

Laboratory of  
Natural Materials  
Technology  
at  
Åbo Akademi  
University



Prof. Martti Toivakka | Prof. Chunlin Xu  
NMT@abo.fi | www.abo.fi/NMT

# Institutionen för träförädling\* (ITF)

Prof. Erik Hägglund ... Prof. em. Henrik Bruun



1921-  
1983



Forest Product  
Chemistry

Prof. em. Bjarne Holmbom

Paper Chemistry

Prof. em. Dan Eklund

Pulping Technology

Prof. em. Bruno Lönnberg

~1983-  
2004

Wood and Paper  
Chemistry

Prof. Stefan Willför

Paper Coating and  
Converting

Prof. Martti Toivakka

Fibre and Cellulose  
Technology

Prof. Pedro Fardim

2005-2018

## Laboratory of Natural Materials Technology

Prof. Chunlin Xu, Prof. Martti Toivakka

2019-



\* 1921-23 *Skogsprodukternas kemi och kemiska teknologi*, 1923-69 *Institutet för trækemi*, 1969-73 *Institutionen för trækemi och cellulosateknik*

# Laboratory of Natural Materials Technology



Biomass  
fractionation  
and molecular  
characterization

Bioproduct  
chemistry

Fibre, pulping  
and papermaking  
technology

Packaging and  
coating  
technology

Sustainable  
materials



Chunlin Xu

Prof. Renewable  
Materials Chemistry



Martti Toivakka

Prof. Paper Coating  
and Converting



Docent Andrey  
Pranovich

Wood Chemistry



Dr. Jan  
Gustafsson

Natural Materials Technology



Docent Anna  
Sundberg



Dr. Mari  
Nurmi



Dr. Xiaoju Wang

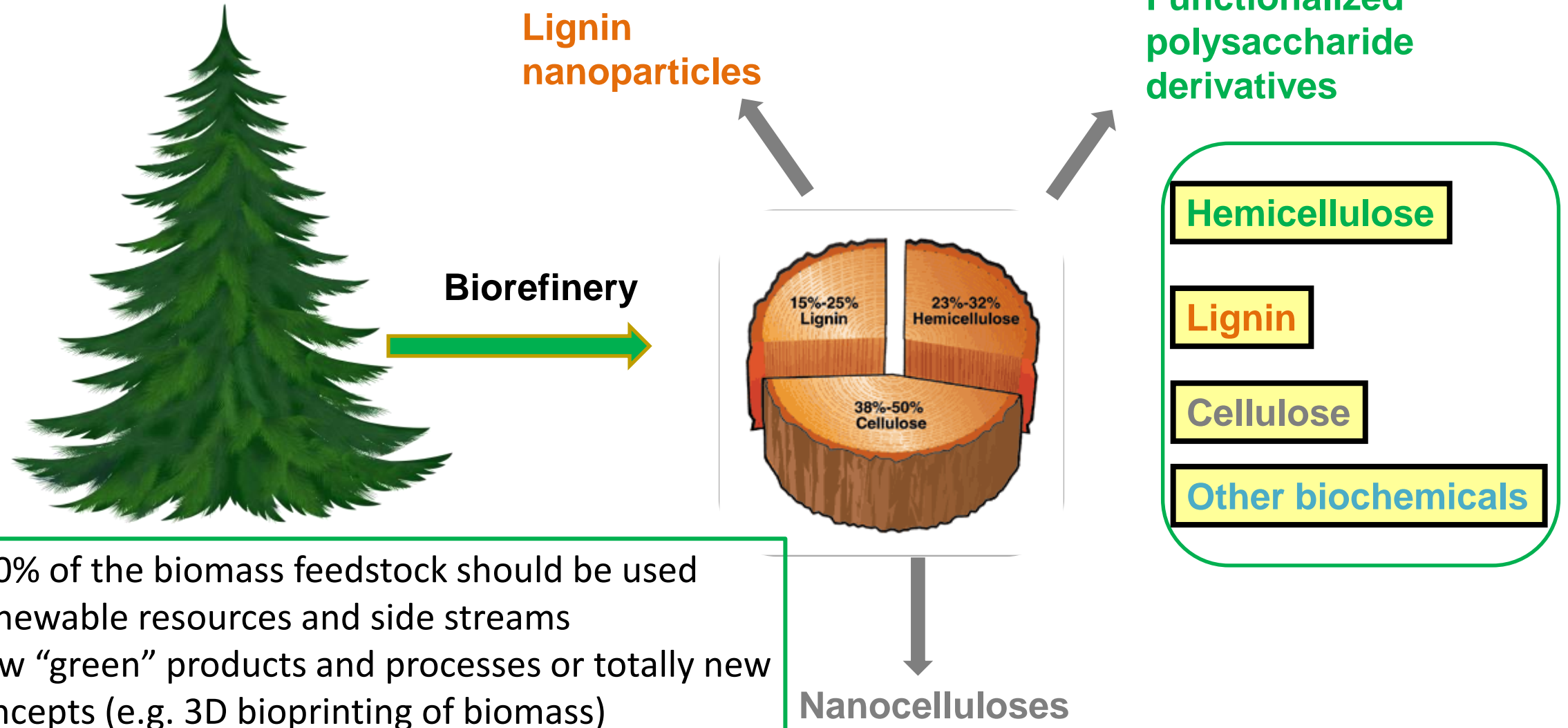
Acad. Research Fellow  
80% with Pharmacy

