



Faculty of Science,
Technology
and Medicine

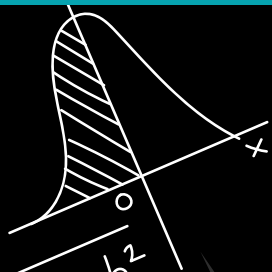
University of Luxembourg

Faculty of Science, Technology
and Medicine (FSTM)

Highlights 21-22



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FSTM growing fast

Word of the Dean

Over the past 20 years since its creation in 2003, the Faculty of Science, Technology and Medicine (FSTM) has undergone an impressive transformation.

Its research has achieved international recognition in all areas of focus, and even demonstrated international leadership in several fields. FSTM now offers high-quality undergraduate programmes in medicine, computer science, mathematics, physics, biology, and engineering.

Its master programmes provide excellent opportunities for students while delivering high-potential graduates to the Knowledge Economy of Luxembourg and the Greater Region. With over 560 registered doctoral candidates, the Doctoral School in Science and Engineering covers a wide range of fields with its doctoral programmes.

FSTM has increasingly supported the economic sector of Luxembourg through its expanding graduate pool and collaborative research projects with numerous industrial partners. Its expertise in cutting-edge topics in science and technology has established it as a leader in the field. FSTM also plays a significant role in raising awareness

of science and technology among the public, particularly high-school students, often partnering with others in this endeavour.

Of note is the expansion of the faculty's activities in medicine and nursing, particularly the completion of a full bachelor programme in medicine, as well as specialisations in general medicine, neurology, and oncology, and the ongoing development of new Bachelors in nursing. This addition is crucial to provide Luxembourg with the well-trained health professionals it needs.

Despite its numerous accomplishments, FSTM has maintained a low profile and dedicated its resources towards developing the quality of its research and teaching activities. It is now time to bring the faculty's achievements to light. This report is a vital step in that direction.

Jean-Marc Schlenker

Management Team

The management team of the faculty ensures the smooth running and growth of the faculty and acts as a link between the rectorate and the departments. Jean-Marc Schlenker is working with Frédérique Perrein who manages the administration and Serge Haan who oversees the teaching part. Together, they have been working with passion and enthusiasm for the faculty.



Key figures



Studies

- 2297 students
- 858 Bachelor
- 568 Master
- 627 PhD
- 244 Lifelong learning programmes



Research

- Total of 12 ERC grants
- 21 million euros external grants (2022)
- 778 publications (2022)



Society

- 2.7 million euros industrial collaborations (2022)
- Several outreach activities

Excellence in research

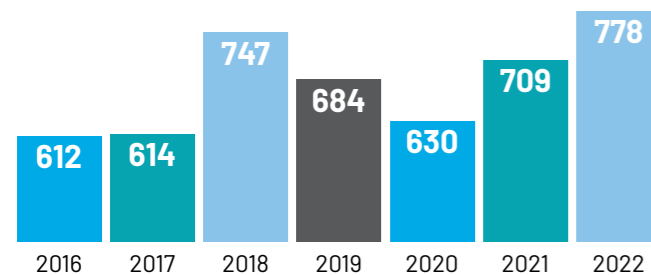
In 2021-2022, research at the faculty has continued to grow with the recruitment of 10 new professors, the acquisition of 3 ERC and 2 EIC grants, the impressive and growing number of publications as well as the development of industrial projects such as the launch of the Paul Wurth Chair in Energy Process Engineering. Thus, the faculty greatly pursues its mission of excellence in fundamental and applied research.

Key figures

- 585 researchers
- Recruitment of 10 renowned professors
- Acquisition of 3 ERC grants
- Acquisition of 2 EIC grants

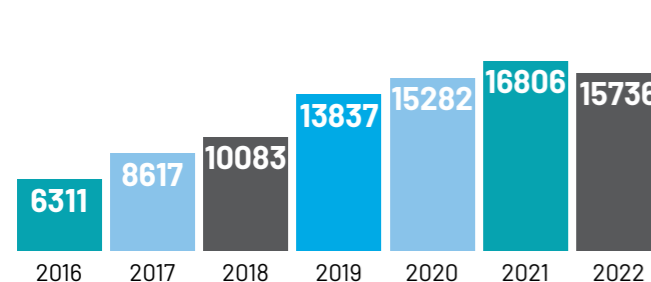
Evolution of the number of publications

Number of publications (total FSTM)



Evolution of external funding

Evolution of external project expenditures (k euros)



Key grants

ERC grants (European Research Council)



DISCOVERER: Novel chemical discovery platform (150 000 euros)

In January 2021, Alexandre Tkatchenko, Professor of theoretical chemical physics at the University of Luxembourg, was awarded a Proof-of-Concept grant to develop and prepare for commercialisation a platform for chemical modelling that combines molecular quantum mechanics and artificial intelligence (AI).

By modelling quantum fluctuations in complex molecular structures, physicists at the University have developed a set of machine-learning and physics-based methods to model materials composed of thousands of atoms. With such methods, other researchers and industrial users can calculate and predict the behaviour of large molecular structures with unprecedented accuracy and efficiency.

"Recent research in our field enables expedient searches of novel molecules in vast chemical spaces. Now we are ready to put this technology to use to answer molecular design questions in chemical and pharmaceutical industries. We work together with our industrial partners towards enabling the "chemical discovery revolution", says Prof. Tkatchenko. ■

REVEAL: Smart mechanical sensors (150 000 euros)

Jan Lagerwall, Professor in experimental polymer physics at the University of Luxembourg, obtained a Proof-of-Concept grant in February 2022 to work on the production of sheets and fibres of smart sensors applicable on various materials and therefore useable in monitoring the health and stability of buildings and in smart textiles, respectively.

"At large scale, smart sensors are invaluable for monitoring the structural health of our built environment, such as houses, bridges and event arenas. However, current technology typically employs one-dimensional strain sensors with low spatial resolution, giving limited information about complex deformations.", comments Prof. Lagerwall.

Thus, physicists propose a new solution offering two-dimensional distributed strain sensing with high resolution, as well as a one-dimensional version that is very interesting for smart textiles. The research project will continue until 2024, after which a commercialisation phase will start. ■



FITMOL: Molecular interactions (2.5 million euros)

In April 2022, Prof. Alexandre Tkatchenko received an Advanced Grant for his multidisciplinary research project entitled "Field-Theory Approach to Molecular Interactions", which spans the fields of quantum mechanics, machine learning, complex materials, and high-performance computing.

Over the past decade, Prof. Tkatchenko and his research team have created predictive methods and novel conceptual tools based on quantum and statistical mechanics for enabling and understanding simulations of complex molecules and materials with thousands of atoms. "We have achieved this by developing advanced quantum-mechanical methods and novel machine learning approaches used by thousands of researchers worldwide. It is my vision that revealing functional mechanisms of (bio)molecules with millions of atoms will require a conceptually new level of methods for modelling molecular interactions based on (quantum) field theory. Achieving this goal will be the main breakthrough of this project", says Prof. Tkatchenko. ■



EIC grants (European Innovation Council)

REMAP: Environmental impact of microfabrication (432 000 euros)

The research project "REusable MAsk Patterning" (REMAP) launched in May 2022, aims to establish a paradigm shift in the field of microfabrication, a process used to fabricate components at nanometres to micrometres scales that are essential to our daily life, such as microprocessors, sensors and flat panel displays.

Gathering seven European academic and industrial partners, this grant was the first one from the European Innovation Council (EIC) awarded to a researcher in Luxembourg, namely Professor Phillip Dale, Head of the Laboratory for Energy Materials at the University of Luxembourg.

"The University of Luxembourg has two main roles in REMAP: the first is to prototype a device to measure the efficacy of the new stencilling technique, and secondly to apply the REMAP concept to fabricate micro-concentrator photovoltaics which are a special type of solar cell designed to have improved performance over conventional ones", explains Prof. Dale. ■





SYMBIOTIK: AI-driven data visualisation (4 million euros)

Started in September 2022, the research project “Context-aware adaptive visualizations for critical decision making” (SYMBIOTIK) proposes a novel framework to lay the basis for an interaction dialogue between humans and the machine to support decision making processes, inspired by known biological principles and guided by artificial intelligence (AI).

The project brings together researchers from the University of Luxembourg, AEGIS IT Research (Germany), Université catholique de Louvain (Belgium), and Telefónica I+D (Spain). This is the first EIC Pathfinder grant that is coordinated by the University of Luxembourg and more precisely by Prof. Luis Leiva, Professor in Machine Learning and Human-Computer Interaction at the University.

“We propose an ambitious framework to create symbiotic self-adaptive InfoVis systems. Ultimately, the project will offer a principled framework to support decision making in situation and time-sensitive tasks”, explains Prof. Leiva. ■



ATTRACT (Luxembourg National Research Fund)

QOMPET: Quantum Physics (2 million euros)

In December 2021, Aurélia Chenu, Professor in theoretical physics, won the prestigious ATTRACT funding from the FNR to create her own group in quantum physics.

Open quantum systems represent a vast diversity of systems, ranging from simple building blocks to complex mesoscopic systems. Their study has led to advances in fields including quantum optics, quantum control, and physical chemistry. Today’s conventional concepts and material performance are governed by quantum properties and the associated dynamical processes. So, understanding the underlying dynamical properties is key to identify system layouts with optimised functions.

“We aim at generating control protocols that engineer dissipation and decoherence to reach a target quantum state or quantum dynamics, combining analytical and numerical tools. By protecting the fragile quantum properties of nature, we can find new ways to optimise quantum transport in dissipative networks for efficient energy-harvesting systems. Instead of trying to suppress the effect of the environment, we aim at exploiting and optimising it to protect useful quantum features in the system”, explains Aurélia. ■

We propose an ambitious framework to create symbiotic self-adaptive InfoVis systems. Ultimately, the project will offer a principled framework to support decision making in situation and time-sensitive tasks

explains Prof. Leiva.



Awards

FNR Awards

At the FNR Awards 2022, Prof. Susanne Siebentritt, Head of the Laboratory for Photovoltaics, and Prof. Christoph Odenbreit, holder of the ArcelorMittal Chair of Steel Construction, received an Outstanding Mentor award from the Luxembourg National Research Fund (FNR).

© FNR / Olivier Minaïre



Susanne Siebentritt

PhD candidates who worked with Susanne underlined her unflinching optimism, her huge support for both technical and general discussions and her great availability. For Susanne: “I really want to offer my students guidance, create an environment of trust and help them grow”.

© FNR / Olivier Minaïre



Christoph Odenbreit

Mentees from Christoph Odenbreit emphasised his great kindness and empathy. According to them, Christophe also values the opinion of his students and always transfers his knowledge. For Christoph: “I provide my students with a construction kit for their research and advise them to not believe anything at the beginning and always be respectful with others”.

Grand Prix en Mathématiques

In November 2021, the “Grand Prix en Mathématiques de l’Institut Grand-ducal” also called “Prix de la Bourse de Luxembourg” was awarded to Anton Thalmaier, Professor in Stochastics Analysis at the University of Luxembourg.

The jury recognised the outstanding academic career of Anton Thalmaier in the field of mathematics. He has gained a high international reputation as a specialist in probabilistic methods at the interface of analysis and geometry. He has published 65 papers, participated as invited speaker in more than 120 conferences, collaborated with 18 renowned professors and spent 12 research stays in China, UK, USA, France and Japan. In addition, he has served as Course Director of the Master in Mathematics and supervised 9 PhD students. ■

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Industrial collaborations

Paul Wurth Chair in Energy Process Engineering

In March 2021, the Paul Wurth Chair in Energy Process Engineering was officially created to conduct cutting-edge research, teaching and outreach activities in the field of hydrogen processing and related aspects of carbon-neutral industrial processes.

The partnership between the University of Luxembourg and Paul Wurth supports Luxembourg's ambition to develop a centre of excellence in fields surrounding the emerging hydrogen economy, to stimulate industrial development in process engineering and hydrogen and low carbon emission technologies, and to increase the output of skilled engineers.

In March 2022, Prof. Bradley Ladewig was appointed holder of the Chair. His mission is to build up a new research laboratory with a specific focus on hydrogen-related materials and technologies that address critical gaps in the European context, including the need for very substantial production of green hydrogen for industrial applications. Working together with a range of partners from industry and society, these technologies will be demonstrated and deployed in a range of applications.

"The combination of a dynamic University and the financial and technical support of Paul Wurth provides an excellent foundation to make advances in fundamental and applied hydrogen technologies. I am deeply motivated to work towards a sustainable future and hydrogen will play a critical role in that", comments Prof. Ladewig. ■

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ArcelorMittal Chair of Steel Construction

Since its creation in 2011 by the University of Luxembourg and ArcelorMittal, the Chair of Steel Construction led by Prof. Christoph Odenbreit has achieved numerous successes thanks to the support and motivation of both partners. Its focus is to investigate the steel construction of tomorrow for high-performance buildings and construction techniques, developing new structures and design rules for innovative steel and steel composite construction. A strong emphasis lies on the reduction of greenhouse gas emissions by means of circular economy in construction and improvement of sustainability with the development of green solutions.

