



KNOWLEDGE CENTRE
**MATERIALS
CHEMISTRY**

Newsletter 2020



Contents

Foreword	3
Building and maintaining successful partnerships	4
Materials-related challenges in the High Value Manufacturing Catapult	5
Insights from the Industry Steering Group meeting	6
A new lithium industry for Cornwall and the UK	7
Showcasing UK materials chemistry innovation at the 2020 Materials Research Exchange workshop	8
Helping universities to achieve and deliver impact through knowledge generation	9
Q&A with STFC Hartree's Jonathan Smith	10
CPI's academic strategy	11
Going Digital: the impact of computational tools on chemical R&D	12
The KCMC team	13



Foreword from John Conti-Ramsden

It has been another successful period for KCMC and its partners as we continue to facilitate innovation in the materials chemistry industry.

Our work has consolidated our continuing partnership with CPI as part of the High Value Manufacturing Catapult, and we are delighted by the progress we have made in supporting the commercialisation of revolutionary new technologies.

There have been a number of significant developments from our partners in recent months. The Materials Innovation Factory (MIF) in the University of Liverpool added further major capability with the launch of the Formulation Engine in late 2019. There have also been developments at the Henry Royce Institute in the University of Manchester, which has recently announced a Sustainable Materials hub. In addition, the University of Southampton has launched a new chemical engineering department that will be a critical link in our consortium.

The past year has also seen the completion of the Materials Innovation Translator (MIT) programme, which placed early-career academics on industrial projects within KCMC's partner organisations. The MIT programme has strengthened links between academia and business, and has been supported by a strategic £500,000 investment from the High Value Manufacturing Catapult. By providing flexible funding, the programme enabled scientists to test the feasibility of projects on a short-term basis prior to committing to longer-term collaborations. The response from project scientists has been excellent and the scheme has helped the development of R&D projects that aim to solve important challenges within the materials chemistry industry.

Our workshop held at the Materials Research Exchange event earlier this year was another highlight, attracting delegates from over 60 companies. Organised in partnership with CPI, the aim of the workshop was to showcase accelerated adoption of UK materials innovations into new global markets. It provided a platform for academia and industry to demonstrate the innovative outcomes of collaboration in materials chemistry.

This year has not been without its difficulties and in light of the COVID-19 pandemic, supporting companies and universities through economic struggles will be more important than ever. We are already working on major initiatives that will provide strategic investment across the Northern Powerhouse to support innovation in materials chemistry. Though we are facing challenging times, it is vital that we keep a clear perspective on how academia and industry are helping to deliver globally competitive materials chemistry innovation. The situation is unprecedented, but we will work with our partners to develop greater clarity of purpose and continue enabling UK materials chemistry research to succeed through collaboration.



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**Dr John
Conti-Ramsden**
KCMC Director



Building and maintaining successful partnerships

After 17 years at the helm of CPI, Nigel Perry retired as CEO at the end of March. CPI's new CEO, Frank Millar, is poised to seamlessly lead the company into the future and build on the long-term relationships between CPI, KCMC and stakeholders in academia and industry.

As I step into the role of CEO at CPI, I look forward to progressing and expanding the strong platform built by my predecessor, Nigel Perry. Nigel grew the company from inception to a prominent provider of innovation services. Leading CPI into the future means continuing to focus on what we do best, and that is our ability to build and maintain successful partnerships that make a significant impact on the UK economy.

CPI's ability to develop partnerships may be its greatest strength. The creation and facilitation of these relationships are undoubtedly vital for the continuation of new and innovative technical outputs. When we bring partners together, we know that companies are not looking for incremental innovation, but rather innovation derived from ideas that would have otherwise not had the opportunity to come together. By using foresight to reconcile and understand a given industry's specific challenges, CPI is able to establish unique connections between industry, university partners, government and investors, resulting in the innovation and commercialisation of new ideas, research and concepts. One such example can be seen at CPI's new Medicines Manufacturing Innovation Centre, where one of the partners is perhaps unexpectedly a supplier of services and software to the semiconductor industry. This company's knowledge and insight on digital control technologies contributes new ideas and a fresh perspective, which has proven to be a compelling opportunity to leverage cross-industry learning for the pharmaceutical industry partners, AstraZeneca and GSK.

