AALTO UNIVERSITY BIOINNOVATION CENTER

ANNUAL REPORT 2025

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Aalto University
Bioinnovation
Center

INTRODUCTION

Aalto University Bioinnovation Center is an interdisciplinary research and learning center targeting to accelerate the transition to a circular economy and bioeconomy, and to create opportunities for sustainable economic growth in Finland. The Bioinnovation Center focuses on innovations in sustainable bio-based materials, with special focus on textiles and packaging.

The Bioinnovation Center was established in 2021 with a 10.5 M€ grant from Jane and Aatos Erkko foundation. The Center operates in interdisciplinary research fields, facilitates educational efforts in bio- and circular economy at Aalto University, and strives towards ground-breaking new technologies and innovations. The Center's four pillars are the Doctoral School, a new Professorship, a targeted Infrastructure Program, and an overarching Impact Program. Table 1 shows the overall budget allocated to the four pillars, funds used in 2021-2025, and funds remaining as of 1.1.2026.

Table 1 Bioinnovation Center overall budget, funds spent in 2021-2025, and funds remaining as of January 1st, 2026.

Bioinnovation Center pillars	Overall budget M€	Funds spent 2021-2025, M€	Funds remaining M€
Professorship	2.5	0.3	2.2
Doctoral school	3.5	1.8	1.7
Infrastructure program	4.0	1.9	2.1
Impact program	0.5	0.3	0.2
Total	10.5	4.3	6.2

2025

MANAGEMENT	DOCTORAL SCHOOL	IMPACT PROGRAM
		Jan TAH foundation visit and workshop
	Jan Researcher meeting	
Feb 10th Advisory Board meeting		
		March Teacher training evening at Aalto Junior
March 20th Steering Group meeting		
	March Lighnosphere visit	
		April Teacher training at Sara Hilden art academy, Tampere
	April Aalto Inventors kick-off	
April 15th JAES meeting		
		May Kids book Graphic Days exhibition, Turin
	May Research project video production	
	May Stora Enso Design Studio excursion	
		June Kids English material book in print
		June Kids Mainiot materiaalit summer camps with Aalto Junior
	Aug BIC researcher meeting	
Aug 19th Steering Group meeting		
		Sept / Oct Designs for a Cooler Planet Exhibition
		Sept Marvelous Materials book launch in English
		Sept Legacy Awakens seminar
		Oct Presenting Marvelous Materials during state visit
		Oct Dutch Design Week exhibition
	Oct SpringBoard pilot kick-off	**Oct** Tyttöjen päivä workshops
	Oct Aalto Inventors Program	
		Nov Highschool Workshop Marvelous Materials
		Dec Marvelous Materials talk at Bolzano University

2026

Bioinnovation Center Steering Group

Kristiina Kruus
Dean, School of Chemical Engineering

Janne Laine
Vice President, Innovation

Michael Hummel
Director of Bioinnovation Center, Associate Professor of Biopolymer Chemistry and Engineering (CHEM)

Pirjo Kääriäinen
Associate Professor of Design and Materialities (ARTS)

Tapani Vuorinen
Professor of Wood Chemistry (CHEM)

Minna Halme
Professor of Sustainability in Business (BIZ)

Jouni Partanen
Professor of Materials to Products (ENG)

Kirsi Niinimäki
Associate Professor of Fashion/Textiles Futures (ARTS)

Markus Linder
Professor of Biomolecular Materials (CHEM)

Juho Rousu
Professor of Computer Science (SCI)

Jorma Kyyrä
Professor of Power Electronics (ELEC)

Luana Dessbesell
Assistant Professor of Sustainable Bioproducts Innovation (CHEM)

Susanna Ahola
Coordinator of Bioinnovation Center, Secretary of Steering Group

The Bioinnovation Center steering group has professors from all six Aalto Schools of University.