From 2011 to 2021, the chair has been renewed twice, each time with different teaching and research orientations in line with the industrial needs. Prof. Odenbreit with his team have managed to run 11 research projects, published about 25 papers in renowned journals, participated with about 66 contributions at conferences and gave each year 10 lectures for students. Their efforts have been recognised with 3 awards at national and international levels. ArcelorMittal has supported the Chair with a total of more than 1.6 million euros. At the Luxembourg's Pavillon of Dubai Expo, the Chair promoted a future vision of modular, circular, standardised steel solutions leveraging digital twin technologies. These scientific findings were then applied in the Pavilion "Petite Maison" during the European Capital of Culture Esch2022. In addition, Prof. Christoph Odenbreit received an Outstanding Mentor Award during the FNR Awards Ceremony 2022. The Chair will continue its efforts to make steel construction ever more re-usable and sustainable. ■

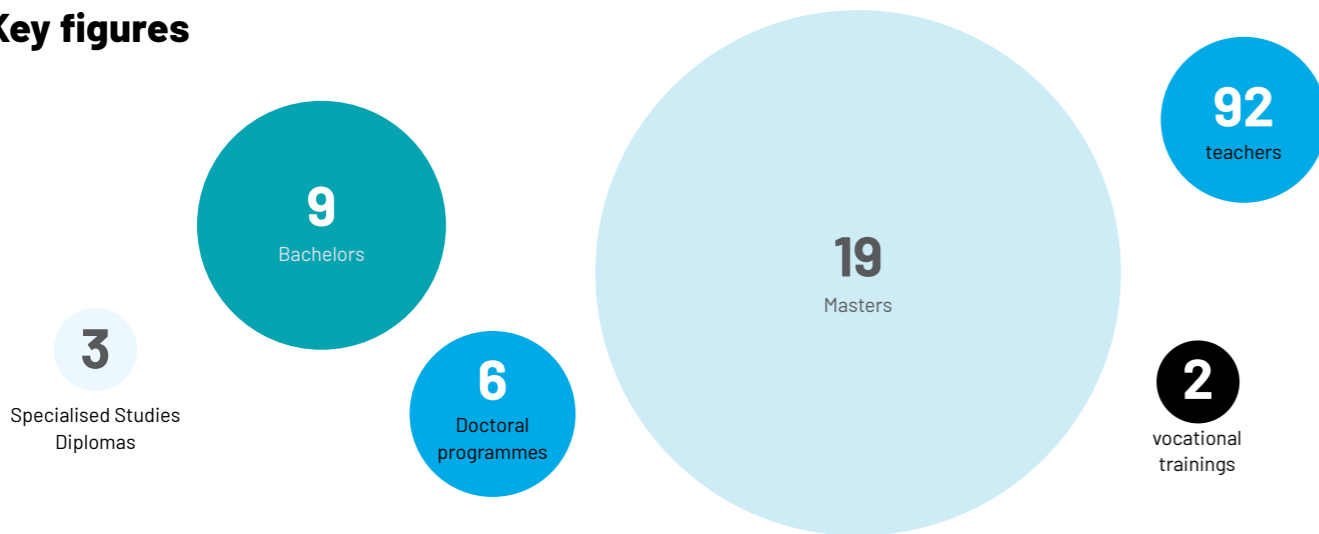
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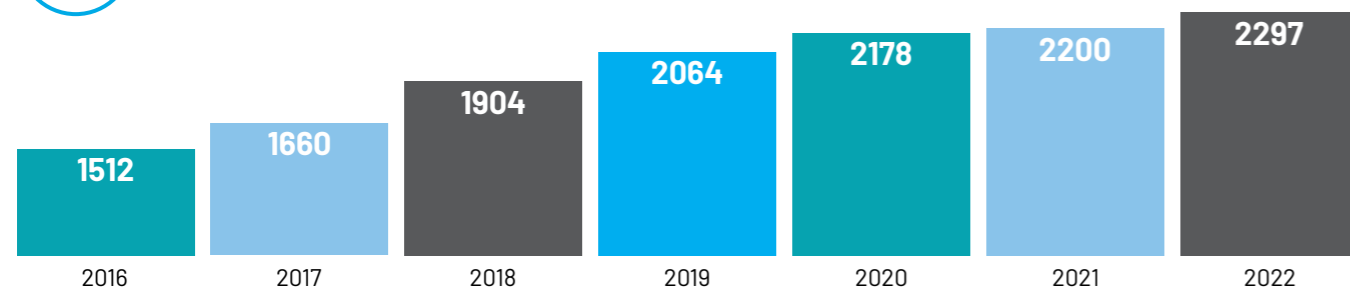
Thrilling teaching activities

In 2021-2022, the teaching activities within the faculty expanded with the launch of 2 new Master programmes in data science and technopreneurship and 3 specialised studies diplomas in medicine. In addition, three programmes in computer science were accredited. The faculty will continue its efforts in accrediting more programmes in the future to strengthen a sustainable quality dynamic of education meeting both the demands of students and the market. Furthermore, the faculty established new partnerships with for instance CentraleSupélec to encourage cooperation and exchanges in areas of mutual academic interest. The faculty is also preparing 2 new Masters in high-performance computing and cybersecurity as well as 7 new Bachelors in nursing science to start in 2023-2024 which will diversify the training offer and meet societal and market needs.

Key figures



Evolution Number of students



New programmes



Master of Data Science

Based on a multidisciplinary approach, the Master of Data Science was launched in September 2021 with 17 students from all over the world. The programme trains students in data analysis, modelling and management, and prepare them to work in areas as artificial intelligence, cloud computing, machine and statistical learning or big data. Data scientists are trained as both mathematicians and computer scientists. This profile makes them the preferred choice for facing the new challenges of the digital transformation.

mads.uni.lu



Master in Technopreneurship

The Master in Technopreneurship: "Mastering smart ICT, standardisation and digital trust for enabling next generation of ICT solutions" started in February 2021 with 12 students. This two-year, part-time programme trains future leaders in the field of smart ICT. The programme is developed in partnership with the Institut luxembourgeois de la normalisation, de l'accréditation, de la sécurité et qualité des produits et services (ILNAS) and the Luxembourg Lifelong Learning Center (LLLC) of the Chambre des Salariés (CSL).

mtech.uni.lu



Specialised studies diplomas in medicine

Following the launch of the Bachelor in Medicine in 2020, the University decided to expand its training offer with three medical specialisations in general medicine, medical oncology and neurology. Launched in September 2021, these new courses are organised in close collaboration with the hospital sector in Luxembourg as well as general practitioners. The programme combines practical exercises through clinical internships with theoretical teaching aiming to deepen knowledge in the chosen discipline. It provides high-quality, multilingual medical training based on innovative technologies and therapies, and promotes medical research in strategic areas. It also helps to renew the Luxembourg medical community.

des.uni.lu



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Accreditation

The Bachelor in Applied Information Technology, the Bachelor in Applied Information Technology – Continuing Education Programme and the Master in Information and Computer Sciences were accredited in 2021 by the German Accreditation, Certification and Quality Assurance Institute, ACQUIN. The accreditation was performed by independent external reviewers who evaluated and assessed the study programmes complying with the “Standards and Guidelines for Quality Assurance in the European Higher Education Area”.

From the conversations with the students and lecturers, the evaluation team gained the impression of very attractive study programmes. In the course of their studies, the students are very well prepared for their future professional field and for their professional tasks. “Those three accreditations are the beginning of a process, and more programmes will be accredited in coming years. In the long run we can expect that all programmes will be accredited”, concludes Prof. Jean-Marc Schlenker, Dean of the faculty. ■

Partnership

CentraleSupélec

In 2021, the University of Luxembourg and CentraleSupélec signed the first “Memorandum of Understanding” to encourage cooperation and exchanges in the fields of physics, engineering, computer science and mathematics. Exchange of students at Bachelor and Master levels as well as special projects will be carried out with the Metz campus on photonics and sustainable development for both research and education.



© CentraleSupélec

Teaching Awards

In 2021 and 2022, four members from the faculty have received the Teaching Awards for their outstanding work as teachers.

Gabor Wiese

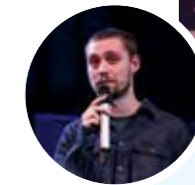
Gabor Wiese is Professor of algebraic number theory and geometry. He is the Course Director of the Master in Mathematics, the Deputy Study Director of the Master in Secondary Education - Mathematics, and the Programme Coordinator of the Doctoral Programme in Mathematics and Applications. According to his students, Gabor cares a lot about their advancement and well-being and always shares his passion and motivation.



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Sebastiano Tronto

Sebastiano Tronto is doctoral researcher in number theory. He is the world-record holder for the Rubik's cube, namely in the mathematical challenge of solving the cube in the least amount of moves. His students mentioned that Sebastiano makes his lectures very interesting and accessible for all.



© Sophie Margue

Wolfgang Poiger

Wolfgang Poiger is doctoral researcher in mathematics. His students mentioned that Wolfgang really invests a lot to make the course interesting and understandable, and that he is dynamic and patient.



© Sophie Margue

Volker Müller

Volker Müller is Professor in Computational Number Theory. He is the Course Director of the two Bachelors in Applied Information Technology. Volker is really appreciated by his students for his passion, honesty, advice and support.



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Making science popular

The faculty is highly involved in outreach activities and, members of the faculty have been participating and offering a varied programme of activities. In 2021-2022, the faculty was particularly successful with the participation in the Universal Expo in Dubai and in Esch2022 European Capital of Culture, the launch of the Inside Colon campaign and the release of the LUX:plorations science comics.

Participation in outreach activities

Portes Ouvertes Luxembourg

In September 2021 and 2022, the faculty opened its laboratories in physics on Limpertsberg campus and engineering on Kirchberg campus during the national event "Portes Ouvertes Luxembourg".

More than 850 visitors discovered the laboratories and could learn more about renewable energies, interact with robots, track molecules, play with light. ■



Relais pour la Vie

The cancer research team from the University of Luxembourg took part in the 2021 and 2022 editions of the Relais pour la Vie.

Organised by the Fondation Cancer, this charity event aims to collect donations to support research projects.

Everybody could participate in the race by running, cycling, or walking. The goal for each individual or team was to clock a combined time of 24 hours. ■



Luxembourg Olympiads in natural sciences

Every year, almost 1000 secondary school students participate in the national competitions in biology, chemistry and physics. The jury examines the skills in solving biological/chemical/physical problems as well as in performing and analysing practical experiments.

The main objective of the Luxembourg Olympiads is to promote students' interest in life sciences as well as to motivate them to become more involved in this field. ■



Science Festival

In November 2021, researchers from the University participated in the Science Festival Luxembourg at Neumünster Abbey. They interacted with the public to explain science in a fun and interactive way.

Visitors could play with light, understand energy consumption, discover science via comics, build various structures and more. ■



Organisation of outreach activities



GEM Day: Girls Exploring Mathematics

In 2022, on the Women in Mathematics Day, 125 girls from 5 high schools in Luxembourg took part in several activities around mathematics.

The objective of GEM Day is to emphasize the evolving role of women in mathematics and to show that mathematics is also for women.

The programme included a lecture from mathematician Ann Kiefer, a hands-on workshop Unpuzzling Mathematics and an interactive play about the stereotypes in the scientific world faced by girls when choosing what they will study. ■



Exploratis: a new experimental station at the Science Center

Since 2021, the Luxembourg Science Center in Differdange has been hosting a new experimental station called Exploratis. Faced with intriguing puzzles, visitors can either try them by themselves, race against each other, or collaborate to find solutions. Little do they know, they are exploring an uncharted world of mathematics. ■





Universal Expo Dubai

On the occasion of the Luxembourg Pavillon, mathematicians from the University of Luxembourg brought mathematics to the Luxembourg pavillon at the 2020 Dubai Expo, to huge success.

Mathematics in the spotlight

Attracting thousands of visitors each day, the Luxembourg Pavillon became one of the most visited pavilions of the Expo in Dubai. A team from the Department of Mathematics, led by Hugo Parlier and Bruno Teheux, were invited to share their outreach activities with the world. "Being the sole representatives of the University of Luxembourg showcased at the pavilion, we had the honour to shine a light on our institution. According to the organisers, this was one of the first times in history that mathematical research and outreach was featured at a Universal Expo", comments Prof. Hugo Parlier.

Over five days in December 2021, the "Simplicity of Complexity" exposition featured original mathematical games in which, beyond the enjoyment of playing, visitors were invited on an exploration through intricate spaces and to the frontiers of knowledge. With thousands of visitors, the success of the temporary exposition exceeded expectations and DMATH was invited to return for a second, longer residency in February 2022.

The second exposition - ReCreate - was even more ambitious. With a distinctive

artistic flavour, visitors were invited to participate in a crowdsourcing art project, in which artistic data were collected for the multidisciplinary European Capital of Culture - Esch 2022 project "The Sound of Data". As in the December exposition, visitors also had the chance to play Quadratis puzzles, but this time, in addition to playing games, they participated in ReTrace, a massive graph collaring project. With approximately 10,000 drawings collected, 10,000 puzzles played and 50,000 patterns explored, the success of the exhibit again surpassed the organisers wildest expectations.

The director of the Luxembourg Pavilion, Daniel Sahr, was very elated with the outcome: "Based on the huge success of the December exhibition in collaboration with the University, we were convinced that ReCreate would become a people magnet as well! We were very glad to see that the temporary exhibition attracted people from all over the world and that they were united by a common interest: to learn about mathematics in an interactive way." ■



ESCH 2022

In the framework of Esch 2022, European Capital of Culture, the faculty was very active with three projects: AI&Art Pavilion, Petite Maison and The Sound of Data.

AI&Art Pavilion

The AI&Art Pavilion was created as a multidisciplinary and interactive environment in which scientists, artists and the public could meet and interact. "Located on the ground floor of the Maison du Savoir, the AI&Art Pavilion combined Belval's industrial heritage with the scientific ambitions of the university, while letting individuals find a sense of community in the face of contemporary and forthcoming challenges. By mixing research and outreach activities, the pavilion is a long-term planned research laboratory for the citizens.", explain Professors Christoph Schommer and Leon van der Torre, coordinators of the project at the Faculty of Science, Technology and Medicine.

The pavilion offered three kinds of activities. Firstly, Singularity 42! collected initiatives in which artists reflected on the interaction between physical and digital existence. Secondly, the Project Corner(stone) offered playful and interactive initiatives for visitors to experiment, discover and rethink their own beliefs. Thirdly, the Magneto project consisted in various events to inform and engage the audience in discussions about the role of AI.

In total, 10 workshops were organised for students and artists on different topics such as "AI dancing avatar", "Automatic mixed painting", "IHAD - I Have A Dream". During the workshops, participants could understand the project, the technical and implementation phases and the challenges as well as discuss the interactions between humans and machines.

In addition, two exhibitions were officially inaugurated at the Computational Creativity Hub: an interactive live portrait art installation "Imaginary Landscapes" and six artworks on critical data "Interface Cultures". The opening and demonstrations were a great opportunity to exchange with artists.

