CMAC

FUTURE MANUFACTURING RESEARCH HUB

Programme
CMAC Open Days
2022

Engineering and Physical Sciences Research Council

CMAC FUTURE MANUFACTURING RESEARCH HUB

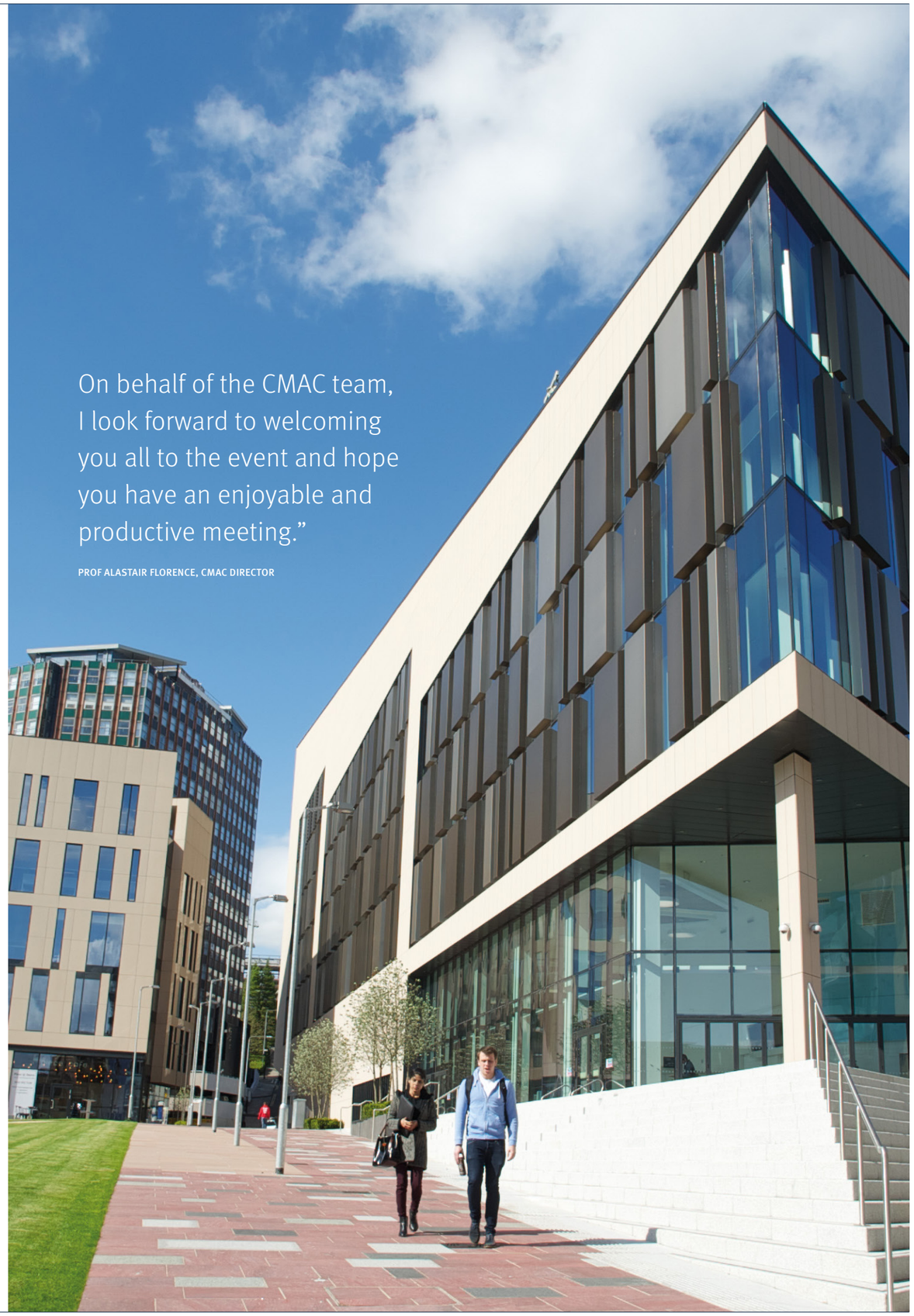
CMAC Open Days 2022

Prof Alastair Florence
CMAC Director

Welcome

“Welcome to the 2022 CMAC Open Days: Hub and ARTICULAR Showcase. This year’s event marks our first major in person event since COVID lockdowns impacted our lives and brought into ever sharper focus the importance of research and innovation to transform the way we develop and manufacture medicines. Running over three days you will hear from the different research teams and have the opportunity to interact and network with colleagues involved in the development of Quality by Digital Design, innovative user-centric workflows, DataFactories, Digital Twins and MicroFactories as well as an array of research across advanced characterisation, product and process modelling, supply chain and network modelling, robotics, artificial intelligence and immersive environments. The event includes a range of plenary speakers, research sessions along with technical demonstrations, lab tours and posters with time for networking with delegates and exhibitors. I am delighted too that the event will host the formal launch of the new Made Smarter Innovation Digital Medicines Manufacturing Research Centre focussed on driving the adoption of industrial digital technologies. The event therefore provides an excellent opportunity to hear about the latest research developments across our network of collaborators and join the discussion on how together we can drive the future of medicines manufacturing research.”

Contents



Day 1: CMAC OPEN DAYS PROGRAMME – MONDAY 16TH MAY 2022

Auditorium B & C

09:30	10:30	Registration & Refreshments Level 2 and Level 3 Foyer Areas
10:30 10:36 10:45	10:36 10:45 10:55	Prof Alastair Florence, University of Strathclyde Prof Jon-Paul Sherlock, AstraZeneca Welcome and Overview Prof Blair Johnston, University of Strathclyde Overview of ARTICULAR Showcase
Session Chair: **Prof Blair Johnston, University of Strathclyde** **DIGITALISATION IN MEDICINES DEVELOPMENT**		
10:55	10:56	Introduction of Presenter
10:56	11:26	Prof Jonathan Hirst, University of Nottingham "Machine Learning and Data-driven Approaches in Drug Discovery"
11:26	11:27	Introduction of Presenter
11:27	11:57	Dr Sophie Bailes, AstraZeneca "Unlocking the Power of Data for Innovative Pharmaceutical Development"
11:57	11:58	Introduction of Presenter
11:58	12:30	Prof Marion Bennie, University of Strathclyde "NHS Scotland Medicines Intelligence: using real world data to inform policy and drive improvements in patient care, enabled through electronic prescribing"
12:30	13:30	Poster Session, Interactive Demos & Exhibition Review with Lunch Level 2 and Level 3 Foyer Areas
Session Chair: **Prof Chris Rielly, Loughborough University** **DATA AND VISUALISATION**		
13:30	13:31	Introduction of Presenter
13:31	13:56	Tiffany Lai, Pfizer R&D UK Ltd "Data Structuring and Enabling Data Science in Formulation Development"
13:56	13:57	Introduction of Presenter
13:57	14:22	Dr Tabbasum Naz, University of Strathclyde "ETL for Pharmaceutical Manufacturing"
14:22	14:23	Introduction of Presenter
14:23	15:00	Victor Portela, Glasgow School of Art "Virtual Reality Immersive Training Environment for an EasyMax Workstation"
15:00	15:30	Poster Session, Interactive Demos & Exhibition Review with Refreshments Level 2 and Level 3 Foyer Areas
Keynote Session Chair: **Prof Blair Johnston, University of Strathclyde**		
15:30	15:31	Introduction of Keynote Presenter
15:31	16:15	Keynote Presentation Maxine Kennedy, NVIDIA "How Artificial Intelligence is Supporting the Transformation of Clinical Care and Drug Discovery"
Session Chair: **Dr Brahim Benyahia, Loughborough University** **APPLICATION OF AI IN DEVELOPMENT AND MANUFACTURING**		
16:15	16:35	Dr Brahim Benyahia, Loughborough University "Robust Control of a Crystallisation Process using Advanced Reinforcement Learning Strategies – Bridging the Gap between MPC and Artificial Intelligence"
16:35	16:36	Introduction of Presenter
16:36	16:55	Dr Antony Vassileiou, University of Strathclyde "A ML Framework for Cross-Solvent Solubility Prediction"
16:55	16:56	Introduction of Presenter
16:56	17:15	Dr Vijay Srirambhatla, University of Strathclyde "Machine Learning Models to Predict Mechanical Properties of Organic Compounds"
17:15	17:30	Prof Blair Johnston, University of Strathclyde Day 1 Wrap-up
18:30	19:15	Drinks Reception Drygate 85 Drygate, Glasgow G4 0UT
19:15	00:00	Dinner Drygate