Additionally, through both CPI and KCMC, strong partnerships have been established between companies and some of the UK's most renowned institutions – the Universities of Manchester, Liverpool, Bolton, Southampton and the STFC Hartree Centre. The combined efforts and insights of CPI, KCMC, and the research organisations help to accelerate the translation of innovative science and technology research into commercial products, resulting in a cleaner environment, a healthier society and a strong UK economy. As supporting organisations, our role in these partnerships is to feed materials chemistry thinking and industry requirements directly into universities. This enables

the fast formation of productive collaborations around technology or research, promoting successful innovation across the supply chain and through to manufacturing at a reduced cost and risk.

Slight differences in both culture and pressures between academia and industry have traditionally limited connections and partnerships, such as the variability in outputs that demonstrate success (e.g. growth of technology, economic effect, intellectual property, or scientific papers). CPI and KCMC's role is to understand the technical opportunities that exist and find the alignment of culture and innovation prospects between these different organisations. By removing all illusions of competitiveness, while accelerating knowledge sharing and demonstrating success for both groups, these partnerships – developed and fostered by CPI and KCMC – can show that a win for one is ultimately a win for all.

The current COVID-19 pandemic has certainly presented us with unique challenges, while also demonstrating the importance of our strong academic and industry partnerships. This is directly visible in our work within the national taskforce that has been established to fast-track a potential COVID-19 mRNA vaccine under development at Imperial College London. CPI is able to provide a critical role in this consortium – ensuring that everything is ready for scale-up so that if the vaccine comes out of clinical trials successfully, the millions of doses that are required can be manufactured at scale quickly.

The world is experiencing an accelerated degree of connectedness and innovation as a result of the current pandemic, and the strength of the relationships fostered by CPI and KCMC will continue to be our focus as we navigate this 'new normal'. Despite these changes, challenges, and new discoveries, we must continue to collaborate effectively to bring new innovations to market and work closely together to drive future economic growth in the UK.



Frank Millar
CEO, CPI

Materials-related challenges in the High Value Manufacturing Catapult

Better performance, improved functionality and increased sustainability are constantly demanded from innovations in advanced materials. The seven Centres¹ within the High Value Manufacturing Catapult (HVMC) are seeking to respond to these major drivers from the UK companies they work with.

Several of the Centres within the HVMC work directly with engineering OEMs (original equipment manufacturers) across many sectors, including companies such as Rolls Royce, Jaguar Land Rover, Siemens Wind Energy and Airbus. New materials for these OEMs offer possibilities for the world-beating products of the future. KCMC and CPI are ideally placed within this network to identify emerging materials-related challenges. By properly understanding the nature of these opportunities, KCMC can better connect its academic partners and companies in materials supply chains with the needs of the Catapult's major OEM members. In turn, this provides connectivity between R&D in materials chemistry through to development and OEM adoption.

“ The biggest challenge in materials innovation is the time it takes for new materials and processes to be adopted into OEM products. ”

Mike Holmes, Academic Development Manager at KCMC and Tom Taylor, Director of Future Business at CPI are working across the seven Centres that comprise the HVMC to achieve this goal. The biggest challenge in materials innovation is the time it takes for new materials and processes to be adopted into OEM products. Cross-centre collaborations – that give visibility across completely different manufacturing supply chains in an efficient and effective way – accelerate innovation and the faster adoption of products, connecting very different industries and disciplines.

A field where this approach is needed is composite materials. These advanced materials are used to make the latest generation of aeroplane wings, wind turbines and advanced transport. They enable lighter, stronger structures that use less material, consume less fuel, and therefore have less impact on the environment. The new generation of sustainable composites need to be developed and tested across more than one supply chain. Co-operation across many disciplines is essential to make technical progress and reduce business risk.

There are significant demands in the UK for products composed of stronger, lighter, and better performing materials, but in order to be successful, development times need to be shortened.

An interesting development has been in the creation of bio-derived and bio-mimetic materials that seek to emulate nature. These materials offer improved performance and minimise the environmental impact of the product, or component, they make up. Produced from renewable sources, or derived from carbon dioxide fixed from the air, these materials are designed to be reused or recycled. Advanced materials designed for 3D printing can enable the manufacture of components made with honeycomb structures with porous infills, providing strength with less material in a similar way to the composition of bone. Methods using 3D printing are enabling some HVMC Centres to incorporate these engineering features into components from the inside out, resulting in better performing, stronger and lighter products. Further development will allow these materials to be used more sustainably and efficiently.