- ~ 40 members
- ~ 20 active doctorate students
- ~ 3 post doc researchers

# Natural Materials Technology

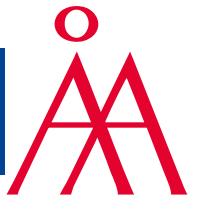
- **Education** (> 500 MSc theses since 1976)
  - Biomass chemistry and modification
  - Biorefinery technology
  - Established and future bioproducts
- **Research** (79 PhD theses since 1988 / >1300 scientific publications since 2000)
  - Nanocellulose, extractives, fats and resins, polysaccharides, lignin, knots and bark, deposits and stickies, utilization of process side streams
  - 3D bioprinting of biopolymers
  - Biocomposites
  - Renewable process chemicals
  - Surface engineering of natural fiber-based materials
  - Fiber-based packaging
  - Novel paper-based applications through printing and coating of functional materials
  - Smart fibres, functional cellulosic beads, cellulosic bioplastics, bioactive materials based on hemicelluloses, and hydrotropic lignin.
- **Services for industry, research institutes, universities, and authorities**
  - Laboratory and pilot scale material processing
  - Analytical services

# Functionality and sustainability: Bioproducts fractionated from the abundant woody resource



- 100% of the biomass feedstock should be used
- Renewable resources and side streams
- New "green" products and processes or totally new concepts (e.g. 3D bioprinting of biomass)

# Research topics and projects



Åbo Akademi University

## Biomass fractionation

- Novel biomass fractionation approach
- Waste stream utilization
- Alternative sustainable feedstocks
- Process chemistry dissolving pulp

## Lignin processing and valorization

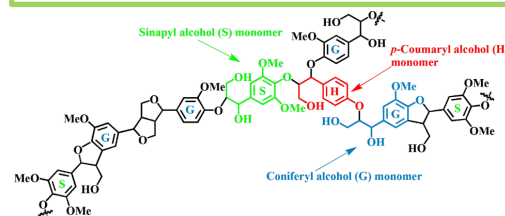
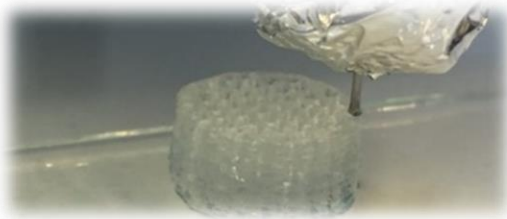
- Lignin characterization
- Lignin fractionation
- Lignin copolymers and resins
- Lignin nanoparticles and composites

## Bioproducts and materials

- Sustainable binders & coatings
- Sustainable energy storage solutions
- Additive manufacturing
- 3D platforms for energy harvesting and medical devices

