



translate

waste heat to electricity

newsletter

ISSUE 3 - JULY 2024




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Professor Justin D. Holmes

Welcome to the third issue of the TRANSLATE project newsletter! We are delighted to share with you the progress and achievements of our team as we continue our journey towards developing a sustainable solution for converting waste heat into electricity using porous membranes.




Over the past year, our team has been hard at work, building on our successes since our [previous newsletter](#) . Our research highlights over the last 12 months include:

- **Numerical simulations by TUD have shown that ionic liquids hold promise as electrolytes for thermoelectric conversion. This finding has recently been published.**
- **UCC have demonstrated that nanowood membranes can generate significant thermovoltages when exposed to a temperature gradient.**
- **UL have successfully developed electrodes with a low voltage threshold for efficient energy storage.**

The excellent project management and communications support provided by UCC Academy has been vital to the project's success. We are grateful for their dedication and expertise in ensuring smooth coordination among our partners and facilitating effective communication within our team.

Furthermore, in the last 12 months, the TRANSLATE team gathered in Riga, Latvia for our 2nd General Assembly, participated in 5 outreach events and 8 other events, presented project results at 5 international conferences, produced 2 research publications, and much more.

We have also taken strides towards the commercialisation of our final device by participating in the EIC Tech2Market programme, showcasing the TRANSLATE project at the Enlit Europe event and partnering with relevant industries like Ardmore Shipping.

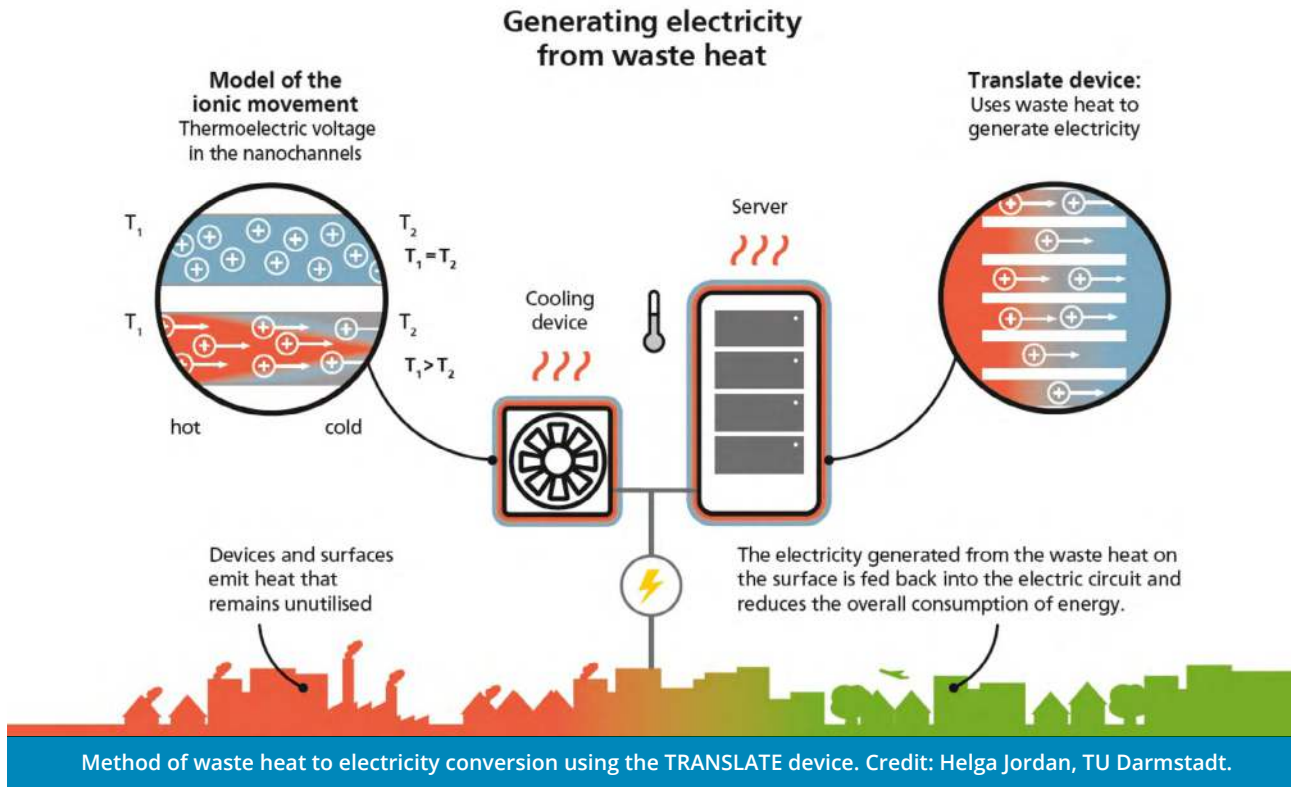
We invite you to stay connected with us through our [Twitter](#)  and [LinkedIn](#)  pages for regular updates on our project. If you have any questions or would like to know more about TRANSLATE, please feel free to reach out to us at translate@ucc.ie .

Thank you for your continued support, and we hope you enjoy reading the third issue of the TRANSLATE project newsletter!

Harnessing Waste Heat for Clean Energy

Imagine a world where waste heat - the energy that's often lost and goes unused - can be harnessed and transformed into valuable electrical energy.

Dr Ailbe Ó Manacháin



This vision is becoming a reality through the groundbreaking work of the TRANSLATE project. The project focuses on developing a novel platform that efficiently converts waste heat into usable electricity, all thanks to the selective movement of ions within nanoscale channels driven by temperature gradients.

At the heart of this transformative technology lies the concept of electric double layers (EDLs) forming within narrow channels. These overlapping EDLs initiate a selective surge of ions into these channels when exposed to temperature differences. This surge generates a higher thermovoltage, a core principle that underpins waste heat conversion.

The waste heat energy harvesting part of the TRANSLATE project is built on three key phases:

Phase 1: Building a Simulation Model for Single and Multiple Nanochannels

Firstly, researchers are creating a simulation model to optimise the design of electrolyte-filled nanochannels. This design is crucial for efficient thermal-to-electrical energy conversion. Through meticulous parameter

exploration, researchers can identify the most promising variables for enhancing energy conversion efficiency.

This step involves comprehensive simulations, backed by comparison with experimental data. The objective is to achieve an optimised multiparameter design/model at the single and multiple nanochannel level. This is being led by Prof. Steffen Hardt from Technische Universität Darmstadt (TUD).

Phase 2: Simulation Model Comparisons with Nanochannel Fabrication in Test Cell Designs – Optimisation of Multiparameter Cell

With the knowledge gained from simulations, the next phase focuses on creating engineered cells with specifically targeted nanochannels with comparison against simulation.

These nanochannels, formed within cost-effective but thermally resistive materials, serve as the foundation for generating high thermovoltages. Techniques like block co-polymer lithography and evaporation-induced self-assembly may potentially contribute to crafting precisely tailored channels.