Day 2: CMAC OPEN DAYS PROGRAMME – TUESDAY 17TH MAY 2022

Auditorium B & C

08:00	09:00	PRIVATE SESSION, BY INVITATION ONLY Tier 1, Tier 2 Engagement Breakfast Session
08:30	09:15	Registration & Refreshments Level 2 and Level 3 Foyer Areas
09:15	09:30	Prof Alastair Florence, University of Strathclyde Welcome and Overview
Session Chair: **Prof Alastair Florence, University of Strathclyde** **DIGITAL DESIGN AND PREDICTIVE TOOLS**		
09:30	09:31	Introduction of Presenter
09:31	09:49	Dr Bilal Ahmed, The University of Sheffield "Exploring Spherical Agglomeration with Mechanistic Understanding: Analysis of an Immersion-Driven Mechanism through Population Balance Modelling"
09:49	09:50	Introduction of Presenter
09:50	10:08	Dr Cameron Brown, University of Strathclyde "Applications of Hybrid Digital Design in Process Development"
10:08	10:09	Introduction of Presenter
10:09	10:27	Dr Chantal Mustoe, University of Strathclyde "CMAC's Automated Crystallisation DataFactory"
10:27	10:28	Introduction of Presenter
10:28	10:45	Dr Murray Robertson, University of Strathclyde "The CMAC Data Lifecycle and Digital Twinning"
10:45	11:15	Poster Session, Interactive Demos & Exhibition Review with Refreshments Level 2 and Level 3 Foyer Areas
Session Chair: **Prof Alison Nordon, University of Strathclyde** **CONTINUOUS PROCESSING MICROFACTORIES**		
11:15	11:16	Introduction of Presenter
11:16	11:34	Dr Sara Ottoboni, University of Strathclyde "Isolation Digital Design for Mefenamic Acid using Mechanistic Modelling"
11:34	11:35	Introduction of Presenter
11:35	11:53	Dr Wei Li, Loughborough University "Model Driven Crystallisation Design and Development for Mefenamic Acid"
11:53	11:54	Introduction of Presenter
11:54	12:11	Dr Magdalene Chong, University of Strathclyde "MicroFactories: Measurement and Control"
12:11	12:12	Introduction of Presenter
12:12	12:30	Dr Jagjit Srai, University of Cambridge "Reconfiguring Supply Chains for Resilience – Opportunities Enabled by MicroFactories"
12:30	13:45	Poster Session, Interactive Demos & Exhibition Review with Lunch Level 2 and Level 3 Foyer Areas
Session Chair: **Prof Sven Schroeder, University of Leeds** **MEASUREMENT AND CHARACTERISATION**		
13:45	13:46	Introduction of Presenter
13:46	14:04	Dr Anu Pallipurath, University of Leeds "Understanding the Solutions You Crystallise from: The Molecular Basis of Co-solvency and Conformational Changes by X-ray Pair Distribution Function Measurements and Modelling"
14:04	14:05	Introduction of Presenter
14:05	14:23	Prof Gavin Reynolds, AstraZeneca "Accelerating Establishment of Continuous Direct Compression Processes Using Digital Twins"
14:23	14:24	Introduction of Presenter
14:24	14:41	Dr Parmesh Gajjar, University of Manchester "Advanced XCT Characterisation of Pharmaceutical Materials"
14:41	14:42	Introduction of Presenter
14:42	15:00	Dr Elke Prasad, University of Strathclyde "The CMAC Future Manufacturing Research Hub: A Novel Hot-Melt-Extrusion – 3D Printing MicroFactory"
Keynote Session Chair: **Prof Alastair Florence, University of Strathclyde**		
15:00	15:01	Introduction of Keynote Presenter
15:01	15:45	Keynote Presentation Dr Gabriella Pizzuto & Dr Hatem Fakhruldeen, University of Liverpool "The New Era of Robotics for Material Discovery"
15:45	15:55	Prof Alastair Florence, University of Strathclyde Day 2 Wrap-up
16:00	17:15	CMAC Lab Tours Groups meet at Registration Desk, Level 2 Foyer
17:15	18:30	Poster Session with Drinks Reception TIC, Level 3 Foyer
19:00	19:30	Drinks Reception Grand Central Hotel Glasgow 99 Gordon Street, Glasgow G1 3SF
19:45	23:45	Conference Dinner Grand Central Hotel Glasgow

Day 3: CMAC OPEN DAYS PROGRAMME – WEDNESDAY 18TH MAY 2022

Auditorium B & C

08:00	**09:00**	PRIVATE SESSION, BY INVITATION ONLY Tier 1, Tier 2 and SCOUT Engagement Breakfast Session
08:30	**09:00**	**Registration & Refreshments** Level 2 and Level 3 Foyers
09:00	**09:20**	**Massimo Bresciani, University of Strathclyde** Welcome and Industry Overview
09:20	**09:21**	Introduction of Presenter
09:21	**10:00**	**Clare Porter, Department for Business, Energy and Industrial Strategy** "Manufacturing the Future: A Policy Response"
Session Chair: **Massimo Bresciani, University of Strathclyde** **INNOVATION THROUGH COLLABORATION**		
10:00	**10:01**	Introduction of Presenter
10:01	**10:20**	**Dr Bhavik Mehta, Siemens Process Systems Engineering Limited** "Development of an Advanced Modelling System for Active Ingredient End-to-End Manufacturing Processes – A KTP Overview"
10:20	**10:21**	Introduction of Presenter
10:21	**10:40**	**Rob Innes, Wyoming Interactive** "Succeeding at Collaboration: SME Perspective"
10:40	**10:41**	Introduction of Presenter
10:41	**11:00**	**Prof Thomas De Beer, Ghent University** "An Academic's Journey to Spin-out – Commercialization of a New Manufacturing Technology: Continuous Pharmaceutical lyophilisation"
11:00	**11:30**	**Poster Session, Interactive Demos & Exhibition Review with Refreshments** Level 2 and Level 3 Foyer Areas

Keynote Session Chair: **Massimo Bresciani, University of Strathclyde**		
11:30	**11:31**	Introduction of Keynote Presenter
11:31	**12:15**	**Keynote Presentation** **Dr Mark Buswell, GSK** "Exploiting Technology to Reimagine CMC Outcomes"
12:15	**13:15**	**Poster Session, Interactive Demos & Exhibition Review with Lunch** Level 2 and Level 3 Foyer Areas
Session Chair: **Prof Alastair Florence, University of Strathclyde** **DM² LAUNCH**		
13:15	**13:16**	Introduction of Presenter
13:16	**13:31**	**Chris Courtney, UKRI** "Delivering the Future we want for Manufacturing in the UK through Digitalisation"
13:31	**13:32**	Introduction of Presenter
13:32	**13:47**	**Dr Jürgen Harter, Cambridge Crystallographic Data Centre (CCDC)** "Digital Medicines – A CCDC Perspective"
13:47	**14:30**	**Panel Session** Digital Medicines Manufacturing: Delivering Value from DM²
14:30	**15:00**	**Prof Alastair Florence, University of Strathclyde** Prize Giving and Closing Remarks
15:00	**15:15**	**Quick Break** Level 2 and Level 3 Foyer Areas
15:15	**17:15**	**CMAC Lab Tours** Groups meet at Registration Desk, Level 2 Foyer

CMAC Open Days Informal Dinner

Monday 16th May 2022

Drygate

85 Drygate, Glasgow, G4 0UT

Drygate is located at Wellpark in Glasgow's East End, just a 10 minute walk from George Square, as well as making exceptional craft beer on site, the venue boasts a 24-tap beer hall, award-winning restaurant, bottle shop, elevated beer garden and gallery space.

Housed in a converted box factory under the iconic Seven Peaks of the roof, our building reflects on Glasgow's industrial past while the experiential brewery and restaurant inside invites visitors on a journey of brewing and discovery and great food.

With 26 rotating taps, a specially curated bottle selection and panoramic views of our Production Brewery the Brewhouse Bar + Kitchen delivers a truly dynamic dining experience, placing you right at the heart of the action.

Running Order:

Drinks Reception:	18:30
Dinner is Served:	19:15
Venue Closes:	00:00
Dress Code for dinner:	Casual

Attendance at the Informal Dinner is by registration only. If you have decided you would like to attend, please ask at the CMAC Registration Desk to see if there is space available.