Batteries and energy technology are also being tackled by the HVMC. For example, WMG² and CPI are working to accelerate the creation of a materials chemistry supply chain for the many components of batteries to be manufactured in the UK. The anode, cathode and electrolyte are advanced materials that can be made on UK shores, but only if innovation can be deployed in a timely way to compete with overseas supply. Energy technology more generally is an area of Catapult support, with wind, nuclear, hydrogen generation and hydrogen storage developments requiring more advanced materials.

It is clear that the team at CPI is working across the HVMC to provide UK companies with access to world-leading innovation capability for advanced materials. There is ample opportunity for further collaboration amongst KCMC university partners with UK materials companies. This is especially important in the light of the current COVID-19 pandemic, where collaboration will be key to help the UK remain globally competitive after its pause in R&D investment. Both Mike Holmes and Tom Taylor believe the activities being undertaken by KCMC and CPI will enable UK companies to adopt the next generation of advanced materials, priming the organisations' customers for success in 2021.

To find out more about materials chemistry and advanced materials visit:
<https://www.materialschemistry.org.uk>



Tom Taylor
Director of Future
Business, CPI



Mike Holmes
Academic Development
Support, KCMC

¹ <https://hvm.catapult.org.uk/our-centres/>

² <https://warwick.ac.uk/fac/sci/wmg/research/energy/>

Insights from the Industry Steering Group meeting

We were delighted to invite long standing collaborators to the latest KCMC Industry Steering Group (ISG) meeting held in Birmingham last November. The event brought together key industry representatives and stakeholders across the UK Research and Innovation (UKRI) and the Catapult, as well as our research institution partners, to network and develop a common understanding of the challenges facing materials chemistry innovation.

A leading researcher in the KCMC, Professor Matt Rosseinsky from the University of Liverpool, presented game-changing approaches to the application of digital technologies for the discovery and development of new materials. The application of digitisation and big data to the design and development of chemicals and materials is a key priority in the UK Chemistry Council Strategy – indeed the importance of embracing technology more widely and effectively has been further highlighted by innovative industry responses to the ongoing COVID-19 pandemic.

Our partners at the Henry Royce Institute discussed the recent government investment in advanced materials and their plans for working effectively across the Royce partnership to help bring new material innovations to market. There were also contributions from the High Value Manufacturing Catapult on our work supporting the development of new materials and the latest government strategies for investing in this industry.

Company perspectives were provided by Kalyan Sarma of Johnson Matthey and Su Varma from NSG Pilkington. Their presentations explored the creative approaches that are being taken by industry to overcome barriers to the commercialisation of materials chemistry innovations. This provided valuable insights that will enable the KCMC network to stay aligned with the needs of UK companies and develop projects that are guided by commercial markets.

John Conti-Ramsden, Director of KCMC:

“ The ISG meeting provides a critical foundation for shaping the materials chemistry innovation landscape in the long-term. The meeting demonstrates to leading academics and industrial members how the latest industry challenges can be aligned with new academic technologies – a complimentary strategy shared in partnership with CPI across a range of sectors. ”



Sophie Walton, Group Director of Academic Engagement of CPI:

“ I very much enjoyed the ISG meeting – these events provide a critical forum to connect with both the leading academic and industry partners of KCMC. I particularly enjoyed Matt Rosseinsky’s talk on the benefits of correctly applied data science for materials discovery – he did an excellent job debunking some of the jargon around data science. ”



A new lithium industry for Cornwall and the UK

The successful search for a new and previously unrecognised source of lithium in the UK began with a chance conversation in 2016. Mining engineer, Jeremy Wrathall, learned from a friend that lithium had been historically observed in the water deep underground within the tin mines of Cornwall. This conversation inspired the formation of his company, Cornish Lithium.

After extensive research into long forgotten historical records, Jeremy confirmed that the lithium in these waters represented a new, and potentially commercial, source. This finding showed great promise for a new lithium extraction industry in the UK, with demand set to surge in the next decade as electric vehicles become more mainstream. Given the UK's aspiration to become a major player in battery material and electric vehicle industries, a domestic supply of lithium could provide a major advantage, reducing dependence on imports for this vital metal.