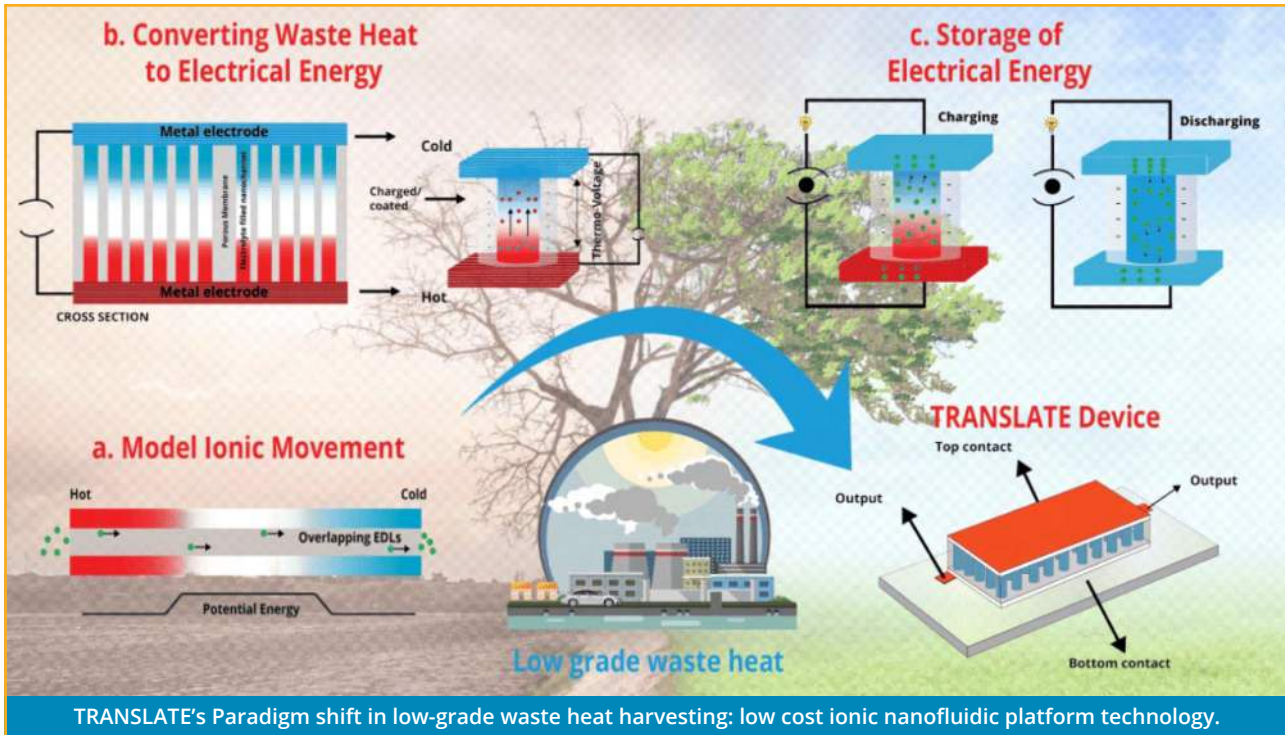
Harnessing Waste Heat for Clean Energy

An optimised balance between thermal, electrical, geometrical and ionic electrochemical multiparameter properties is essential to achieve a maximum thermovoltage generation.

Prof Steffen Hardt, along with Dr Satarupa Dutta and Dr Rajkumar Sarma of TUD are playing important roles in this phase.

experimental error bars within such an integrated assessment.

This comment was appreciated by Dr Ó Manacháin as such error assessment is certainly an intrinsic part of optimising any multi-parameter space. This approach considers the inherent uncertainties in experimental results and parameter variations.



Phase 3: Fabrication and Evaluation of Nanofluidic Energy Harvesting Multi-Cell Systems

The final phase of the energy harvesting objective merges the previous insights in Phases 1 & 2 into a holistic approach.

System engineering is applied to create multi-cell systems targeting specific operational parameters for thermoelectric energy conversion. In the pursuit of efficient waste heat conversion, the TRANSLATE project takes a comprehensive approach by considering multi-parameter combinations.

Senior Staff Scientist at University College Cork and TRANSLATE researcher Dr Ailbe Ó Manacháin's suggestion to create a combined 3D parametric overview for simulation and experimental comparison within a single graphical analysis from the phase 1 and phase 2 activities is a noteworthy step towards understanding optimal scenarios for this innovative technology.

The idea is to identify an optimised combination of parameters that would maximize waste heat conversion efficiency. TRANSLATE's postdoctoral researcher Dr Ievgen Nedrygailov contributes to the suggestion by emphasising the importance of incorporating

By doing so, the graph becomes a representation of combined trends. The real advantage of this combined graph lies in its ability to reveal overarching trends and correlations across a many-parameter space.

This insight can guide researchers towards understanding the interactions and dependencies between different factors, helping to formulate a more informed approach to waste heat conversion and providing important input into phase 3 of the plan.

Ultimately, the TRANSLATE project's dedication to exploring multi-parameter combinations and considering various perspectives is a testament to its commitment to revolutionising waste heat recovery and energy conversion.

The project's innovative spirit continues to push boundaries and pave the way for a sustainable energy future.

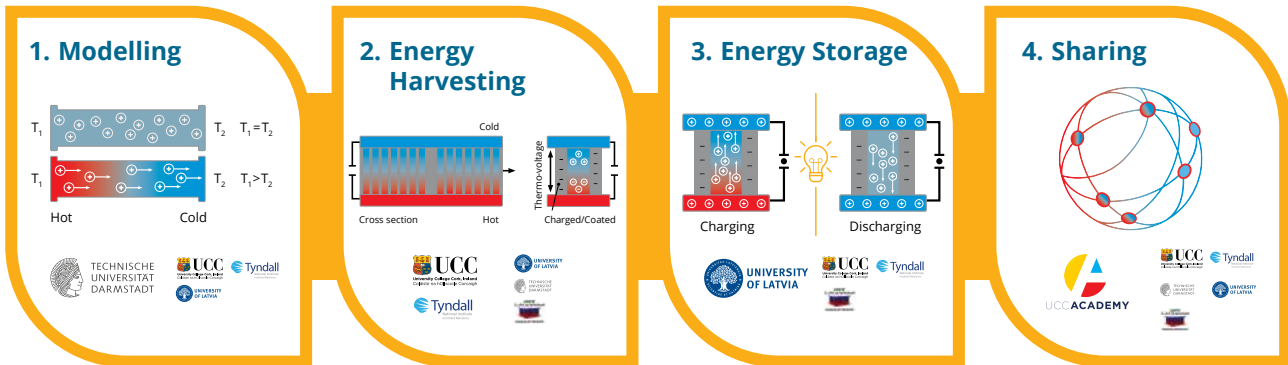
In this collective endeavour, the TRANSLATE project seamlessly blends simulation, fabrication, and integrated optimisation, forging a path towards renewable energy harvesting efficiency and innovation development.

The multifaceted nature of the project fuels the development of efficient waste heat conversion

Harnessing Waste Heat for Clean Energy

methodologies, contributing significantly to a greener, more sustainable energy landscape.

the potential of waste heat, moving us towards more sustainable energy solutions."