Finally, several visits were organised with secondary school students but also with representatives from industry and associations. ■



More information: cch.uni.lu

As one of the key figures spearheading AI and art initiatives, I've had the enriching experience of collaborating with artists and data science professionals to develop AI-enhanced artworks, exhibiting them at CCH, and undertaking outreach and dissemination activities to bridge the public understanding gap surrounding advanced technologies,

comments Sana Nourzi, postdoctoral researcher and protagonist of the project



Petite Maison

The project Petite Maison was built as an ephemeral sculpture on Belval campus in front of the Maison du Savoir to introduce the public to the culture of alternative construction and circularity in the broad sense. Built with recycled materials, as well as with renewable and/or highly reusable materials, products and raw materials, the small prototype consisted of more than 500 construction elements.

The project was led by Prof. Carole Schmit together with Dragos Ghioca from the Faculty of Humanities, Education and Social Sciences and in cooperation with Prof. Christoph Odenbreit from the Faculty of Science, Technology and Medicine and several partners from Luxembourg and the Greater Region.

Petite Maison was based on the research work done by engineers from the University of Luxembourg together with European partners in the frame of the Horizon 2020 project "Reuse and demountability using steel structures and the circular economy" (REDUCE).

From 2016 to 2019, researchers tested new demountable composite floor systems and develop new methodologies, tools and guidance to assist in design for deconstruction. This led to new shear connection systems for demountable composite construction, based on push tests and beam tests to verify composite action and to develop design rules.

● More information: petitemaison.lu



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Thus, Petite Maison is a great showcase for the REDUCE project. The primary structure is composed by elements made from steel: columns, beams and bracings that connected to each other in demountable manners using, when possible, the REDUCE connections. The steel structure is visible from the outside, the connections were meant to be easily observed and understood by the visitors. On top of the steel frames, the lighter wooden structure of the roof is fixed in the continuation of the vertical axis; foundations-steel frame-wooden frame", explains Prof. Christophe Odenbreit, Head of the ArcelorMittal Chair of Steel Construction. ■

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The Sound of Data

"The Sound of Data: Science Meets Music" was a multifaceted, multidisciplinary and innovative project which aimed at creating bridges between the worlds of science and music. It was also a way of introducing the public to the emerging world of data sonification. It was developed by a collaborative team from the University of Luxembourg (FSTM, SnT, C2DH), Rockhal/Rocklab, FNR, and LIST. The project was centred around the topic of data sonification, which is the transformation of numerical data into sound or music.

The FSTM played a significant role in the project: Bruno Teheux and Hugo Parlier's contribution "ReShape" involved collecting worldwide original digital artworks through a custom software they had created before. The data of these images was sonified in a second step, which resulted in three exquisite pieces of music. Additionally, Oliver Glassl, one of the project initiators and the University's representative in the steering committee of the project, collaborated with scientists from LIST and various musicians to collect and sonify traffic data, which yielded four very interesting and diverse sonification arrangements. Also, colleagues

from C2DH and SnT contributed datasets which were sonified by various musicians.

The opening event, attracting families, students, scientists, musicians, and enthusiasts of science and art, drew over 800 visitors in May 2022. Through a science fair, panel discussions, and a sonification lecture-performance, attendees immersed themselves in the realm of data sonification, exploring the translation of scientific data into music and sound. In December 2022, the meticulously curated final concert unfolded as a great success at Rockhal, captivating a dancing audience of over 400 fans throughout the four-hour performance of 12 artists.

Between these milestones, the FNR organised science communication events and conferences on data sonification and the connections between science and music. A multitude of videos were produced to document the entire project. To date, these videos have accumulated an impressive total of over 800,000 views, reflecting their widespread appeal and resonance. ■

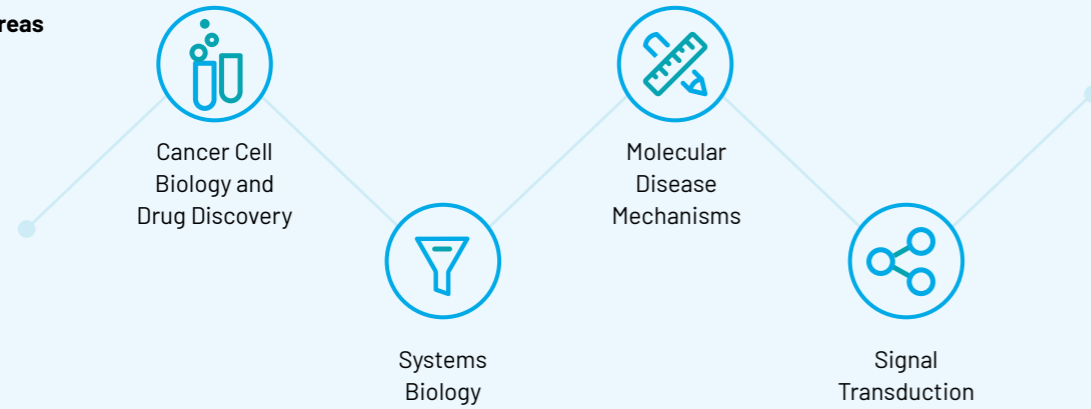
● More information: thesoundofdata.lu



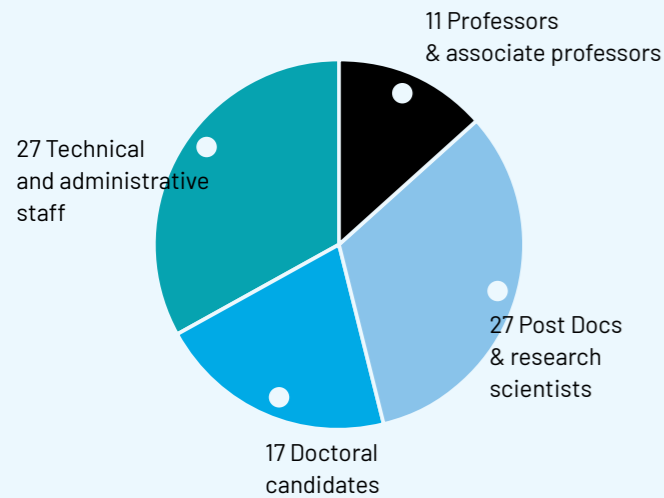
Life Sciences, Medicine and Nursing Science

Key figures

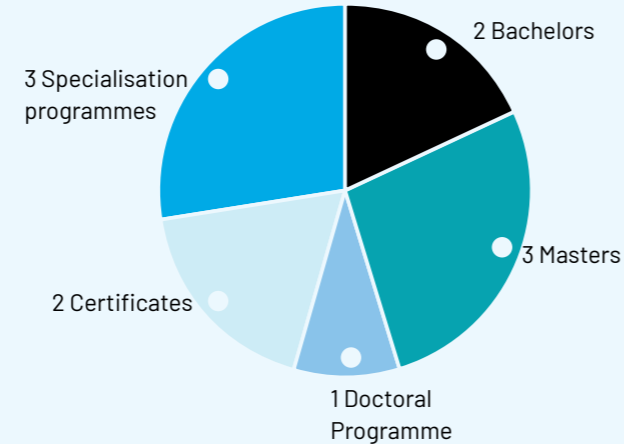
4 research areas



82 members



11 study programmes



Upcoming in 2023/24: 7 Bachelors in Nursing Science

Publications: 75 peer-reviewed articles in scientific journals (2021-2022)

Funding and collaborations:

- Acquired funding (2021-2022): €5 million
- More than 40 national and international collaborations with research institutions, universities, companies and hospitals

Life Sciences



Editorial Prof. Iris Behrmann, Head of DLISM

The Department of Life Sciences and Medicine (DLISM) aims for excellence in research and education in Life Sciences, offering cutting-edge teaching programmes in Biology, Medicine and Nursing Science to train the next generation of scientists and healthcare professionals.

DLISM research activities combines basic and translational, wet lab and computational research to address critical questions in human health and disease, with a focus on tumor biology. 2021 and 2022 were successful years despite the COVID-19 crisis, with 8 PhD students completing their theses. New projects were initiated through strong engagement and perseverance of all DLISM scientists, and collaborations with national and international partners led to fruitful achievements in view of future cancer therapies, such as new insights into carcinogenesis and drug resistance.

The DLISM has expanded its teaching programmes, offering a Bachelor in Medicine since 2020 and three medical specialisation tracks since 2021. Two new colleagues have recently joined the Faculty to establish 7 Bachelors in Nursing Science starting in 2023. The Master in Integrated Systems Biology and the International Master of Science in Biomedicine run at full capacity, demonstrating the popularity of the modern educational programmes in Biosciences and Biomedicine.

2023 will bring renewal with the renovation of the Biotech II building and the start of construction for Biotech III, a new state-of-the-art structure for biomedical research, which will offer more workspace for DLISM and LCSB (Luxembourg Centre for Systems Biomedicine) teams in the future. ■

More information: dls.uni.lu



Staff

Academic Promotion



Elisabeth Letellier

As research scientist and co-head of the Molecular Disease Mechanisms group, Elisabeth Letellier is strongly involved in colorectal cancer research, focusing on the development of novel experimental approaches to study the mechanisms underlying colon cancer and to identify potential therapeutic targets. She is now Assistant Professor in Biology.



PhD story

Sunday Ojochegbe Okutachi

Experience at University: Sunday worked on the characterisation of novel covalent and non-covalent drugs against KRAS surrogate targets.

Current position: R&D Scientist in Design Transfer and Process Validation, Siemens Healthineers, Luxembourg



Postdoc stories

Ines Kozar

Experience at University: Ines studied the mechanisms of resistance to targeted therapies in melanoma.

Current position: Technical Officer, Laboratoire National de Santé (LNS), Luxembourg

Yujuan Gui

Experience at University: Yujuan worked on the identification of genetic and epigenetic regulators of dopamine concentration in the midbrain.

Current position: Bioinformatics support engineer, Becton Dickinson, Netherlands



Research

Towards new therapies to fight colorectal cancer

Different gut-derived bacteria have been suggested to induce tumour growth in colorectal cancer (CRC). However, the crosstalk between the gut microbiome and the host as well as their impact on tumour cell metabolism remains largely unexplored.

In the recent years, the Molecular Disease Mechanism (MDM) group is using novel experimental approaches such as the gut-on-chip model HuMiX (in collaboration with Professor Wilmes' group who established the model) and patient-derived gut organoids in combination with in-silico metabolic models and various mouse models to go beyond the observational microbiome studies described so far in the literature.

"Using this integrated approach, we have discovered that host-microbe crosstalk leads to formate as a metabolic derived product, contributing to the gut microbe's pathogenicity in CRC by driving cell invasion and metastasis. It thereby opens a new important research area and a valuable resource for the microbiome cancer research society", says Prof. Elisabeth Letellier, Co-Head of the Molecular Disease Mechanisms group.

Their findings were published in [the journal Nature Metabolism](#) in 2022. ■



New ways of teaching computational systems biology

Project-based learning (PBL) is a dynamic student-centred teaching method that encourages students to solve real-life problems on their own with the help of a teacher.

Jointly written by teachers and students, an educational article describes in detail the schedule and content of the PBL-based computational biology course, exemplary student projects, and reflects on outcomes and lessons learned.

"PBL in computational biology enables students to face real-world scientific challenges while developing relevant skills in programming, data retrieval from databases and literature, data analysis, and omics data integration. Independent of achieving the initial project goals or not, the PBL approach provides students with the ability to develop active thinking, including pinpointing critical aspects or strengths of a project, as well as the ability to formulate relevant questions, draw biological conclusions, or to foresee possible developments", explains Prof. Thomas Sauter, Head of the Systems Biology group.

The paper was published in [PLOS Computational Biology](#) in 2022. ■



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Studies

Tri-national diploma in the field of Biomedicine

The International Master of Science in Biomedicine was launched in 2018 as a tri-national programme with the University of Luxembourg, the University of Strasbourg and the Johannes Gutenberg University Mainz. With the growing importance of academic and industrial biomedicine laboratories in the region, the Master provides students with an excellent training in biomedicine at the international level, strengthened by an adapted training in fundamental sciences, and an integrative knowledge in cardiovascular and metabolic diseases, neurosciences, immunology and systems biology.

28 students were already graduated in 2020, 2021 and 2022 and are now pursuing their studies or working in the biomedical sector.



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Students can learn within small class sizes, benefit from individual mentoring, and have the possibility of using state-of-the-art experimental and computational facilities. The programme promotes scientific culture exchanges between students with different educational backgrounds,

explains Prof. Thomas Sauter, Course Director of the programme.



Louise Chomel, one of the first graduates, really enjoyed the programme. "This Master offers the possibility to have precise and broad scientific knowledge in line with the specialities of each university. What I have appreciated the most during these two years is the great richness and diversity of teaching and the opportunity to interact with our teachers." She is now doing a PhD at the National Institute for Health and Medical Research (INSERM), in France. ■



● More information: mbiomed.uni.lu

Outreach

Colorectal cancer (CRC) is the third most frequently diagnosed cancer and the second cancer with the highest mortality rate in Europe. The University of Luxembourg organised the event "Inside Colon - Discover the inside of your colon!" in November 2022 at the Shopping Centre Belle Etoile, bringing researchers and science closer to the public.

Visitors had the opportunity to interact with the experts and have a guided visit of the inside of a giant inflatable colon. In addition, high school students from Luxembourg were invited to participate in a Science and Art Competition about cancer and diet. The participating art pieces were exhibited at the Shopping Centre.

The initiative was supported by the Fondation Cancer and the Ministry of Health. ■



Indeed, boosting awareness about CRC will not only help improve lifestyle choices, but will also help identify new therapeutic strategies and implement larger screening programmes to reduce cancer mortality and morbidity in the future. This event was a good opportunity to engage in a dialogue about the importance of participating in the national Luxembourgish CRC screening programme and a way to open the discussion with high school children about the risk factors and the importance of a healthy diet,

explains Prof. Elisabeth Letellier, leader of the project.



● More information: inside-colon.uni.lu



Medicine

Editorial Prof. Gilbert Massard, Director of Medical Education

Medical education at the University saw significant growth in 2021 and 2022 despite the ongoing pandemic, with the Bachelor of Medicine programme expanding its offer to 2nd and 3rd year consecutively.