(CHEM, ARTS, BIZ, ENG, SCI, ELEC)

Aalto University
Bioinnovation
Center

Bioinnovation Center Executive Team

Michael Hummel
Director of Bioinnovation Center

Luana Dessbesell
Doctoral School

Tapani Vuorinen
Impact program

Pirjo Kääriäinen
Impact program

Susanna Ahola
Coordinator of Bioinnovation Center

Elli Käpylä
Corporate Relations Manager

Greta Salonen
Project Coordinator

Sonja Dallyn
Graphic Designer

Bioinnovation Center Advisory Board

The Advisory Board's main role is to support and guide the functions and development of the Bioinnovation Center. The Advisory Board has five external members from academia and industry, and internal members from the Bioinnovation Center steering group. The Advisory Board does not have formal authority to govern the organization, but it will make recommendations and provide key information and materials to support the success of the Center.

Prof. Elvin Karana, TU Delft, Netherlands

Elvin Karana is Professor of Materials Innovation and Design at the Faculty of Industrial Design Engineering at Delft University of Technology. Her main research interests are materials innovation and design, materials experience, bio-based materials and bio-technology for product design. She has founded the research group Materials Experience Lab, which introduces new ways of understanding and designing (with) materials by combining methods and tools from design, social sciences, materials science, and engineering.

Niklas von Weymarn, CEO, Metsä Spring Ltd

Niklas has a Doctor of Science degree in biotechnology from Aalto University. He has also studied economics and innovation strategies. He has wide experience from R&D and startup companies. At Metsä Group, he first served as Vice-President of Research at Metsä Fibre Ltd, after which he moved to Metsä Group's innovation company Metsä Spring Ltd.

Suvi Haimi, CEO, Ovido

Suvi is the CEO and Co-founder of a software company Ovido, which is helping manufacturers and brands of manage product data. She is also a co-founder and previous CEO of Sulapac, a material innovation company with the mission to save the world from plastic waste. Suvi has a PhD in Medical Biomaterials from the University of Tampere. Before founding Sulapac, she worked in leadership positions for 10 years at universities in Finland and The Netherlands.

Tuomas Mustonen, Managing Director, Paptic Ltd

Managing Director of Paptic with a history of working in the paper & forest products industry and research institutes. Tuomas has an MBA degree in International Finance and Global Marketing from Aalto University, and a MSc degree in Industrial Physics from the University of Jyväskylä.

Riikka Paarma, Chief Strategy and Sustainability Officer, Halton Group

Chief Strategy and Sustainability Officer at Halton Group. Prior to shifting to Halton Group, Riikka has worked e.g. as Sustainability Partner at EY-Parthenon and the Director for Circular Economy at Stora Enso. Riikka has a MSc degree from Sustainable enterprising from the University of Stockholm.

DOCTORAL SCHOOL

The Bioinnovation Center Doctoral School (DS) offers *interdisciplinary research and doctoral education* to create new innovations that foster the transition towards bio and circular economy, and to educate future experts with knowledge and skills to thrive and innovate in diverse multidisciplinary teams. The Doctoral School's research projects aim at innovations in line with the main themes of the Center: *sustainable textiles and packaging*. The doctoral school combines fields from all the six Schools of Aalto University, such as chemistry, biomaterial sciences, design, digital production, artificial intelligence, entrepreneurship, and business. The doctoral school is a thematic school for doctoral students coordinated by the Bioinnovation Center.

Actions 2025

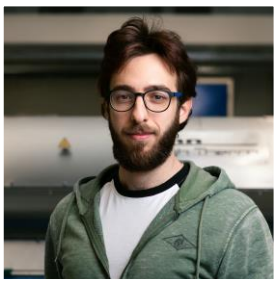
In 2025, the Bioinnovation Center doctoral school reached its biggest size with 15 interdisciplinary research projects ongoing. A new project, *Crea-Bio*, was launched in August 2025 representing a collaboration between professors Sesilja Aranko (CHEM) and Barbara Pollini (ARTS).