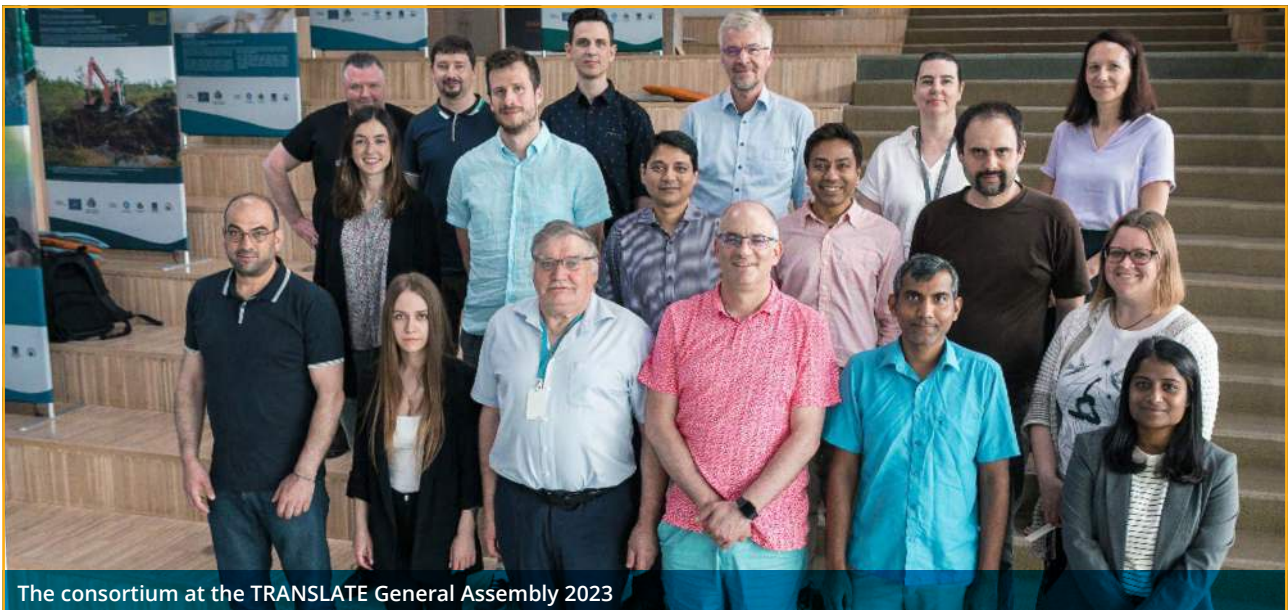
The pillars of TRANSLATE project

By advancing waste heat recovery and utilisation, the TRANSLATE project contributes to the development of cleaner energy sources. Through the collaborative efforts of dedicated researchers, the project explores

Learn about TRANSLATE's concept and device through this video series: <https://www.youtube.com/watch?v=wfnWPqXJv90>. We extend a special thank you to the individuals who organised and created these videos, bringing the perspectives of our teammates to life.

3rd TRANSLATE General Assembly Meeting

The annual General Assembly meetings serve as important moments for the TRANSLATE consortium, bringing together members to engage in comprehensive discussions on project advancements and future strategies.



The consortium at the TRANSLATE General Assembly 2023

Following the inaugural online gathering in 2021 and the subsequent meeting in Cork in 2022, TRANSLATE convened its third General Assembly at the University of Latvia's Academic Centre Nature House from May 25th to 26th, 2023.

With a turnout of 20 consortium members, the Riga meeting provided a platform for rigorous evaluation of ongoing research endeavours within TRANSLATE.

Progress on each work package was discussed, accompanied by strategic planning and documentation of actionable insights.



TRANSLATE group exploring the lab

Updates on project management, as well as dissemination, exploitation, and communication efforts, were shared to ensure alignment with project objectives.

A notable highlight of the Assembly was a dedicated workshop addressing present and future avenues for project result exploitation. Insights garnered from this session laid the groundwork for TRANSLATE's participation in the Horizon

Results Booster programme, underscoring the consortium's commitment to maximising project impact.

Additionally, attendees were treated to a comprehensive tour of the Academic Centre and its cutting-edge infrastructure, further enhancing collaborative spirit and appreciation for the host institution.

On the second day, researchers engaged in focused group sessions aimed at refining theoretical frameworks and delineating experimental research trajectories. Discussions encompassed project achievements, encountered challenges, and planning of next steps at both the work package and project levels.

The day culminated with the biannual Executive Board meeting, facilitating high-level decision-making and strategic direction-setting.

Special recognition is extended to the project management team, led by Professor Donats Erts (University of Latvia) and Rebecca Buckley (UCC Academy), whose meticulous planning and execution ensured the success of the General Assembly.

Their dedication and proficiency underscore the collaborative ethos driving TRANSLATE forward.

As TRANSLATE continues its journey, fueled by collective expertise and unwavering commitment, the General Assembly stands as a beacon of collaboration, innovation, and progress.



Dr. Irina Oliseveca from University of Latvia taking the team through the labs



The group observing the project ongoing

The EIC T2M Programme

TRANSLATE researchers Dr. Ievgen Nedrygailov and Dr Ailbe Ó Manacháin participated in the EIC Tech to Market (T2M) Venture Building Programme, which supports innovators in transitioning their projects from the lab to the market.

The EIC T2M programme specifically targets deep-tech innovative researchers funded under the EIC Pathfinder and Transition initiatives who have entrepreneurial aspirations.

During their participation, Ievgen and Scott represented TRANSLATE and showcased the market potential of the TRANSLATE technology. Their efforts were met with success, as the project was selected to progress to the next phase — the EIC Tech to Market Entrepreneurship Programme.

This phase provides comprehensive support to researchers throughout their entrepreneurial journey, guiding them towards the maturation of their innovative projects.

Here is Project Officer Abhisweta Bhattacharjee in conversation with Ievgen.

Abhisweta Bhattacharjee: What, from your perspective, were the advantages of participating in the EIC T2M Venture Building Programme?

Dr. Ievgen Nedrygailov: As a researcher, the primary output of our work is academic publications, which contribute to knowledge production. However, as scientists aiming to create real-world impact and drive positive change, we understand that publications alone are not sufficient. We aspire to develop practical devices or products that people can use and benefit from. This objective presents challenges as we must not only know how to create such innovations but also understand the needs and preferences of users.

Participating in the EIC Tech to Market Programme provided a valuable opportunity to engage with industry leaders and investors who possess deep insights into user needs. It was an enlightening experience to learn their thoughts on our research and receive feedback from individuals who may potentially utilise the devices we develop. This feedback was particularly valuable since it came from individuals who were not biased by working closely with us. They provided insights on how to enhance and make my research more appealing to end users.

By participating in such programmes, we gain direct knowledge from device users. Their perspectives and



expectations differ from those of colleagues who are aware of all the advantages and disadvantages. Understanding the needs and desires of regular consumers, who simply seek functional and user-friendly products, allows us to align our research to truly serve them.



"This Tech Demo Day was a great opportunity to talk to those people who drive this industry, who invest in the industry, so they know the needs of people. It was a great experience to see what they think about your research and how you can make it more interesting for end users."

AB: What did you think of the experts' comments during the interactions? Did you agree or disagree? Was it helpful or not what you expected?

IN: The feedback and questions from the experts proved immensely helpful. The questions posed during the various sessions were significantly



different from those typically encountered at research conferences or in internal discussions with fellow researchers. Researchers often focus on experimental methodologies, data analysis, and ensuring reliable results. However, the experts' questions delved into the practical use of the device, comparing its advantages and disadvantages to existing or emerging technologies.