In October 2021, we welcomed the first generation of students in our new training curricula in General Medicine, Neurology and Medical Oncology. Autumn 2022 saw a new beginning with the recruitment of two full professors in nursing science, whose mission is to develop seven new bachelors in allied health care professions, thus broadening the spectrum of educational offer in Health Sciences in Luxembourg.

In response to high demand for novel teaching tools, a simulation training unit (SimUL) was developed to include task training, digital learning tools, and high-fidelity mannequins. Early immersion into clinical practice, a key element for success, was achieved thanks to support from medical professionals and general practitioners.

The administrative team was expanded to meet growing needs and participated in several educational events in the domain of education sciences and simulation training. We are now members in several dedicated scientific societies, such as the CIDMEF (International Conference of Deans of French-speaking Faculties of Medicine) which is supporting us to auto-evaluate our training programmes. ■



Studies

New medical specialisations

In September 2021, the University of Luxembourg launched the new medical specialisations in general medicine, medical oncology and neurology. These courses are organised in close collaboration with the hospital sector in Luxembourg as well as general practitioners.

This network provides a mainly practical training programme through clinical internships, with theoretical teaching aiming to deepen knowledge in the chosen discipline. Course participants are also able to participate in research in areas where Luxembourg has a strong track record, such as cancer research and neurodegenerative diseases.



The solid experience of internship supervisors who welcome our young colleagues in hospitals and in their practices for practical training is a guarantee for success. The University offers its simulation teaching unit, equipped with latest generation digital learning tools. This high-level medical and scientific training opens the path for a brilliant professional future, both in Luxembourg and abroad,

says Prof. Gilbert Massard.

Sven Urbano, second-year student in General Medicine is really interested in investigating medical research: "Doing a research project is a good complement to internships in general practice and allows me to acquire new medical knowledge. It is also a good opportunity to meet people from different medical departments." ■



More information: des.uni.lu

Peer tutoring Bachelor in Medicine

With the help of the medical team, second and third year students launched a peer tutoring project in 2021. This tutoring project aims to provide first year students with motivational, psychological and educational support throughout the academic year.

In addition, students were able to use the virtual anatomy dissection table, perform various manipulations on multiple mannequins and enhance their clinical reasoning on a virtual patient simulator. ■



Outreach

Heart Day event: learning how to perform cardiac massage

The European Restart a Heart Day was founded with the support of the European parliament and takes place on the 16th of October every year. The aim is to create awareness that everyone can learn cardiopulmonary resuscitation and facilitate basic life support courses in schools and public locations.

On this occasion, third-year students from the Bachelor in Medicine at the University of Luxembourg demonstrated how to perform cardiopulmonary resuscitation. ■

A day for high school students to discover medical studies

Contemplating a medical career requires an early immersion, to navigate numerous challenges ranging from admission processes to rigorous scientific background requirements.

To inspire future medical students and tickle their motivation, the University of Luxembourg organised four sessions for secondary school students. During the tour, 149 students learned more about the medical study programme and the medical profession, visited the simulation unit, and exchanged with professors and students. ■



Nursing Science

In order to better meet the needs of Luxembourg's healthcare sector in the long term, the Luxembourg government mandated the University of Luxembourg to develop several Bachelor programmes in nursing science, in maieutic sciences-midwifery and for MIT in radiology (medical imaging technician). In total, seven new bachelor degrees will be launched gradually, combining academic training using innovative and interactive methods with practical training in inpatient and outpatient settings:

- In September 2023, four Bachelors of Nursing Science – Specialisations will be launched: Surgical Medical Technical Assistant, Nurse in Anesthesia and Resuscitation, Pediatric Nurse and Psychiatric Nurse.
- In September 2024, a Bachelor of Nursing in General Care, a Bachelor of Maieutic Sciences - Midwifery and a Bachelor of Medical Imaging Technicians in Radiology

Professors Laurence Bernard and Marie Friedel have joined the University of Luxembourg since 2022 to develop attractive bachelor programmes related to identified holistic needs of patients and the nursing profession, focused on evidence-based nursing, interprofessional collaboration, sustainability, cost-effective quality care, including a special attention to the well-being and quality of life of nursing students.

Their academic mission is also to develop nursing science research. But what are nursing science? Nursing science assess healthcare systems and environments, improve patient, family and community outcomes and shape healthcare policy. Nursing science combine clinical care, education and research and aim to promote constantly individualised care to each child, adult and elderly, at every step of their life. ■



Staff

New Professors

Marie Friedel

Marie Friedel joined the University in November 2022 as Professor in Nursing Science. She has been teaching for more than 20 years at the Haute Ecole Léonard de Vinci in Brussels and focused her research activities on paediatric palliative care, outcomes measurement in healthcare, ethics and nursing education. Her new role is to develop education and research in nursing science at the University.



Laurence Bernard

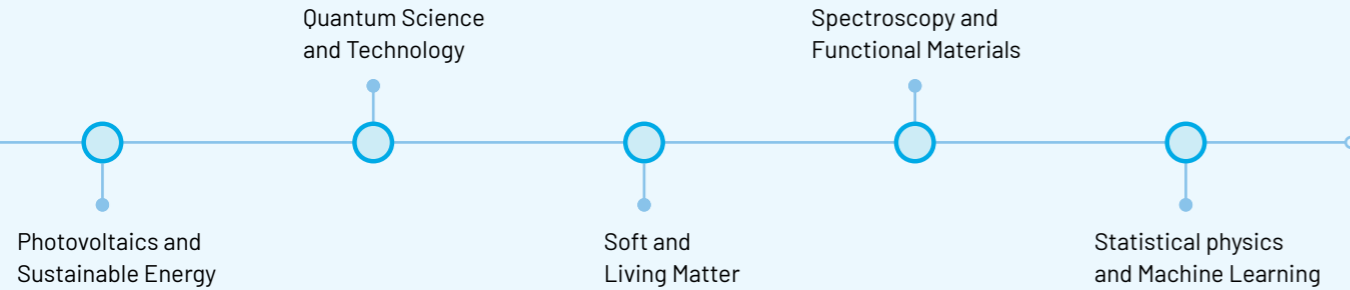
Laurence Bernard joined the University in October 2022 as Professor in Nursing Science. She has a ten-year experience as professor at Université de Montréal and has published in the domains of health care safety, pandemics and critical theory, including feminism, postmodernism or socio-constructivism. Her new role is to develop education and research in nursing science at the University.



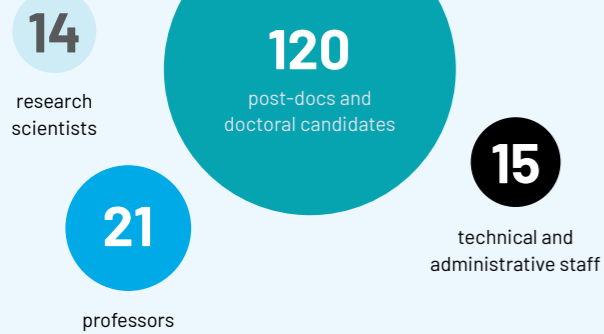
Physics and Materials Science

Key figures

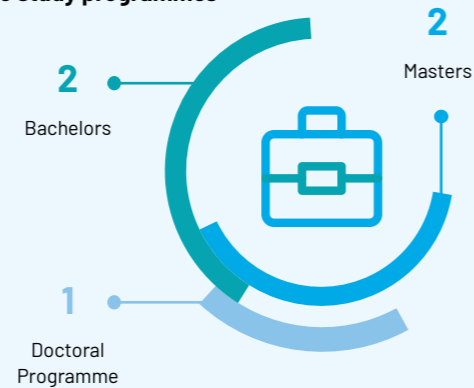
5 research areas



170 members



5 study programmes



Funding and collaborations

- €30 million acquired in new research projects in 2020-2022
- 8 FNR ATTRACT fellows since 2010
- 4 ERC grant holders, including one Advanced
- 3 ERC proof-of-concept grants and Luxembourg's first EIC grant

Publications

- 150 peer-reviewed articles in scientific journals (2022)

Editorial

In 2021-2022, a different way of working and living continued to shape our life. With incredible commitment and creativity, The Department of Physics and Materials Science (DPhyMS) has continued on its successful trajectory! In 2021, the DPhyMS team was reinforced with the co-affiliation of Associate Prof. Alexander Skupin (Luxembourg Centre for Systems Biomedicine), and the addition of two new theory groups headed by Prof. Adolfo del Campo and Associate Prof. Aurelia Chenu. This presents new perspectives for the department and puts us on a path towards a comprehensive Physics and Materials Science Department.

We have established a department structured into five topical clusters with a broad interdisciplinary spectrum of expertise, excellent researchers, and highly competent employees, which results in breakthrough discoveries published in top-level international journals, multiple prestigious ERC, EU, FNR, and foundation grants, as well as strong partnerships with local and international industry. Among others, we

obtained, in 2021-2022, one highly coveted EIC-Pathfinder grant, one ERC-Advanced Grant, one MSCA Individual fellowship, four IAS-projects, one John Templeton Foundation Grant, a collaborative grant with Janssen Pharmaceuticals and another one with Boehringer-Ingelheim, an unrestricted gift from Google, and thirty FNR grants including an FNR-ATTRACT grant.

We continue to actively contribute to the intellectual life of the country via local outreach activities. In 2021-2022, we interacted with the general public to explain science in a creative and interactive way via our participation in the "Portes Ouvertes Luxembourg", and we organised regular workshops to engage with high school students.



Prof. Alexandre Tkatchenko, Head of DPhyMS

More information: dphyms.uni.lu



Staff

New Professors

Aurelia Chenu

In 2021, Aurelia Chenu joined the University as a Research Scientist and a candidate for the ATTRACT grant. She is now Associate Professor and an FNR ATTRACT Fellow. Her research project aims to establish a competitive and ambitious research programme in quantum science and technology.



Adolfo del Campo

Adolfo del Campo joined the University in 2021 as Full Professor of Theoretical Condensed Matter Physics working at the interface of theoretical physics and quantum information technologies, such as quantum computing and quantum metrology.



PhD stories

Evandro Martin Lanzoni

Experience at University: Evandro investigated how post-deposition treatments boost the power conversion efficiencies of solar cells

Current position: Postdoctoral Researcher, University of Luxembourg

Martin Stöhr

Experience at University: Martin's work was to gain fundamental understanding and accurate description of nano-scale systems in realistic settings.

Current position: Postdoctoral Scholar, The PULSE Institute & SLAC National Accelerator Laboratory, Stanford University, USA



Postdoc stories

Maria Belén Farias

Experience at University: Belén worked on the theoretical study of light-matter interaction in topological systems, open quantum systems and quantum thermodynamics.

Current position: Research Scientist, University of Luxembourg

Research

Better understanding quantum chaos

The quest for the understanding of complex quantum systems and their properties occupies a central stage at the frontiers of physics, with applications ranging from material science to black holes. The pursuit of this quest has motivated emergent quantum technologies such as quantum computation.

Quantum systems are often characterised by discrete energy levels and a powerful approach to foster the understanding of complex systems. The ubiquitous coupling to the surrounding environment makes such an approach of limited use in many experimental scenarios. Indeed, environmental effects are generally believed to suppress quantum features through a process known as decoherence.

"In our study, we have shown that certain environments characterised by balanced gain and loss naturally provide a spectral filter that brings out the statistical correlations between energy levels. In turn, this facilitates the identification of physical properties such as chaotic behaviour. The findings establish a bridge between numerical methods for the study of complex quantum systems and their simulation in the laboratory" explains Julien Cornelius, Bachelor student in Physics supervised by Prof. Adolfo del Campo.

The groundbreaking findings were published in the renowned [Physical Review Letters](#) in 2022. ■



Improving solar cell efficiency

High efficiency is a key factor for solar cells because this reduces the cost of the whole system: less area is needed for the same electrical output. Conventional solar cells are becoming so good, that they get close to their theoretical efficiency limits. A large step forward can be achieved with tandem solar cells, which are essentially two solar cells on top of each other which make much better use of the solar spectrum.

A solar cell developed by physicists from the University of Luxembourg in partnership with Uppsala University was certified in 2021 with an efficiency of 14%, which came close to the world record of 15.5%. "We are working on new top cells for such tandem cells, based on chalcopyrites. By improving the bulk of the absorber and improving the interface with the contact layers, we could make a large step forward in the efficiency of these stable top cells. The next step will be to actually integrate them into a tandem cell", explains Prof. Siebentritt, Head of the Laboratory for Photovoltaics.

These new findings were published in the international journal of energy research [Joule](#) in 2021. ■



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Studies

Doctoral Training Unit ACTIVE: a great success

The Doctoral Training Unit ACTIVE aims at training 14 PhD students in the emerging field of active systems, i.e. systems subjected to nonequilibrium driving forces keeping them away from thermodynamic equilibrium. The focus of the DTU ACTIVE is on the multiscale organisation of primary metabolism as the essential mechanism to keep living systems out of equilibrium. The links between intramolecular energy transfers, enzyme activity and nutrient exchanges will be analysed from the perspective of active interactions at the molecular, cellular and population level. The integration of these complementary approaches will lay out more general strategies to study active interactions in mesoscopic systems and provide new insights into the nonequilibrium organisation of life.

Elected by the Luxembourg National Research Fund (FNR) under the PRIDE programme, the DTU ACTIVE brings together 9 internationally leading research groups in Biology, Physics and Engineering at the University of Luxembourg. The PhD students have the unique opportunity to work in a multidisciplinary and collaborative environment that brings together theory with analytical and computational approaches of active living matter and cutting-edge experiments from life science across various scales (molecular, cellular and population level). ■



● More information: cls.uni.lu/doctoral-training/

Outreach

Energy Balance project: high-school students calculate their energy score

The Energy Balance project started a couple of years ago from a shared idea that leapt through the minds of a multi-disciplinary group of scientists with different expertise at the University: how can we calculate our energy footprint? What can we do to raise awareness? Can Luxembourg go 100% renewable?

In trying to answer these questions, Prof. Phillip Dale, Dr. Michele Melchiorre and Dr. Alfredo Capozucca came up with the idea of a project/workshop to educate high school students and the public about renewable energies and the balance between energy demand and energy production.



