



Singapore-MIT Alliance for Research and Technology

Dear SMART team,

Welcome to the third edition of our newsletter. Since our last issue in January, the world around us has changed in ways we could not have imagined, and it has no doubt affected all of our lives. Please know that my thoughts are with each one of you, and your safety and well-being is my utmost priority.

As we fight this global pandemic, researchers and scientists across the world have come together to share information freely to discover treatments, tests and vaccines for a virus that only months ago we knew nothing about. It has highlighted what our community can achieve when we collaborate with one another.

Our researchers at SMART have also responded by shifting much of our focus and resources to address the direct and indirect threats of this pandemic, ranging from disease detection to food security.

I am very grateful to our colleagues, our partners and our sponsors for enabling the collaborative work that we do at SMART, and for the opportunity to improve lives in Singapore and the rest of the world through our research.

As we look back at some of our work over the last quarter, let us also look forward to continuing to solve some of the world's most pressing problems through science and innovation. Thank you for your dedication and support.

Stay healthy, stay safe and take care.

Eugene A. Fitzgerald

COVID-19 Updates

We've implemented a number of precautionary measures due to the current situation around the SARS-CoV-2 virus. Our colleagues have been asked to work from home where possible. And for those who need to be in the laboratories to carry out essential research, we are taking every precaution to ensure their safety.

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AMR and LEES researchers Hadley Sikes, Jia Huan, Tonio Buonassisi, and Isaac Siyu Tian optimise materials used in rapid protein tests

Professor Hadley D Sikes, Principal Investigator of SMART's Antimicrobial Resistance (AMR) Interdisciplinary Research Group (IRG), is working with collaborators in Singapore and MIT to develop a diagnostic protein test for COVID-19 that can work in 10 minutes. With current RNA tests taking several hours or even days to show results, Professor Sikes' work can lead to much more efficient and widespread detection of the disease.

Professor Sikes and her partners have received a grant from the National Medical Research Council's (NMRC) COVID-19 Research Fund to carry out their work in Singapore.

You can read about her journey to Singapore to collaborate with researchers and learn from the city's past experience in combating coronavirus diseases in this MIT News [article](#).

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AMR Principal Investigator Professor Eric Alm and CENSAM Principal Investigator and NTU Professor Janelle Thompson are carrying out important research on surveillance through sewage samples, where they tested wastewater at an urban treatment facility in Massachusetts and found the presence of SARS-CoV-2. Their work can potentially be used for modeling the current COVID-19 pandemic and other future outbreaks.

A preprint version of their paper "[SARS-CoV-2 titers in wastewater are higher than expected from clinically confirmed cases](#)" is available on medRxiv.

Professor Alm and Professor Thompson jointly received National Research Foundation's (NRF) Intra-CREATE Thematic Grant for their project titled "Sewage-based surveillance for rapid outbreak detection and intervention in Singapore".

In the News



Professor Krystyn Van Vliet giving a TEDx talk on cell therapy

We're happy to share that we've received a good deal of media attention over the past months, with SMART's researchers appearing in a number of publications, interviews and talks.

That includes a [TEDx talk](#) in November where Professor Krystyn Van Vliet, co-lead Principal Investigator of SMART's IRG Critical Analytics for Manufacturing Personalized-Medicine (CAMP), discussed the opportunities as well as the challenges of using cell therapy against life-threatening illnesses.

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Towards the end of December, SMART researcher Dr Lup Wai Chew participated in an interview on [Channel 8's Morning Express programme](#). Dr Chew discussed Cooling Singapore, a collaborative project dedicated to finding solutions to address the urban heat challenge in Singapore.

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FM researcher Dr Rui Zhu speaking to Portfolio Magazine about building sustainable cities

SMART's Future Urban Mobility (FM) IRG researcher Dr Rui Zhu spoke to Portfolio Magazine about the importance of promoting renewable energy and SMART's work in helping to build 3-dimensional sustainable cities. Dr Zhu's interview appeared in the magazine's January print issue as well as in a [video feature](#) on their website.

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The Singapore Business Review published an [article](#) written by SMART's Low Energy Electronic Systems (LEES) IRG Principal Investigator Professor Tonio Buonassisi, where he discusses how we can speed up materials production by utilising self-driving laboratories (SDLs).

The article also highlights the important collaborative work facilitated by SMART, bringing together researchers from Agency for Science, Technology and Research (A*STAR), National University Singapore (NUS), Nanyang Technological University (NTU) and Massachusetts Institute of Technology (MIT).

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Professor Fitzgerald filming with Asian Scientist magazine for their video series 'Asia's Changemakers'

Our CEO Professor Eugene A Fitzgerald spoke to Asian Scientist Magazine last month about the important work SMART is doing through collaborative research in Singapore. Watch out for his feature among other inspirational leaders in their "[Asia's Changemakers](#)" series!

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For regular updates, please follow SMART's official [Facebook](#) and [LinkedIn](#) pages.

Our Awards

Applications for SMART Innovation Centre's 19th Innovation and Ignition Grant cycle have closed, and results will be announced on July 20. The Innovation Centre grants offer

researchers from Institutes of Higher Learning in Singapore, SMART employees and MIT faculty a chance to receive up to \$250,000 in awards to help move their discovery to the market.

