



Center of Excellence in Functional Materials

Scientific Advisory Board Meeting
14-15.08.2013
www.funmat.fi






Center for Functional Materials



FunMat
- Innovative science

- Functional inks (DPC)
- Functional carriers (LPT)
- Functional polymers (LPC)

Materials → **Functionalization** → **Utilisation**

Functional printing (FPL) → Functional substrate (LPC) → Functional devices (DP)



Our Vision

We believe that new functional materials will enable the printed intelligence revolution

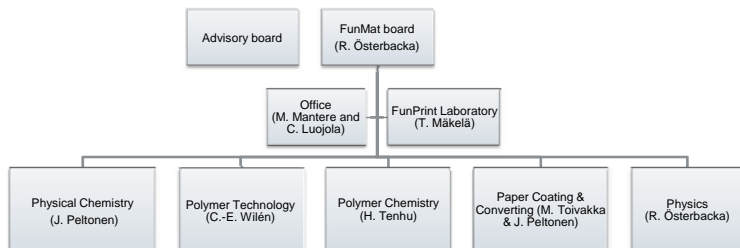
Our Mission

To create and demonstrate new functionalities for future interactive products by combining advanced chemistry and complex materials with printing technologies.

Key Objectives

- Excellence and innovativeness in research
- Highly inter- and multidisciplinary approach to research
- Strong national and international networking
- To be the leader in paper based printed intelligence research


The structure of FunMat



Board:

Co-Chair Professor Jouko Peltonen	<i>Lab. Phys. Chem. (DPC, I)</i>
Member Professor Carl-Eric Wilén,	<i>Lab. Polymer Tech. (LPT, II)</i>
Member Professor Heikki Tenhu,	<i>Lab. Polymer Chem. (UH, LPC, III)</i>
Member Professor Martti Toivakka,	<i>Lab. Paper Coat. Conv. (LPCC, IV)</i>
Chair Professor Ronald Österbacka,	<i>Lab. of Physics (DPh, V)</i>

Advisors Mining Counselor Tor Bergman/Turku Science Park
 Prof. Emeritus Jarl B. Rosenholm





Scientific Advisory Board

- Professor Ann-Christine Albertsson, Royal Institute of Technology, Stockholm, Sweden
- Professor Ananth Dodabalapur, University of Texas at Austin, Texas, USA

- Vice Rector (research), Professor, Mikko Hupa, Åbo Akademi University
- Vice-dean, Professor Marja-Liisa Riekkola, University of Helsinki
- Professor Sirkka-Liisa Jämsä-Jounela, Aalto University and Research Council for Natural Sciences and Engineering, Acad. Finland
- Research Director, Anne-Christine Ritschkoff, Technical Research Centre of Finland, VTT
- Science expert, Outi Oila, Academy of Finland, Research Council for Natural Sciences and Engineering