Traditionally, lithium is extracted using solar evaporation methods. However, in places like Cornwall, where this is not possible, new methods that do not rely on sunlight and good weather are still being developed. Despite Jeremy's extensive background in the mining industry, he did not have the materials chemistry background to face this challenge alone.

Ron Swart, a Knowledge Transfer Manager at KCMC based at the University of Southampton (an academic partner institution of KCMC), contacted Cornish Lithium with a possible solution. Ron informed the team of a new technology being developed at the university with the potential to extract lithium directly from brine. Through a number of visits and discussions, Ron facilitated a collaboration between Cornish Lithium and the materials chemistry expertise at the university. Today, this partnership has successfully demonstrated the proof-of-concept for the extraction process at bench-scale.

Following extensive studies and fieldwork in Cornwall, Cornish Lithium has now demonstrated that the lithium-enriched groundwaters can be brought to the surface for extraction. Furthermore, with similar geological formations found across a large part of the county, it is now believed that lithium-enriched groundwater may be found in other areas, representing a potentially major industry for the UK.

Cornish Lithium intends to continue working with the University of Southampton to explore the commercial application of this novel British technology. The next steps for the company will be to secure funding and develop this technology further, with the aim of demonstrating lithium extraction at a larger scale.



Jeremy Wrathall
Founder / CEO,
Cornish Lithium

UNIVERSITY OF
Southampton



Showcasing UK materials chemistry innovation at the 2020 Materials Research Exchange workshop

CATAPULT

High Value Manufacturing

Materials chemistry innovations are essential for the development of advanced materials and technologies, but to ensure continued success, cross-sector collaborations across industry and academia must be facilitated. In February, the High Value Manufacturing Catapult (HVMC), in collaboration with CPI, sponsored a workshop at Materials Research Exchange 2020. This showcased how KCMC's partnership approach to driving collaborations between academia, Catapult centres and industry is accelerating materials innovation in the UK.

Materials Research Exchange 2020 was a two-day exhibition, showcasing the wealth of UK materials research and investment opportunities to industry, academia and government. The focus of the workshop was to accelerate the adoption of UK materials innovations into new global markets. It drew delegates from over 500 companies, spanning the Knowledge Transfer Network (KTN) and Innovate UK.

Some highlights from the workshop included a presentation from Graphene Composites covering its GC Shield. This protective plate incorporates nanomaterials to provide ballistic and stab prevention with unrivalled strength, lightness and resilience. Additionally, Dr Alex Casson from the University of Manchester and Andrea Kelley, Project Manager at CPI, highlighted how their University-Catapult collaboration aims to drive cutting-edge flexible electronic sensor technology into the health and wellness wearables market. Finally, Dr Su Varma,

Academic Director of Incubator R&D at NSG Pilkington, emphasised its specialised glass products, including the latest float glass technology and advanced coatings for architectural applications. By partnering with the HVMC, these products have directly benefitted from shortened timescales, reduced costs and accelerated advancements in materials discovery and innovation. The workshop concluded with a panel discussion on how each industry can work together more effectively.

All in all, the event was a resounding success, providing a platform for industry to showcase ground-breaking new materials and manufacturing processes across the supply chain. KCMC and CPI are driving these innovations to commercialisation, fostering new collaborations across industry and academia to allow for the continued acceleration of materials development in the UK.

“ This workshop was a fantastic opportunity to demonstrate the broad applications of materials chemistry innovations. By joining the dots between industry sectors, we can accelerate materials innovation in the UK. ”

Tom Taylor
Director of Future Business, CPI



You can find more information about the Materials Research Exchange 2020 event on the KCMC website:

<https://www.materialschemistry.org.uk/news/2020/kcmc-organise-workshop-with-cpi-at-materials-research-exchange-2020-to-showcase-uk-materials-chemistry-innovation>



Helping universities to achieve and deliver impact through knowledge generation



Mike Holmes
Academic
Development
Support, KCMC

Universities have historically been at the heart of knowledge generation in the UK and have sought to demonstrate the impact of the new knowledge that is generated in several ways. In the field of materials chemistry, the KCMC plays an important role in helping universities achieve impact in many materials-related applications. Delivering impact is important to the UK by, for example, delivering broad societal benefits and supporting economic growth. In turn, this helps generate tax revenues, a proportion of which will be invested through UK Research and Innovation (UKRI) and the Research Councils in further university-based research.

