SSPC 15 YEARS

The SFI Research Centre for Pharmaceuticals, 15 years in business

A World Leading SFI Research Centre

Science Foundation Ireland sfi For what's next

ISSUE Q2 2023

NEWS UPDATE

www.sspc.ie

societal goals

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

SSPC celebrating 15 years

"Our goal is to ensure that Ireland remains a leader in pharmaceutical research and development by delivering new science that addresses patient needs. Our researchers are providing new opportunities for patient treatment utilising digital health, AI-driven materials development, precision medicine and nanomedicine."

Prof. Damien Thompson **More details here**

SSPC Researchers named among top scientists globally

Our people are globally ranked, with recent statistics highlighting ***Prof. Michael Zaworotko***, University of Limerick, (chemistry) as the number 1 chemist in Ireland (and in top 1% globally). **More details here.**

Eight SSPC researchers secure €4.4 million nationally through the SFI Frontiers for the Future Programme

Recently, Minister for Further and Higher Education, Research, Innovation and Science, Simon Harris, TD announced 62 grants valued at €42 million through Science Foundation Ireland's Frontiers for the Future Programme.

The SSPC projects are focused on vaccines, anticancer agents, treatment of resistant cancers and a new type of molecule that enhances pharmaceutical properties. Substance that stimulates or suppresses the immune system and may help the body fight cancer, infection, or other disease, DNA targeting and modelling implications for microfluids. **More details here.**

Dr Andrea Erxleben

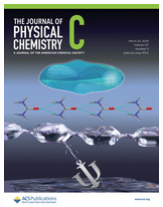
PROJECT SPOTLIGHT

Crystalline Drug Substances for Improved Medicines

The research led by ***Dr Andrea Erxleben*** with ***Lamis Alaa Eldin Refat,*** PhD student, UoG, is aimed at the design and study of new solid-state forms of APIs. The research is particularly based on the application of sublimation as a solvent-free (i.e. green) method to control the polymorphism and crystal morphology and to obtain new cocrystals. A lab-scale sublimation method has been developed that produces high quality single crystals in a short time. Using sublimation to crystallize cocrystals from the gas phase that were not accessible from solution, we were able to obtain a ternary cocrystal of pyrimethamine by sublimation. Ternary cocrystals are much more challenging to prepare than binary cocrystals, but can further enhance the functionality of supramolecular materials. The first examples of additive-controlled growth of organic cocrystals from the gas phase and demonstrated that tailor-made additives can provide significantly higher levels of morphology control in gas phase crystallization than what is typically achieved in additive-controlled solution crystallizations has been published. The team have also investigated the crystallization of organic salts from the gas phase following sublimation of neutral coformers. This requires proton transfer in the absence of a solvent and raises the interesting question how and when the proton transfer takes place. They have used modelling studies to show that small molecular clusters provide an environment which can make proton transfer spontaneous.

FUNDING HIGHLIGHTS

Frontiers funding: **Dr Andrea Erxleben,** UoG, Novel Platinum-Based Mitocans for the Treatment of Resistant Cancers: Synthesis, Targeted Delivery and Biological Studies.**Prof. Declan Gilheney**, UCD, Small Nitrogen Bicycles: Constrained Molecular Geometry for Aza Bioisosteres, Encouraged Lewis Pairs and Pentavalent, Pentaco-ordinate Nitrogen.



JOURNAL COVER

Front cover of Physical Chemistry, Decoding Supramolecular **Packing Patterns from Computed Anisotropic Deformability Maps of Molecular Crystals**

Reabetswe R. Zwane, Joaquin Klug, Sarah Guerin, Damien Thompson and Anthony M. Reilly

Link to paper here

Check out our 2023 publications now available on the SSPC website

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Dr Marcus Baumann

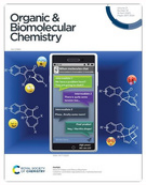
PROJECT SPOTLIGHT

Cyanide-free cyanation reactions in continuous flow mode

This work is led by ***Dr Marcus Baumann*** with PhD student, ***Niamh Disney***, at UCD and ***Almac Sciences***, Craigavon with Tom Moody, Megan Smyth, Scott Wharry. The work by Niamh took inspiration from earlier reports from the 1970s by van Leusen, who reported the underlying transformation in batch mode. Achieving an optimized process with high productivity across a set of diverse substrates including new insights in the formation of potential side products. Flow offered not only better reproducibility but also improved heat and mass transfer as well as scalability in small foot-print lab reactors. The developed flow approach will provide a safer entry towards nitriles that are common groups in drugs and their building blocks. Through optimization, the use of base, solvent and reagents was optimized to reduce chemical waste thus contributing towards our shared sustainability goals. Due to very short reaction times (~1.5 min), large quantities of product can be made quickly which is key for further industrial development. This may have implications on future chemical processes used for drug manufacturing as relevant to Ireland as a whole.