The annual theme for Bioinnovation Center in 2025 was *From research to Business*. Doctoral School activities focused on activities around research commercialization. In spring 2025, the Bioinnovation Center supported the development and launch of the new field-specific innovation training program called Aalto Inventors. Aimed at doctoral students and post-docs, the program provides hands-on training in invention disclosures, IP & patent analysis, communication, funding opportunities and business-thinking for researchers. The training is combined with inspirational talks and networking with corporates, researcher-entrepreneurs and investors operating in the specific field. Two bioeconomy focused programs were organized in 2025 and four Bioinnovation Center doctoral students completed the training.

Doctoral School Projects ongoing in 2025

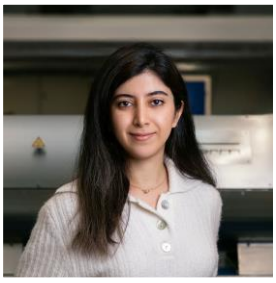
2022

CELLUGAMI - Laureen Mahler
Prof. Masood Masoodian
Prof. Jarkko Niiranen
Univ. Lecturer Kirsi Peltonen
ARTS, ENG, SCI
Started 03/2022



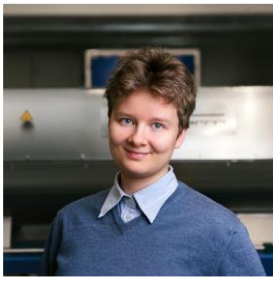
AIYARN - Matteo Iannacchero
Prof. Masood Masoodian
Prof. Jarkko Niiranen
Univ. Lecturer Kirsi Peltonen
ARTS, ENG, SCI
Started 03/2022

INTELLIGENT PACKAGING
Madhawa Basnayaka
Prof. Jouni Paltakari
Prof. Riku Jäntti
CHEM, ELEC
Started 04/2022



SUSTAINABLE LIGNIN COATINGS
Sahar Babaeipur
Prof. Monika Österberg
Prof. Pekka Oinas
CHEM
Started 06/2022

COMPTUTATIONAL FABRIC - Sofia Guridi
Prof. Kirsi Niinimäki
Prof. Simo Särkkä
Prof. Yu Xiao, Prof. Jaana Vapaavuori
ARTS, ELEC, CHEM
Started 06/2022



CELLUMIMICRY - Helena Sederholm
Prof. Michael Hummel
Prof. Samuli Patala
Prof. Minna Halme
CHEM, BIZ
Started 09/2022

2023

SEREPLAS - Emilia Kauppi
Collaboration partners: Stora Enso & Valmet
Prof. Jouni Paltakari
Prof. Petri Kuosmanen
CHEM, ENG
Started 06/2023

BIO DYES - Senni Heimala
Collaboration partner: Luke
Prof. Ali Tehrani, Prof. Michael Hummel
Prof. Pirjo Kääriäinen, Prof. Kirsi Niinimäki
CHEM, ARTS
Started 09/2023

CELLFIL - Maria Livia de Almeida
Prof. Luana Dessbesell
Prof. Kirsi Niinimäki
CHEM, ARTS
Started 09/2023

CELLFIL - Tooba Qureshi
Prof. Luana Dessbesell
Prof. Eeva Vilkkumaa
CHEM, SCI
Started 11/2023

2024

RECYCLING OF MULTIMATERIAL CARDBOARD - Vida Hardjono

Business Finland project SciSustain

Prof. Luana Dessbesell, Prof. Jouni Paltakari

Jenny Müller-Wahlman (Stora Enso)

CHEM *Started 08/2024*

CARBAMATED CELLULOSTIC FILMS

Waleed Mehmood

Business Finland Project SciSustain

Prof. Luana Dessbesell

Janak Sapkota (UPM)

CHEM *Started 09/2024*

REGENERATED CELLULOSTIC FILMS

Karam Moussa

Business Finland project SciSustain

Prof. Luana Dessbesell, Prof. Michael Hummel

Jatin Sethi (Metsä)