CMAC Open Days Conference Dinner

Tuesday 17th May 2022

Grand Central Hotel Glasgow

99 Gordon Street, Glasgow, G1 3SF

Right in the heart of Glasgow, directly adjoining Glasgow Central station, our hotel has been an iconic landmark since we first opened our doors in 1883. Throughout the centuries, we have played host to countless famous faces and have seen the coronations of four monarchs and the abdication of a King. We have survived two World Wars and the Great Depression, yet still stand tall and proud in the heart of our thriving city.

When you arrive, you'll be struck by our impressive building. An iconic landmark, voco® Grand Central Glasgow was designed by one of Scotland's leading Architects – Sir Rowand Anderson, who also designed Scotland's National Portrait Gallery and the family home of the Marquises of Bute, which is regarded as Britain's most outstanding Gothic mansion.

Today, our hotel strikes a fitting balance between historic and modern – providing 21st-century luxury and comfort, while retaining the essence of the hotels' historic glamour and grandeur.

Running Order:

Drinks Reception:	19:00
Sit-down for Dinner:	19:30
Dinner is Served:	19:45
Venue Closes:	23:45
Dress Code for dinner:	Smart casual

Attendance to the Conference Dinner is by registration only. If you have decided you would like to attend, please ask at the CMAC Registration Desk to see if there is space available.

CMAC FUTURE MANUFACTURING RESEARCH HUB

CMAC Virtual Open Day 2022

Speaker and Panel Member Biographies – Day 1

Professor Alastair Florence
University of Strathclyde
CMAC Director

Professor Alastair Florence is a Distinguished Professor in Pharmaceutical Sciences at the University of Strathclyde and is Director of CMAC providing leadership across the centre's portfolio, engaging with our key stakeholders and driving the Centre's vision to transform the development and manufacture of medicines. He leads a number of major collaborative programmes across the portfolio including the EPSRC Future CMAC Manufacturing Research Hub, Made Smarter Innovation - Digital Medicines Manufacturing Research Centre (DM²) and the CMAC National Facility. Working with a national and international academic team across the multi-institution academic team he works in close collaboration with our industry partners to understand existing or emerging challenges to develop effective solutions delivered by the CMAC programme. His research interests lie in the science and technology associated with continuous crystallisation, physical form control and advanced characterisation of pharmaceuticals and the development of predictive methods for experimental design, processing and control.

Professor Jon-Paul Sherlock
AstraZeneca
Senior Director, Innovative Manufacturing Technology

Jon-Paul Sherlock is Senior Director, Innovative Manufacturing Technology. He is responsible for the development and introduction of new manufacturing technologies that improve quality and process robustness, supply chain agility, reduce costs and ensure the AstraZeneca Global Operations supply network is fit for the future. He has a PhD in Chemical Engineering, is a chartered chemical engineer, Fellow of the IChemE and has over 20 years' experience of pharmaceutical Research and Development. Jon-Paul has created links between industry and academia founding significant collaborations in formulation, physical processing and advanced manufacturing technologies. He is a Visiting Professor at the University of Manchester and University of Strathclyde, is a member of the MMIC Leadership Team and chairs the Industry Board of the CMAC Manufacturing Research Hub.

Professor Blair Johnston
University of Strathclyde
Professor of Pharmaceutical Data Science

Blair Johnston is Professor of Pharmaceutical Data Science at the Strathclyde Institute for Pharmacy and Biomedical Sciences and is Assistant Director of the EPSRC's Future Manufacturing Research Hub in Continuous Manufacturing and Advanced Crystallisation (CMAC). Current research focuses on the use of AI and machine learning in medicines manufacturing and is being driven by a four-year, EPSRC funded project to investigate ARtificial inTelligence for Integrated ICT-enabled pharmaceUticaL mAnufactuRing (ARTICULAR). He has strong links with industrial pharmaceutical companies through involvement in the Innovate UK ISCF Digital Design Accelerator (DDAP), Made Smarter Innovation Digital Medicines Manufacturing Research Centre (DM2), EPSRC Prosperity Partnership for a Healthier Nation, Digital Design and Manufacture of Amorphous Pharmaceuticals (DDMAP), Right First Time Manufacture of Pharmaceuticals (RiFTMaP), and Dialling up performance for on demand manufacturing research programmes.

Professor Jonathan Hirst
University of Nottingham
Professor in Computational Chemistry

Jonathan Hirst is Professor in Computational Chemistry at the University of Nottingham (UoN). In 2020, he was awarded a Chair in Emerging Technologies by the Royal Academy of Engineering, focusing on research that will empower the development of next-generation molecules that chemical engineers and chemists make, by using machine learning to augment human decision-making. His tenure as Head of School (2013-2017) saw some significant transformations under his leadership, including the building of the GSK Carbon Neutral Laboratory and a successful bid for an Athena Swan Silver Award. He leads UoN's participation in regional high performance computing via the HPC Midlands+ facility and leads the "AI-enabled medicinal chemistry" theme of the "Accelerated Discovery and Development of New Medicines" Prosperity Partnership with GSK. Jonathan's funding track record, past and present, comprises over £25M from more than 60 grants from US, European, UK and industrial sources, generating 150+ peer-reviewed publications.

Dr Sophie Bailes
AstraZeneca
Associate Director – Digital Transformation PT&D

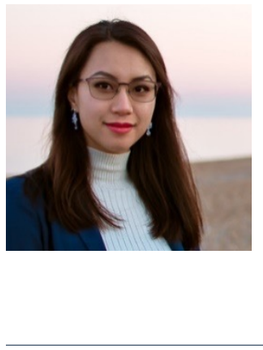
Sophie joined AstraZeneca in 2005 and has held a number of leading roles across chemical development and product development delivering drug products from Phase 1 to commercial submission. As Associate Director for Digital Transformation for Pharmaceutical Technology & Development, Sophie leads a cross discipline team in Science and IT to deliver a new digital backbone for data capture, use, and reuse for 1200 scientists across 9 development sites.

Her team ensures development data is FAIR (Findable, Accessible, Interoperable, Reusable) and easily searchable through cataloguing, creating data models, schemas, and defining data relationships based on scientific needs. Integrating key software and equipment to deliver a seamless data transfer to increase data quality and reduce time required for data handling. Identifying critical software and capability build required to increase predictive, modelling, and data science capabilities to innovate in a simulated environment and target physical experiments, thereby reducing laboratory waste

Professor Marion Bennie
University of Strathclyde
Professor of Pharmacy Practice

Professor of Pharmacy and Pharmacoepidemiology, University of Strathclyde and Chief Pharmacist, Public Health Scotland (PHS). She is the senior officer in PHS responsible for all national medicines intelligence resources spanning the whole healthcare system. Her academic portfolio includes leadership in pharmacoepidemiological studies using real world data to generate intelligence to drive improvements in clinical care locally, nationally and internationally. Most recently this has included new data curation and analysis to understand the use and outcome of novel COVID treatments in clinical care outwith the clinical trial setting.

Current strategic leadership roles include; Associate Director, Health Data Research (HDR) UK Scotland; Immediate past Chair, European Drug Utilisation Research Group (EuroDURG); lead for NHS Scotland Cancer Medicines Outcome Program. Marion is a Fellow of the: Royal Pharmaceutical Society, UK; Faculty of Public Health, Royal Colleges of Physicians, UK, and; Royal College of Physicians, Edinburgh.



Tiffany Lai
Pfizer
Informatics Scientist in Drug Product Design

I have worked at Pfizer for 6 years, exploring the latest software and digital tools to improve efficiency of data capture and availability of data to support the development of solid dosage formulation development. As the interface between the scientists and technology experts, my role is to translate the requirements of our researchers into functional digital tools. In addition, I also work on the application of machine learning and data visualisation to support the development and manufacture of drug products. I am a pharmacist by education and background, with years of experience in community and hospital pharmacy.

Dr Tabbasum Naz
University of Strathclyde
Research Fellow

Tabbasum Naz is a Research Fellow at CMAC and is working in the Digital Design Accelerator Platform (DDAP) project funded by Innovate UK, Industrial Strategy Challenge Fund (ISCF). In DDAP, she is working on the development of data architectures, models and ontologies to underpin future medicines discovery and development. As a part of DDAP, she works with the wider CMAC network of Tier 1 and Tier 2 Partners including AstraZeneca, Pfizer and GSK. After finishing her PhD in domain of Computer Science from Vienna University of Technology, Austria, she has worked in multiple organisations including University of Essex, Open University in the UK and University College Cork in Ireland as post-doctorate researcher. Her research interests include information extraction and integration, semantic web, software engineering, data modelling and ontology-based applications.