FUNDING HIGHLIGHT

The SFI National Challenge Fund: Dr Matthias Vandichel & Prof. Vivek Ranade, UL. *GEOTHERMAL*: Sustainable Geothermal Energy as zero-fuel alternative for heat pumping, storage and power generation.
Frontiers funding: Dr Doireann O'Kiely, UL: WrinkleTech



JOURNAL COVER

The inside front cover of **Organic & Biomolecular Chemistry Carbene-controlled regioselectivity in photochemical cascades.**
Mara Di Filippo and Marcus Baumann
Link to paper here

Dr Jessica Whelan

PROJECT SPOTLIGHT

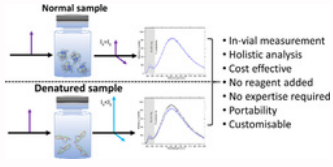
The monitoring and optimization of cell culture medium preparation to support bioprocess intensification

Dr Jessica Whelan, Claire Boles, PhD researcher and ***Dr Roderick Jones***, UCD, working with ***Thomas Canty*** – CEO, JM Canty, Colin Dalton and Ciaran Dunne. As biomanufacturing processes are intensified, the demands on cell culture media which supply the nutrients and substrates required for cell growth and protein production are increasing. This has resulted in more demanding media preparation with elevated temperatures and pH adjustments now required to achieve effective dissolution resulting in subsequent stability challenges. This research focuses on the development of a PAT method using the Canty image analysis based Microflow system for the monitoring and characterization of media preparation with the aim of optimizing media preparation steps supported by a digital twin. Ultimately the project will contribute to providing patients with access to biomanufactured medicines and therapies at affordable prices by supporting process intensification and improving process robustness which ensures supply and reduces cost of goods.

FUNDING HIGHLIGHTS

Frontiers funding: **Prof. Elizabeth Topp**, NIBRT, **Prof. Steven Ferguson**, UCD: Stable chemically modified mRNA vaccines, >€1.2M
Dr Jakki Cooney, UL, Dynamic communication networks controlling immunomodulatory enzyme specificity and activity (DyNetIME).

PUBLICATION



In-Vial Detection of Protein Denaturation Using Intrinsic Fluorescence Anisotropy
Analytical Chemistry
K Krishnakumar Chullipalliyalil, Khaled Elkassas, Michael A. P. McAuliffe, Sonja Vucen , Abina Crean
Link to paper here

Check out SSPC's YouTube Channel

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Dr Ger McGlacken

Dr Jerry Reen

PROJECT SPOTLIGHT

N-Alkyl-2-Quinolonopyrones Demonstrate Antimicrobial Activity against ESKAPE Pathogens Including Staphylococcus aureus

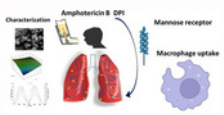
Antimicrobial resistance (AMR) poses a significant challenge to society, one that if unmet, will result in significant mortality from infections that are currently manageable in the clinic. This work, led by ***Dr Ger McGlacken*** and ***Dr Jerry Reen***, UCC, uses derivatives of the natural signal from dominant organisms to control the anti-infective behaviour in pathogens. To a large extent, the team use the natural language of microbes as a tool to control and moderate their behaviour. The 'perfect storm' of increased resistance within populations of key opportunistic pathogens (such as the ESKAPE group: Enterococcus sp., *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Acinetobacter baumanii*, *Pseudomonas aeruginosa*, and Enterobacter sp.) and a decline in the 'discovery' of new antibiotic classes is of serious concern.