## Biomass analytics

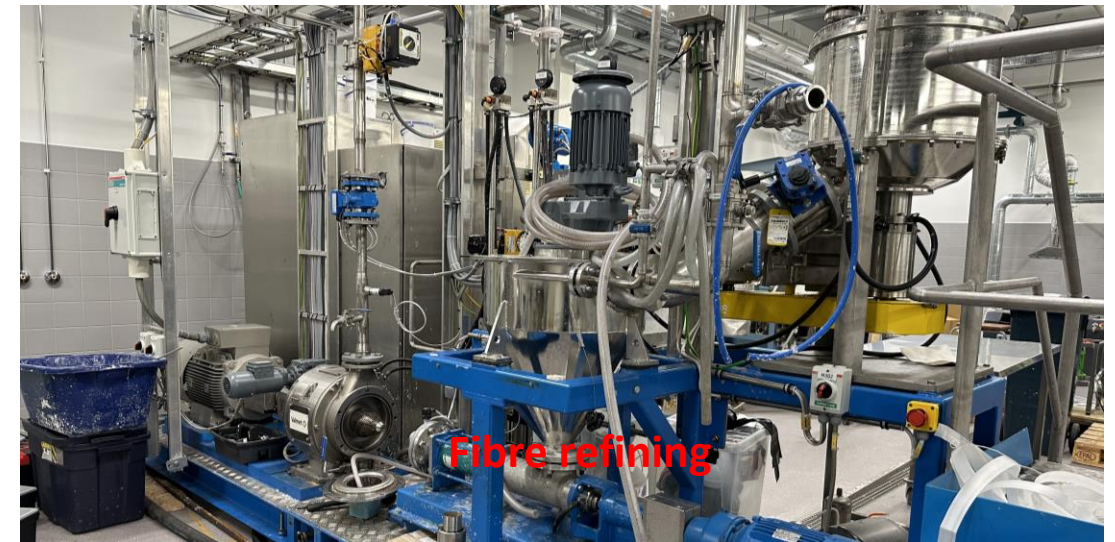
- Green adaptable method for biorefining
- Analytical method development
- Analytical services and troubleshooting



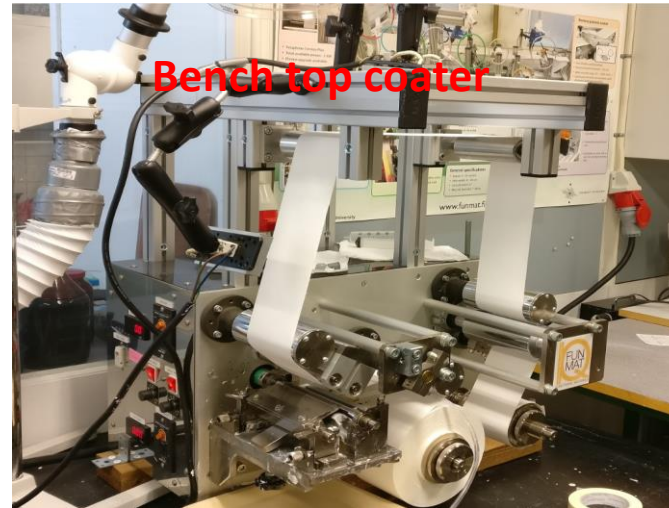
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# Key infra: Biomass processing and biopolymer modification

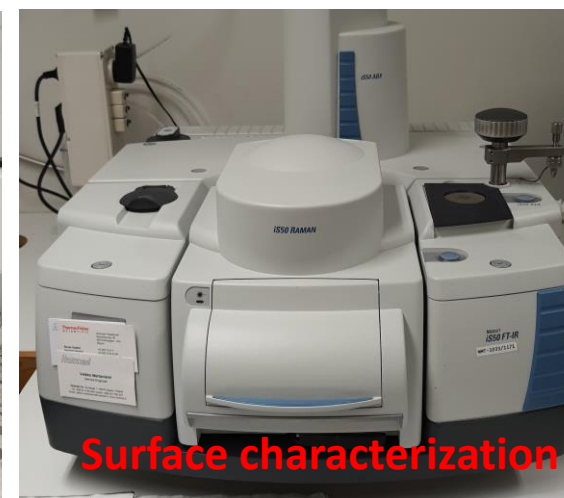
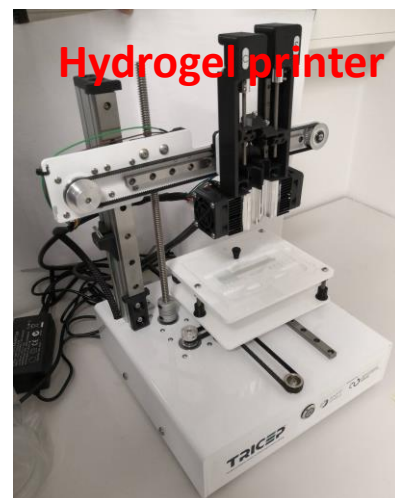
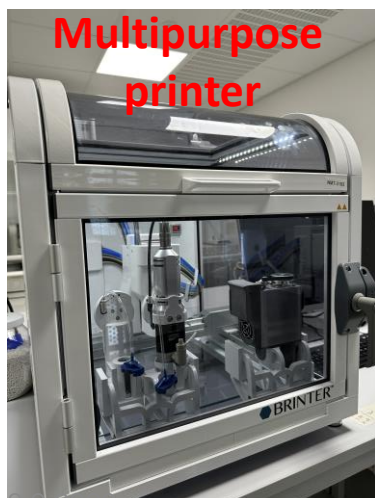