I found their perspectives enlightening since these aspects are not typically at the forefront of our experimental planning or device design considerations. The feedback received provided valuable insights into understanding real-world needs.

Moreover, the timing of these interactions was advantageous as they occurred during the proof-of-concept phase, before the device's physical realisation. Now, as we enter the device design phase and explore potential applications, we can incorporate the experts' feedback to make informed decisions.

The experts' questions prompted us to explore various applications for the device, such as household lighting or mobile phone charging. Their inputs will guide our thinking about the device's future applications and related considerations.



"The experts' questions were more about the use of the device, its advantages and disadvantages compared to existing or developing technologies. This aspect is not something I normally take into account during experimental planning or device design. Now we can take this feedback and address all the questions raised by the experts, making informed decisions about our device's final design and potential applications."

AB: Do you have a clear understanding of the next steps for the TRANSLATE device after engaging with the experts and their questions about its applicability? What do you anticipate as the next decision-making process for the device in the innovation sector?

IN: Absolutely, the engagement with the experts and their questions regarding the device's applicability provided valuable insights and a clear roadmap for the next steps for the TRANSLATE project.

We recently finished the second year of the project, with various teams working on different aspects, including electrolyte materials, electrodes, membranes, and power management for the device. The next critical step is to integrate these components into a cohesive

device. We plan to combine the contributions of various teams to create the final device.

Based on discussions with investors and reviewers, we now possess invaluable guidelines and insights that will inform the device's design parameters. Considerations such as device size, output voltage, output current, and charging/discharging durations will be addressed, incorporating the feedback received during these interactions.

This phase marks a significant milestone, consolidating all research efforts into a tangible device. The input from experts and investors guides our decision-making process, ensuring the final device meets end-user requirements and aligns with industry expectations.



"Now we can think, OK, what should be the size of the device? What should be the output voltage, output current? How long should it be charged or discharged? All those things related to the parameters and design of the device will now be done after taking into account these discussions with investors and reviewers."

AB: Throughout your experience, was there any particular aspect that stood out as the highlight? Is there something you would like to emphasize as exceptionally valuable?

IN: Indeed, there was a standout aspect that I consider the highlight of the entire experience. It was the remarkable efficiency with which we prepared for our participation in the event. Despite having only a week's notice, we successfully addressed all the questions and requirements provided by the organisers.

Working diligently, we crafted a concise, yet informative presentation within the constraints of a five-slide format and five-minute time limit. Our effort in presenting our work clearly and convincingly paid off when we were selected for the next phase—the EIC T2M Entrepreneurship Programme.

The fact that we were able to deliver a concise and compelling presentation demonstrates our clarity of vision and the potential impact of our work. It was gratifying to see that our efforts resonated with the experts and evaluators, confirming the promise of our research in developing new technologies.



"We were clear in our presentation and were convincing enough to show that what we are doing is actually having some potential. It really can result in some new technology."

AB: Looking back at your experience, was there anything that could have enhanced your representation of TRANSLATE to the committee? This could be related to the internal project or aspects of the overall experience.

IN: There is an aspect that I believe would have enhanced my representation of TRANSLATE to the committee, which is access to basic information on marketing and transitioning research to the market. While I anticipate receiving such guidance through the EIC Tech to Market Programme, having this knowledge earlier would have been advantageous.

During the preparation for the presentation, we received a questionnaire from programme managers, which contained a wealth of information that was previously unknown to me. It introduced various parameters and values commonly discussed in commercial and industrial applications. Concepts such as payback time and cost of ownership were crucial considerations raised by investors.

As researchers, we often lack formal training in marketing management and may be unfamiliar with the language and parameters important in the business realm. Consequently, I devoted significant time to self-guided research, searching for papers on marketing and product management to grasp the language and understand the essential factors. This allowed me to respond confidently to investor questions and present myself as well-informed.

However, having access to this vital knowledge earlier would have reduced the need for extensive self-guided research and provided a stronger foundation for addressing marketing-related inquiries. It would have facilitated a seamless integration of research and market perspectives, enabling a clearer and more impactful representation of TRANSLATE to the committee. <https://zenodo.org/records/12608372>



"As researchers, we don't really have training in marketing management and having some basic information about how to introduce a resource or technology to the market? What language those people use and what parameters are important for them. So, this knowledge I didn't have before the meeting."

Functionalising Nanochannel Membranes

Dr. Kamil Rahme

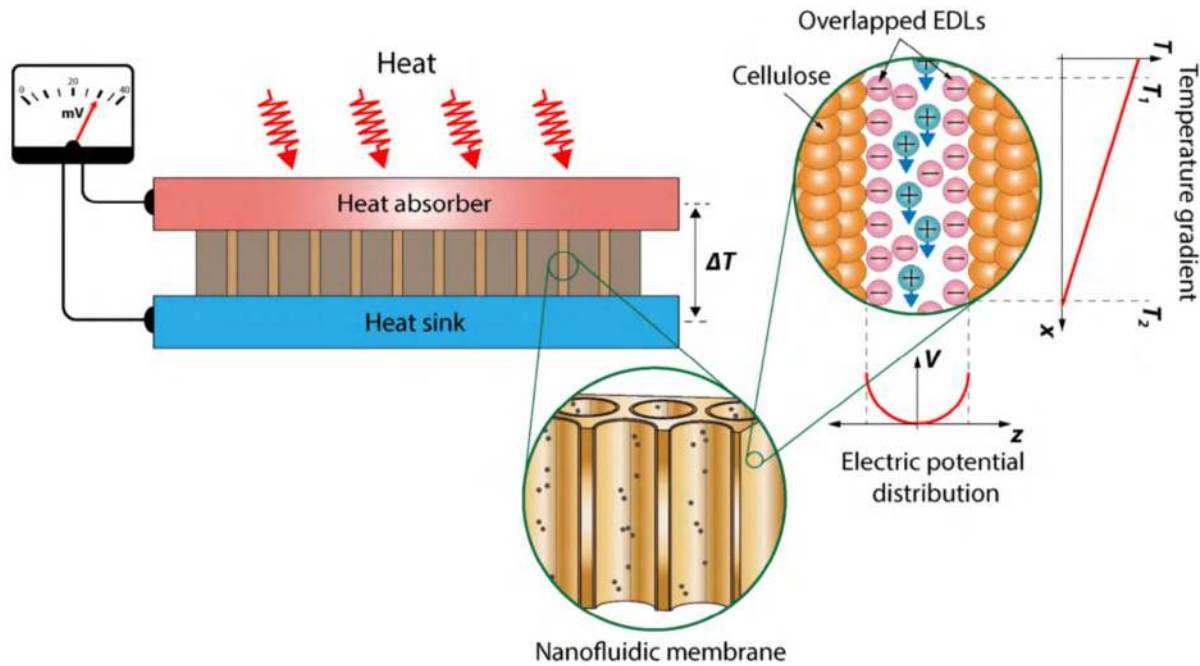
The TRANSLATE project's overarching objective is the development of a nanofluidic platform for efficiently converting waste heat into electricity.

While the project encompasses various facets, including electrode development and ion intercalation, the specific focus of Work Package 2, Task 2.2, centres on the functionalisation of nanochannel membranes to establish a charged surface and modify the charge densities on the inner surfaces of their walls.