CHEM, SCI *Started 11/2023*

W-E-A-V-E

Elise Piquemal

Collaboration: University of Borås, Swedish School of Textiles

Prof. Kirsti Niinimäki

Prof. Pirjo Kääriäinen

ARTS *Started 09/2024*

CREA BIO - Ardalan Rahimipour

Prof. Sesilja Aranko

Prof. Barbara Pollini

CHEM, ARTS

Started 08/2025

2025

Research visits, video production, and excursions

In 2025, the mobility program for BIC doctoral students was continued. BIC aims to actively promote international research visits by offering the possibility to apply for additional funding to cover all costs associated with the visit. Three BIC students completed a research visit in 2025. Doctoral candidate Sahar Babaeipour did a research exchange to Grenoble INP-Pagora in France. She investigated grease and moisture barrier coatings based on lignin nanoparticles for packaging applications. Doctoral candidate Matteo Iannacchero visited Technical University of Denmark to investigate the development of a yarn-based ingestible supercapacitor. Doctoral Candidate Sofia Guridi visited IT University of Copenhagen (Denmark) and KTH (Sweden). She investigated bio-based eTextiles for human-computer interaction.

A mentorship program was also ongoing in 2025. The intention of the Bioinnovation Center doctoral school mentorship is to provide our students with a discussion partner outside the university to also gain perspective from an industry viewpoint and support career planning.

In March 2025, the Bioinnovation Center welcomed a visit from Eero Knuutila, the CEO of Lignosphere, who shared their story as an Aalto spin-off working towards sustainable lignin-based materials and the challenges related to commercialization and scale-up. In May 2025, a group of Bioinnovation Center students visited the new headquarters of Stora Enso and their packaging Design Studio and got to see firsthand how sustainable packaging is being created from idea to product.

As an outreach activity, doctoral candidate Helena Westerback organized *Clothes and climate* -themed lectures and workshops for school groups as a part of Aalto University Junior's Scientists in Schools -program. She reached 1200 students and teachers in 2025.

Doctoral candidate Sahar Babaeipour did a research exchange at Grenoble INP-Pagora. She investigated grease and moisture barrier coatings based on lignin nanoparticles for packaging applications. Photos by Esa Kapila (left) and Sahar Babaeipour (right).

PROFESSORSHIP

The vision of the Bioinnovation Center also encompassed a new professorship to provide strong expertise in materials research and circular economy, and to proactively network with stakeholders such as experts in the field of bio- and circular economy and creative industries, large companies, and start-ups. This new professor shall release the interdisciplinary potential in bioinnovation development from research ideation to commercialization via circular economy and sustainability to have a social, environmental, and economic impact in wider perspective.

The first two years of the professorship have built the foundation for collaboration between academia and industry. The BIC vision is becoming a reality thanks to Prof. Luana Dessbesell´s Sustainable Bioproducts Innovation research group and its strong collaboration with the Finnish forest industry, with projects with 8 Finnish companies, from startups to technology suppliers and large pulp and paper companies. As well as two European projects with more than 20 international collaborators. At Aalto, the interdisciplinary work continues. Collaboration with Aalto ARTS and BIZ has been strengthened with joint projects, such as SciSustain and CELLFIL. Some examples for publications from the research group range from LCA (find the paper here), market, techno-economic analysis and circularity (find the paper here) and sustainability indicators (find the paper here). Professor Dessbesell's research group size, research funding, and main projects in 2025 on the right.

Sources of Funding:
BF Business Finland. EU: European Union Horizon Funding,
AAL: Aalto University, FinnCERES: Research Council of Finland Flagship

2.7 M€

3 postdocs
9 phDs
1-3 masters/y

SciSustain (1.3M€) BF

Accelerating bioinnovation realization via sustainability assessments for biobased packaging applications.

SAUNA (0.2M€) EU

Sustainable pulping innov. achieving zero pollution through efficient wood residue feedstock utilization.

TexTerials (0.1M€) BF

Refined fibers from wasted textiles from high performance long-lasting materials.

EFP (0.2M€) BF

Emissions Free Pulping. Reduce biomass burning and increase the product yield from wood from 50% to 70%.

CleanCELL and ACFilm (0.5M€) FinnCERES

Cellulose-based membrane for waterborne impurities removal.