Victor Portela
Glasgow School of Art
Lecturer in Immersive Environments

Victor Portela is a Lecturer in Immersive Environments at the School of Simulation and Visualization (SimVis) at the Glasgow School of Art. His background is in computer engineering with specialisation in Extended Reality (XR) technologies. Most of his developments involve working with the game engine Unity3D and has worked on a wide variety of projects involving VR and AR. He is currently completing a Ph.D. in collaboration with the University of Strathclyde, investigating different training and learning methods involving VR in the EPSRC-Funded project ARTICULAR.

Dr Brahim Benyahia
Loughborough University
Reader in Chemical Engineering

Brahim Benyahia is a Reader in Chemical Engineering at Loughborough University and currently CoI on the EPSRC's CMAC HUB and ARTICULAR. He also leads the Digital Quality Control Platform at the Digital Medicines Manufacturing Research Centre (DM²). He has over 10 years' experience of research in high fidelity modelling (i.e. estimability and identifiably issues), pharmaceutical manufacturing, crystallisation, model-based process design optimisation and control. He played a key role in the development of industrial digital technologies for the first End-to-End Integrated Continuous Pharmaceutical Manufacturing Pilot Plant at MIT, USA. His current research activities are focused on Quality by Digital Design, real-time release testing, sustainability, and Artificial Intelligence for real-time monitoring, control, and fault detection.

Dr Antony Vassileiou
University of Strathclyde
Research Associate

Antony obtained a MSci in Chemistry before undertaking a PhD in protein molecular dynamics for allosteric binding site detection, under the direction of Prof. Blair Johnston at the University of Strathclyde. On joining CMAC in 2016 he applied his skills in programming, data science and machine learning across a range of projects in collaboration with experimentalists throughout the Centre. He joined ARTICULAR in 2018 to work on the development of novel AI approaches for pharmaceutical manufacturing. Collaborating with industrial partners, he has led projects on i) enhanced API solubility prediction through machine learning, ii) particle vision and classification via both feature-based and deep learning approaches, iii) data visualisation of manufacturing process datasets.

Dr Vijay Srirambhatla
University of Strathclyde
Research Associate

Vijay Srirambhatla is a solid-state Scientist with expertise in analytical and computational methods. In the past Vijay gained his PhD in Chemistry from Heriot-Watt University, where he was working on co-crystallisation of API's. After his PhD, following a brief stint as Scientist in industry, Vijay joined CMAC as a post-doc in the CPOSS project where he was involved in developing experimental methods to discover novel computationally predicted polymorphs. In the past few years, he has been working on the ARTICULAR project to develop machine learning methods, where he has been involved in developing machine learning work flows to predict glass forming ability, mechanical properties, image classification and analysis, and co-crystallisation of APIs. His research interest includes solid state screening and analysis, studying polymorphism and phase transformations, computational spectroscopy, and machine learning methods.

CMAC Virtual Open Day 2022

Speaker and Panel Member Biographies – Day 2

Dr Bilal Ahmed
The University of Sheffield
Research Associate

Bilal is currently working as a CMAC Hub research associate within the Department of Chemical and Biological Engineering at The University of Sheffield where he is developing mechanistic models for powder based manufacturing and product performance processes. His research interests are driven mechanistic understanding for studying particulate processes such as crystallisation, spherical agglomeration, milling and granulation where he has experience in applying process modelling tools with experimental techniques.

Bilal joined CMAC in 2014 to begin his PhD within the Doctoral Training Centre at University of Strathclyde. His PhD investigated the combination of crystallisation with wet milling methods to which he completed in 2019. Bilal then worked in the CMAC National Facility on industrial Tier 1 pharmaceutical proprietary projects involving batch and continuous crystallisation processes as well as isolation methods. He then joined The University of Sheffield in 2020 as part of the CMAC Hub programme.

Dr Cameron Brown
University of Strathclyde
Senior Lecturer

Cameron is a Senior Lecturer for the Strathclyde Institute of Pharmacy and Biomedical Sciences at the University of Strathclyde, Glasgow. Specialising in the development of digital design tools and strategies for pharmaceutical manufacturing. His current research is focused on the application of generative and deep learning approaches to the design of pharmaceutical equipment, processes, and products. A Co-Investigator for the Future CMAC Manufacturing Research Hub, ARTICULAR, and Digital Design and Manufacturing of Amorphous Pharmaceuticals (DDMAP) projects. As part of the GlaxoSmithKline, Nottingham University and University of Strathclyde Prosperity Partnership for a Healthier Nation, he also leads the University of Strathclyde team in the digital manufacturing of novel pharmaceutical processing equipment. A wealth of experience in knowledge exchange and translation of research to industry has resulted in Cameron being the academic lead for a Knowledge Transfer Partnership with Siemens Process Systems Engineering Ltd. He can be reached at cameron.brown.100@strath.ac.uk or on Twitter @CameronBrown42.

Dr Chantal Mustoe
University of Strathclyde
Research Fellow

Chantal is a CMAC Research Fellow for the Hub's DataFactory. She is responsible for integrating the automated parts of the DataFactory and implementing autonomous decision-making for this system. With research experience at NPL and SLAC National Accelerator Laboratory, she is familiar with working in interdisciplinary environments from automated measurement and analysis of the atmosphere to using machine learning to calibrate particle accelerator radiation energies. Chantal received her Ph.D. from the University of British Columbia in Chemistry where her interest in using coding to tackle challenges in the physical sciences was sparked.

Dr Murray Robertson
University of Strathclyde
Research Fellow

After completing his PhD in organic chemistry (University of Glasgow, 2009) Murray has held several post-doc positions at the University of Strathclyde and the University of Sydney with a broad scope of research interests. These include molecular docking and virtual screening, medicinal chemistry, open source science and ICT development. Murray joined the EPSRC Future CMAC Manufacturing Research Hub in 2013 and is currently a research fellow where he is responsible for developing the digital platform.

Professor Alison Nordon
University of Strathclyde
Professor, Department of Pure & Applied Chemistry

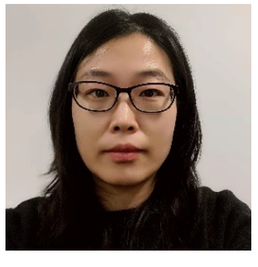
Alison Nordon is a Professor in the Department of Pure and Applied Chemistry at the University of Strathclyde, Glasgow. Alison has over 20 years' experience in the development of spectroscopic techniques in conjunction with multivariate data analysis methods for the on-line monitoring of chemical processes. Her research interests cover advances in measurement techniques (optical, acoustic and nuclear magnetic resonance), developments in data analysis methods, and process monitoring applications across a wide range of industries, e.g. pharmaceutical, nuclear, petrochemical and speciality chemicals.

She has extensive experience of multi-disciplinary research and interaction with industry, and is the Technical Director of the Centre for Process Analytics and Control Technology (CPACT) and a co-investigator in the EPSRC Centre for Continuous Manufacturing and Advanced Crystallisation (CMAC) Future Manufacturing Research Hub.

Dr Sara Ottoboni
University of Strathclyde
Research Associate

Sara is currently employed as PDRA on the Future CMAC Manufacturing Research Hub Programme, within which her focus is Isolation and Purification. Sara developed new analytical techniques to investigate isolation mechanisms and the correlation of particles-solvents chemical and physical properties and the process parameters. She designed workflow tools for optimal isolation process development and conversion from batch to continuous process, assisted with modelling tools.

Sara first joined CMAC in 2014 as part of the third cohort of PhD students in the Doctoral Training Centre. After completing her PhD on continuous isolation, she started her PDRA role in CMAC. Sara participated to the visNET programme, and she secured funding for a fellowship project. She is a member of the Strathclyde Researcher's group, collaborating with OSDU to design and deliver early career researchers seminars. She is a member of the UKRI Early Career Researcher Forum, Royal Society of Chemistry (MRSC), American Filtration and Separation Society, and AIChE.



Dr Wei Li
Loughborough University
Research Associate

Wei is a research associate in the Future CMAC Manufacturing Research Hub. She is responsible for crystallisation process development, using experimental techniques (inline Process Analytical Technology and offline characterisation) and modelling tools to aid process design and understanding, targeting required critical product quality with increased efficiency and reduced cost.