The project's success hinges on the control of two important factors for nanochannel-based energy harvesting – permeability and selectivity. Charged nanochannels will attract counter ions and repel

co-ions leading to the creation of an electric double layer (EDL) at the channel walls. Moreover, EDL overlap within the nanochannels, is a critical element for the separation of ions and the effective conversion

of waste heat into electricity. This electric double layer, formed by a charged surface on the nanochannel walls, facilitates the selective movement of ions, thereby enhancing the thermovoltage.



Concept of electric double layer (EDL) facilitating the movement of ions within nanochannels.
Created by Dr Ievgen Nedrygailov, UCC

Coating the inner walls with organic ligands of different functional groups and charges leads to the formation of the electric double layer, and the attraction of oppositely charged ions.

For example, a negatively charged wall selectively attracts positive ions while repelling negative ones, leading to a charge separation that is a key factor for energy harvesting culminating in what we term an “ion-selective membrane.”

This ion-selective membrane allows the passage of one type of ion, augmenting ion flow and creating a higher voltage difference under temperature variation. This ion selectivity is integral to our project’s efficiency.

Achieving the necessary overlap of the electric double layer is crucial for the project’s success, with the nanochannel diameter serving as a pivotal factor.

Narrow nanopore diameters play a significant role in attaining the desired electric double layer overlap, allowing for the generation of high thermovoltages. The assessment of charged surfaces and their interaction with surrounding ions in the solution involves

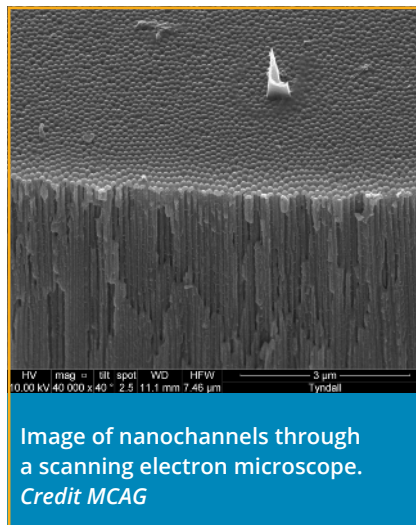


Image of nanochannels through a scanning electron microscope.
Credit MCAG

measuring Zeta potential values, specifically at a defined plane within the electric double layer.

My work over the past two years at University College Cork (UCC) has been devoted to this crucial aspect of the project – functionalisation of the nanochannel membranes.

My primary role involves the production of charged nanofluidic membranes. To make the membranes more sustainable, I have utilised materials such as anodised aluminium oxide (AAO) in

collaboration with the University of Latvia and explored polycarbonate and cellulose membranes with fellow TRANSLATE team member Anjali Ashokan.

Work on TRANSLATE also extends to the development of nanofluidic membranes, where I have explored materials such as graphite and polyelectrolytes to create films with incorporated nanochannels, deepening our comprehension of their properties. The significance of my work lies in contributing to the creation of functionalised nanochannel membranes.

Notably, the functionalisation process has a modest yet valuable effect on pore size, contributing to their narrowing and ion selectivity via enhanced charge density.

As stated above, this phenomenon enhances ionic conductivity, promotes electric double layer overlap, and increases the thermovoltage.

The long-term stability and performance of the device depends on a range of factors, including the materials used throughout the device, electrode selection, and membrane characteristics.

Functionalising Nanochannel Membranes

While ion separation and ionic movement are essential for large thermovoltages, the device's longevity and stability are contingent on the overall design and materials selected.

As of September 2023, our estimated progress in Task 2.2 stands at approximately 90%, with the successful functionalisation of nanochannel membranes marking a significant achievement. We are actively exploring the impact of functionalisation on ionic conductivity and thermoelectric behaviour.

This phase is currently underway, with numerous samples generated and ongoing collaboration with fellow researchers. Our remaining efforts are focused on studying the effects of functionalisation on ionic conductivity, thermoelectric generation, and the selection of optimal electrodes for the device.

Presently, I am actively preparing and dispatching a comprehensive set of functionalised samples for subsequent tasks within the work packages.

Our extensive sample collection includes a particular emphasis on those with the narrowest pore diameters, with ongoing exploration of even smaller sizes.

Our collaborators in the University of Latvia are diligently working on further reducing pore sizes through atomic layer deposition.

I am deeply appreciative of the opportunity to collaborate with an exceptional team on the TRANSLATE project, and our collaborative spirit is commendable.

I extend my gratitude to Professor Holmes for his impactful guidance. I am enthusiastic about our progress to date and eager to achieve even more in the future.



Dr Kamil Rahme working on the infiltration setup

Boosting our results through Horizon Results Booster

In the realm of research and innovation, the journey from groundbreaking discoveries in laboratories to tangible societal benefits is the principle of scientific impact.

Recognising the importance of this journey, the TRANSLATE project applied and were successful in their application for the Horizon Results Booster (HRB) initiative.

Understanding the Horizon Results Booster Initiative

The Horizon Results Booster (HRB), an initiative pioneered by the European Commission, functions as a pivotal catalyst in translating research endeavours into tangible societal benefits. Going beyond conventional Dissemination and Exploitation (D&E) obligations, the overarching goal of the HRB is to maximise the impact of publicly-funded research through free consulting services provided by a consortium of specialised companies

TRANSLATE's HRB Journey

The initiation of TRANSLATE's participation in the HRB began with our application for the Portfolio Dissemination and Exploitation Strategy. Selecting Module C, our overall aim was to improve our existing exploitation strategy. The application submission comprised a concise 1600-character

essay encompassing an explanation of the project, a summary of ongoing exploitation endeavours, and a clear articulation of anticipated benefits from the programme.

Upon approval, META Group initiated the service delivery for TRANSLATE. An introductory webinar was held on 28th August 2023 and served as an initial step, focusing on the project's needs, Key Exploitable Results (KERs), and the structural nuances of the programme. The objective was clear – to enhance the exploitation strategy by revising, complementing, and clarifying existing plans, identifying stakeholders, and performing risk analyses.

Following the conclusion of this meeting, META Group provided the necessary documents to finalise the preliminary report. This report was shared with us

Services of the Horizon Results Booster Initiative

<p>Exploitation service <i>Aim:</i> support single projects in exploiting their research results and enhance beneficiaries' capacity to improve their exploitation strategy</p>	<p>Module A</p>	<p>Identifying and creating the portfolio of Research & Innovation project results</p>
	<p>Module B</p>	<p>Creating the portfolio of results; design & execute a portfolio dissemination plan</p>
<p>Dissemination services <i>Aim:</i> to strengthen the capacity of Project Groups (PGs) in disseminating, maximising the dissemination of a portfolio of results & offering a wider and more complete view to potential users</p>	<p>Module C</p>	<p>Assistance, coaching and mentoring for go-to-market activities</p>

prior to a workshop scheduled after this, enabling us to thoroughly acquaint ourselves with its contents. Later refined as necessary into its final iteration, it served as the foundation for workshop discussions and activities.

The Horizon Results Booster Final Workshop was held on 20th December, 2023. The main aim was to brainstorm ideas related to the exploitation pathway for our Key Exploitable Results (KERs). The team discussed unique value propositions, go-to-market strategies, and the identification of early adopters. Discussions also revolved around potential markets for our future technology. Overall, the session facilitated important discussions and agreements on the exploitation strategy for TRANSLATE.