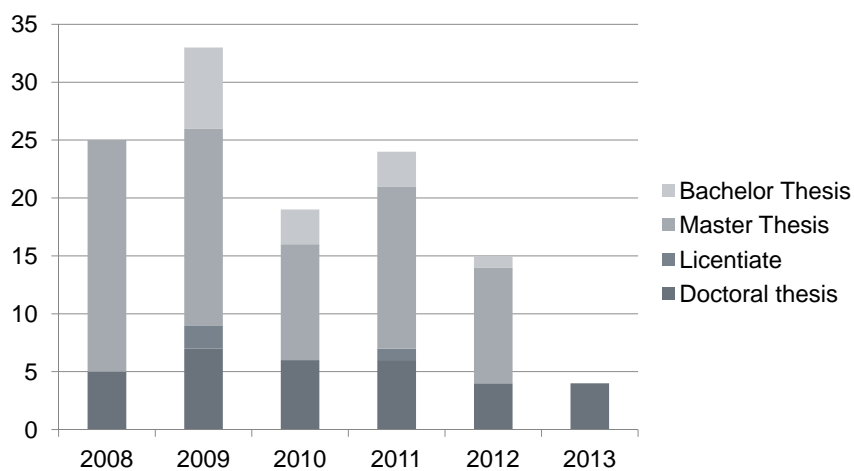
Key numbers

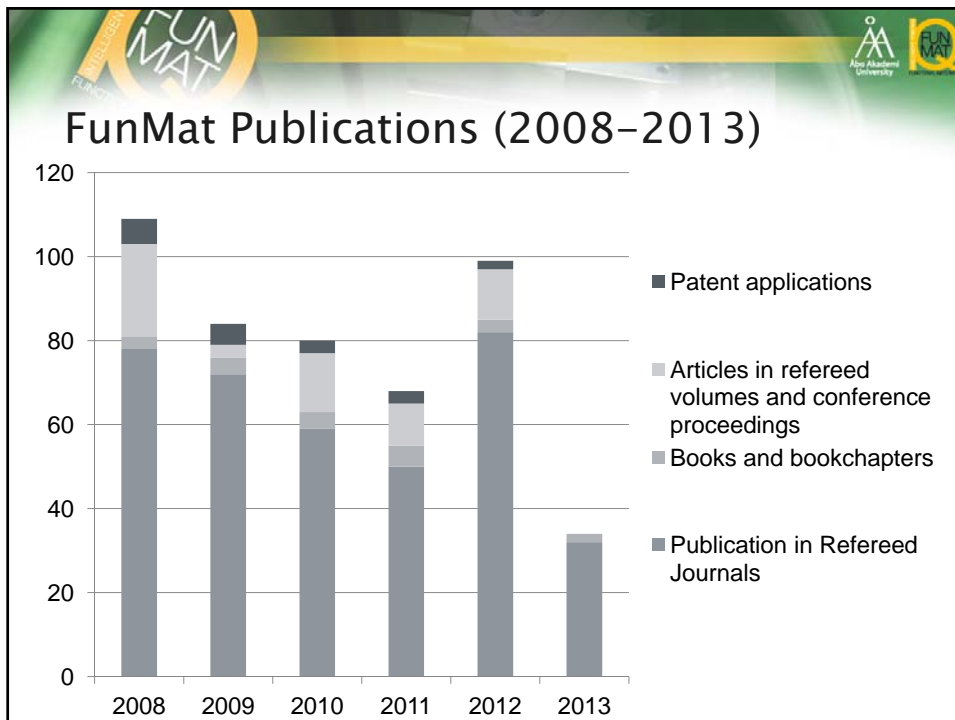


Human Resources

- A total of ~200 people involved (2008–2013)
 - › 1/3 Females
 - › 50% Finnish citizens
- Around 80 FTE annually
- Average funding ~ 4M€/per year
- International activities:
 - › On the average more than 200 months international exchange (students and faculty) per year
 - › Main exchange countries EU, China, US and Japan

Thesis produced (2008–2013)





Research Awards 2012


- **Best Results, Functional Materials Summer Festival: FLEX-SENSE project/J. Peltonen:**
- **Best paper awards:**
 - › **M. Toivakka:** International Paper and Coating Chemistry Symposium 2012, Stockholm Sweden
 - › **Parvez Alam:** "Int'l conference on nanostructures, nanomaterials and nano-engineering", 2012
- **Best Poster Awards:**
 - › **Weronika Pawelec:** "2nd Intl symposium on flame-retardant materials and technologies"
 - › **Parvez Alam:** "StAT Natural Science Conference, Estonia"





Scientific Prizes 2012:

Parvez Alam (LPCC) received the ÅAU Per Brahe Prize for scientific achievements



The slide features a header with the 'FUN MAT' logo on the left and the Åbo Akademi University logo on the right. The main text is centered, and a portrait of Parvez Alam is positioned to the right of the text. The background is a light green gradient.