Wei graduated with a Bachelor in Material Engineering and an MSc in Chemical Engineering from Beihang University (China). She then worked on Pharmaceutical Filtration and Drying during her PhD study at the University of Leeds. After obtaining her doctorate degree she joined the Department of Chemical Engineering at Loughborough University as a CMAC post-doc.

Dr Magdalene Chong
University of Strathclyde
Research Associate

Magdalene completed her BSc in Natural Sciences at the University of Bath. She did an industrial placement as part of the degree, which was based in the process analytical technology (PAT) group at Genzyme. She completed her PhD in inorganic chemistry at the University of Nottingham. She did a short post-doc at The University of Manchester, working on a project with AstraZeneca developing fluorescence-based PAT. Since 2017, Magdalene joined the CMAC Hub, based at the University of Strathclyde and working for Professor Alison Nordon.

Dr Jagjit Srai

University of Cambridge

Director of Research, and Head, Centre for International Manufacturing, IfM

Dr Jagjit Singh Srai is a Director of Research in the Department of Engineering, University of Cambridge, where he is Head of the Centre for International Manufacturing, Institute for Manufacturing. His research brings an engineering and strategic management perspective to the design, analysis and operation of supply chains, focusing on the disruptive impacts of new production and digital technologies. Extensive engagements with industrial collaborators and institutions include co-Chair World Economic Forum Council on Advanced Manufacturing. Previous leadership roles in industry include Technical Director and Supply Chain Director roles in Unilever. Jag is a CEng and FIChemE and holds degrees in Engineering (BEng 1st, Aston; PhD, Cambridge).

Prof Sven Schroeder

University of Leeds

Bragg Centenary Chair - Engineering Applications

Sven L. M. Schroeder holds the Bragg Centenary Chair in Engineering Application of Synchrotron Radiation in the School of Chemical and Process Engineering at the University of Leeds. Originally trained as a physical chemist (FU Berlin) with a PhD in catalysis and surface science (University of Cambridge), he combines fundamental with applied research using advanced X-ray characterisation techniques, working across discipline boundaries and industrial sectors. He is leading the CMAC spoke at Leeds and the CMAC Group in the Research Complex at Harwell. His team contributes to several research strands in the CMAC Hub programme, where it provides expertise in the use of synchrotron radiation X-ray spectroscopy, imaging, diffraction, and scattering.

Dr Anuradha Pallipurath

University of Leeds

Research Fellow

Dr Anuradha Pallipurath, is presently a Research Fellow at the University of Leeds working with Prof Sven Schroeder as part of the Advanced Characterisation Team. After obtaining her PhD in Physical Chemistry at the University of Cambridge, she went on to work at the Synthesis and Solid State Pharmaceutical Centre in Ireland to improve drug bioavailability. She then joined the Metastable Materials team at the University of Bath, to develop non-ambient methods of spectroscopic and crystallographic analysis of crystallisation and phase transition in metastable materials. She currently works on developing methodologies for the structural analysis of in situ crystallisation processes using X-ray synchrotron methods.

Prof Gavin Reynolds

AstraZeneca

Senior Principal Scientist, Pharmaceutical Technology and Development

Gavin Reynolds is a Senior Principal Scientist in Process Engineering and Digital, based within Pharmaceutical Technology and Development at AstraZeneca, Macclesfield and is also a Visiting Professor in the Department of Chemical and Biological Engineering at The University of Sheffield. His interests include applying mechanistic modelling and simulation to pharmaceutical processes and driving the implementation of Digital Twins. He is a Fellow of the IChemE and has authored over 80 peer-reviewed publications.

Dr Parmesh Gajjar

University of Manchester

Research Associate

Parmesh Gajjar is a Research Associate at the University of Manchester, based within the National Facility for Laboratory X-ray Computed Tomography and the Henry Royce Institute for Advanced Materials. Parmesh specialises in applying X-ray Computed Tomography (XCT) methods to understand the properties, performance and behaviour of pharmaceutical materials. During the last year, Parmesh has been involved in a CMAC Feasibility project to apply XCT methods to materials and processes strategically important to CMAC, through a partnership between CMAC, The University of Manchester and the University of Hertfordshire.

Parmesh has published a number of works utilising XCT for pharmaceutical materials, including novel insight into tablet structure, inter-crystal interactions within a powder bed and inhalation powder blends. He has also been invited to speak on several occasions at the prestigious Respiratory Drug Delivery conference series. Parmesh has a PhD in Applied Mathematics from The University of Manchester, and holds a concurrent position as a Principal Scientist at Seda Pharmaceutical Development Services.

Dr Elke Prasad
University of Strathclyde
Research Fellow

Elke is a Research Fellow responsible for the secondary processing activities within the MicroFactory research theme of the CMAC Future Manufacturing Research Hub. Her research interests focus on formulation development and characterisation with a particular interest in HME applications linked to downstream processes such as 3D printing and injection moulding. Elke also supports CMAC, National Facility and the MMIC team with her expertise in formulation, pharmaceutical analysis and manufacturing processes.

Elke is a registered Pharmacist in the UK and Germany and has 17 years' research experience in the pharmaceutical industry and academia, developing formulations for a range of pharmaceutical dose forms such as injectables, oral thin films, tablets, liquid and powder filled capsules as well as 3D printed tablets.

Dr Gabriella Pizzuto
University of Liverpool
Early Career Researcher

MDr Gabriella Pizzuto is an interdisciplinary early career researcher in robotics and applied machine learning, currently working at the University of Liverpool as the lead research associate on the €10M ERC Synergy Grant 'Autonomous Discovery of Advanced Materials' (ADAM). Previously, she worked on dynamics model learning and control for robotic manipulation as a research associate at the Edinburgh Centre for Robotics within the EPSRC RAI Hub NCNR. She obtained her Ph.D. in Computer Science from the University of Manchester, where she was also a Marie-Sklodowska Curie early stage researcher and a visiting scholar at the University of Edinburgh and Italian Institute of Technology. Her research interests lie within the intersection of robot learning and control, focusing on generalisation and safe human-robot collaboration, particularly for real-world environment such as material discovery laboratories.

Dr Hatem Fakhruldeen
University of Liverpool
Intelligent Automation Theme Lead

Dr Hatem Fakhruldeen is the intelligent automation theme lead at the Leverhulme Research Centre for Functional Materials Design, University of Liverpool. He holds a PhD in Robotics and Autonomous Systems from the University of Bristol. His research interests are focused on robotic systems' integration and robotic manipulation in the context of a chemistry laboratory. His latest work involves the development of the Autonomous Robotic Chemistry (ARChemist) system architecture, which is a novel robotic system architecture specifically designed for chemistry lab automation. Hatem is a passionate roboticist and software developer who is proficient in different programming languages and paradigms. In his free time, he loves to hike, exercise and play video games.?

CMAC Virtual Open Day 2022

Speaker and Panel Member Biographies – Day 3

Massimo Bresciani
University of Strathclyde
CMAC Industry Director

Massimo Bresciani is the Industry Director at the Advanced Crystallisation and Medicines Manufacturing Research Centre based at Strathclyde (CMAC) and is actively supporting the group of Professors of Practice at the University of Strathclyde on various strategic initiatives.

Massimo holds an MBA and has a wealth of experience from over 25 years spent in the pharmaceutical and innovation sector in senior industrial R&D and manufacturing roles and at the interface between research and commercial application of innovative solutions. Massimo's consolidated multidisciplinary expertise in pharmaceutical development and drug delivery technologies applies to both generic drugs and NCEs from lead optimisation throughout all the preclinical and clinical phase, and includes extensive experience in the early phases regulatory landscape.

Massimo is active internationally in innovation and alliance management, the creation of coopetitive partnership and associated strategy, collaborative alliances and pre-competitive consortia. He is a decision maker based on facts and both short and long-term vision.

Clare Porter
Department for Business, Energy and Industrial Strategy (BEIS)
Head of Manufacturing

Clare has led the manufacturing policy team for the Department of Business Energy and Industrial Strategy since 2015. Priorities include developing the UK's position as a leader of the 4th Industrial Revolution through Made Smarter – the UK's Industrial Digitalisation programme; strengthening UK Supply Chain Capability and leading international engagement to identify opportunities for collaboration.

Clare worked with industry to produce the Made Smarter Review, published in 2017 and leads work for the department on how to deliver its ambitions through government policy. This includes delivery of Made Smarter adoption support for manufacturing SMEs and the Made Smarter Commission. Clare started working in BEIS in 2011, has led on Growth Deal policy; worked on the Heseltine Review and with LEPs. Clare joined the civil service in 2002 and has worked across a number of government departments and policy areas including counter terrorism, community cohesion, 2012 Olympics and UK drug policy.