Programme Benefits

The focused workshops and expert guidance enabled the project team to refine and align their ideas, serving as a constructive checkpoint in the project for assessing and strengthening our exploitation intentions. Participation in the HRB solidified our thinking around

potential applications of the technology under development, and has served as important step in our journey to real-world application.

“Participation in Horizon Results Booster has helped define the project’s potential commercial strategy, providing invaluable support and guidance to enhance its impact.”

– Justin Holmes
 Principal Investigator & Project Coordinator

Looking Ahead

TRANSLATE will incorporate the learnings from the HRB into the latest version of the Dissemination, Communication and Exploitation plan, and include the report from META Group as an appendix to our periodic report.

Our journey with the HRB has served as a roadmap, guiding the project towards strategic decisions, refined exploitation plans, and enabling a better understanding of the commercial and societal value of its innovations.

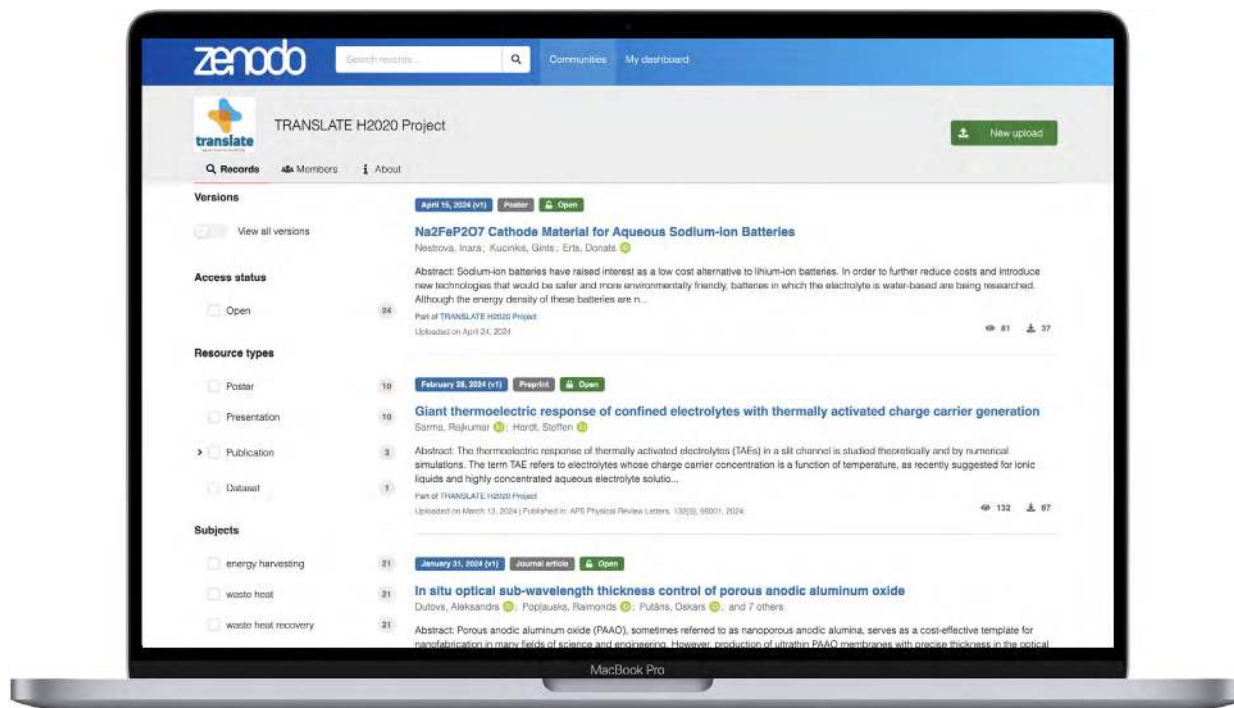
Research Resources

TRANSLATE is committed to Open Access research and is taking part in a European Commission pilot on Open Access to Research Data. All publications from the TRANSLATE project are freely accessible and published as open access articles at either gold or green standard.

Our research publications and data are stored in an [open-access data repository on Zenodo](#) to enable researchers to access, exploit, reproduce and disseminate our data in the future. This repository is validated as Open Access by OpenAIRE, with an associated [OpenAIRE project page](#)

Here is a list of recent TRANSLATE resources and publications with the link they can be accessed:

- **Innovation Radar Showcase:** Improved energy harvester with capacitor capabilities based on advanced nano-structures, whilst utilising Earth-abundant materials. [Click here](#)
- **Poster:** Comprehensive Comparison of Anodic Alumina Membrane Infiltration Methods: Electrolyte Selection, Membrane Stability and Flow Rate Characterization | [Zenodo](#)



- **Presentation:** Overview of TRANSLATE and Results to Date at the 80th International Scientific Conference of the University of Latvia | [Zenodo ↗](#)
- **Presentation:** Transport through nanochannels driven by electric fields and temperature gradients | [Zenodo ↗](#)
- **Poster:** Converting waste heat into electricity using cellulose membranes | [Zenodo ↗](#)
- **Presentation:** Characteristics of ionic transport in highly ordered nanoporous aluminum oxide membranes. | [Zenodo ↗](#)
- **Poster:** Functionalisation of nanochannels for the development of a sustainable and efficient low-grade waste heat harvester | [Zenodo ↗](#)
- **Presentation:** Ionic thermoelectric effect in nanofluidic membranes for efficient conversion of waste heat into electrical energy | [Zenodo ↗](#)
- **Poster:** European Researcher's Night at the University of Latvia | [Zenodo ↗](#)
- **Presentation:** Converting waste heat into electrical energy in ionic nanofluidic membranes | [Zenodo ↗](#)
- **Journal article:** A fully automated measurement system for the characterization of micro thermoelectric devices near room temperature | [Zenodo ↗](#)
- **Presentation:** Nanowood: Fully renewable, biodegradable, environmentally friendly, natural material for the next generation thermoelectrics | [Zenodo ↗](#)
- **Poster:** NiSe₂ modified Carbon Fibre Cloth as the High- Performance electrode for Thermally Chargeable Super Capacitors | [Zenodo ↗](#)
- **Dataset:** Data associated with the following publication: "A fully automated measurement system for the characterization of micro thermoelectric devices near room temperature" | [Zenodo ↗](#)
- **Poster:** TRANSLATE poster for Researchers' Night Latvia 2023 | [Zenodo ↗](#)
- **Presentation:** Thermovoltage Generation with Thermally Activated Electrolytes | [Zenodo ↗](#)
- **Poster:** Optimization of Nanoporous Membranes for Ionic Thermoelectric Harvesters | [Zenodo ↗](#)
- **Poster:** Insitu grown metal selenides (MX; M=Ni, Co; X=Se) on carbon fibre cloth as novel electrodes for thermally chargeable supercapacitors | [Zenodo ↗](#)
- **Presentation:** Thermoelectric Energy Conversion in Nanochannels Filled with Ionic Liquids | [Zenodo ↗](#)
- **Poster:** Infiltration Control of Highly Ordered Nanoporous Aluminum Oxide Membranes with Aqueous Electrolytes | [Zenodo ↗](#)
- **Presentation:** Preparation and Characterization of Electrodes for Na-ion batteries: Na₂FeP₂O₇ and Na_{0.67}MnO₂ | [Zenodo ↗](#)
- **Journal article:** In situ optical sub-wavelength thickness control of porous anodic aluminum oxide | [Zenodo ↗](#)
- **Preprint:** Giant thermoelectric response of confined electrolytes with thermally activated charge carrier generation | [Zenodo ↗](#)
- **Poster:** Na₂FeP₂O₇ Cathode Material for Aqueous Sodium-ion Batteries | [Zenodo ↗](#)

Conferences

74th Irish Universities Chemistry Research Colloquium 15th – 16th June 2023



Held at the Institute of Chemistry, University of Galway, this was a colloquium that included medicinal chemistry, organic chemistry, material chemistry and electro-chemistry.