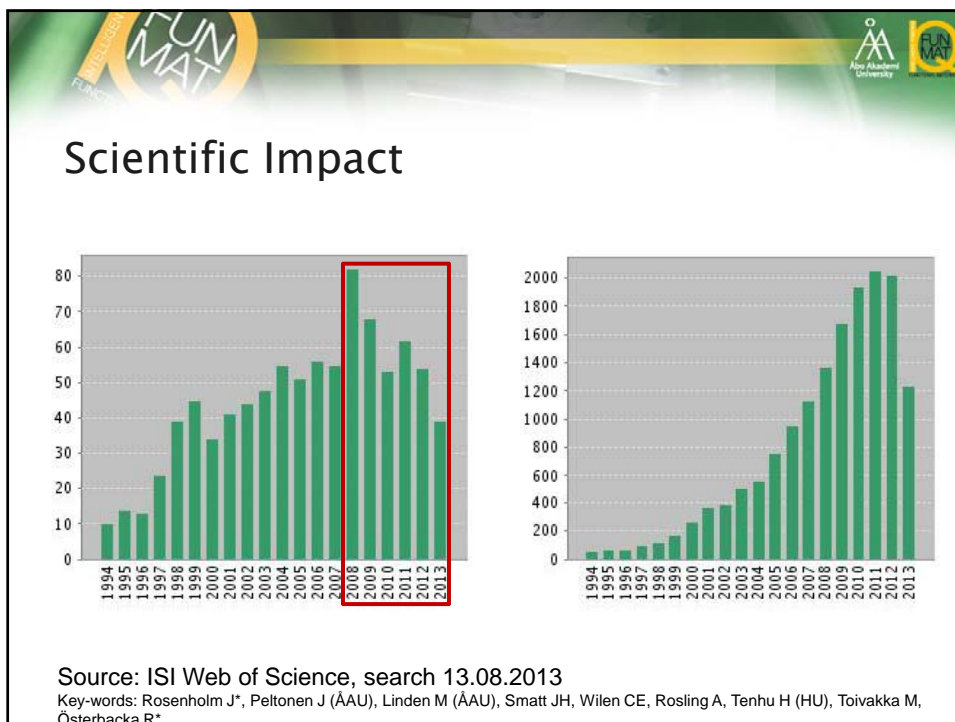
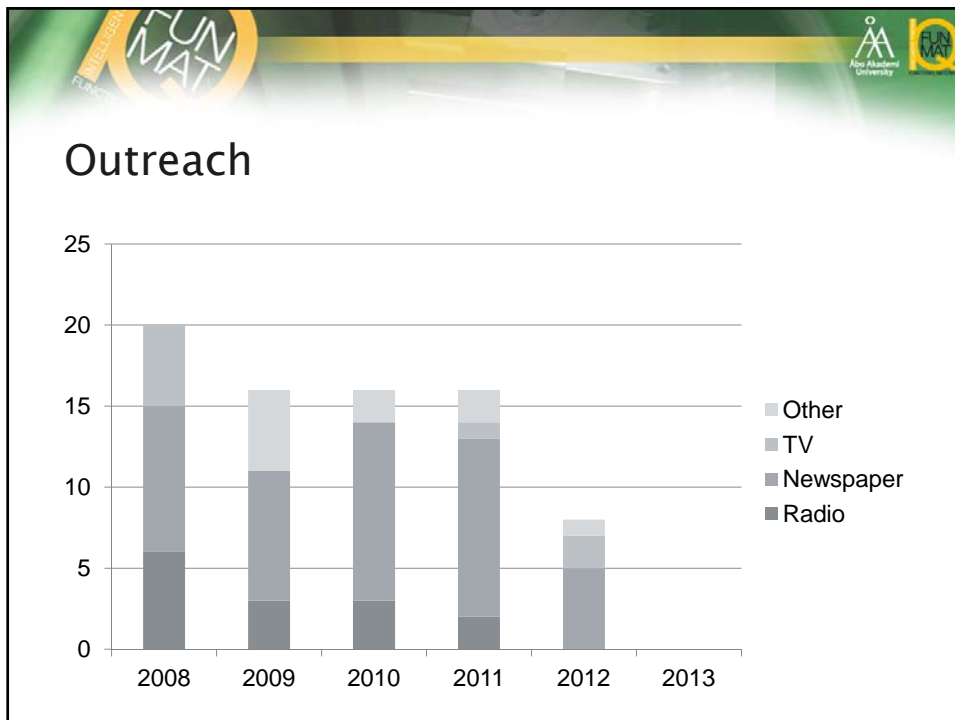