CELLFIL (0.3M€) EU

A Horizon Europe project developing sustainable, bio-based Lyocell filaments.

CIMANET (0.1M€) AAL

LCA-driven future kraft pulping: a design for added value. Trackability of MMCF supply chain.

INFRASTRUCTURE PROGRAM

The Bioinnovation Center's Infrastructure Program provides funds for strategic investment in research infrastructure to support and promote developments at Aalto University in the field of bioeconomy towards commercialization.

During 2024, the vision for a flagship biodegradation laboratory to support bioproducts development and the transition towards bioeconomy was formed. The laboratory will be installed in two phases. The planning of phase I was completed in 2024 and first procurement actions took place in 2025. First equipment was installed, and Phase I is expected to be completed in early 2026. Phase II will be launched in 2026 and we expect research and analysis operations to commence in mid-2026.

Ioncell film production in the laboratory. Photo by Kalle Kataila (left). Image by Sonja Dallyn (right).

IMPACT PROGRAM

The Impact Program's target is to *maximize the scientific and societal impact* of the Bioinnovation Center. The Impact Program activities involve communication actions, events, exhibitions, and network collaboration. The main target groups of the Impact Program's actions are 1) academic and professional community, 2) decision makers, and 3) children and youth. In 2025, the impact program's theme was *From Research to Business.* This theme was highlighted in doctoral school activities and events throughout the year.

Legacy Awakens -seminar

Bioinnovation Center organized the fall seminar "Legacy Awakens – an inspiring journey through science and design" on September 25, 2025, at Marsio, Aalto University, in honor of Aalto Distinguished Professor Tapani Vuorinen's career. The event gathered 140 onsite participants and 30 online attendees from across academia, industry, and the public sector. The program focused on education, innovation, and collaboration, highlighting the interdisciplinary foundations of Vuorinen's work and its impact on research and practice.

A panel discussion titled "A journey through Science and Design," facilitated by Raili Pönni, brought together Tapani Vuorinen, Pirjo Kääriäinen, Christine Hagström-Näsi, Ainomaija Haarla, and Olavi Pikka. The discussion reflected on different phases of Vuorinen's career, emphasized the role of key collaborations, and identified factors behind major innovations and successes. The exchange underscored the importance of cross-sector partnerships and the integration of scientific and design approaches in advancing sustainable solutions.

Concluding the seminar, Professor Vuorinen delivered a career-concluding talk, "The Power of Imagination," emphasizing creativity, curiosity, and collaborative problem-solving as drivers of impact. The event provided a forum for knowledge exchange and community building, reinforcing the Bioinnovation Center's mission to connect disciplines and stakeholders around future-oriented research and education.

Professor Tapani Vuorinen at the "Legacy Awakens" -seminar. Photo by Matti Ahlgren.

Kids material book Marvelous Materials

In 2024, the Bioinnovation Center launched a material experiment book for children and youth *Mainiot Materiaalit* (in Finnish). The book contains 17 bio-based material recipes utilizing bio-based, recycled, and natural ingredients. The target of the book is to inspire children and youth to experiment with the development and design of bio-based materials in a playful and engaging way.

In fall 2025, the English version “MARVELOUS MATERIALS – Instructions for Bio-based Experiments” was to make it accessible to a wider, international audience. Growing up in an increasingly digitalized world, physical contact with (biobased) materials and the experience of creating products with their own hands can help children to (re-)connect with natural materials. In addition, hands-on experimenting can ease climate anxiety by creating a mindset that we can take challenges in our own hands and create better alternatives.

The English version of the material experiment book has gained international attention. Photo by Esa Kapila.

The Marvelous Materials book team organized six teacher training sessions, organized or participated in four exhibitions, eight related workshops and events, and held three summer camps in collaboration with Aalto University Junior. Active communication and the teacher training sessions made the book well known among Finnish teachers. Further, teaching based on the book's instructions was implemented at the University of Bolzano, children's art schools in Helsinki, Forssa, and Espoo, as well as the EMMA museum, among others. The team also accepted invitations to speak at the University of Bolzano's series of material discussions and at the Helsinki Artists' Association's member evening on sustainability.

