SSPC

A World Leading SFI Research Centre

Science Foundation Ireland sfi For what's next

ISSUE 01 2024

NEWS UPDATE

www.sspc.ie

societal goals

Sustainability | Small Molecule | Large Molecule | Health | Education & Public Engagement

Positioning Ireland for Success: Fuelling Innovation for the Future of Irish BioPharma

Industry Leaders, Academics, and Government Officials discuss the future of innovation in Irish Biopharma

An event hosted by the Royal Irish Academy, in collaboration with SSPC and BioPharmaChem Ireland, the Ibec group, saw representatives from industry, academia, and government agencies come together to discuss the future of innovation in the Irish Biopharma sector to address pivotal issues concerning Ireland's enterprise in attracting investment, maintaining competitiveness, fostering innovation, and nurturing talent to ensure sustained growth in the sector.

"SSPC is part of a thriving Irish ecosystem, driving collaborative R&D and building the reputation of Ireland globally. This reputation hinges not only on the quality of research conducted here, but also on the ability to attract and retain top talent. To ensure sustained growth in this ecosystem, the talent pipeline must be nurtured to support value-added Irish research and innovation and critically examine the support systems necessary for R&D. Specific actions must be taken to propel Irish research and innovation forward in the competitive landscape and leverage collective expertise to accelerate the Irish BioPharmaChem sector." **Prof. Damien Thompson, SSPC Scientific Director**

Click link here

Click here to download a recent report from the Expert Group on Future Skills Needs entitled ***Researching and Forecasting the Current and Future Skills Needs of the Biopharma Sector in Ireland to 2027***

WEBINAR

'A Multi-Scale Digital Twin to Predict and Control Real-Time Bioreactor Performance: CADFEM-SSPC collaboration, listen to Dr Marc Horner of Ansys present on Bio Reactor Digital Twins, showcasing the capabilities of the software. **Click link here.**

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Research Spotlight

Prof. Anne Moore: Formulation Approaches to Create Next Generation Vaccines that Block Infection & Transmission

Listen to **Prof. Anne Moore**, University College Cork (UCC), break down the goals of prophylactic vaccines and how re-formulating your vaccines can address eliminating training costs, reconstituion, needlesticks and reduce logistic costs and more. Prof. Moore's research focus is to enhance vaccine accessibility and acceptability. Her research group uses both vaccine development strategies as well as qualitative research methodologies to advance these research aims.

WEBINAR **To listen, click link here.**

On Friday, May 3, NIBRT & UCC, officially announced a strategic collaboration as part of the Future Pharmaceuticals initiative with the joint appointment of Prof. Anne Moore as Principal Investigator at NIBRT & the School of Biochemistry & Cell Biology in UCC.

Funding Updates

Horizon Europe:

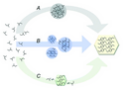
Prof. Elizabeth Topp, NIBRT, partners on EvaMobs, which will develop a platform to discover, develop, and validate adaptable antivirals.

Prof. Christophe Silien, University of Limerick, coordinates uCAIR, a project using AI to speed up medical diagnoses allowing for more timely & better tailoring of treatments for patients.

Dr Jessica Whelan, University College Dublin, partners on PROSPLIGN which will prospect the bio-activity of various natural lignin molecules for potential application in pharmaceuticals and other products.

SFI Frontiers for the Futures award: Dr Finbarr O'Sullivan, Prof. Martin Clynes, Dublin City University, have been funded to investigate the biological role of polyamines in CHO and other cells.

PUBLICATION



Mesoscale Clusters in the Crystallisation of Organic Molecules. Barua, H.,| Svärd, M.,| Rasmuson, Å.C.,| Hudson, S.P., | Cookman, J. (2023) *CrystEngComm*