To encourage UK universities to look for opportunities to deliver impact from curiosity-driven research, a number of measures have been introduced by UKRI. The measures taken include the Research Excellence Framework (REF) and the Knowledge Exchange Framework (KEF), which are planned to be implemented later this year, as allowed by the evolving situation with COVID-19¹. The information generated by REF and KEF are used by central government to inform the allocation of around £2 billion per year of public funding across the whole of the UK research and innovation landscape.

Delivering impact through industry collaborations

There are at least two mechanisms by which universities can achieve impact. They are 'knowledge push' and 'knowledge pull'. In the case of 'knowledge push', a university will often protect the new knowledge generated in a Research Council-funded project through one or more patents. Once protected, the university will often seek to generate opportunities to exploit the new intellectual property through collaborations with companies. This usually offers a fast route to market. For 'knowledge pull', a company with a challenge it is looking to overcome will seek to develop a collaboration with an academic with the knowledge and expertise needed to help address the challenge. This will help a business solve technical challenges during product and/or process development and again, speed up the route to product or process launch.

Academics can also benefit from collaborating with industry. Working with companies gives academics a wider and deeper understanding of the drivers, requirements and issues that companies face in growing their businesses. The understanding gained through the interactions with industry help academics to develop research project proposals that address strategic drivers such as energy storage, light-weighting and mobility, healthy ageing, and decarbonisation.

It is for these reasons that academic and industry collaborations are considered such an important driver of innovation and economic growth². They help focus curiosity-driven research and provide efficient routes through commercialisation to market, which in turn, drives economic growth. Finally, this circles back and provides access to further funding for new investment in research and innovation.

Recent studies have shown that there is plenty of headroom for the UK to grow the impact achieved from UKRI-funded research. In 2015, a UK Innovation survey estimated that only 4.8% of manufacturers cited universities as a source of innovation information³.

The KCMC solution

KCMC is the UK's leading knowledge transfer organisation for academia and industry in the materials chemistry industry. At KCMC, we understand that there is a great opportunity to improve how the UK utilises and accomplishes academic-industry collaborations. With many years of experience in the materials landscape, KCMC has a deep understanding of how industry and academia operate and how to bring the two parties together to achieve successful collaborations. One of the key steps is to generate a clear understanding of what each party is seeking to achieve and to develop a mutually beneficial collaboration. To connect the

right companies and academics, KCMC draws from its extensive academic network, comprising the Universities of Manchester, Liverpool, Southampton and Bolton, as well as STFC Hartree Centre.

Through this activity, companies, academics, UKRI and Innovate UK can be confident that a materials chemistry innovation is supported from research to commercialisation, which will ultimately benefit the UK economy.

Case Studies

The MagnaPharm research project is a good example of KCMC facilitating collaborations between academia and industry to drive the commercialisation of materials chemistry innovations. Led by Dr Simon Hall, Reader in Materials Chemistry at the University of Bristol, this project aims to create controlled crystalline structures of pharmaceutical molecules through the use of strong magnetic fields. This can have a transformative effect on a significant proportion of pharmaceutical compounds. Through KCMC's established network of contacts, a partnership with AstraZeneca was facilitated, whereby testing is performed on the materials produced as part of the project.

Another instance of KCMC forging a partnership between its academic network and industry contacts is in the development of a commercially viable smart sensor technology platform. This project, known as iPESS, combines the expertise of researchers from the University of Manchester and the University of Cambridge with knowhow from companies via the KCMC network. The output of this project is a sensor, capable of providing sensitive and selective detection of gas molecules at industrially-relevant concentrations, while operating at low voltage operation and low power consumption.

Expanding the network

So how can a university join the academic network? KCMC is always on the lookout to expand its portfolio of academic partners and the associated expertise in materials chemistry. As part of this, KCMC is also aiming to broaden its geographical reach. This is because it recognises that many SMEs will reach out to local universities for the information and knowledge they need to solve a problem or issue, rather than seeking to develop an interaction with a geographically-remote UK university.

Moreover, KCMC's ongoing strategic objective is to offer UK businesses the widest and best possible access to materials chemistry expertise in UK universities. The two main criteria considered when a university approaches the KCMC about joining the academic network are:

1. Does the university offer complimentary materials chemistry expertise to the existing university partners?
2. Does the university broaden KCMC's geographical reach?