TRANSLATE PhD students Rupa Ranjani and Anjali Ashokan presented two different posters - Anjali's poster was entitled '**Optimization of nanoporous membranes for ionic thermoelectric energy harvester**' (modified version reused from 7th Green and Sustainable Chemistry Conference), while Rupa's poster was entitled "**NiSe₂ modified Carbon Fibre Cloth as the High-Performance electrode for Thermally Chargeable Super capacitors**".

Materials Today Conference 2023 2nd – 5th August 2023

University of Latvia's Dr Irina Olisevca delivered a poster presentation entitled "**Comprehensive comparison of anodic alumina membrane infiltration methods: electrolyte selection, membrane stability & flow rate characterization**".



This is an Elsevier organised conference, organised in partnership with the Materials Today family of journals and offered the materials science community

a highly visible platform to showcase their latest and novel research alongside an outstanding list of invited speakers.

The focus highlighted forward-looking, novel materials science research contributing to solving global challenges including: Energy and sustainability, Soft and biomaterials, Advanced functional and structural materials.



iCOM - First Indian conference on Micro Nano Fluidics 29th September – 1st October 2023

29th Sep – 1st Oct, 2023
IIT Madras, India



The 1st Indian conference on
Micro Nano Fluidics – From soft matter to bioengineering

TU Darmstadt researcher Dr Steffen Hardt attended this first of its kind conference where research and industry were brought together.

Though he presented on another topic, Dr Hardt distributed TRANSLATE brochures to the attendees.

There was also a small industrial fair at the conference.

ADI European Technical Conference 9th November 2023

Project Manager Rebecca Buckley attended the 2023 conference on invitation of external advisor Colm Glynn.



Along with attending the talks, Rebecca met with Colm and gave him TRANSLATE goodies and flyers to hand out to colleagues working on projects relevant for TRANSLATE.

Over the course of two days, the event featured four parallel tracks consisting of Keynotes, Special Sessions, Workshops, Papers, Demos, and a Poster Expo.



With over 650 in-person attendees and streaming to our virtual audience, the programme aimed to foster conversation, collaboration, and coordination within the industry.

75th Annual Meeting of the APS Division of Fluid Dynamics (APS DFD) 19th – 21st November 2023

TRANSLATE researcher Dr Rajkumar Sama delivered a presentation entitled **“Thermoelectric Energy**

Conversion in Nanochannels Filled with Ionic Liquids”

The meeting focused on the theme of “Fluid Dynamics & the World’s Grand Challenges.”

Participants engaged in discussions related to emergent global issues, including education and inequality, water security, climate change, renewable energy, health, and our understanding of the universe.



It featured a diverse scientific program, including abstract presentations, invited talks, and mini symposia. Researchers and practitioners shared their latest findings and explored the intersection of fluid dynamics with real-world challenges.

8th Baltic Electrochemistry Conference: Finding New Inspiration (BEChem) 14th – 17th April 2024

TRANSLATE PhD student from University of Latvia, Inara Nesterova, participated with a poster presentation titled **“Na₂FeP₂O₇ cathode material for aqueous sodium-ion batteries”**, for which she was awarded the best student poster.



This conference was held in Tartu, Estonia, on April 14-17, 2024. The meeting was hosted by the Institute of Chemistry at the University of Tartu in collaboration with the Estonian electrochemistry society Elektrokeemia Selts.

The scientific program of BEChem 2024 focused on sustainable energetics, the application of operando and computational methods for the development of interfacial electrochemistry as well as finding new employment for prominent electrochemical measurement methods.

Outreach Events & Campaigns

Cork Carnival of Science 2023 10th – 11th June 2023

Kafil M. Razeeb, Kamil Rahme, Rupa Ranjani, Anjali Ashokan and Abhisweta Bhattacharjee comprised of the TRANSLATE team that participated in the Carnival.



The team received positive response from the visitors. The festival featured lots of different events including garden games, street cuisine and a packed line-up of live demonstrations, big top shows, hands-on workshops and entertainment.



Over the weekend the festival had about 25,000 visitors. A [short video](#) of the highlights of the Carnival was uploaded to the project YouTube channel.



Photographs showing different moments of the TRANSLATE team at the Cork Carnival of Science."

ERI Early Career Researcher lunch 20th July 2023

University College Cork's Environmental Research Institute hosted an early career researcher lunch where PhD student Anjali Ashokan presented an overview of the project along with latest findings. This event was attended by other early career researchers including PhD students and postdoctorates.

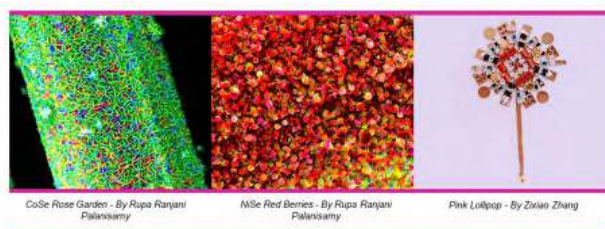


Anjali Ashokan presenting the project to PhD students and postdoctorates

STS Elionix Scientific Image Competition 28th July 2023

PhD student Rupa Ranjani and Tyndall researcher Dr Padman Narayanasamy won the Q2 2023 of the STS Elionix competition (Rupa - Blue Star Gooseberries | Padman - Co3O4 Blue Daisy Flowers).

Find more information about the winners [here](#) ↗



The winning pictures of STS Elionix Scientific Image Competition.

Tyndall Poster Presentation competition/event

1st August 2023

PhD student Rupa Ranjani presented a poster entitled "Insitu grown metal selenides (MX; M=Ni,Co; X=Se) on carbon fibre cloth as novel electrodes for thermally chargeable supercapacitors".

International Workshop on Thermo-electrochemical Devices (IWTED) 2023

7th – 8th September 2023

IWTED was the first event completely devoted to thermoelectrochemical systems, such as thermoelectrochemical cells (thermocells, thermogalvanic cells), ionic thermoelectric supercapacitors, and similar devices combining electrochemical phenomena with thermal processes.



In-person attendees of IWTED 2023

Dr Ievgen Nedrygailov from UCC delivered a presentation in person entitled **“Nanowood: Fully renewable, biodegradable, environmentally friendly, natural material for the next generation thermoelectrics”** ↗. TUD researcher Dr Rajkumar Sarma presented a talk online entitled **“Thermovoltage Generation with Thermally Activated Electrolytes”** ↗.