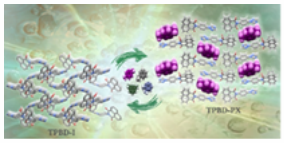
Publication Spotlight

BIO

Crystalline sponges make breaking up easy to do

Supramolecular chemistry, the field of chemistry that studies how molecules recognise each other, profoundly influences many biological mechanisms (e.g., DNA base pairing) and chemical processes (e.g., how to purify mixtures of compounds). Some chemical mixtures of relevance to the pharmaceutical and chemical industries are composed of molecules that are very similar in their size and chemical properties, meaning that there are no simple, energy efficient methods available to purify the components. Such is the case for a class of compounds known as C8 aromatic hydrocarbons which are amongst the largest volume products of the chemical industry. In this work, the team from University of Limerick, led by Professor Mike Zaworotko's group, report the synthesis of a new molecule, TPBD, using a green synthesis method. TPBD was found to have very special molecular recognition properties, because it can serve as a crystalline sponge for p-xylene (PX), the most widely used of the C8 aromatic hydrocarbons. Much research has gone into the study of different types of crystalline sponges, especially a class of materials known as zeolites, yet TPBD outperforms all other materials to enable the isolation of high-purity liquid PX from other C8 isomers in only one cycle. Further, there is very little energy needed to conduct the separation, which occurs because of the molecular recognition that occurs between TPD and PX as they form a new inclusion compound called TPBD-PX.

These new findings are counterintuitive as they reveal that nonporous molecular compounds like TPBD can outperform porous materials like zeolites. This suggests a new paradigm for energy-efficient purification processes that exploits "induced fit" binding sites of the type that exist in many biological systems.



Link to paper: Highly Selective p-Xylene Separation from Mixtures of C8 Aromatics by a Nonporous Molecular Apohost. Rahmani, M., | Matos, C., R., M., O., | Wang, S., | Bezrukov, A. A., | Eaby, A. C. | Sensharma, D., | Hjiej-Andaloussi, Y. | Vandichel, M., | Zaworotko, M.J. (2023) *Journal of the American Chemical Society.*

WEBINAR **'The PFAS Problem': Challenging Times Ahead:** Listen to **Dr Soumya Mukherjee**, University of Limerick, key researcher in this space talk about PFAS: The Here & Now. **Click link here.**

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SSPC-Axelyf biotech collaboration launched to find drug delivery breakthroughs

AXELYF

BIO

SSPC and Maynooth University recently announced a research partnership with Icelandic biotechnology start-up, Axelyf. This collaboration aims to impact patients' lives through the development of next-generation delivery technologies for emerging therapeutics, such as the mRNA class of compounds.

The project is being led by Associate Professor Rob Elmes of Maynooth University and championed by Dr Örn Almarsson (CEO & co-founder, Axelyf). The team aims to exploit the fundamental principles of supramolecular chemistry to develop a series of innovative technologies to enhance the current state-of-the-art and drive forward the field of bio-therapeutics. **Click link here.**

Dr Örn Almarsson (CEO & co-founder, Axelyf), Associate Professor Rob Elmes, Maynooth University and Jamie Guidera, Business Development Manager, SSPC

PUBLICATION

Tracking the cellular uptake and phototoxicity of Ru(ii)-polypyridyl-1,8-naphthalimide Tröger's base conjugates, Bright, S.A.| Erby, M.| Poynton, F.E.| Monteyne, D.| Pérez-Morga, D.| Gunnlaugsson, T.| Williams, D.C.| Elmes, R.B.P. (2024) *RSC Chemical Biology*

WEBINAR

'Supramolecular Approaches to Fighting AMR': Listen to **Assoc. Prof. Rob Elmes** talk about his work in anti-microbial responses. **Click link here.**

Project Spotlight

unesco United Nations Educational, Scientific and Cultural Organization

K4C-4-Kids, a Junior Researcher Training programme for 11- to 13-year-olds

UL is part of the UNESCO sponsored Knowledge for Change (K4C) global consortium of Higher Education Institutions committed to best practice community-based learning and research. K4C-4-Kids is an multi-annual collaboration between UL Engage, SSPC, St. Mary's Primary School and Our Lady of Lourdes primary school. The programme was designed by UL Engage, SSPC and students on the Professional Diploma in Community Engagement and delivered by Niamh O'Sullivan, UL Engage. This year, in the third year of the programme, 41 pupils worked in small groups to conduct research projects focused on the needs and interests of their school communities.

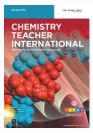
Programme Aims and objectives:

- Introduce the children to the concept of research and all stages of the research process.
- Support the children to carry out independent research allowing pupils to take an active role in the research process.
- Create a positive relationship between the University, the school and the pupils to help the children to see higher education as an option for them in the future.
- Introduce the students to current researchers to learn about research as a career option.