The combination of a web-based energy calculator with hands-on experiments gives participants an understanding of the energy value of different daily activities and how the sum of these makes a national total energy use. Through experiments, participants calculate the energy that can be produced in Luxembourg using photovoltaic, wind, biomass and human cycling technologies. Finally, participants visualise how much land surface of Luxembourg is required to fill with renewable energy technologies given their energy demand,

explains Prof. Dale, Head of the Laboratory for Energy Materials.

In just one year, the workshop has reached out to more than 650 high-school students and 30 teachers and around 300 persons during the Open Lab Day. In addition, several students were hosted as interns in the labs, and the website e4l.uni.lu counted more than 1400 energy scores.

The Energy Balance project was funded by the Luxembourg National Research Fund (FNR) and is now part of the Scienceteens Lab workshops. ■

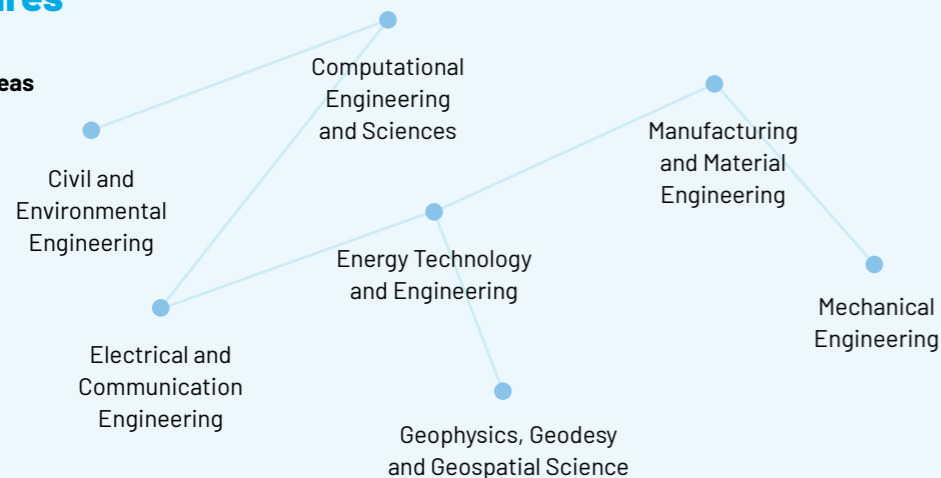
● More information: scienceteenslab.uni.lu



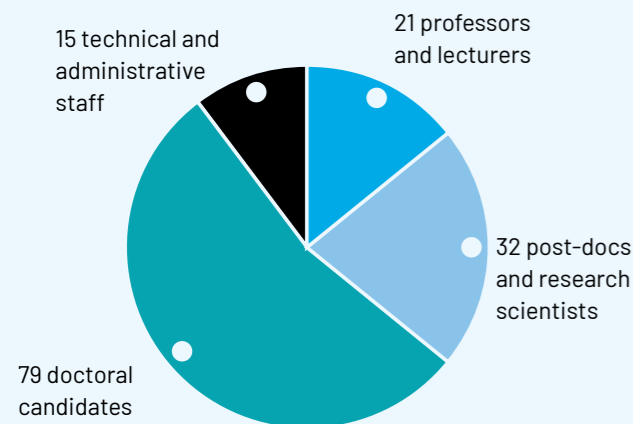
Engineering

Key figures

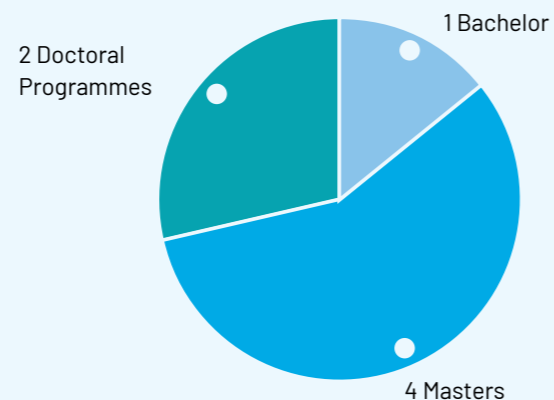
7 research areas



147 members



7 study programmes



Funding and collaborations

- 32 new projects started: funding of ~ €5.5 million, 60% as collaborative projects with industry and public institutions (FNR funded or directly sponsored by industry/institutions)

Publications

164 peer reviewed articles in scientific journals (2022)

Editorial



The past year has brought attention to rising energy costs, including transportation fuels, home heating, and industrial electricity and natural gas.

In 2022, a major contribution in this area was the creation of the Paul Wurth Chair in Energy Process Engineering with the aim to conduct cutting-edge research in the field of hydrogen processing and related aspects of carbon-neutral industrial processes. This new chair perfectly complements the faculty's energy-related research and education activities as part of the sustainable development pillar of the Department of Engineering.

To manage this Chair, Prof. Bradley Ladewig was appointed in April 2022 with the mission to build up a new research laboratory focusing on hydrogen-related materials and technologies that address critical gaps in the European context. Prof. Ladewig quickly became integrated into the University and Luxembourg's energy and innovation ecosystem. In addition, two new professors joined the

Department of Engineering (DoE) in 2022, Inès Chihi and Christian Vincenot who reinforce our team in the fields of smart metering and modelling.

In parallel, the engineering study programmes address, among others, the urgency of decarbonising industry and society. All four Master programmes, for example, offer courses on different aspects of sustainability, such as energy-efficient building, sustainable transportation systems, resources management, and sustainable products.

The Department of Engineering is proud to contribute to Luxembourg's continued economic success for a decarbonised future, thanks to the support of key industrial partners like Paul Wurth and ArcelorMittal, and public stakeholders.

Prof. Stephan Leyer, Head of DoE

• More information: doe.uni.lu



Staff

New Professors

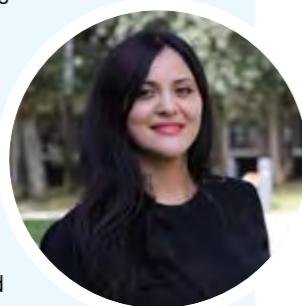
Bradley Ladewig

Bradley Ladewig is passionate about research and education in the area of green hydrogen. He was appointed Paul Wurth Chair holder in April 2022 and is working to build up a diverse and talented team to work on topics like ammonia to hydrogen conversion, integrated hydrogen and energy projects with industry, and novel concepts for ammonia or green hydrogen in steelmaking.



Inès Chihi

In January 2022, Inès Chihi joined the University as Assistant Professor and Head of the Advanced Engineering and Smart Sensors Solutions laboratory. Her research work allows to close the gap between theoretical and applied engineering to solve scientific and complex problems related to estimation, identification, measurement, and smart sensors.



Christian Vincenot

Christian Vincenot started his tenure at the University in October 2022 as Associate Professor in modelling and simulation of complex systems. He will strive to develop the field of complex systems analysis at large. He also intends to help pioneer the development of ecological research at the University.



PhD stories

Marie-Alix Dalle

Experience at University: Marie-Alix developed an observation tool to improve the energy efficiency of a low-tech desalination process.

Current position: Green Research Engineer, ArcelorMittal



Christina Schubert

Experience at University: Christina focuses on the acceptance and integration of storage technologies by addressing the needs of and benefits for grid operators.

Current position: Product Manager Energy Storage, J.M. VOITH SE & Co. KG, Germany



Pascal Loew

Experience at University: Pascal developed a numerical model to predict the lifetime of rubber gaskets.

Current position: Manager, Tesla Automation, Germany



Research

Better use of water in sustainable buildings

Efficient management of water as a resource is nowadays a major challenge in sustainable buildings. In conventional water concepts for households, the different wastewater streams are collected in one pipe and sewered through the drainage system to a centralised wastewater treatment plant. In general, household wastewater can be divided into black water (water from toilets) and grey water (everything beside the wastewater from toilets). Each of these streams has specific characteristics. When they are kept separated, further treatment and resource recovery can be performed in a more effective way.

In sustainable concepts, grey water has been identified as a potential stream for water reuse in applications such as toilet flushing, washing machines or irrigation of flowers, greens, etc. "The advantages in reusing grey water for sustainable buildings are multiple: it replaces potable water use, contains nutrients beneficial for plant growth, and implies potential cost reduction for the centralised wastewater treatment plants. The main disadvantage is that treating greywater in a decentralised way is performed mostly in small technical installations which lead to high energy consumption, high operation costs and

that need regular maintenance from experts", explains Prof. Joachim Hansen, Head of the Urban Water Management Lab at the University of Luxembourg.

In two INTERREG (European interregional cooperation programme) projects (EmiSûre and CoMinGreat), researchers from the Water Lab at the University of Luxembourg have developed and tested specific constructed wetlands as an additional treatment step for micropollutant elimination from municipal wastewater. The main idea of the project is to adapt this technology on greywater. The main approach is to develop and test a modular-designed system for greywater treatment from households, based on Constructed wetlands with special substrate (biochar from plants), and then use the treated water as a decentralised solution in sustainable buildings.

Beside lab-scale investigations, a pilot plant will be located in the Lycée Edward Steichen of Clervaux for the duration of 15 months. The project is funded by the Administration de la gestion de l'Eau aiming to save potable water in line with the scope of the European Commission's Circular Economy Action Plan. ■



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Predicting the future of transport and mobility in Luxembourg

In recent years, the fast growth of the population, the workplace relocation of major firms to the outskirts of the capital city, together with the strong development and implementation of innovative transport and mobility services have complexified the urban dynamics and created major challenges for planning.

Therefore, the project MERLIN (Multimodal Electrified infRastructure pLannIng) was launched in 2018 with engineers from the University to provide a decision support tool for the government and for the info-mobility operator. Multimodality and electro-mobility were the central elements considered in this project.

Funded by the European Research and Development Fund (ERDF) and supported by the Ministry of Economy, the MERLIN project was finalised in the beginning of 2022. Three new monitoring and planning tools were developed for Luxembourg: a mobility data portal able to acquire continuous data from multiple sources, predict future mobility trends and visualise different KPIs; a 24h multimodal planning scenario and a 24h agent-based microsimulation platform of Luxembourg.

The project successfully delivered all intended outcomes, which were greatly appreciated by the funding agency.

"MERLIN has been an excellent example of how investments on research can facilitate the creation of new approaches for guiding policy and planning decisions. The project has exceeded the expectations in different ways. It has generated new knowledge in mobility and transport analysis through the development of innovative models, and it has evolved during the project life in response to the fast evolution of data collection and computational technologies. Moreover, it has delivered very useful tools for storing and analysing mobility data and for simulating the complex multimodal transport systems in Luxembourg", comments Bob Simon from the Ministry of Economy.

"Moreover, it facilitated visibility and excellent career opportunities for many of the team members working on the project. MERLIN represents the perfect marriage of fundamental research based on the three principles of computational sciences (data, modelling and simulation) and problem-driven development", comments Francesco Viti, Professor in Engineering science traffic planning and management transportation engineering, who led the project. ■



Studies

Master in Energetical and Financial Efficiency: great opportunities for students

Launched in 2014, the Master en Sciences de l'Ingénieur - Efficacité Énergétique et Économique combines technical elements with units from economical sciences and business administration in the aim of providing the full range of skills required for approaching technically and commercially energy related problems. Since its creation, 32 students have been graduated and are now mainly working as energy engineer within private or public companies.

Elisa Urbain who studied this Master received the "Prix d'Excellence" from the Fondation Enovos in 2021 for her Master thesis "The heat pump, as a reference installation within the luxembourgish legislation". The purpose of this work was to define the maximum acceptable noise limit produced by the heat pump for regulatory drafting.

"In order to achieve the European climate targets and with a view to become independent from fossil fuels, Luxembourg has decided to integrate the heat pump as a benchmark in the Luxembourg legislation on residential buildings. In my thesis,



I carried out a market study considering different parameters such as noise intensity, the location of noise measurement, the type of installation, the nature of the habitat environment, etc. These values were then compared with those of other neighbouring countries. In order to conclude, using practical cases, representing different arrangements in Luxembourg's neighbourhood, limit values were proposed", explains Elisa. ■

More information: meee.uni.lu

Outreach

H2 Think-Tank: fruitful discussions about a European H2-economy

In July 2022, European stakeholders and experts came together on Kirchberg Campus to discuss Luxembourg's and Europe's hydrogen economy and technologies. More than 100 participants from academia, industry and government attended the event organised by the University of Luxembourg in collaboration with the European Investment Bank (EIB), Paul Wurth and EnBW Energie Baden-Württemberg.

The conference was held in the form of a H2-Think-Tank Meeting, which consists in presentations and a forum for discussion and exchange on hydrogen and all derived products. Over the course of the event, participants had the opportunity to learn and exchange about the general context and perspectives of hydrogen in Luxembourg, the integration of renewables with the energy system and legal aspects and norms for integration with the industry.