By recruiting more complementary academic institutions, KCMC can build connections with more companies in new locations - further strengthening the interface between academia and industry in the UK. As such, KCMC is always ready to discuss how it can help the UK materials chemistry landscape to thrive.

If your academic institution would like to open a discussion, please contact:
info@materialschemistry.org



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¹ https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/730048/industrial-strategy-white-paper-web-ready-a4-version.pdf

² <https://re.ukri.org/documents/2019/rand-europe-summary-report/>

³ ONS UK Innovation Survey 2015

Q&A with STFC Hartree's Jonathan Smith



Jonathan Smith

We spoke with Jonathan Smith, KCMC representative and Science and Technology Facilities Council (STFC) Hartree Centre's Business Development Manager, about his background, the Hartree Centre, and his new role within KCMC.

Could you briefly describe your background and scientific studies?

I received a master's degree in physics, and throughout my studies I was always conscious of wanting to apply those skills to something with real-world value. Following my degree, I transitioned to e2v (now Teledyne e2v), where I focussed on engineering amplifiers for satellite communications. But after working in an industrial environment for roughly five years, I got itchy feet and decided to go back and get my PhD. Here, I worked closely with STFC staff on particle accelerator design. On completion of my doctorate I made the jump to Tech-X UK Ltd, a company that brought together two things I had been interested in my whole career to date: computational electromagnetics and high-performance computing. However, after nearly ten years I was looking for a change. I had been transitioning away from a purely technical role and increasingly into business development while at Tech-X, and this made my move to STFC Hartree Centre, becoming Business Development Manager in March of 2019, an apt switch.

This theme of high-performance computing has carried throughout my career and scientific studies. I have always been interested in computers making intelligent decisions – bringing artificial intelligence (AI), big data and high-performance computing (HPC) together to solve productivity challenges. There is really only one place in the UK that does that at scale really nicely – and that's the Hartree Centre.

What does your work at STFC Hartree Centre involve?

It's best to frame this in terms of Hartree Centre's role in the UK ecosystem, which is to enable businesses to adopt advanced digital technologies. Through events, various trade organisations and networking, I help them to first understand the potential of adopting cutting-edge developments in these technologies. These include HPC, AI, machine learning and big-data technology, which are all ready for exploitation.

My role in this is starting a discussion with businesses to see what challenges they may be facing, and to determine if advanced digital technologies can help to improve their business in some way. That could be increasing productivity through improved use of cloud resources, using intelligent decision making within their processes or AI for forecasting production issues. In essence, my day-to-day role is networking with companies, talking to people about what's going on in their business, and helping them to scope solutions that the dedicated technical teams at the Hartree Centre can deliver.

What role does the STFC Hartree centre play in the materials chemistry industry?

STFC Hartree Centre is able to fill a sector need, allowing for the targeting and optimisation of molecules, compositions or formulations within the materials chemistry industry. We develop software that enables people to perform experiments *in silico*; these are experiments that would otherwise require a lot of expensive and time-consuming lab testing. This ability to automate and predict properties of materials or formulations has far-reaching performance benefits for people in a number of areas. By using predictive technologies to sweep over a large parameter space, the best collection of properties for a given composition of ingredients can be determined; in the first instance, this allows for intelligent down-selection

to a much smaller number of candidate recipes or sets of ingredients. Essentially, the Hartree Centre is able to use HPC to run calculations in a shorter timeframe to speed up the process of developing new formulations, or fix the problems in existing ones. This helps companies minimise time to market, while reducing time and resources that might otherwise be wasted on experiments that don't work.

A great recent example of this is presented in a case study from the pharmaceutical sector, which is different from the materials chemistry industry but closely related, in that it brings together data science with multiple scientific disciplines to accelerate innovation. Hartree Centre researchers worked with AstraZeneca to accelerate lead optimisation, providing insights on a new class of drugs with the potential to reduce costs and increase productivity.

More information on the case study mentioned in the interview can be found here: <https://stfc.ukri.org/about-us/our-impacts-achievements/case-studies/simulation-and-machine-learning-for-future-medicine/>

How do you work with KCMC in the materials chemistry space? What do you enjoy most about this?