Winners from the 18th Grant Cycle include:

AMR lead Principal Investigator Professor Peter Dedon and AMR Research Scientists Dr Wei Lin Lee and Dr Boon Chong Goh

Disruptive & Sustainable Technologies for Agricultural Precision (DiSTAP) IRG's Principal Investigator Dr Kang Zhou and DiSTAP Scientific Director Dr Gajendra Pratap Singh

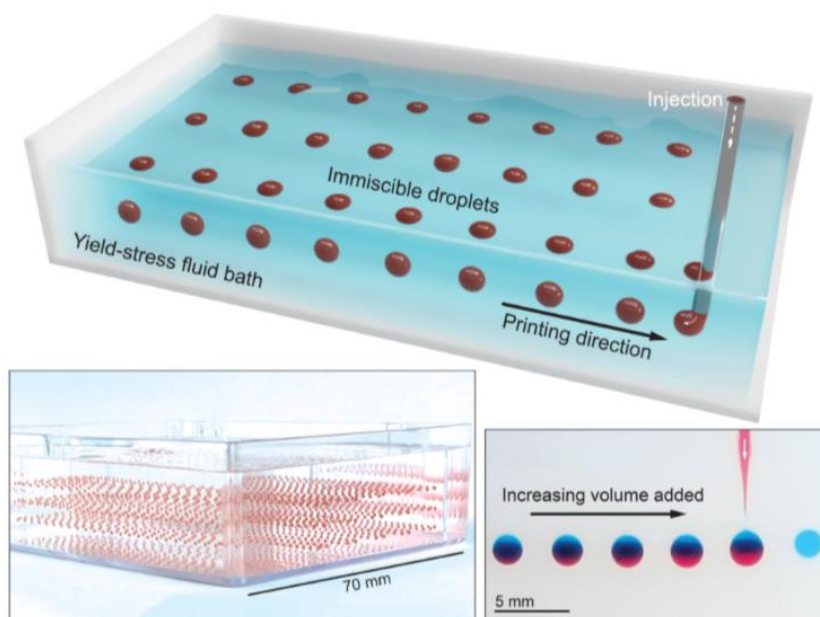
CAMP Principal Investigator Dr Michael Birnbaum

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Our researchers have also clinched other awards and grants. AMR's Professor Dedon and Dr Goh received the Therapeutics Development Review grant for their project "Developing inhibitors of the erythromycin resistance methyltransferase as broadly useful antibiotic adjuvants". The award is hosted by the Biomedical Research Council (BMRC) at A*STAR.

A big congratulations to all of these researchers and their teams!

Our Research



The new embedded droplet printing method suspends 3-D arrays of droplets in a uniquely isolated state that allows for precise processing and experimentation

SMART researcher Dr Arif Zainuddin Nelson, along with researchers from MIT and NTU, have developed a new way of processing fluid droplets through research funded by the NRF Intra-CREATE Collaborative Grant.

Explained in their paper “[Embedded droplet printing in yield-stress fluids](#)” published in Proceedings of the National Academy of Sciences of the United States of America (PNAS), their discovery creates a completely isolated environment for chemical and biological reactions and can be useful for a number of scientific applications.

Their research also received coverage from leading Science trade publications like [Phys Org](#) and [BioSpectrum](#), as well as [MIT News](#).

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AMR’s Professor Dedon’s paper “[SspABCD-SspE is a phosphorothioation-sensing bacterial defense system with broad antiphage activities](#)” was recently published in Nature Microbiology. The paper discusses AMR’s discovery of a new epigenetic mechanism that could be used to modify or engineer phages to overcome bacterial resistance to phages in common pathogens.

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Professor Sikes and her team at AMR also wrote a paper titled “[Functional comparison of paper-based immunoassays based on antibodies and engineered binding proteins](#)” published in peer-reviewed journal Analyst. The paper discusses a faster and more efficient alternative for rapid diagnostic tests to detect diseases such as Zika virus.

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DiSTAP's nanosensors implanted within plant leaves can send signals that communicate the stress-induced signalling pathways of plants to a smartphone. [Credit: Felice C. Frankel]

DiSTAP co-lead Principal Investigator Professor Michael Strano, in collaboration with MIT and Temasek Life Sciences Laboratory (TLL), have developed a way to track the internal communication of plants using nanotube sensors that can be embedded in plant leaves. The technology can help scientists understand how plants respond to different types of stress, providing valuable information for genetic modification of plants.

The issue of food security has always been a major focus for Singapore, and it is a concern across the world today as countries impose border restrictions and lockdowns. DiSTAP's research, which allows agricultural scientists to study how to maximise crop yield, is a timely contribution that can help accelerate Singapore and the world's urban farming capabilities.

Their research was published in the Nature Plants paper “[Real-time Detection of Wound-Induced H₂O₂ Signalling Waves in Plants with Optical Nanosensors](#)”, and received some

great press coverage from [OpenGov Asia](#), [Food & Beverage Asia](#) and [Asia Pacific Food Industry Magazine](#) among others.

You can also read about it in this [MIT News](#) article.

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DiSTAP Principal Investigator Dr Kang Zhou's paper titled "[Upcycling chitin-containing waste into organonitrogen chemicals via an integrated process](#)" was published in PNAS.

The paper discusses the obstacles in upcycling waste-derived chitin into value-added products through microbial fermentation, and how Dr Zhou's team developed an integrated biorefinery process with a highly customizable microbial engineering platform to overcome them.

Recent Events



A panel discussion at the CAMP workshop 2020

Back in January, the AMR, DiSTAP and LEES teams held successful Scientific Advisory Board meetings, while the AMR and CAMP teams also held workshops for their staff.

Many thanks to the presenters for sharing the work we are doing and to everyone who attended!

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The Singapore Therapeutics Development Review (STDR), jointly organised by SMART, A*STAR, and National Health Innovation Centre (NHIC), hosted the STDR Lunchtime Talk on 6 April.

You can watch the pre-recorded webcast [here](#).

Watch SMART Innovation Centre's Director Howard Califano talk about how STDR can support researchers in their journey to therapeutics development [here](#).

Thank you for reading our newsletter. Here's to another quarter of problem-solving and groundbreaking innovations!