Dr Bhavik Mehta
Siemens Process Systems Engineering Ltd
KTP Associate

Dr. Mehta is a KTP Associate at Siemens Process Systems Engineering and CMAC Future Manufacturing Research Hub at the University of Strathclyde. He received his Bachelor's in Chemical Engineering with Environmental Engineering at The University of Nottingham in 2015, his Masters in Advanced Chemical Engineering at The University of Birmingham in 2016, and his PhD in Engineering at The University of Liverpool in 2020. His work focuses on developing mechanistic models for crystallisation, filtration and isolation processes. He has several publications and presentations in prestigious journals and conferences. He has also contributed to commercial release material for gPROMS Formulated Products, a mechanistic process modelling environment.

Rob Innes
Wyoming Interactive
Head of Consultancy

Rob has 20 years of experience in digital transformation using data to unlock value for Life Science organisations. Originally from a technology background building applications for supply chain integration, customer self-service and customer acquisition, now heavily involved helping organisations to do more with data - generating insights that are accessible to users regardless of their data expertise. Collaborates with manufacturers, academics, researchers and government to work smarter with data by building integrations, applications and visualisations.

This session focuses on how to succeed at collaboration and is the fruit of many successful (and some attempted, but not successful) collaborations that Rob has been part of.

Professor Thomas De Beer
Ghent University
Professor at Ghent and Co-founder & CEO of RheaVita

Thomas De Beer graduated in pharmaceutical sciences in 2002 at the Ghent University in Belgium. He obtained his PhD at the same university in 2007. For his PhD research, he examined the suitability of Raman Spectroscopy as a Process Analytical Technology tool for pharmaceutical production processes. Within his PhD research period, he worked for four months at University of Copenhagen in Denmark, Department of Pharmaceutics and Analytical Chemistry. After his PhD, he was an FWO funded post-doctoral fellow at the Ghent University (2007-2010). Within his post-doc mandate, he worked 9 months at the Department of Pharmacy, Pharmaceutical Technology and Biopharmaceutics from the Ludwig-Maximilians-University in Munich, Germany. In February 2010, he became professor in Process Analytics & Technology at the Faculty of Pharmaceutical Sciences from the University of Ghent. His research goals include bringing innovation pharmaceutical production processes (freeze-drying, hot-melt extrusion, continuous from-powder-to-tablet processing etc.). More specifically, Prof. De Beer contributes to the development of continuous manufacturing processes for drug products such as solids, semi-solids, liquids and biologicals. Thomas De Beer is also director of Ghent University's Center of Excellence in Sustainable Pharmaceutical Engineering (CESPE) which is founded in 2016. In 2018, Thomas De Beer became co-founder and CEO of the Ghent University spin-off company RheaVita which provides a continuous freeze-drying technology for the pharmaceutical market.

Dr Mark Buswell
GSK
Vice President, Vaccines Tech

Mark Buswell is the VP of Vaccines Tech, GSK. He has accountability for the Tech solutions supporting GSK vaccines division spanning R&D, manufacturing, quality and business operations. He joined GSK in 2002 and has held roles in R&D, manufacturing and Tech. He has a PhD in Chemical Engineering from University of Cambridge and an MBA from Cranfield University. His interests include information technologies, synthesis of APIs using novel methods, novel formulation technologies, fermentation technologies, advanced analytical technologies and automation. He is a Chartered Chemical Engineer, a Fellow of the Institute of Chemical Engineering and a Fellow of the Royal Academy of Engineering.

Chris Courtney
UKRI
Challenge Director: Made Smarter Innovation

Chris is UK Research and Innovation (UKRI) Challenge Director for Made Smarter Innovation, which is a £147M programme supporting the manufacturing sector in the UK. Through the development and adoption of new technologies it aims to transform the competitiveness, productivity, resilience and sustainability of the manufacturing sector in the UK and shape how the world does business. Prior to this Chris lead the Industry 4 effort in across manufacturing in Deloitte, developing and delivering smart factory and connected supply chain solutions across multiple industries. Chris has also been a CTO of a start-up, was the launching Chairman for CFMS and before that an Engineering VP in Rolls Royce where he worked in aerospace defence and commercial and offshore marine. Throughout Chris' career he has developed and delivered new technology capability and business transformations and has worked extensively in Scandinavia, USA, Singapore and Europe.

Dr Jürgen Harter
Cambridge Crystallographic Data Centre (CCDC)
CEO

Jürgen is CEO of the Cambridge Crystallographic Data Centre (CCDC) who curate, maintain, and distribute the world's database of small-molecule crystal structures, the Cambridge Structural Database. After completing his Ph.D. in Organic Chemistry, Jürgen worked in research for 5 years before moving to business development in Abcam, PerkinElmer Informatics, and others. He went on to manage global informatics and information systems at Horizon Discovery. Throughout his career, he has championed digital transformation and taken a special interest in how data and knowledge management can expedite research. Today he leads the CCDC to deliver data, software, and consultancy services to over 20,000 global users.

CMAC FUTURE MANUFACTURING RESEARCH HUB

CMAC Open Days 2022

Interactive Demos and Poster Presentations

Digital & Model Toolbox

No.	Poster / Demo	Title	Lead Author and Institute	Project	Location
1	Poster	DM² Platform II: AI-Assisted Optimization of Oral Solid Dosage Form Development	Mohammad Salehian, University of Strathclyde	DM²	Conf 2
2	Poster	DM² Platform II: Development of an Automated Microscale Manufacturing System for Oral Solid Dosage Forms	Jonathan Moores, University of Strathclyde	DM²	Conf 2
3	Poster & Demo	Medicines Manufacturing Innovation Centre (MMIC): the Use of a Digital Twin	Hikaru Jolliffe, University of Strathclyde	MMIC	Conf 3
4	Poster	Process Activities to Develop a Digital Twin MMIC GC1: Introduction and Activities	Carlota Mendez Torrecillas, University of Strathclyde	MMIC	Conf 3
5	Poster	Using Machine Learning to Predict Residence Time Distributions in Coiled Flow Inverter (CFI) Reactors	Maria Cecilia Barrera, University of Strathclyde	Prosperity Partnership	Conf 3
6	Poster & Demo	In-line Process Reactor Test Bed & Sensor Development	Aleksandar Josifovic, University of Strathclyde	Prosperity Partnership	Conf 3
7	Poster	Accelerated Discovery and Development of New Medicines: Prosperity Partnership for a Healthier Nation; Theme 4: Digital Design Toolset for Manufacturing Novel Pharmaceutical Processing Equipment	Aleksandar Josifovic, University of Strathclyde	Prosperity Partnership	Conf 3
8	Poster	Mitigation of Encrustation using a Novel Plug Flow Crystallizer Configuration	Aniruddha Majumder, University of Aberdeen	Feasibility Study	Conf 3
9	Poster & Demo	Wet Milling of Mefenamic Acid for Seed Generation: Model Driven Size Reduction for Maximizing Yield	Bhavik Mehta, University of Strathclyde/ Siemens	KTP	Conf 4/5
10	Poster & Demo	Comparison of One Dimensional and Two-Dimensional Population Balance Model for Optimization of a Crystallization Process	Bhavik Mehta, University of Strathclyde/ Siemens	KTP	Conf 4/5
11	Poster & Demo	Integrated Filtration and Washing Modelling: Optimization of Impurity Rejection for the Filtration and Washing of Active Pharmaceutical Ingredients	Sara Ottoboni, University of Strathclyde	Hub	Conf 4/5
12	Poster & Demo	Mechanistic Modelling of Spherical Agglomeration Processes	Bilal Ahmed, University of Sheffield	Hub	Conf 4/5
13	Poster & Demo	The CMAC Digital Twin	Murray Robertson, University of Strathclyde	Hub	Conf 4/5
14	Poster & Demo	SAFT-γ Mie Molecular Modelling of Active Pharmaceutical Ingredients and Solvents; Solubility Calculation	Thomas Bernet, Imperial College London	Hub	Conf 4/5
15	Poster & Demo	Model Driven Crystallization Design and Development for Mefenamic Acid	Wei Li, Loughborough University	Hub	Conf 4/5
16	Poster	Hub Translation	Rhys Lloyd, University of Strathclyde	Hub	Conf 6/7
17	Poster & Demo	CMAC AssetStore	Subhaa Arumugam, University of Strathclyde	Hub	Conf 6/7
18	Poster & Demo	Many-Objective Process Optimisation with Constraints for Continuous Tabletting Lines: a Case Study in Lovastatin	Kai Eivind Wu, University of Sheffield	Feasibility Study	Conf 6/7
19	Poster & Demo	Machine Learning Workflows to Predict Crystallisability, Glass Forming Ability, Mechanical Properties of Small Organic Compounds	Vijay Srirambhatla, University of Strathclyde	ARTICULAR	Conf 6/7
20	Poster & Demo	A Unified AI Framework for Solubility Prediction Across Organic Solvents	Antony Vassileiou, University of Strathclyde	ARTICULAR	Conf 6/7
21	Demo	Virtual Reality Immersive Training Environment for an EasyMax Workstation	Victor Portela, Glasgow School of Art	ARTICULAR	Conf 6/7
22	Poster & Demo	Multidimensional Particle Characteristics from *In-Situ* Sensors	Christopher Boyle, University of Strathclyde	Core Project	Conf 6/7
23	Poster & Demo	Making Pharmaceutical Manufacturing Data Ready for AI	Tabbasum Naz, University of Strathclyde	DDAP	Conf 6/7
24	Poster	Modular Configurations Enabled by MicroFactory Technologies: Toward Pharmaceutical Supply Chains Resilience	Ettore Settanni, University of Cambridge	Hub	Level 3 foyer