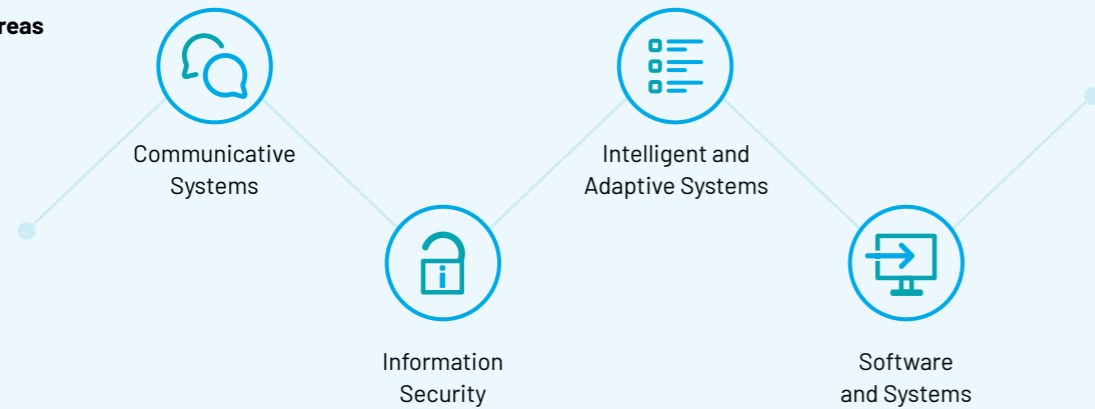
Researchers from the University of Luxembourg, the Luxembourg Institute of Science and Technology (LIST), Belfast Metropolitan College and Indian St. Joseph's College of Engineering and Technology focused on their last findings while representatives from Bosch, Creos, EnBW, Paul Wurth, Rotarex shared their experience from the field. Among the dignitaries present were Mr. Claude Turmes, Luxembourg's Minister for Energy and Ms. Elena Yorgova-Ramanauskas, State Secretary at the Saarland Ministry of Economic Affairs, Innovation, Digital Affairs and Energy. ■



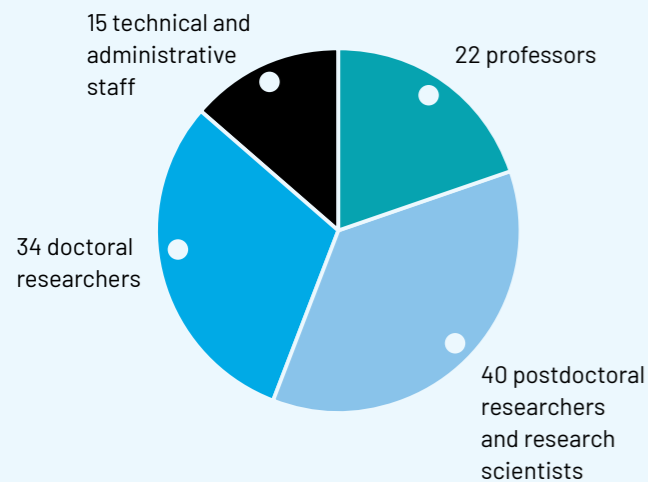
Computer Science

Key figures

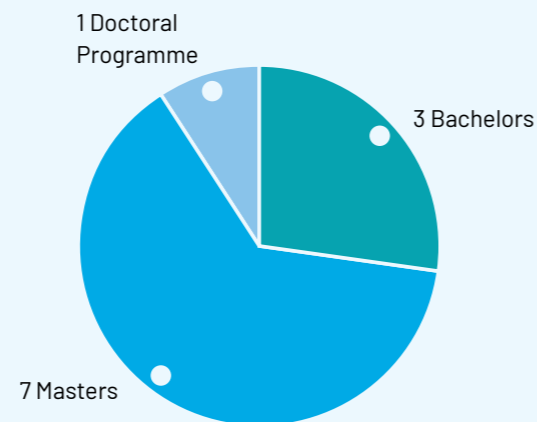
4 research areas



111 members



11 study programmes



Publications (2022)

- 77 peer-review articles in scientific journals
- 134 conference papers

Editorial

The Department of Computer Science (DCS) has significantly expanded its research and outreach activities in the field of artificial intelligence, modeling and high-performance computing (HPC) in the last two years. Over that time span, three new specialised Master programmes were also created by the department to meet the needs in quickly emerging areas such as HPC.

The research activities on Machine Learning and Human-Computer Interaction were reinforced with the arrival of Prof. Luis Leiva in 2021. In a short time, he has developed high-level research, teaching and international collaborations with the acquisition and coordination of an EIC Pathfinder Challenge grant of 4 million euros in AI-driven data visualisation and a Future and Emerging ICT grant of 2 million euros in Brain-Computer Interfaces.

In addition, the new supercomputer AION officially inaugurated in 2021 brings to the University and its partners a powerful tool for research and innovation based on intensive computing

and large-scale data analysis, particularly used in computer science, materials physics, bio-medicine and life sciences, cryptology and artificial intelligence, but also digital history or socio-economic simulations.

To meet the quickly growing societal needs for academic and professional education in computer science, the Department launched, in 2021 the Master in Technopreneurship and, in 2022, the first pan-European High Performance Computing pilot Master's programme EUMaster4HPC and an Erasmus Mundus Master in Cybersecurity. To further improve the teaching quality, the Department has also initiated the certification of its study programmes by international agencies, with already three programmes officially accredited by the German Accreditation, Certification and Quality Assurance Institute (ACQUIN).

Nicolas Navet, Head of DCS

More information: dcs.uni.lu



Staff

New Professor

Luis Leiva

Luis Leiva joined the University as Assistant Professor in Machine Learning and Human-Computer Interaction in February 2021. His research group conducts fundamental and applied research in computational interaction.



PhD stories

Jim Barthel

Experience at University: Jim solved several variants of the simultaneous Chinese remainder problem, with potential applications in cryptography.

Current position: Teacher in mathematics and computer science, Lycée Classique d'Echternach, Luxembourg.



Christof Ferreira Torres

Experience at University: In collaboration with Spuerkeess and the Technical University of Munich, Christof developed several techniques that would help developers write safer smart contracts.

Current position: Postdoctoral Researcher, Secure & Trustworthy Systems Group at ETH Zurich, Switzerland.



Sviatlana Höhn

Experience at University: Sviatlana analysed participants' orientation to linguistic identities in chat and introduced data-driven computational models for communicative intelligent computer-assisted.

Current position: Postdoctoral Researcher, LuxAI, Luxembourg.

Research

Spresso: Historical newspaper photography goes supercomputing

While supercomputers are traditionally being used in physics, material science and advanced chemistry, the Spresso project entails the very first formal cooperation between the LuxProvide that operates the Luxembourgish supercomputer MeluXina, the Bibliothèque nationale du Luxembourg and an interdisciplinary team of researchers from the University of Luxembourg, to explore the automatic enhancement of 20th century historical newspaper photography at a large scale through deep learning algorithms. For years, press photography has played an integral role in shaping the image of countries, humans and events in the minds of newspaper readers all over the world. As such, these images provide an invaluable source for historians.

Newspaper photos were printed using a process called half-toning and its characteristic dot pattern.

The Spresso project is focused on digital copies of these half-toned images. "By applying a super-resolution algorithm based on deep learning models to the scanned half-tone images, Spresso has created new synthetic images from the source material with an often surprising degree of detail, eliminating the previously existing patterns that degenerated the image quality", explains Luis Leiva, Professor in Machine Learning and Human-Computer Interaction. ■



Improving security in future automotive networks

In 2021, the University of Luxembourg and Honda R&D Europe decided to work together to investigate and develop new efficient and secure in-vehicle communication technology. The research project SETICA "Securing time critical traffic in automotive networks" was launched with the support of the Luxembourg National Research Fund (FNR).

Today's vehicles incorporate more and more enhanced services such as smartphone integration, autonomous driving, connectivity, and entertainment for passengers. These services require a large number of sensors that have to exchange information via the in-vehicle network.

The goal of SETICA is to combine time-sensitive networking with media access control security and adapting these protocols to the automotive domain, which is of the essence for future vehicles in terms of safety and security as well as comfort. This requires answering challenging research questions and thorough evaluation.

"SETICA" will generate significant value, researching and developing important future technology to be used as key communication technology in vehicles", comments Prof. Thomas Engel, Head of the Security and Networking Lab at the University of Luxembourg. ■



Studies



Master in Information and Computer Sciences: a well-established training

Launched in 2005, the Master in Information and Computer Sciences has graduated 288 students equipped with very good knowledge in computer science and high-level skills in one key subject among artificial intelligence, communication systems, information security, reliable software systems and information systems engineering. The programme has been very successful with graduates finding career opportunities easily as analyst developer, business analyst, cloud engineer, consultant, cyber security analyst, data scientist, product developer, research assistant, software engineer in renowned companies.

In September 2021, the programme was accredited by the German Accreditation, Certification and Quality Assurance Institute (ACQUIN). "The Master with its modular structure has the advantage to be continuously updated via a dynamic set of profiles to stay in touch with the quickly evolving research in computer science. In addition, the programme is very project-oriented and offers interdisciplinary work within a research or industry environment. The multilingual and intercultural environment empowers the students to work both individually and in multinational teams", comments Pierre Kelsen, Study Director of the Master.

More information: mics.uni.lu

What I appreciated most about the Master in Information and Computer Sciences was not only the flexibility of the profile choice, allowing the exploration of a wide range of subjects, but also the many opportunities to work with research teams in exciting and innovant projects. The many research teams are easy to reach and always welcome motivated students by implicating them in various studies and projects that yield beneficial experience for the students,

says student Elliott Bonte.

© Sophie Marque



Outreach



In 2021-2022, two new workshops in computer science were launched in the frame of the Scienceens Lab, the first research lab for high-school students in Luxembourg. Supervised by experienced scientists and teachers from various disciplines, the Scienceens Lab offers hands-on experiments to give students an insight into scientific research and the day-to-day work in the lab.

Developed by Régine Poussin, Research and Development Specialist at the University, 50 sessions were already attended by 677 high school students and the interest in this field is growing with the addition of digital sciences course within secondary schools in 2021-2022. ■

Art and Artificial Intelligence

In this workshop, participants discover that artificial intelligence can be used to create works of art. Through presentations and hands-on activities, this workshop highlights the importance of data and how it can be used to train intelligent machines, and let the participants form their own opinion on AI. The workshop also invites them to reflect on questions such as: Can intelligent machines perform art? Does computer science involve or even require creativity?

"Students learn how to design an unplugged AI and use computer programming to produce drawings," details Régine Poussin and teenagers were really interested "I liked the way how the workshop was cheerful and fun! That was a nice experience to do! Thank you!", comments one of the participants. ■



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© Olli Eichholtz/Agency Kontext

Think, talk and act like a robot

In this workshop, middle school students explore algorithms, coding and robotics in order to compare how humans and robots act or react. The hands-on activities allow pupils to answer questions such as: What makes robots different from humans? Do robots think differently than humans? How can we interact with robots?

"We explore the basics of computer science and apply them to the Alpha Mini robots. The workshop was designed to support the Digital Science classes and excite students for computer science", explains Régine. Students showed enthusiasm as one mentioned: "I really liked the workshop, I have learned and enjoy".

Other projects are already in progress such as the creation of new workshops on data, Chat GPT, autonomous vehicles and the creation of a new platform to attract especially girls to computer science (testit.uni.lu). ■

More information: scienceenslab.uni.lu



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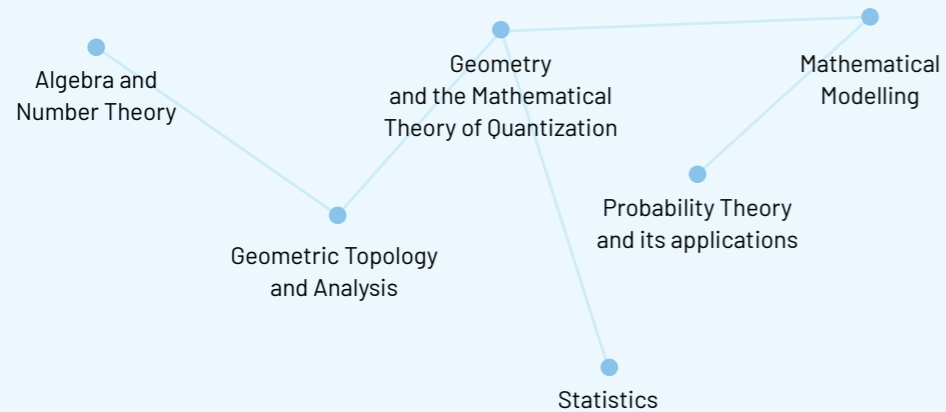


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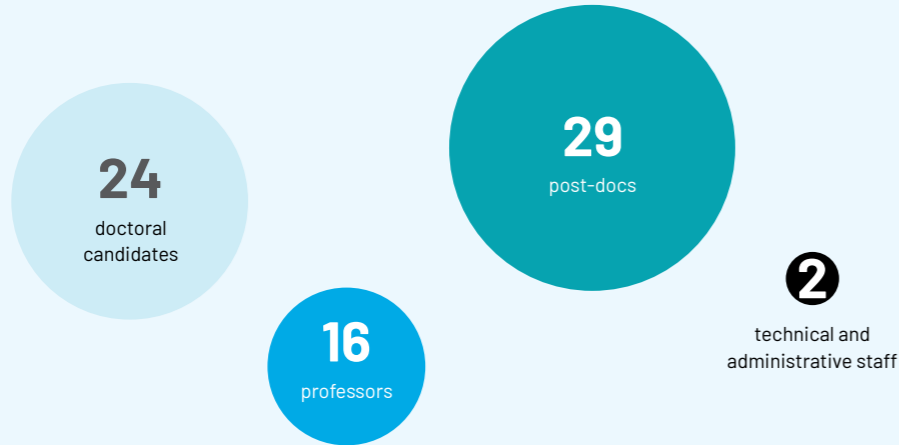
Mathematics

Key figures

6 research areas



170 members



Funding and collaborations

- €2.9 million acquired in new research projects (2022)
- FNR-funded interdisciplinary doctoral programme in Mathematical Tools for Complex Data Structures DTU MATHCODA (€1.2 million)

Publications

107 peer-reviewed articles in scientific journals (2022)

Editorial

Progress in modern science is largely attributed to the development and application of mathematics in the analysis of models arising from natural and social phenomena. Research in fundamental mathematics plays a key role in this process. Luxembourg recently acknowledged this importance by including applied mathematics within its National Research priorities as of 2020.

Thanks to its worldwide recognition, the Department of Mathematics (DMATH) has managed to secure prestigious grants to support its stellar research. In 2021-22, DMATH secured 4 out of 7 OPEN grants awarded by the FNR, covering topics in algebra, geometry and probability. In addition, two AFR grants were secured to help foster the collaboration with the National University of Singapore in both probability and geometry. The Department has also reinforced its team in statistics and algebra with the arrival of Christophe Ley and Pieter Belmans in 2021.

Launched in September 2021, the Master of Data Science provides students with the necessary skills to solve complex problems with data in different contexts. Future graduates will be able to face the new challenges of the digital transformation. This is a very promising Master.

Last but not least, the outreach activities have expanded rapidly since 2021 with, on the one hand, the launch of new projects such as the Math Day Competition, the participation at the Universal Expo in Dubai, the installation of Exploratis at the Luxembourg Science Center, the creation of a visual mathematical dictionary and, on the other hand, the pursuit of other activities such as MATH.en.JEANS, Girls Exploring Mathematics, Mathematical Careers Day and Math Day.

