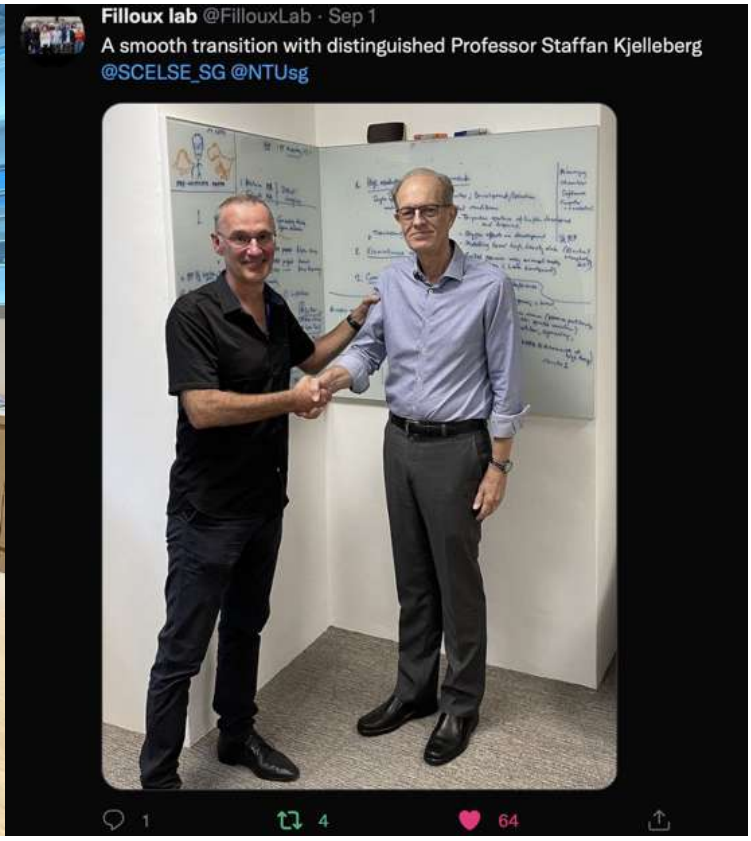
Quorum
SCELSE
Singapore Centre for Environmental Life Sciences Engineering
10 YEARS OF RESEARCH EXCELLENCE
SEPTEMPBER 2022

Prof Alain Filloux takes office as SCELSE's new centre director

Prof Staffan Kjelleberg, incumbent centre director, will continue to remain as advisor to SCELSE

All set in SCELSE! Check out Prof Filloux's special perpetual calendar (foreground) when you pop in for a tête-à-tête with him.



Prof Filloux is on Twitter! And a prolific user too! Follow him and better yet, emulate him in leveraging social media to promote the SCELSE brand.

Prof Alain Filloux (pronounced Alai Fee-you) had his first day in SCELSE on 1 September 2022, almost a year after he was first named SCELSE's next director. After spending 15 years in London as Professor in Imperial College London, Prof Filloux has been looking forward to this next big step in his career.

Tweeting his arrival

An avid proponent of communicating on social media (follow him on twitter), Prof Filloux has been keeping us informed of his transition from Imperial College London to SCELSE, culminating with photos from his start in office on 1 September.

Meeting SCELSE troops

Staff and students had an opportunity to mingle with Prof Filloux during morning tea on 8th September, catching up with the former SCELSE visiting professor and learning about his current and future research plans.

Morning tea session











A letter from Prof Alain Filloux to SCELSE

Dear SCELSE community,

On September 1st 2022, I took office as SCELSE director and felt excited and honoured embarking on this new challenge.

SCELSE's work in the field of biofilms and microbiomes is acclaimed worldwide and this reputation conveys the strength of the Singapore, NTU and NUS vibrant scientific environment.

Reaching such a level of recognition is the result of the brightness and hard work of all SCELSE staff and students, from the administrative support, final year student rotation, and all the way to the scientific directors.

For the future I want SCELSE to keep being such an inspirational place to work and provide a unique environment where social and scientific life can be pushed to its best.

SCELSE will be strongly positioned in every place where biofilms and microbiomes count, and that is in a continuum linking environment and human health.

For the future I want SCELSE not only to be at the top of academic research and education but to be successful in translating our work into tools, principles and processes that would improve human life and well-being, in Singapore and worldwide.

For the future I want SCELSE to be even more strongly anchored with all Singapore stakeholders and maintain sustainable collaborations with top international institutions. This is instrumental to make SCELSE unavoidable when it comes to biofilm and microbiome research.

We are currently moving on a very solid ground and the emergence and strengths of SCELSE came to light at the occasion of its 10th anniversary. There, it was clear that our Research Centre of Excellence is needed because the microbial world, its complex communities and their lifestyle impact all aspects of our living planet. It should be our belief that it is our discoveries and know-how which will be key for intervention when it comes to manipulate the microbial populations, make them beneficial for our environment and agriculture, or prevent them from causing chronic diseases and putting a toll on ageing and morbidity.