CMAC FUTURE MANUFACTURING RESEARCH HUB

CMAC Open Days 2022

Interactive Demos and Poster Presentations

Digital & Model Toolbox - Continued

No.	Poster / Demo	Title	Lead Author and Institute	Project	Location
25	Poster	Automatic Extraction of Pharmaceutical Manufacturing Data from Patents using Natural Language Processing (NLP)	Diego Alvarado Maldonado, University of Strathclyde	PhD	Level 3 foyer
26	Poster	Model-Driven Optimisation of Tablet Structure for FdM-Based 3D Printing	Patrycja Bartkowiak, University of Strathclyde	PhD	Level 3 foyer
27	Poster	Flowsheet Optimisation and Global Sensitivity Analysis of an Integrated Continuous Ibuprofen Manufacturing Processes	Timothy Campbell, Loughborough University	PhD-Hub	Level 3 foyer
28	Poster	Digital Design Strategies for Industrial Crystallisation Development	Mitchelle Mnemo, University of Strathclyde	PhD	Level 3 foyer
29	Poster	Unravelling Anomalous Mass Transport in Antisolvent Crystallisation	Irene Moreno Flores, University of Strathclyde	PhD	Level 3 foyer
30	Poster	Prediction of Mefenamic Acid Crystal Shape by Random Forest Classification	Siya Nakapraves, University of Strathclyde	PhD	Level 3 foyer
31	Poster	Machine Learning Methods for Accelerated Generative Equipment Design for New Medicines	Thomas Ralph, University of Strathclyde	PhD	Level 3 foyer
32	Poster	Modelling the Swelling of Pharmaceutical Tablets from Single Particle Understanding using DEM	Mithushan Soundaranathan, University of Strathclyde	PhD	Level 3 foyer
33	Poster	Discovery and Applications of a Novel Solid-State Arrangement: Water Bridge Salt Form	Saadia Tanveer, University of Strathclyde	PhD	Level 3 foyer

Advanced Materials Characterisation Posters – Level 3 foyer

Poster No.	Poster Title	Lead Author and Institute	Project
34	Advanced X-Ray Characterizations for Medicine Manufacturing Products and Processes	Dipankar Saha, University of Leeds	Hub
X1	Relativistic Ultra-fast Electron Diffraction and Imaging Facility (RUEDI)	Prof. Nigel Browning, University of Liverpool	-
35	Characterisation of Inclusion Complexes Using Powder X-Ray Diffraction, and Low- and Mid-Frequency Raman Spectroscopy	Nura Abdallah, University of Strathclyde	PhD
36	Predicting Long-Term Stability of Oral Solid Dosage Forms	Mark Anthony Carroll, University of Strathclyde	CAMS
37	Insights into Surface Structural Dynamics for Particle Property Control	Dave Collins, University of Leeds	PhD
38	Probing the Effect Non-/Hydrostatic Pressures on Ofloxacin and Levofloxacin	Julia Gasol Cardona, University of Strathclyde	PhD-Hub
39	Reactive Crystallisation of Benzaldehyde Sodium Bisulfite	Christopher McArdle, University of Strathclyde	PhD
40	Real-Time X-Ray Imaging of Crystallisation Processes	Oliver Towns, University of Leeds	PhD
41	Calibration Model Development for *In-Situ* Monitoring of Solute Concentration for Antisolvent Crystallisation	Maria Velazco, University of Strathclyde	Core Project
42	Application of Multivariate Curve Resolution to *In-Situ* THz - Raman Spectroscopy of Amorphous Solid Dispersions in Pharmaceutical Products	Pattavet Vivattanaseth, University of Strathclyde	PhD
43	Recovery of High-Pressure Solid Forms to Ambient Conditions	Martin Ward, University of Strathclyde	-
44	X-Ray Research Facility Developments	Alan Martin, University of Strathclyde	National Facility
45	Physical & Chemical Analysis of Pharmaceutical Materials	Christoph Busche, University of Strathclyde	National Facility
46	ToF-SIMS: Methods & Applications	Aruna Prakash, University of Strathclyde	National Facility

CMAC FUTURE MANUFACTURING RESEARCH HUB

CMAC Open Days 2022

Interactive Demos and Poster Presentations

Primary Processing Posters – Level 3 foyer

Poster No.	Poster Title	Lead Author and Institute	Project
47	Particle Engineering-Size Controlled Spherical Agglomeration of Benzoic Acid	Vishal Raval, University of Strathclyde	National Facility
48	A Crystallisation Development Workflow for the Manufacturability Improvement of Active Pharmaceutical Ingredients	Humera Siddique, University of Strathclyde	National Facility
49	Continuous Crystallisation - Case Studies	Humera Siddique, University of Strathclyde	National Facility
50	Controlling Urea Crystallisation via Heterogeneous Nucleation	Samira Anker, University of Strathclyde	PhD-Hub
51	Nucleation and Crystal Growth of α-Glycine: Classification of Crystallisation Behaviour	Andrew Cashmore, University of Strathclyde	PhD-Hub
52	Towards Controlling Crystallization Using Liposomes: Manipulation of Liposome Size Through Microfluidics	Greg Chambers, University of Strathclyde	PhD-Hub
53	Investigating Crystal Nucleation and Growth under the influence of Optical Tweezers	James Flannigan, University of Strathclyde	PhD-Hub
54	Drying Pharmaceutical Compounds – Predicting and Reducing Undesired Agglomeration in an Agitated Filter Dryer	Suruthi Gnanenthiran, The University of Sheffield	PhD
55	Mechanistic Model Development of α-Lactose Monohydrate Crystallisation	Jenna Johnston, University of Strathclyde	PhD-Hub
56	Influence of Impeller Geometry on the Formation of Spherical Agglomerates	Victoria Kitching, University of Sheffield	PhD-Hub
57	Measuring Interface Induced Concentration Enhancement in Solutions	Ruairidh Mackay, University of Strathclyde	PhD-Hub
58	Diffusive Mixing in Antisolvent Crystallisation	Russell Miller, University of Strathclyde	PhD

Primary Processing Posters – Level 3 foyer - Continued

Poster No.	Poster Title	Lead Author and Institute	Project
59	Crystal Nucleation Rates from Induction Time Measurements and Microfluidic Devices	Daniel Powell, University of Strathclyde	PhD-Hub
60	A Structured Approach to Implementation of Measurements: Crystallisation in the Mefenamic Acid Micro-Factory	Magdalene Chong, University of Strathclyde	Hub
61	The CMAC MicroFactory: Mefenamic Acid	Magdalene Chong, University of Strathclyde	Hub
62	Crystallisation MicroFactory Test Bed	Momina Pathan, University of Strathclyde	Hub
63	Small-Scale Experiments Supporting the MicroFactory	John McGinty, University of Strathclyde	Hub
64	The CMAC Quality by Digital Design Workflow	Chantal Mustoe, University of Strathclyde	Hub
65	Towards an Autonomous DataFactory for the Small-Batch Cooling Crystallisation of Active Pharmaceutical Ingredients	Chantal Mustoe, University of Strathclyde	Hub
66	Developing an Autonomous DataFactory workflow for Small-Scale Batch Cooling Crystallisation with the Antiviral Lamivudine.	Thomas Pickles, University of Strathclyde	PhD-Hub