All of KCMC's partners have complimentary offers and provide different specialisms. At STFC Hartree Centre we specialise in the development of computational tools that can predict important properties of materials – taking existing tools and making them go faster or work better – particularly when applied to real-world challenges.

I particularly enjoy creating partnerships with industry to understand and realise their needs, a key role and skill of KCMC. By working together with KCMC's varied partners, we can deliver positive outcomes that are more than the sum of the individual partner's contributions.

Are there any materials chemistry projects underway between STFC Hartree Centre and KCMC that you are excited about?

With support from KCMC, we are currently collaborating with the University of Liverpool and NSG Pilkington, world leaders in the manufacture of glass and glazing solutions. Together we are working to fuse materials chemistry knowledge with high performance computing to highlight the opportunity for digital approaches and to tackle problems across their global business. As a result of this collaboration, NSG Pilkington has begun to embed new, faster, computational methods into its R&D teams, creating new opportunities for product development through innovative materials chemistry research.

Aside from that collaboration, due to the nature of our work, most of the other projects we are working on are protected under non-disclosure agreements. However, we have additionally collaborated with KCMC on networking events. In particular, it was a pleasure working with KCMC and KTN on the Going Digital workshop, also covered in this newsletter.

We see plenty more opportunities for future projects utilising our supercomputing power, expertise in speeding up software, and projects involving our in-house computational chemistry team. Increasingly, I see us offering the data-driven piece of a multi-partner project, leveraging our expertise in data science and AI to deliver new insights.



CPI's academic strategy

A strong understanding of long-term academic partnerships is resulting in the creation of new and exciting opportunities for KCMC through CPI's academic strategy. These partnerships aid the progression of research concepts through to development – giving innovative academic ideas a route to successful commercialisation and implementation.

Materials development and application are a key part of CPI's work with different partnerships and businesses. Using KCMC's expertise, as well as access to collaborations within KCMC's partner universities, CPI can connect companies with materials needs to a university partner. CPI is able to help with some of the scale-up and development capabilities, while maintaining close relationships with materials experts to deliver materials improvements.

Under the leadership of the Director of Academic Engagement, Sophie Walton, CPI's academic strategy has shifted from an end-market focus to an academic focus. Through this, CPI aims to realise the support that universities can provide in shaping materials research during a company's product development, rather than retrospectively influencing products once they have been made.

Sophie says:

“ Academia has a critical role to play in bringing new, innovative products and processes through to the marketplace. I believe that the research that goes on in our universities is absolutely critical for us to solve the world's big societal challenges. ”

Sophie Walton

Director of Academic Engagement,
CPI



The UK is blessed with some of the strongest universities in the world, and as such, it is critical that CPI leverage its value more efficiently, ensuring science and thinking

are converted rapidly and efficiently into tangible products to allow for new materials chemistry innovations. By encouraging partnerships between academia and companies, and creating the right funding mechanisms, CPI will be able to take advantage of the world-class research happening in UK universities and bring this research to market.

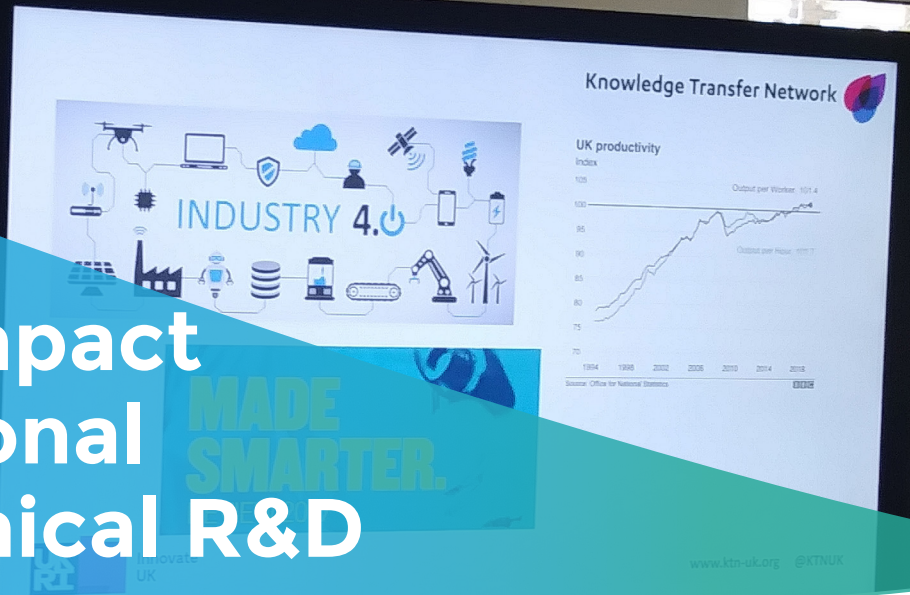
Working with KCMC will help CPI to understand university pressures and determine which areas to focus on, better aligning CPI's work with products already being manufactured within industry. In addition, it will enable CPI to receive access to university expertise for its existing projects. KCMC's Knowledge Transfer Managers provide companies with the knowledge and confidence to invest in materials research. These managers encourage companies to “take the leap” in applying valuable materials research from the academic world towards product innovation, design and development. Working with KCMC will also allow CPI to support existing KCMC partnerships with industry, finance and stakeholder connections later in the product development lifecycle.