I have trust in our potential, I have trust in your work which should be done with passion and ambition, and in the strict respect of others and scientific conduct. It is my duty to trigger momentum and to this end it is my engagement to provide a multidisciplinary environment which will open opportunities for innovation and lead to further success.

We are opening a new chapter in the SCELSE book, I wish you all the best in your journey with us and it is my conviction that together we will deliver achievements that matter.

Prof Alain Filloux

If you have questions for Prof Alain, submit them here (look out for answers in the next issue!)

RESEARCH UPDATES

SCELSE team discovers 'future-proof' method using bacteria to remove phosphorus from wastewater

The technique enables phosphorus removal at higher temperatures, which is important for global warming preparedness.

A group of SCELSE scientists led by Prof Stefan Wuertz has developed a technique to remove phosphorus from wastewater at higher temperatures (30°C and 35°C) than is possible using existing techniques, by adjusting operational parameters that enable phosphate accumulating bacteria to continue to function at higher - and formerly prohibitive - temperatures.

Current techniques to remove phosphorus do not work well at temperatures above 25°C, which occur now in tropical climates, and is expected to extend to more countries, with climate changes and global warming.

Why remove Phosphorus?

"Phosphorus is present in wastewater all the time. It is a nutrient that can lead to algal blooms and that's why it is advisable to remove it from wastewater before it is discharged. If we manage to remove phosphorus, then we also have an opportunity to recover and reuse the phosphorus, which is a limited resource on our planet," said Prof Wuertz.

The bacterial genus responsible, *Candidatus* Accumulibacter, is not harmful to humans or the environment and removes phosphate from wastewater and stores it internally as polyphosphate granules. The SCELSE researchers' method could be used in laboratory-scale reactors and full-scale treatment plants.

A cleaner technology

Unlike other methods, the SCELSE-developed method to remove phosphorus from wastewater does not involve chemicals, such as iron and aluminium coagulants. These methods produce a large volume of inert sludge that needs to be treated and subsequently disposed.

The results of the study were published in the journal ***Water Research*** in June.

Prof Wuertz, who led the study, said: "We have shown that phosphorus could be stably removed in Singapore's water reclamation plants even as we expect global water temperatures to increase further. Employing a slow-feeding strategy and sufficiently high carbon input into biological reactors,

> We have shown that phosphorus could be stably removed in Singapore's water reclamation plants even as we expect global water temperatures to increase further. Employing a slow-feeding strategy and sufficiently high carbon input into biological reactors, we effectively limited the carbon uptake rates of competing bacteria.

PROF STEFAN WUERTZ
Deputy Centre Director,
SCELSE

we effectively limited the carbon uptake rates of competing bacteria. This allows *Ca*. Accumulibacter to flourish and benefites a stable and efficient process, representing basic conditions suitable for future full-scale treatment plants. This will help Singapore and other countries experiencing high water temperatures to prepare for the effects of climate change."

Co-author Dr Rohan Williams, Head of the SCELSE's Integrative Analysis Unit, said: "We found that the *Ca*. Accumulibacter strains in the reactors were closely related to those commonly found in temperate systems, suggesting that the chosen strategy successfully preserved the microdiversity needed for a stable process."

Dr Guanglei Qiu, a former research fellow at SCELSE, who also co-authored the study, said: "Operating biological reactors side by side at different temperatures provided the clues for a mechanistic understanding and underlying changes in the microbial community."

The science behind the discovery

To begin the process, the researchers enriched the bacteria from wastewater in experimental reactors with temperatures from 30°C to 35°C, while ensuring that the pH was around neutral. After a six-hour cycle, the bacteria absorbed the phosphorus completely.

Over a testing period of more than 300 days in a laboratory setting, they found that there was consistent removal of phosphorus, coping with the daily infusions of fresh wastewater that contained the element.

The team will be carrying out ongoing research to further improve the efficacy of its method. The researchers are also looking towards using the bacteria to capture and store phosphate, which some experts believe could be depleted from natural sources globally within 50 to 100 years.

Prof Wuertz added: "Nearly all the phosphorus that farmers use today, and that we consume in the food we eat, is mined from a few sources of phosphate rock, mainly in the United States, China, and Morocco. Our solution could not only help to future-proof biological phosphorus removal, but also store the element and then re-introduce it into agricultural systems.

READ THE PAPER:	Global warming readiness: Feasibility of enhanced biological phosphorus removal at 35°C published in Water Research on 1 Jun 2022
READ THE PRESS RELEASE:	https://www.scelse.sg/PressRelease/Detail/a26157cc-7d81-4bf7-87e6-b8d1cf003ee6

Reported in:
1. Channel NewsAsia, 2. ST online, 3. Zaobao, 4. Science daily, 5. Industry update, 6. Environmental news network, 7. Trillions Intelligence Network, 8. AlphaGalileo

RESEARCH UPDATES

SCELSE PI to lead project on crop resilience in new centre for urban farming challenges

The $10 m research centre at NUS intends to boost food security through research and innovation

NUS has launched a new Research Centre on Sustainable Urban Farming (Surf) on 5th August 2022, which will tackle complex challenges related to urban farming.