Secondary Processing Posters – Level 3 foyer

Poster No.	Poster Title	Lead Author and Institute	Project
67	An Additive Manufacturing MicroFactory: Overcoming Limitations of Pharmaceutical Formulations	Elke Prasad, University of Strathclyde	Hub
68	A Story of a 3D Printing Filament - From a Single Component to a Pharmaceutical 3D Printing Filament	Moulham Alsuleman, University of Strathclyde	PhD
69	Understanding the Effect of Spherical Agglomeration on Tablet Manufacturability and Performance	Jack Creswick, University of Strathclyde	PhD-Hub
70	Modelling Packed Bed Structures	William Eales, University of Strathclyde	Hub
71	Understanding Drying Effects on Active Pharmaceutical Ingredient Particle Properties	Mariam Siddique, University of Strathclyde	PhD
72	Multi-Modal Dissolution Testing System for Pharmaceutical Tablets	Hannah Jesney, University of Strathclyde	PhD
73	Developing Framework for Flexible and Robust Real-Time Release Testing	Natalie Maclean, University of Strathclyde	RiFTMaP
74	Non-destructive Estimation of Particle Size in Powder Compacts	Keir Murphy, University of Strathclyde	PhD
75	Enhancing Virtual Tablet Formulation Design	Musab Osman, University of Strathclyde	PhD
76	Prediction of Powder Flow of Pharmaceutical Materials Using Machine Learning	Laura Pereira Diaz, University of Strathclyde	PhD-Hub

Exhibitors

- Alconbury Weston Limited
- Altair
- Analytik Limited (Laminar Co., Ltd distributor)
- Anatune Limited / Syft Technologies
- Armstrong Chemtec Group
- Britest Limited
- Bruker UK Limited
- The Cambridge Crystallographic Data Centre (CCDC)
- Clairet Scientific Limited
- CMAC Future Manufacturing Research Hub
- CPACT
- Huxley Bertram
- Leon-nanodrugs GmbH
- Malvern Panalytical (a spectris company)
- MEDELPHARM
- Mettler-Toledo Limited
- MG2 s.r.l.
- M-Star Center Europe GmbH
- NiTech Solutions Limited
- NVIDIA
- Perceptive Engineering an Applied Materials Company
- QbDVision
- SCOUT
- Siemens Process Systems Engineering Limited
- Technobis Crystallization Systems
- Thermo Fisher Scientific
- Wyoming Interactive

Delegate list

First Name	Last Name	Organisation
Faisal	Abbas	University of Strathclyde
Adrian	Abbotts	Siemens Process Systems Engineering
Nura	Abdallah	University of Strathclyde
Mohaned Ahmed	Aboshatta	University of Strathclyde
Adel	Abrar	Anatune
Bilal	Ahmed	The University of Sheffield
Sana	Ahmed	QbDVision
Mohammed	Al Qaraghuli	University of Strathclyde
Mais	Al-Attili	University of Strathclyde
Moulham	Alsuleman	University of Strathclyde
Diego	Alvarado	University of Strathclyde
James	Anderson	Analytik Ltd
John	Andrews	Clairet Scientific Ltd
Tommaso	Angelini	Chiesi Farmaceutici SpA
Samira	Anker	University of Strathclyde
Mahmoud	Arastoo	University of Strathclyde
John	Armstrong	University of Strathclyde
Hafiz	Arshad	University of Strathclyde
Subhaa Chandar	Arumugam	University of Strathclyde
Clive	Badman	University of Strathclyde
Sophie	Bailes	AstraZeneca
Maria Cecilia	Barrera	University of Strathclyde
Patrycja	Bartkowiak	University of Strathclyde
Alastair	Barton	Alconbury Weston Ltd
Marco	Bellentani	MG2 s.r.l.
Martin	Bennett	Huxley Bertram
Marion	Bennie	University of Strathclyde
Brahim	Benyahia	Loughborough University
Sean	Bermingham	Siemens Process Systems Engineering
Maximilian	Besenhard	UCL
Simon	Bevis	Wyoming Interactive
Aaron	Bjarnason	Cambrex
Paul	Blakeman	CPI
David	Booth	Cambrex

Delegate list continued

First Name	Last Name	Organisation
Ilias	Bouchkira	Loughborough University
Quentin	Boulay	MEDELPHARM
Dominic	Bowles	Analytik Ltd
Christopher	Boyle	University of Strathclyde
Massimo	Bresciani	University of Strathclyde
Cameron	Brown	University of Strathclyde
Nigel	Browning	University of Liverpool
Christoph	Busche	University of Strathclyde
Mark	Buswell	GSK
Stephen	Byard	Quotient Sciences
Kim	Cameron	Industrial Biotechnology Innovation Centre
Euan	Cameron	Cohesion Medical Limited
Timothy	Campbell	Loughborough University
Javier	Cardona	University of Strathclyde
Mark Anthony	Carroll	University of Strathclyde
Andrew	Cashmore	University of Strathclyde
Greg	Chambers	University of Strathclyde
Claudia	Chen	University of Strathclyde
Magdalene	Chong	University of Strathclyde
Michael	Chrubasik	National Physical Laboratory
Suoda	Chu	University of Strathclyde
Sergio	Cicognani	MG2 s.r.l.
Findlay	Clark	University of Strathclyde
Mollie	Clay	Mettler-Toledo Ltd
Simon	Coleman	Alconbury Weston Ltd
Dave	Collins	University of Leeds
Adam	Connolly	Adjacency Group Ltd
Chris	Courtney	UKRI
Jack	Creswick	University of Strathclyde
Jennifer	Currie	Altair
Andrea	Cusack	Leon-nanodrugs GmbH
Sebastion	Davidson	Independent
William	Davies	NiTech Solutions Ltd
Shireen	Davies	Solasta Bio Ltd
Adrian	Davis	Pfizer R&D UK Ltd
Thomas	De Beer	Ghent University
Rebecca	Dean	University of Strathclyde
Michael	Devlin	University of Strathclyde

First Name	Last Name	Organisation
Gordon	Dobie	University of Strathclyde
William	Eales	University of Strathclyde
Hatem	Fakhruldeen	University of Liverpool
Alessandro	Falchi	Chiesi Farmaceutici SpA
Helen	Feilden	University of Strathclyde
James	Flannigan	University of Strathclyde
Alastair	Florence	University of Strathclyde
Cameron	Forsyth	University of Strathclyde
Ying	Fu	University of Strathclyde
Jason	Fung	Applied Materials
Cecile	Gabaude-Renou	Sanofi
Parmesh	Gajjar	The University of Manchester
Shang	Gao	Loughborough University
Julia	Gasol Cardona	University of Strathclyde
Kevin	Girard	Pfizer, Inc.
Andrew	Girdwood	Chemtec UK Limited
Suruthi	Gnanenthiran	The University of Sheffield
Lorna	Gray	University of Strathclyde
Cheryl	Haidon	Bruker UK Ltd
Jürgen	Harter	CCDC
Kevin	Healy	Siemens Process Systems Engineering
Silke	Henry	University of Ghent
Jonathan	Hirst	University of Nottingham
Scott	Hone	University of Strathclyde
Peter	Hou	University of Strathclyde
Ian	Houson	University of Strathclyde
Hannah	Hunter-Hill	Altair
Michael	Hutchins	BioPhorum
Isra’	Ibrahim	University of Strathclyde
Rob	Innes	Wyoming Interactive
Sandeep	Ippalapalli	Dr Reddy’s Laboratories
Tahani	Islam	University of Strathclyde
Hannah	Jesney	University of Strathclyde
Jenna	Johnston	University of Strathclyde
Blair	Johnston	University of Strathclyde
Andrea	Johnston	BioPhorum
Craig	Johnston	uMIST Technologies Ltd
Hikaru	Jolliffe	University of Strathclyde

Delegate list continued

First Name	Last Name	Organisation
Hanna	Jonasdottir	IUK KTN
Andy	Jones	Innovate UK, UKRI
Nicola	Jones	Applied Materials
Mebin	Joseph Babu	University of Strathclyde
Aleksandar	Josifovic	University of Strathclyde
Gina	Kaysan	Karlsruhe Institute of Technology
Maxine	Kennedy	NVIDIA
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