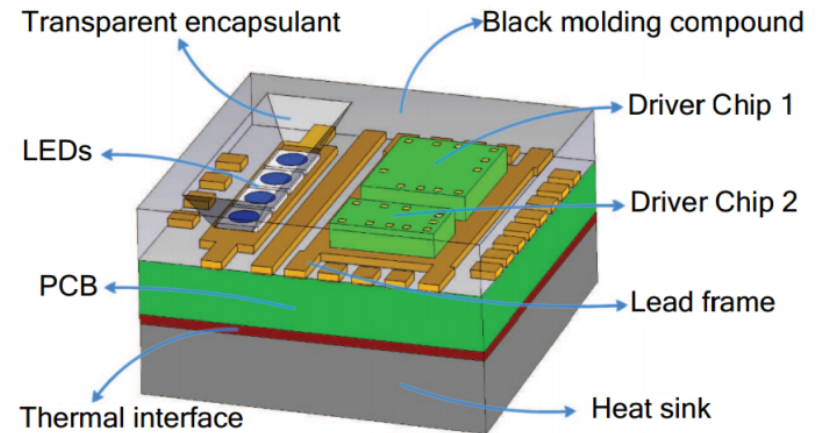


Figure 1: LED SiP design concept



More than Moore (13 papers)

- Electrostatic sensors
- Transducers
- Actuators
- Cantilevers
- Material and electrodes
- Mask layout
- Energy harvesting (3)

- MDO + Multi-level optimization
- Topology/shape/parameter
- multimaterial

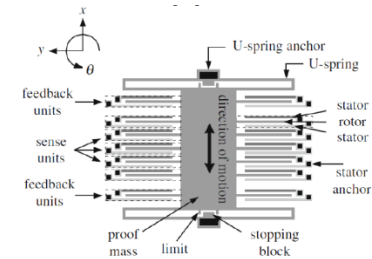


Figure 3: Schematic illustration of micro-accelerometer design [10]

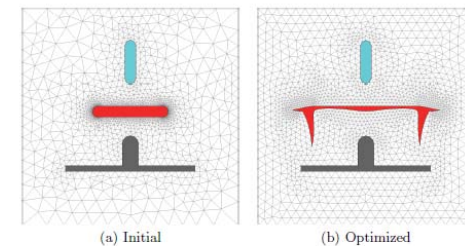
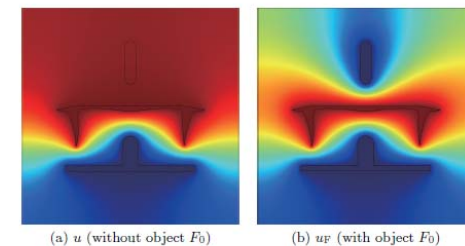
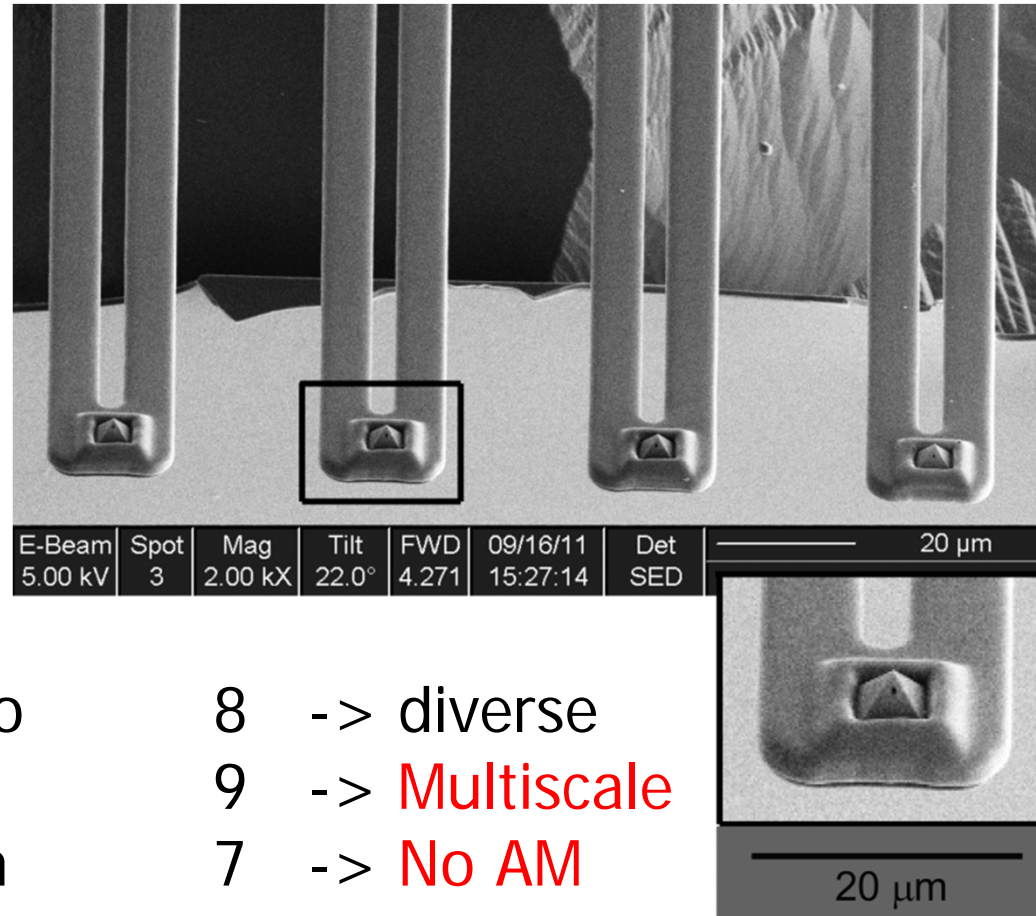