FUNDING HIGHLIGHT

Frontiers funding: Dr Darren Griffith, RCSI, Development of Pt-based PROteolysis TArgeting Chimeras (Pt-PROTACs) as Molecular Probes for Pt-binding proteins and Next Generation Anticancer Agents. **Dr Susan Quinn,** UCD, PhotoGene: Photoactive Nucleic Acid Probes Towards New Diagnostics and Therapeutics

PUBLICATION

Targeting lung macrophages for fungal and parasitic pulmonary infections with innovative amphotericin B dry powder inhalers



de Pablo, E., O'Connell, P., Fernández-García, R., Marchand, S., Chauzy, A., Tewes, F., Dea-Ayuela, M.A., Kumar, D., Bolás, F., Ballesteros, M.P., Torrado, J.J., Healy, A.M., Serrano, D.R.

Link to paper here

The OTTER project

Dr Orla McCormack

Dr Martin McHugh

Dr Regina Kelly

Dr Deirdre O'Neill

Learning science outside the classroom for a sustainable future

In April SSPC was invited to collaborate on the EU Otter Project via SSPC EPE investigator ***Dr Orla McCormack***. Funded by the EU Research and Innovation programme, the project is spearheaded by the School of Education, University of Limerick. The project has a focus on sustainability and learning outside the classroom.

The goal of the project is to address low interest in STEM subjects, especially at a time of high demand for scientists. The day was led by ***Dr Deirdre O'Neill*** (School of Education, UL) and ***Dr Martin McHugh*** (SSPC) with over fifty 6th and 2nd class primary school pupils from Scoil Íde in Limerick.

The school pupils engaged in three parallel sessions investigating topics such as hand hygiene, bacteria in waterways and a campus field trip. OTTER harnessed SSPC's expertise within non-formal education along with adapting our school resources to the needs of the project and the visiting pupils. **For more information visit: https://otter-project.eu/**

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ISSUE Q2 2023

INDUSTRY CORNER

www.sspc.ie

UPCOMING EVENTS

To learn more about any of the events or training opportunities listed below, please contact our industry team, Kristy.Sirr@ul.ie, Jamie.Guidera@ul.ie and Aisling.Arthur@ul.ie

July

Training: Microscale Thermophoresis Training with NanoTemper, July 19-20th, Dublin City University

Aug.

Training: Chemometrics, Dr Phillipa Wilkes, August 17th, University of Limerick

SSPC Annual Symposium,
Wednesday, August 30th at the University of Limerick

Interested in exhibiting? Contact our Industry team

Sept.

Training: Drug Product Formulation - Small Molecule.
Prof. Abina Crean & Prof. Anne Marie Healy, September 13th

Knowledge Day: Molecular Modelling

CFRT: Continuous Flow Reactor Technology for Industrial Applications, September 27-28. Email our industry team if you would like to learn more about the roundtable discussion on 27th.

Dec.

Knowledge Day: Synthetic Peptides

SSPC welcomes new industry members

CADFEM HORIZON SEROSEP

INDUSTRY PLACEMENT

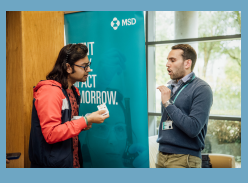
Alice Parkes, Janssen, Beerse, Belgium

"I had an invaluable PhD industrial placement at The Janssen Pharmaceutical Companies of Johnson and Johnson in Beerse, Belgium. I worked on a spray drying project which was a collaboration between Oral Solids Development, Process Engineering and Parenteral and Liquids Development."

Full story here

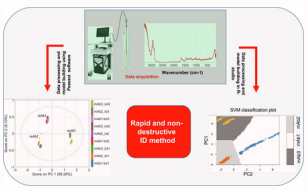
SSPC Recruitment Drive

SSPC recently welcomed industry members **Alkermes, Eli Lilly, APC Ltd., Pfizer, MSD, CADFEM, Janssen, Innopharma and SK biotek** to a pharmaceutical recruitment day. The day provided an opportunity to not only showcase the talented pipeline of PhDs within the Centre, but also gave 80 students a chance to learn more about the sector and to meet with representatives from 9 of our industry members. The day featured poster presentations and network opportunities over tea and coffee sessions. Thank you to all who attended.


PUBLICATION

SANOFI



Identification of monoclonal antibody drug substances using non-destructive Raman spectroscopy in Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy
Collaboration between SSPC, University of Limerick and Sanofi.
Mahendra K. Shukla, Philippa Wilkes, Norma Bargary, Katherine Meagher, Dikshitkumar Khamar, Donal Bailey, Sarah P. Hudson. **Full link to paper here.**