Throughout the year, both language versions of the book appeared in a total of nine different medias in Finland and internationally, including FRAME, Wallpaper, Domus, and MaterialDistrict. Events to the book engaged approximately 1,000 children, young people, teachers, and professionals. The exhibitions associated with the book attracted approximately 25,000 visitors. Most notably, the book and intention of this project were presented to a delegation comprising the Finnish and Icelandic presidents, which provided additional international recognition.

For these outstanding achievements, the Marvelous Materials book team received the CHEM Impact Act 2025 award.

The book is available through the Aalto University Shop and other vendors, such as Heureka Shop, Suomalainen Kirjakauppa, Akateeminen Kirjakauppa, and Adlibris. In 2025, 200 copies of the book were sold.

Marvelous Materials -project presented to the presidents of Iceland and Finland. Photos by Mikko Raskinen (left) and Matti Ahlgren (right).

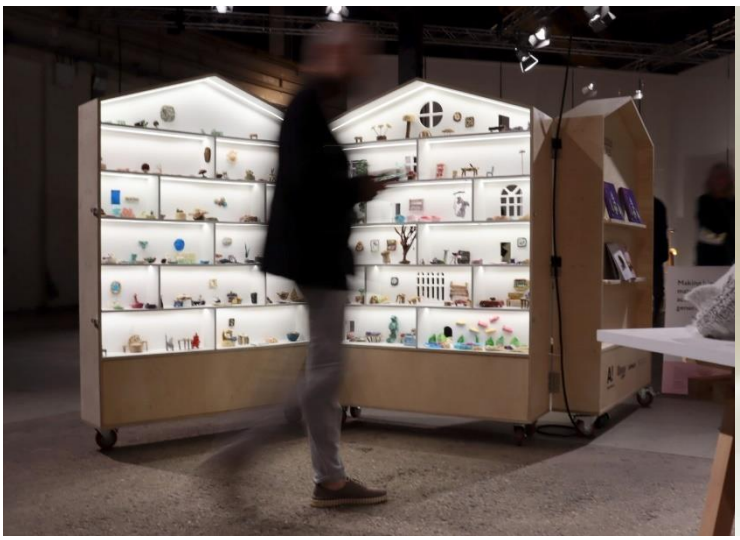
Exhibitions

Dutch Design Week exhibition showcased bio-based material prototypes. Photo by Greta Isola.

The main exhibition in 2025 was *Designs for a Material Future*, held at *Dutch Design Week* (DDW), which brought together research by doctoral students at the Bioinnovation Center, material experiments by CHEMARTS bachelor's and master's students, and crafts by children and youth. The exhibition was curated by Anna van der Lei, Susanna Ahola, and Greta Isola. The exhibition connected bio-based material explorations with research-based solutions, united in the pursuit of a more sustainable and creative material future. It had an educational focus that highlights the research and learning from the Aalto University Bioinnovation Center and CHEMARTS. The DDW exhibition gained interest and visibility among companies, decision makers, students, and the general public. Designs for a Material Future exhibition was visited by several curated tours, including participants from international companies and decision makers. The exhibition was mentioned in FRAME magazine's top 12 must see exhibitions at Dutch Design Week.

At Aalto University's annual *Designs for a Cooler Planet* exhibition, the Bioinnovation Center was represented by two exhibition concepts: Marvelous Materials, focusing on activities for children and youth, and Everyday Materials, showcasing selected projects by doctoral students. The Everyday Materials exhibition was curated by Pirjo Kääriäinen, Enni Äijälä, and Susanna Ahola.