# Key infra: Coating (lab & pilot), barrier testing, and composites

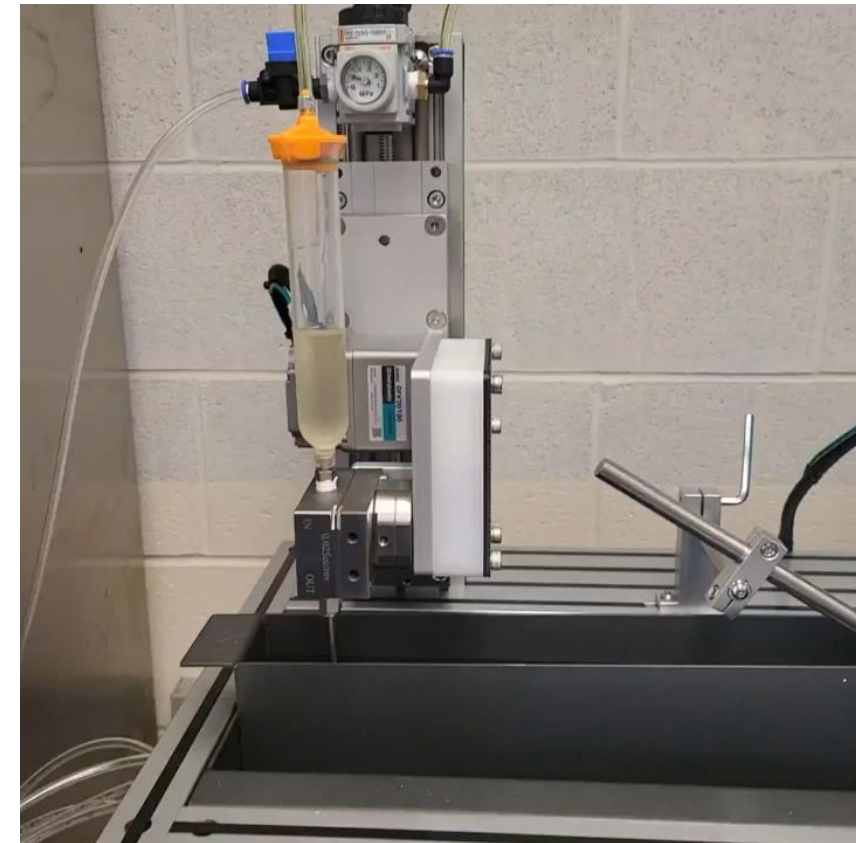




# Key infra: 3D printing and material development



# Key infra: Fiber spinning



# Key infra: Biomass characterization and bioproduct analysis

Ekaterina (Katja)  
Korotkova,  
Coordinator for  
analytical services



6 GC and 2 GC-MS

Py-GC-MS

4 HPLC/SEC-RI/MALLS

Fiber analysis

Joint University Infra  
CCMA: 5 NMRs + 5 Q-ToF/LC-MS  
Surface analysis: Imaging (TEM, SEM), XRD, etc.

[www.abo.fi/NMT](http://www.abo.fi/NMT)

## Contact

- [Martti.Toivakka@abo.fi](mailto:Martti.Toivakka@abo.fi), +358405040689
- [Chunlin.Xu@abo.fi](mailto:Chunlin.Xu@abo.fi), +358440362088
- [Anna.Sundberg@abo.fi](mailto:Anna.Sundberg@abo.fi)
- [Mari.Nurmi@abo.fi](mailto:Mari.Nurmi@abo.fi)
- [Jan.R.Gustafsson@abo.fi](mailto:Jan.R.Gustafsson@abo.fi)



## Publications

- Scientific articles:
  - <https://research.abo.fi/en/organisations/laboratory-of-natural-materials-technology/publications/>
  - <https://web.abo.fi/fak/tkf/pap/refbase/publish/NMT-all.html>
- PhD, MSc, BSc theses:
  - <https://web.abo.fi/fak/tkf/pap/refbase/publish/NMT.html>

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