Research Design:

The eight-week programme included an on-campus STEM workshop delivered by Dr Martin McHugh (SSPC) to aid the pupils in defining their research question and planning their methods. The pupils worked in groups on projects looking at a variety of research questions. The programme culminated in a poster presentation day during which the pupils confidently explained their processes and findings.

PUBLICATION



Top Tips for Designing and Managing a Public Engagement Laboratory. McHugh, M., Eren, E., Guralp, G., Hayes, S., O'Hehir, C., O'Sullivan, E., Zauers, A. & Tyndall, C. (2023) *The Journal of Chemical Education*

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PROJECT SPOTLIGHT

Prof. Sarah Hudson, Associate Profs. Emmet O'Reilly and **Kieran McGourty,** University of Limerick (UL), are part of a project, Selio System, funded under the Disruptive Technology and Innovation Fund (DTIF) for diverse and potentially life-changing disruptive technology projects.

MedTech

Disruptive Technologies Innovation Fund

SELIO MEDICAL

Wellcome Trust - HRB Clinical Research Facility at St. James's Hospital

INVERMED

Selio System will develop a pre-biopsy intervention to prevent haemorrhage occurring before kidney or liver biopsy takes place, thereby facilitating same day release of patients. Selio Medical is a dedicated medical device company specializing in the development of novel, disruptive medical devices to reduce complications associated with percutaneous needle access procedures.

The team from UL will work at the polymeric materials/biological interface. Specifically they will be responsible for material formulation, design and characterisation using state of the art analytical technologies. They will integrate the materials into ex-vivo cell culture models, the results of which will inform future material design iterations. All work will be performed in the Bernal Institutue and SSPC labs.

Partners: CRF located in the heart of St. James's Hospital is Ireland's largest acute academic teaching hospital with a proven track record in completing clinical trials of medical devices and investigational medicinal products. InverMed Teoranta specialises in Overmoulding for assembly, Micro Overmoulding, Tipping & Overmoulding of various shafts including Polyimide, Polyamide, Pebax, PEEK and also metals.

PROJECT SPOTLIGHT

Prof. Lidia Tajber, Trinity College Dublin and **Dr Peter Byrne,** University College Dublin**,** in collaboration with MSD Ballydine Ireland and Merck Rahway, NJ USA

Mechanochemistry

Drug Substance

MSD

Friedl Crafts Reaction

This project collaboration investigates Friedel-Crafts acylation reactions using mechanochemical approaches. Mechanochemistry allows the activation of chemical transformations by the application of mechanical forces to solids. Such reactions can be conducted under solvent-free processing conditions, providing the chemical industry with an effective strategy to reduce greenhouse gas emissions, waste and pollution, allowing cleaner and cheaper manufacturing processes. The objectives of this project are to develop Friedel-Craft acylation (or similar) reactions using mechanochemistry, investigate the reaction conditions on the regioselectivity, reaction time and yield of the product, evaluate compatibility of the reaction conditions with material of construction of ball mills and extruders, and determine the impact of the process condition on the particle properties of the reactants and products.

"Working with SSPC allowed us to collaborate with world experts and rapidly explore uncharted chemical territories. This collaboration has enabled us to learn about mechanochemistry, applying this technology to challenging chemical transformation and rapidly gain knowledge of tools that are rarely utilized for the synthesis of active pharmaceutical ingredient." **Francois Levesque Merck US**

WEBINAR

Pharmaceutical mechanochemistry: Listen to **Prof. Lidia Tajber** talk about the variety of different processes involved in pharmaceutical mechanochemistry and green, more sustainable approaches to chemical synthesis. **Click link here**

PUBLICATION

sensors an Open Access Journal by MDPI

Susceptibility of the Different Oxygen-Sensing Probes to Interferences in Respirometric Bacterial Assays with Complex Media, Zanetti, C.| Li, L.| Gaspar, R.D.L.| Santovito, E.| Elisseeva, S.| Collins, S.G.| Maguire, A.R.| Papkovsky, D.B. (2024) *Sensors*