Giovanni Peccati, Head of DMATH



More information: dmath.uni.lu



Staff

New Professors

Christophe Ley

Christophe Ley joined the University in November 2021 as Professor in statistics with the aim to reinforce the growing team of statisticians to boost research and training in mathematical statistics and data science in Luxembourg.

Pieter Belmans

Pieter Belmans joined the University of Luxembourg in August 2021 as Assistant Professor, specialised in algebraic geometry. His work combines ideas and tools from algebraic geometry with noncommutative algebra and representation theory.



PhD stories

Sebastiano Tronto

Experience at the University: in his thesis, Sebastiano treated different aspects of Kummer theory for commutative algebraic groups, with particular emphasis on explicit and effective results.

Current position: scientific software consultant, ALTEN, The Netherlands

Andrea Tamburelli

Experience at the University: Andrea studied various aspects of the geometry of globally hyperbolic anti-de Sitter 3-manifolds.

Current position: Assistant Professor, University of Pisa, Italy



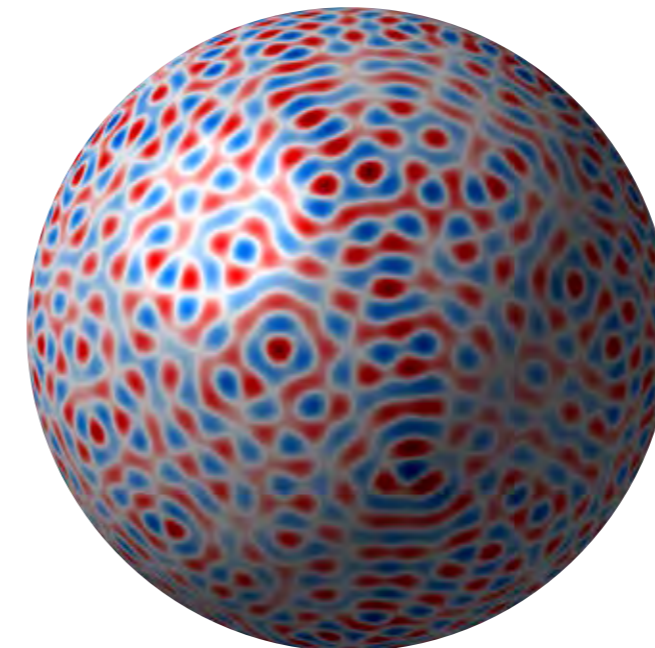
Research

Towards novel tools of stochastic analysis

Mathematicians from the University of Luxembourg focused their research at the intersection of probability and geometry. As such, they explored certain geometric features of Gaussian random fields on manifolds by introducing novel tools of stochastic analysis – in particular, a new way of coupling Gaussian fields by exactly controlling the decay of certain integral operators.

One of the main achievements of our work is a small-scale fluctuation result for a class of generic approximate Laplace eigenfunctions, known as monochromatic random waves. These fluctuations are deduced by coupling monochromatic waves with the so-called Berry's random wave, a conjecturally universal object which has been the object of intense study for several decades, explains Giovanni Peccati, Professor in Stochastic analysis and financial mathematics.

Their findings were published in the renowned journal [Communications in Mathematical Physics](#) in 2022. ■



A bridge between hyperbolic geometry and high-energy physics

Hyperbolic geometry was discovered in the XIXth century as an answer to an ancient question in mathematics, the independence of Euclid's Parallel postulate. It has regained a central role in the 1980s, when hyperbolic structures turned out to play a key role in Thurston's geometrization programme in 3-dimensional topology. More recently, 3-dimensional hyperbolic manifolds appeared in quantum gravity, where they emerge as possible backgrounds of the theory in a limit where a number of more refined aspects are neglected. This point of view led to new notions, such as a "renormalised" volume of infinite-volume hyperbolic manifolds, that were useful to prove new results in hyperbolic geometry and related areas of mathematics.

One of the central tenets of modern quantum gravity is the AdS/CFT correspondence, a conjectural but well-established "holographic" principle, relating quantum gravity in certain spaces to conformal field theories on their boundaries. In this collaboration with Edward Witten – a highly respected scientist, known for many fundamental contributions to both high-energy physics and mathematics – techniques developed to study hyperbolic geometry are used to propose a solution to an apparent paradox emerging from the AdS/CFT correspondence.

The paper was published in the [Journal of High-Energy Physics](#) (JHEP 25th anniversary special issue). ■



Studies

Training high-level researchers in complex data analysis

The Doctoral Training Unit "Mathematical Tools For Complex Data Structures" (MATHCODA) was launched in 2022 with the aim to train a new generation of researchers, possessing a full mastery of the mathematical tools that are needed for modelling and statistically analysing data structures displaying non-standard features, such as high-dimensional components, complicated topological structures or long-range dependence.

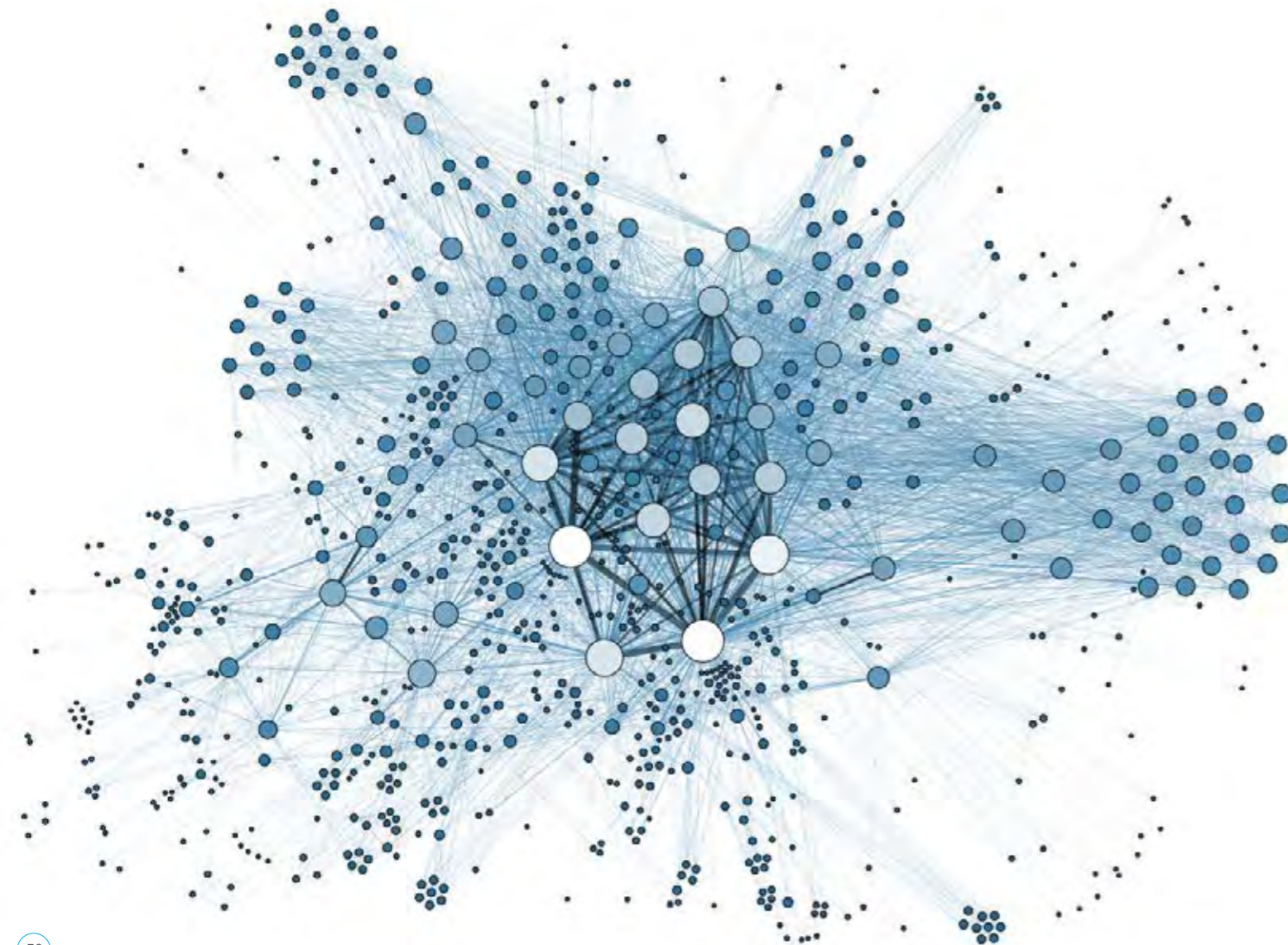
Since the turn of the millennium, technology has allowed the collection and storage of increasingly complex and large data sets, which has spurred significant advances in medicine, meteorology, engineering, finance, social sciences, and many more areas. Most of these advances rely on strong mathematical foundations.

The recent pandemic, the associated financial crisis, or even the recent floods in Luxembourg and neighbouring countries, have demonstrated that modern societies keep facing new challenges involving many intertwined factors, and that

researchers and practitioners need flexible mathematical tools for analysing the resulting complex data structures.

"Therefore, it is of the utmost importance to train a new generation of scientists to take up these challenges and build novel, high-performance tools for modelling and statistically analysing complex data", says Prof. Giovanni Peccati, coordinator of the project.

The project is funded by the FNR and will benefit from the collaborative and multidisciplinary work from a team composed of mathematicians, engineers and backers. ■



Outreach

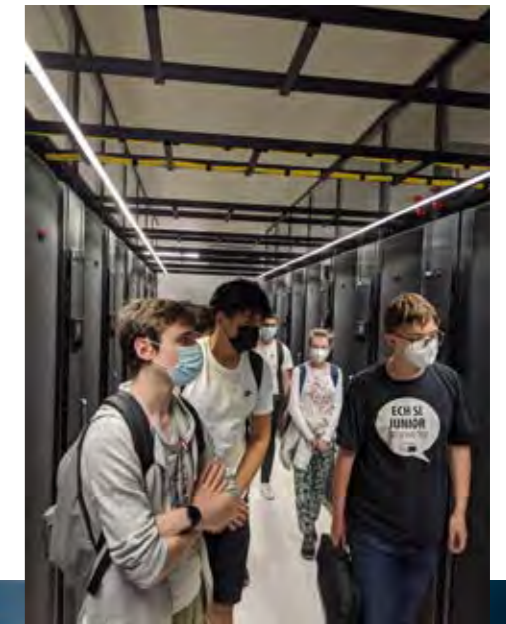
Data Science Summer School: raising awareness about data science

In July 2021, the University of Luxembourg organised the first edition of the Data Science Summer School on Belval campus, gathering 12 secondary school students to learn more about data science. They enjoyed a lot the interactive activities and exchanges with mathematicians from the University.

High school students had the opportunity to learn more about four topics: information theory, probability, artificial intelligence and statistical learning. Different interactive classes, exercise sessions, visits and informal discussions punctuated the week. In addition, they had the opportunity to visit the Restena facilities and discover the transmission of information in the Luxembourgish network and the coding of data for the fiber-optic cable.

The event was organised by the Department of Mathematics at the University in the frame of the ERA Chair in Mathematical Statistics and Data Science (SanDAL) and with the support of the Scienseens Lab.

"Despite the pandemic situation, we have succeeded in organising the event on site. Students were really interested, asked a lot of questions, we were very impressed by their level in mathematics and their readiness to learn", comments Prof. Antonella Perucca, coordinator of the project. ■



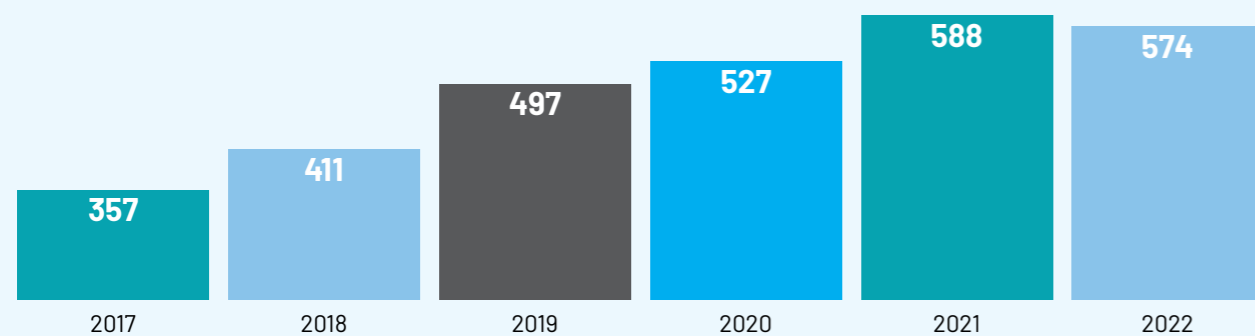
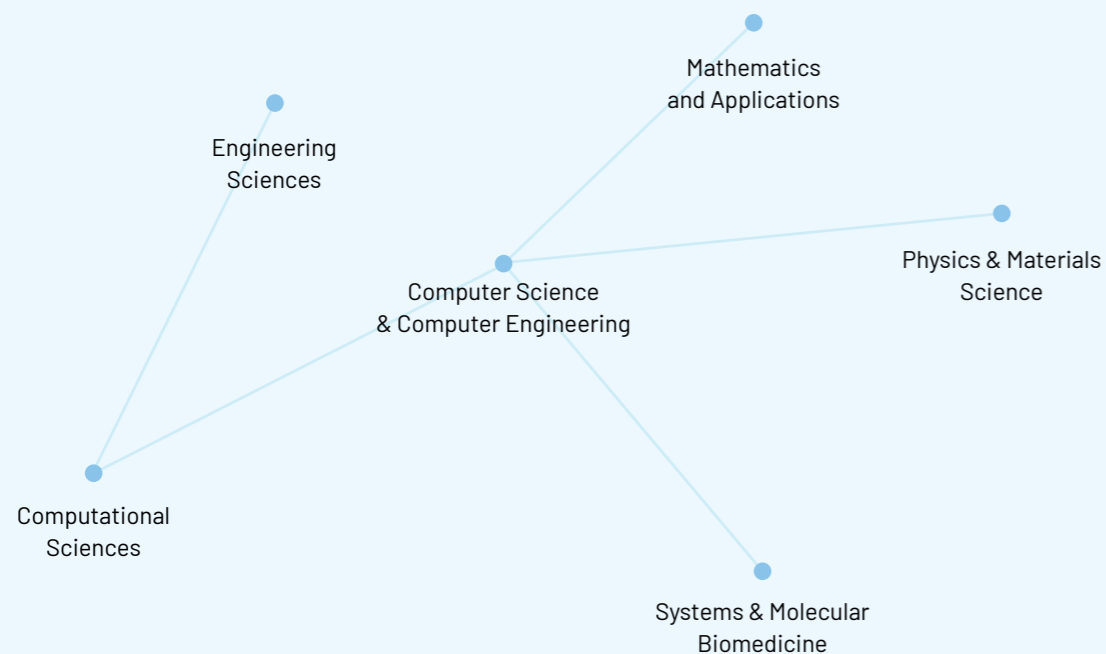
Doctoral School in Science and Engineering

Key figures

More than **580 doctoral candidates** from **60 countries**

273 Supervisors

6 Doctoral Programmes



Editorial

The Doctoral School in Science and Engineering (DSSE) is the largest doctoral school at the University of Luxembourg with close to 600 enrolled PhD students. The DSSE organises training and education of young researchers within scientific disciplines such as mathematics, physics, engineering, computer science, computational and life sciences. We aim to ensure the highest possible scientific level among the next generations of researchers. The DSSE provides training for PhD candidates in required scientific skills as well as complementary competencies and transferable skills.