Figure 9: Example 2: Shapes before and after domain variation



Nano-Materials-Production



- Micro/nano 8 -> diverse
- Materials 9 -> **Multiscale**
- Production 7 -> **No AM**

Energy

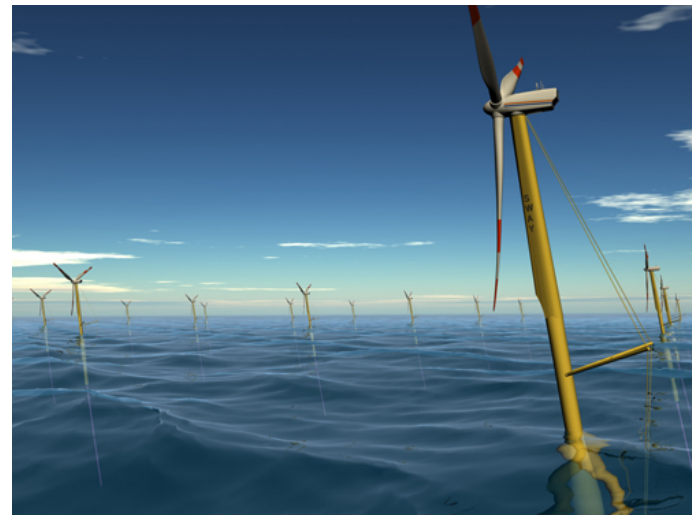
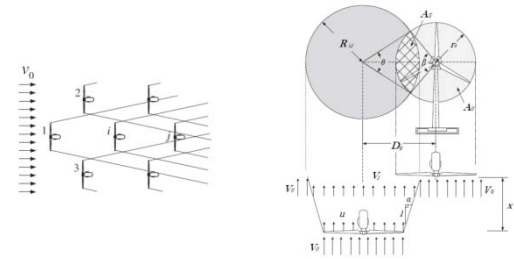


- Wind 8
- Solar 4
- Diverse 2

Wind (8 papers)

- Reliability
- cost models
- Multi-objective: capacity land use, social effects
- Wake/shadowing
- Layout of parks
- Tower, foundation, blades
- Floating: damper optimization

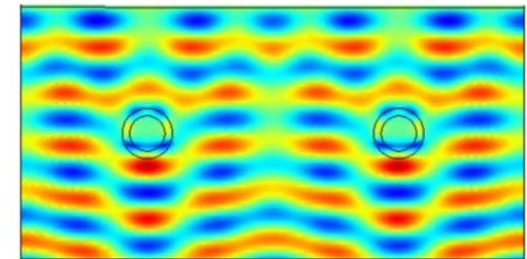
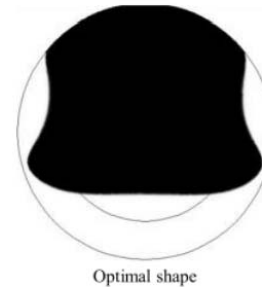
Note: weak link with control



Energy Solar (4 papers)

- Maxwell
- Plasmonics
- Maximize light absorbance
- Thin film -> nano particle optimization

Note: related papers in ICT, NMP, Security



Diffusivity of coefficient = $1e-5$, Volume fraction = 0.7
Objective value 1 \rightarrow 2.5

Observations

- Weak:
 - Link with control
 - Additive manufacturing
- Prominent: Wave propagation (ICT, N, Energy, cloaking, ...)
 - Acoustics/phononics: 10
 - Photonics: 8
- ICT is a main driver (MtM, Thermal, ...)
- “High potentials”: Multi-scale and medical (optimal surgery)
- Opportunity: “Food, Agriculture and Biotech”?