The pivotal role of academia in bringing academic products and processes to the marketplace is directly visible in the role Imperial College London is playing in informing government decisions throughout the COVID-19 pandemic. CPI is currently supporting several universities around COVID-19-related inventions – from the development of potential vaccines to the production of new electronic ventilator components. These both highlight the direct benefit of utilising academic research and discoveries to enhance materials development in the UK, as well as illustrating how these partnerships can help us to confront major societal challenges.

CPI hopes to further expand this academic network with KCMC in the future, with continued partnerships, innovations, and communication that will ensure academic and company partnerships are fostered, allowing advanced and innovative material development to thrive in the UK.



Going Digital: the impact of computational tools on chemical R&D



Recent advances in digital technologies are enabling R&D-intensive businesses in the pharmaceutical, agricultural and chemical industries to drastically improve their efficiency, for example through automated production lines or computer models. However, the adoption of these computational tools is currently limited, either by R&D companies who lack the digital knowhow or the digital service providers who are unsure of how to help.

To tackle these limitations and discover the best possible digital improvements, KCMC and the Knowledge Transfer Network (KTN) brought together both R&D-intensive companies and digital service providers at the "Going Digital" event at the STFC Daresbury campus in February. The goal of this meeting was to improve the strategy for digital service providers and R&D companies to adopt and implement innovative digital technologies. To accomplish this, the event highlighted current digital tools on offer, brought together key representatives, and presented funding opportunities through the wider KTN.

The event kicked off with an introduction from Dr Jonathan Smith, STFC Hartree Business Development Manager and Dr Matthew Reeves of KTN, highlighting key advancements in digital technologies that can lead to the optimisation of R&D. One example being areas of artificial intelligence such as natural language processing, which enables valuable information to be extracted from free-form text reports.

When discussing the potential for computational tools to aid in materials development, Smith highlighted that:

“Some of these simulation tools are getting to a point where they can enable step changes in R&D productivity. These tools can calculate and optimise processes in a way that would be impractical in a laboratory, where compounds or formulations would have to be synthesised over an extended period of time.”

A number of engaging talks came out of this event. Dr Richard Sawko from IBM compared computational and physical measurements of fluid dynamics. The computational model was ultimately able to provide a much deeper understanding of droplet formation in different types of flow, demonstrating a benefit of measuring physical parameters using digital technologies. Additionally, Dr Josie Harries overviewed the digitalisation journey of Domino Printing Sciences; from its inception to its progression over the past four years. Both talks outlined the advantages of digitalisation at distinct stages of R&D and different scales of production.

Several solution-providers presented their views on a digital roadmap, outlining the steps that companies can take to harness the benefits of digitalisation. Coming out of the event, KTN and KCMC were in agreement that a document should be generated to capture the ideas presented and help companies to adopt these steps. The event has resulted in a better understanding of challenges faced by its range of partner organisations, while identifying the appropriate tools and steps for R&D companies to move forward in their own digitalisation journeys.

Dr Matthew Reeves of KTN said: “The event provided excellent networking opportunities for those in attendance and helped us at the KTN to understand the challenges faced by both parties. We look forward to working with these digital solution providers in the future to address these challenges, and to help companies boost the productivity of their R&D function, as well as their manufacturing activities.”



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