Societal Impact

INTELLIGENT PRINTING
**FUN
MAT**
FUNCTIONAL MATERIALS

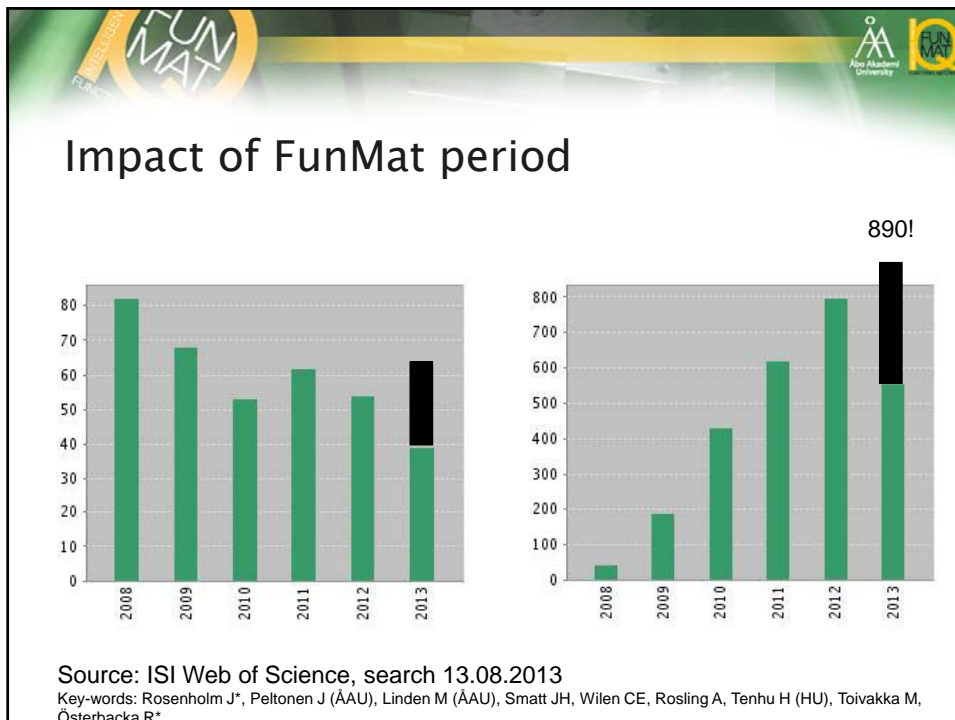


The slide features a header with an image of an industrial printing process on the left and a 'FUN MAT' logo on the right. The main text is centered. The background is a light green gradient.



Source: ISI Web of Science, search 13.08.2013

Key-words: Rosenholm J*, Peltonen J (ÅAU), Linden M (ÅAU), Smatt JH, Wilen CE, Rosling A, Tenhu H (HU), Toivakka M, Österbacka R*



International Conferences organized by FunMat laboratories






International Electrokinetic Conference



ELKIN 2010



INTERNATIONAL ELECTROKINETICS CONFERENCE



- The ninth Electrokinetic phenomena conference was held June 6–9, 2010 in Turku
- Chairman Prof. J.B. Rosenholm



European Coating Symposium 2011

- Turku, June 8–10, 2011
- Chair: Professor Martti Toivakka
- Co-chairs:
 - › Dr. Parvez Alam
 - › Dr. Jarkko Saarinen







Nordiska polymerdagarna 2013

- Co-organized by H. Tenhu, University of Helsinki
- 29–31.5.2013
- In Helsinki



ICSM2014

- The International Conference of Science and Technology of Synthetic Metals (ICSM)
- Turku in July 2014
- Chair Ronald Österbacka
- Co chairs:
 - › Carita Kvarnström (UTU)
 - › Ari Ivaska (ÅAU, PCC)






TURKU, FINLAND
CITY CULTURE IN THE HEART OF THE ARCHIPELAGO



FunMat Highlights 2008–2013

–A snapshot

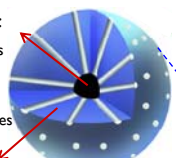
–Continuation in the following presentations and posters



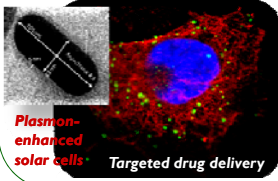

Materials development

Core-shell nanoparticles

Functional core:
 Fluorescent NDs
 Magnetic Fe₃O₄
 Plasmonic Au
 Optical properties for detection



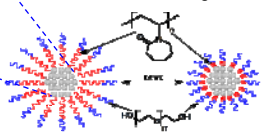
Functional shell:
 Protective layer / particle stabilization
 Biorecognition/organic modification
 Porous SiO₂ for drug loading, etc...



Plasmon-enhanced solar cells **Targeted drug delivery**

Controlled polymer synthesis

- "Smart", responsive polymers
- Amphiphilic, self-assembling (e.g., micelle forming ones for DNA transfection)
- Block and star copolymers
- Photoactive and conducting

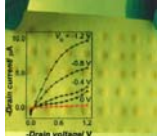


Hybrid nanomaterials

- Above: mesoporous silica nanoparticles grafted with a thermoresponsive polymer
- Gold, silver, clay nanoparticles grafted with polymers


Polymer post modification

Electron beam induced grafting of functional monomers, tailor-made additives for plastic electronics



Polymer synthesis

Preparation of functional biopolymers, semiconductors, hyperbranched polymers, hydrogels, dispersions, etc.



The paper electronics platform

Indicators
biomaterials, hazardous gases, EC pixels

Fluidics
Liquid transport and filtration

Screening assays
cells, biofilms, pharmaceutical

Electronics
Transistors, circuits

Sensors
Chemical, Environmental, Biological

H₂S sensor response:

Time [min]	Log R [Ω]
0	~150000
10	~100000
20	~50000
30	~20000
40	~10000
50	~5000
60	~2000
70	~1000
80	~500
90	~200

SAB meeting seminar 14.8

- 5 talks by group leaders
- Invited talk by Mining councillor Tor Bergman
- 45 posters
- 70 participants
- Dinner at Suomenlinnan panimo