At the workshop, 30 researchers had the opportunity to disseminate their work, meet the invited speakers, enjoy scientific discussions, exchange ideas, and meet other international researchers and collaborators. Dr Nedrygailov’s **presentation** has been uploaded to the project’s YouTube channel.

European Researchers’ Night at the University of Latvia

29th September 2023

On the evening of September 29, within the framework of Researchers’ Night 2023, the University of Latvia (UL) hosted about 4,000 science enthusiasts in the Academic Center to show how diverse and fascinating science can be in experiments, discussions, games and lectures.

The UL TRANSLATE team was excited to meet everyone interested in science at the UL Institute of Chemical Physics. An active and engaging discussion was hosted with guests about the importance of converting low-grade waste heat into usable electricity and main paradigms of the TRANSLATE platform.

Hundreds of visitors, both children and adults, were able to transform the energy of flowing liquid and heat into electricity at our hands-on interactive workshop.



UL researcher demonstrating TRANSLATE’s principles to guests in University of Latvia’s Researcher’s Night

EU Energy Efficiency Day

12th October 2023

The second edition of European Energy Efficiency Day took place in a hybrid format. This high-level conference brought together leading policymakers, business players and civil society organisations.

The event was a unique platform to discuss energy efficiency as cost-effective and socially fair decarbonisation solution to achieve the EU Green Deal. Project Officer Abhisweta Bhattacharjee from UCC Academy attended the EU Energy Efficiency Day 2023 online and disseminated on social media.

STS Elionix Scientific Image Competition

31st October 2023



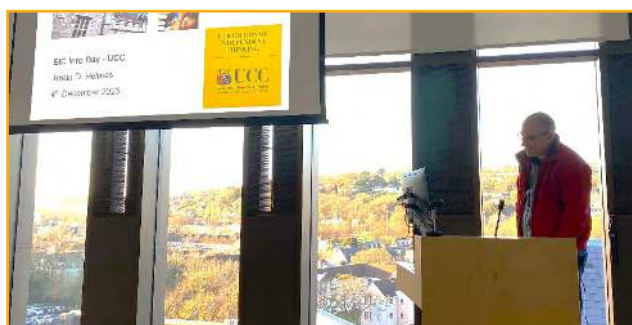
Rupa’s winning image

Outreach Events & Campaigns

PhD student Rupa Ranjani Palanisamy achieved distinction by winning the STS Elionix Scientific Image competition for the second time in a year (in Q3 2023) for picture of “candy cubes.” These innovative structures, crafted from transition metal chalcogenides (TMCs), hold significant promise in the field of thermal energy storage and conversion.

Renowned for their remarkable thermal stability, superior electronic conductivity, and versatile redox states, TMCs have emerged as pivotal materials in this domain. The inherent attributes of Zinc-based “Candy Cubes,” characterized by their multifaceted valence states, diverse morphologies, and heightened redox activity, position them as highly viable candidates for electrode applications within thermal management systems (TMSs).

European Innovation Council Information Day 4th December 2023



Prof Justin Holmes presenting at the European Innovation Council Information Day

Principle Investigator Prof Justin Holmes and Project Manager Rebecca Buckley attended the European Innovation Council Information Day providing insights on how to successfully develop a proposal for EIC Pathfinder Grant and the role of UCC Academy in leading the management and DEC activities of the project.

AMBER's Transition Year Event 2023 13th December 2023

AMBER, Ireland's leading materials science research centre, recently organised an outreach event for Transition Year students on 13th December 2023, at the Environmental Research Institute (ERI), University College Cork. The centrepiece of AMBER's initiative is the annual “Exploring Materials” Transition Year work experience programme. This event provided a hands-on experience for students to delve into the world of scientific exploration.

The TRANSLATE project, the **RADICAL** project and **FreeHydroCells** project were presented to

8 transition year students by Prof Justin Holmes, Dr Ievgen Nedrygailov and Dr Ailbe Ó Manacháin. The highlights of the event are available [here](#).



TRANSLATE and FreeHydroCells researchers with the 8 transition year students

Presentation to Minzu University delegation 20th March 2024

Project researcher Dr Ailbe Ó Manacháin delivered a presentation on “Pathways of Water, Heat and Light to Novel Renewable Energy Sources” (access the presentation [here](#)) to a delegation of 30 students from Minzu University of China and their supervisors.



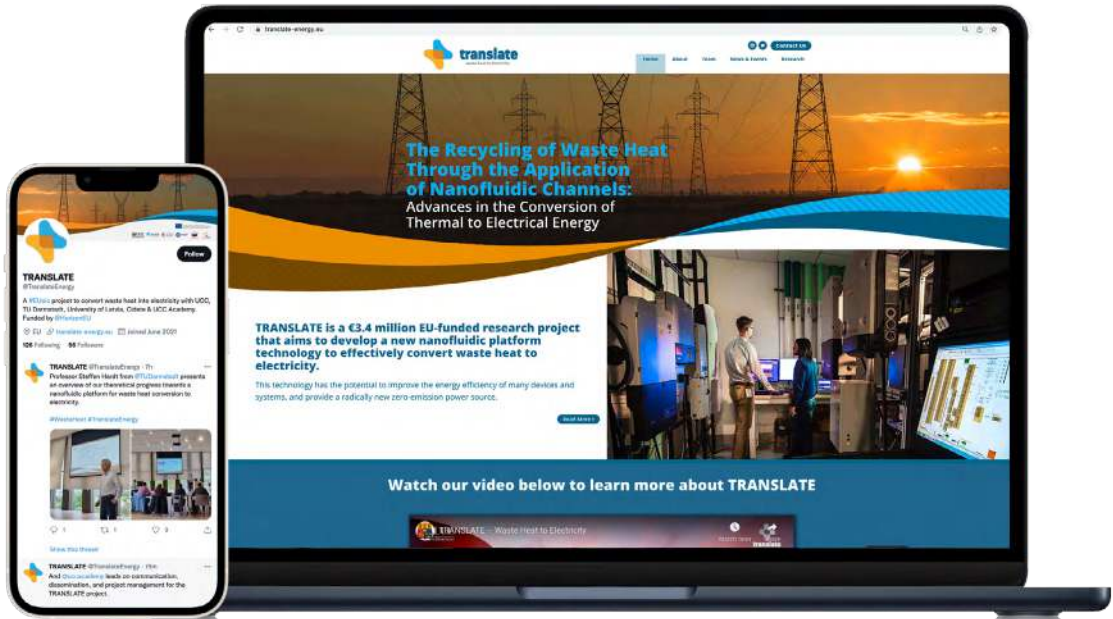
Dr Ailbe Ó Manacháin delivering the presentation to Minzu University of China delegation

The presentation highlighted the innovative research happening in TRANSLATE and FreeHydroCells. The presentation was delivered.

Mathematics Seminar of New Jersey Institute of Technology 12th April 2024

Prof Steffen Hardt from TU Darmstadt was invited to speak in a Mathematics Seminar organised by New Jersey Institute of Technology where he shared the results achieved by TRANSLATE. This was an online talk.

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TRANSLATE is a multidisciplinary collaboration between partners across Europe including University College Cork (Ireland), Technische Universität Darmstadt (Germany), University of Latvia (Latvia), Cidete Ingenieros Sociedad limitada (Tenerife, Spain) and UCC Academy (Ireland).