The Marvelous Materials book was showcased at four different exhibitions, reaching an audience of over 25,000 visitors. The children's book institute's Kirjakori 2024 was the first exhibition of the year, featuring all Finnish children's books published in 2024. Marvelous Materials book was invited to participate to the Accessible Complexity exhibition, held during the Graphic Days festival in Turin, Italy. The goal of the exhibition was to popularize science and make knowledge more accessible. A catalog of the exhibition was also published. At Aalto University's Designs for a Cooler Planet exhibition, our participation involved an exhibition concept implemented in collaboration with Aalto Junior. Bio-based furniture, textiles, plants, interior design items, and creatures for a wooden miniature house were crafted by summer camp participants following instructions in the book. The book was displayed at DDW with the same concept, as part of the Bioinnovation Center and CHEMARTS exhibition titled *Designs for a Material Future*.



Dutch Design Week exhibition prototypes were made by Finnish children in collaboration with Espoo and Forssa Art Schools for kids. Photos by Greta Isola.

SPRINGBOARD

In 2025, Aalto University Bioinnovation Center launched another initiative called SpringBoard. This program aims to support innovative developments in the field of bioeconomy or bioproducts that are in an early or advanced stage to reach the next level. The selected innovators receive tailored support to focus on the advancement of their invention which is mapped through multiple *innovation readiness level* (IRL) dimensions. SpringBoard works closely with Aalto University Innovation Services and Aalto University Founder School to support and educate the innovators and provide them with the necessary tools and mindset to reach the next IRL. In 2025, the SpringBoard piloted with one project by innovator Elizaveta Lingonberg:

Taiga Barrier project

About one third of all packaging used today is made of paper. Most of this paper contains a hidden plastic layer which protects products from water and oil. The TAIGA Barrier ↟↟↟ project aims to replace this plastic layer by developing a bio-based coating that makes paper water- and oil-resistant, using plant-based biopolymers.

The central focus of this project is linking research with real industrial conditions. The work is carried out in close communication with packaging producers and industrial coating lines, whose practical insights guide the laboratory work. This approach ensures that the coating is designed to be relevant to current industry needs and potentially easy to adopt in future industrial applications.

Taiga barrier prototype. Photo by Elizaveta Lingonberg.

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ANNUAL REPORT 2025

OUTLOOK

Aalto University Bioinnovation Center is looking joyfully towards 2026. The Center will celebrate its first 5 years of operation with an anniversary seminar, presumably taking place in March 2026. Also, we are expecting our first doctoral students to graduate from the program, marking a true milestone of the Bioinnovation Center.

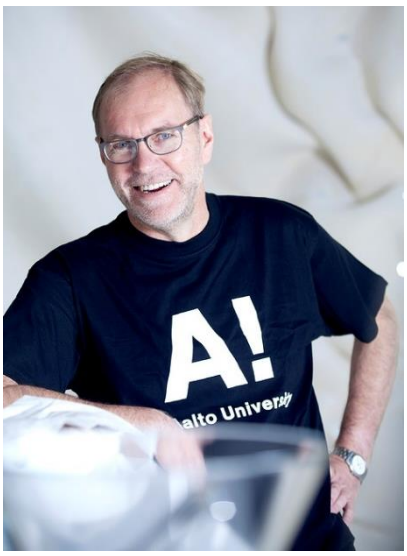
The impact program activities will include, amongst others, another main display at the *Designs for a Cooler Planet* exhibition during the Helsinki Design Week. We will also be present at the *Wardrobe of the Future* exhibition in Oulu, which will be the European capital of Culture in 2026. Designers in Material Science seminar will be organized in the fall 2026.

Our infrastructure investments will continue with the expansion of ongoing initiatives (biodegradation laboratory) and initiation of new ones to promote developments and innovations in bio-based material research.

Also our recently started SpringBoard will continue to support and promote promising early-stage innovation concepts to help them reaching the next level, striving for economic and societal impact.

We are also happy to have a new member in our steering group, Prof. Petri Kuosmanen from the School of Engineering. Welcome Petri! He will succeed Jouni Partanen who will retire from his position at ENG. Thank you for your support and guidance in the establishment of the Bioinnovation Center, Jouni, and all the best for your next chapter in life.

The Bioinnovation Center will start to develop its strategy for the future to continue its mission on promoting products and bioeconomy and to have a lasting impact in these areas.



Jouni Partanen

Petri Kuosmanen