The PhD projects generally last three to four years and include an independent research project, stays at other/international research institution(s), PhD level courses, teaching and other types of knowledge dissemination. The PhD is concluded by writing and defending a PhD thesis in front of an international jury of experts from the research field.

PhD candidates of the DSSE are central actors of the research conducted at FSTM laboratories and departments.

Progress of research projects and programmes often heavily rely on the motivation, perseverance, creativity and hard work that PhD candidates dedicate to their projects. The DSSE provides the organisational backbone to all activities required to complete a PhD life cycle. We are dedicated to providing the best possible organisation and administration so that students can concentrate on becoming independent researchers with excellent skill sets.

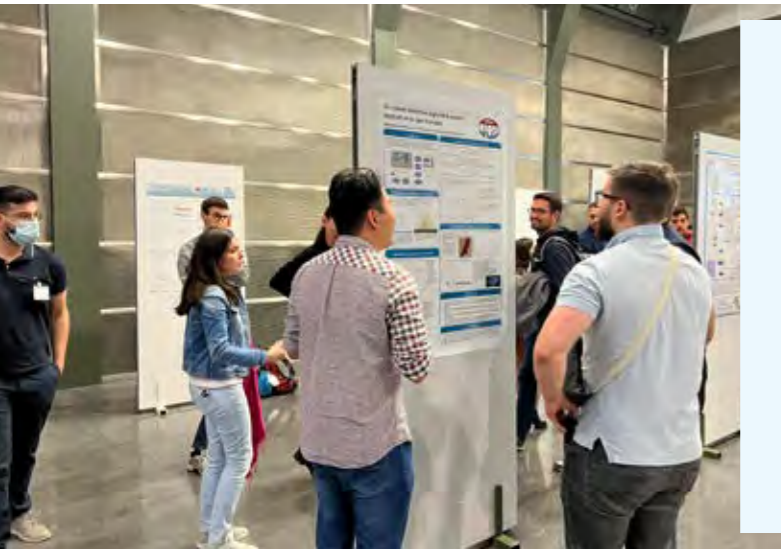


Prof. Stephanie Kreis, Head of DSSE

More information: dsse.uni.lu

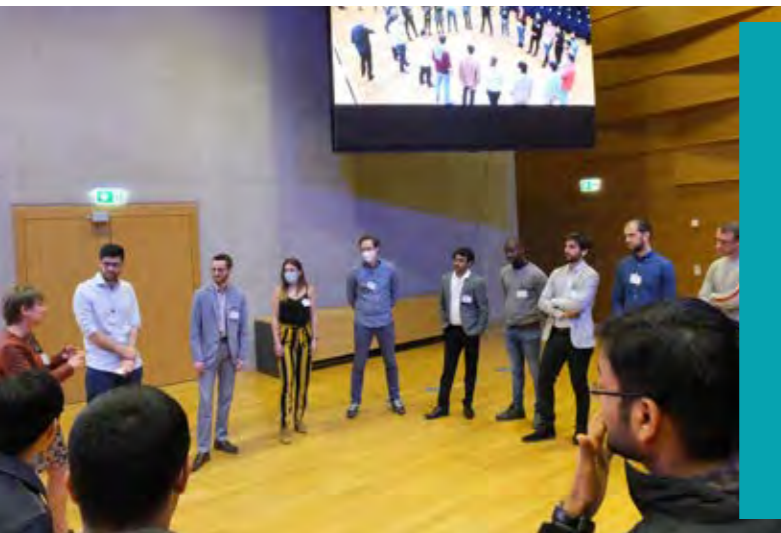


Activities



Broad range of courses

From 2021 to 2022, DSSE and the 6 programmes organised more than 100 courses, which were attended by more than 1000 doctoral candidates. Besides the many courses organised by the programmes and the university, training offer set up by DSSE was enlarged with courses, among others, on teaching, presentation and writing skills.



Getting to know each other

Several exciting events have been organised to exchange, to meet each other and create a living network of doctoral candidates. Presentations, informal talks and team building activities took place during the Physics PhD days and Computational Sciences workshop. In addition, a writing café and a research day was organised for Engineering doctoral candidates to support them in their writing. Doctoral Candidates in Mathematics had also the opportunity to experience an international journey at the University of Milano-Bicocca in Italy.



Supporting candidates

PhD student representatives were very active in supporting doctoral candidates in many ways as well as organising additional social activities. "Serving as a representative for PhD students has been an incredible experience. It was always a pleasure collaborating with fellow representatives, DSSE administration, and the office of the vice-rector, our interactions always offered a learning experience. Looking back at some of the fruitful changes gives me immense satisfaction. I can't thank everyone enough for this unique opportunity", comments Saurabh Deshpande, Doctoral Candidate Representative.

Enjoying research



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Awards

Rolf Tarrach Prize

The Rolf Tarrach Prize for the best PhD thesis of the University of Luxembourg was conferred to Dr Martin Stöhr by the Amis de l'Université in July 2022. His outstanding work on "Van der Waals Dispersion Interactions in Biomolecular Systems: Quantum-mechanical Insights and Methodological Advances", under the supervision of Prof. Alexandre Tkatchenko was really appreciated by the jury.

"It was a great honour to be selected from the pool of outstanding candidates for this year's Rolf Tarrach Award. Since I defended my thesis during a time of social distancing, discussing my work and celebrating science with friends and a broad audience during the award ceremony was particularly special to me", says Martin.



© Amis de l'Université



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Foundation August Laval prize

The Fondation Auguste Laval Prize 2022 was awarded to Alvar Torello Massana for his thesis "Electrocaloric coolers and pyroelectric energy harvesters based on multilayer capacitors of $Pb(Sc_{0.5}Ta_{0.5})O_3$ "

"In my thesis, we studied a novel cooling technology called electrocaloric cooling. It is based on solid-state materials (ceramics and polymers) that have the capability to change their temperature when they are connected to a battery. The way it works is the following: when connected, electrocaloric materials increase their temperature. This is nice. But what is even more interesting is that when disconnected from the battery, they cool down! This thermodynamic cycle can then be embedded into corresponding devices to make air conditioners and fridges. This is exactly what I did in my thesis, to develop novel electrocaloric demonstrators and push their performance close to the real values that real applications demand, which had never been done. In this journey, we have crossed key milestones imposed by the cooling industry that make us be very optimistic about the future of this technology", explains Alvar.

Pelican Grant

For the 2022 Pelican Grant edition, five international students were awarded: Catherine Delbrouck, Andrea Scafidi, Elisa Gomez De Lope, Kyriaki Barmpa and Susanne Gonder.

The Fondation du Pélican, under the aegis of Fondation de Luxembourg, yearly awards several doctoral candidates affiliated with the systems and molecular biomedicine programme of the Doctoral School in Science and Engineering (DSSE) at the University of Luxembourg with the "Pelican Grant". This grant may be used for research expenses, such as costs for additional experiments or travel expenses to participate in conferences and training workshops, as well as to finance short-term stays abroad in the context of research collaborations.



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University Excellent PhD Thesis Awards

The DSSE awarded 10 doctoral candidates in 2021 and 13 in 2022 for their outstanding doctoral theses. Their research covers a wide variety of topics, tackling important issues and providing innovative solutions. Besides having achieved outstanding research results, the academic excellence of the awardees is also reflected in the fact that all of them maintained a career in research and that most of them moved on to work at academic institutions within and beyond Europe.



2021 awardees:

Jérémy Dauphin
Khouloud Gaaloul
Alireza Haqiqatnejad
Susanna Martinez Arbas
Cosme Milesi-Brault
Yamila Omar
Cui Su
Martin Stöhr
Emiliano Torti
Valentino Vigneri
Hannah Würzer



2022 awardees:

Lynn Bonetti
Alessio Buscemi
Laura de Nies
Christof Ferreira Torres
Salah Ghamizi
Đình Hiếu Trần
Arnaud Mazier
Nhật Minh Doãn
Emanuele Penocchio
Christina Schubert
Mohit Sood
Alvar Torelló Massana
Giuseppe Vitto



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Doctoral Education in Science Communication (DESCOM)

Editorial

Science and research aim at helping us to understand our world. It is one of the main drivers of modern societies and impacts probably all areas of our daily life. But due to the increasing complexity of academic activities and an exponentially growing amount of data and research outcomes, it is getting more and more difficult for lay audiences to navigate within the daily stream of information and knowledge, to evaluate the quality of a piece of information, or to understand the validity of a research result.

Science communication presents research results not only within the scientific community but communicates it in an understandable way at large scale to wide audiences and therefore helps to empower individuals to make informed decisions, supports their autonomy and independence and ultimately supports democratic societies. On the other hand, science communication is needed to maintain and enhance trust in science and research.

DESCOM (Doctoral Education in Science Communication) focuses exactly on this: providing training to young scientists in Luxembourg in order to improve their science communication skills. The programme is open to all doctoral candidates in Luxembourg, irrespective of their field of research, and it offers courses and activities to convey theoretical knowledge as well as to provide hands-on experiences. Through its outreach activities, DESCOM also fosters networking and cooperation of the different institutions in Luxembourg involved in science communication.

In 2021-2022, around 100 doctoral candidates participated in the activities of DESCOM. ■



Serge Haan, Vice-Dean

● More information: descom.uni.lu



Science Communication Course

Since January 2021, the Science Communication Course, a four-day training offered in the transferable skills course catalogue of the University, has been conducted four times. Altogether, a total of 68 doctoral candidates from different fields of research participated. The course participants acquired an understanding of basic concepts of science communication and were introduced to different tools of science communication. All three courses received a good to very-good evaluation by the participants.

Pocket guide

Based on the science communication course, a pocket guide was published in 2021 to give an introduction into science communication. Interested scientists, researchers and science communicators can find theoretical knowledge as well as practical tips on science communication. Readers can also find chapters on stakeholders, core messages, language, strategy, organisation and brand building as well as basic information on different channels of science communications.

● More information: scicomguide.uni.lu

Internships

DESCOM also offers several opportunities for internships in science communication at different partner institutions. Doctoral candidates get the opportunity to gain hands-on experience in institutions of the DESCOM network. Doctoral candidates get the opportunity to gain hands-on experience and get to know the work environment and daily tasks in this field. Even though the pandemic posed major obstacles, altogether 12 doctoral candidates took the opportunity and engaged in science communication during a two to three weeks long internship.

Laure Pauly, doctoral candidate at the DSSE, took the opportunity to do an internship at the Luxembourg National Research Fund (FNR).



The hands-on experience acquired during my internship allowed me to develop my science communication skills and to further deepen my curiosity for sharing my passion for science.

Laure Pauly

Science Writing Competition

Following the launch of the first Science Writing Competition by the University of Luxembourg in June 2021, five persons were awarded for their excellent writing: Daniele Proverbio, Lilia Hassouna, Marie-Alix Dalle, Nicolas Stamets and Hichem Omrani.

Working in research and/or innovation in Luxembourg, the five awardees submitted excellent articles about science and research, which the Jury honoured with several prizes. The submissions were anonymised and evaluated by an interdisciplinary jury consisting of representatives from the FNR, the LIH, the LIST, as well as the three faculties of the University. ■

Comics

To get young scientists involved in science communication and gain practical skills, DESCOM offers several outreach activities in which they can participate. One of those activities was the production of Volume 2 of LUX:plorations, a comic book about research activities of doctoral candidates in Luxembourg.

21 doctoral candidates collaborated with Luxembourgish comic artists and developed comics about their various research topics. They produced eight stories which bring science and research in Luxembourg closer to the reader by showing what scientists work on and what their daily lives look like.

Each story is centred around a different scientific topic, for instance, how historians and engineers can collaborate

to enhance the analysis of historic data, or how bacteria develop resistance against antibiotics. By using this visual medium, the young scientists wanted to interest the public, mainly high-school students, in science.

The comics were published in 2021 in five languages (English, French, German, Luxembourgish and Portuguese). Until the end of 2022, around 9,500 copies were distributed during various events at national level such as the University Open Day, Nuit de la Culture, Science Festival and at international level at Comic Con Brussels and LuxCon 2022. The comics have also been broadcasted in exhibitions at the Luxembourg Learning Centre and the Luxembourg Science Center. ■

More information: descom.uni.lu

● More information: sciencecomics.uni.lu



Celebrating

Since 2021 and more prominently in 2022, the faculty has resumed organising promotional and festive events such as the Open Day in March to present teaching programmes; the Welcome Day in September to enable new students to learn more about the University; the General Assembly to gather members of the faculty during an informal event and the Graduation Ceremonies to congratulate the new graduates. ■



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