SCELSE's very own plant expert, A/Prof Sanjay Swarup, is one of the PIs in the centre, working on harnessing microbes in the natural environment to improve crop production and resilience.

Other projects include genome editing of plants to improve yield and quality, and LED light illumination to improve shelf life.

The overarching goal is to contribute to Singapore's 30 by 30 vision (achieving a local production of 30% of its nutritional needs by 2030). Read more in the Straits Times.

Singapore researchers contribute to advances in the detection and quantification of viral pathogens in wastewater

The discovery will pave way for better management of future disease outbreaks

(L-R) SCELSE: Desmond Chua, Janelle Thompson, Ng Wei Jie, Stefan Wuertz; SMART: Eric Alm, Lee Wei Lin, Federica Armas, Chen Hongjie, Franciscus Chandra, Gu Xiaoqiong

Playing a crucial role in the pandemic and dengue outbreaks are SCELSE & SMART researchers who leverage instruments (as shown in photo) for wastewater surveillance.

The team compromising of researchers from SMART, NTU, NUS, MIT, SCELSE and Istituto Zooprofilattico Sperimentale della Lombardia e dell'Emilia Romagna (IZSLER) in Italy has developed a new quantitative RT-qPCR assay that is able to detect the Omicron variant of SARS-CoV-2.

These tests enable accurate tracing of variant dynamics in a population and support the implementation of public health measures tailored to the traits of the viral pathogen.

These latest advances in detection and quantification of viral pathogens in wastewater play an invaluable role in preparing the world for future viral pandemics. Read more

READ THE PAPER: https://www.sciencedirect.com/science/article/pii/S004313542200762X?via%3Dihub

SCELSE HAPPENINGS

SCELSE seminar series returns with aplomb

Look forward to high-profile speakers and mingling sessions

The return to normalcy continues as SCELSE's in-person seminar series recommences . The first event featured prominent Singapore public health expert Prof Dale Fisher (professor at NUS Department of Medicine and chair of infection control at NUH).

In his talk "Control of MRSA and emerging infectious diseases: Opportunities for research", Prof Fisher outlined the dangers of methicillin-resistant *Staphylococcus aureus* (MRSA) in hospitals, and his successful strategies to control outbreaks.

Prof Fisher opens the SCELSE seminar series with a talk on MRSA.

Prof Fisher breaks down the various stakeholders involved in controlling a disease outbreak.

SCELSE community listening to Prof Fisher's experiences tackling methicillin-resistant Staphylococcus aureus *(MRSA) outbreaks in the hospital.*

Students and colleagues mingle with Prof Fisher after the talk over snacks and drinks.

The second talk in the series was by Dr Rohan Williams, on repurposing King and Wilson's "two levels" of variation for dissecting the genetic architecture of ecophysiological traits in microbial ecology.

SCELSE's seminars are held at SBS Classroom 1 (NTU) every Thursday.

Look out for the next announcement in SCELSE's social media.

INDUSTRY BEAT

New tripartite partnership to support aquaculture nutrition and health

SCELSE/NTU, Adisseo France SAS and PC Biome sign agreement

In Singapore National Biofilm Consortium's (SNBC) effort to boost collaboration between industry and academia, SCELSE/NTU, Adisseo and PC Biome have signed an eighteen-month long research collaboration agreement (RCA) in the area of aquaculture nutrition.

A global leader in nutritional solutions and additives for animal feed, Adisseo and start-up company PC Biome Pte Ltd (also an SNBC industry member) are partnering with SCELSE to reduce the need of animal testing for nutrition and health studies in aquaculture through this research programme.

This agreement underscores SNBC's objective of enabling technology translation, while lending strength to Adisseo's corporate research & innovation (R&I) efforts of improving animal welfare. SCELSE will be the main host for all lab-based work while PC Biome will provide its expertise in using its proprietary models on the gut microbiome.

Prof Stefan Wuertz, SCELSE deputy director (education & training), said: "SCELSE has expertise in biofilms & microbiomes, which can truly benefit the enterprises. We hope that this is the first of many RCAs to come with Adisseo."

Mr Michel Birnbaum, leading SNBC's business development arm said: "SNBC is celebrating its third anniversary this year, and already boasts over 25 industry memberships from a broad range of sectors. SNBC is particularly pleased to play a prominent role in engaging its stakeholders of aqua- and agri-food industry to boost Singapore's food security." We are grateful to Adisseo for engaging fully with the Singapore ecosystem.

Left to Right: Dr I-Tung Chen, Science Manager (Aquaculture), Adisseo, Mr Jean-François Rous, VP Innovation, Adisseo, Prof Peter Preiser, AVP Biomedical & Life Sciences, NTU, Prof Stefan Wuertz, Deputy Director (Education & Training), SCELSE & Vg Prof Patricia Conway, PC Biome Pte Ltd (on screen)

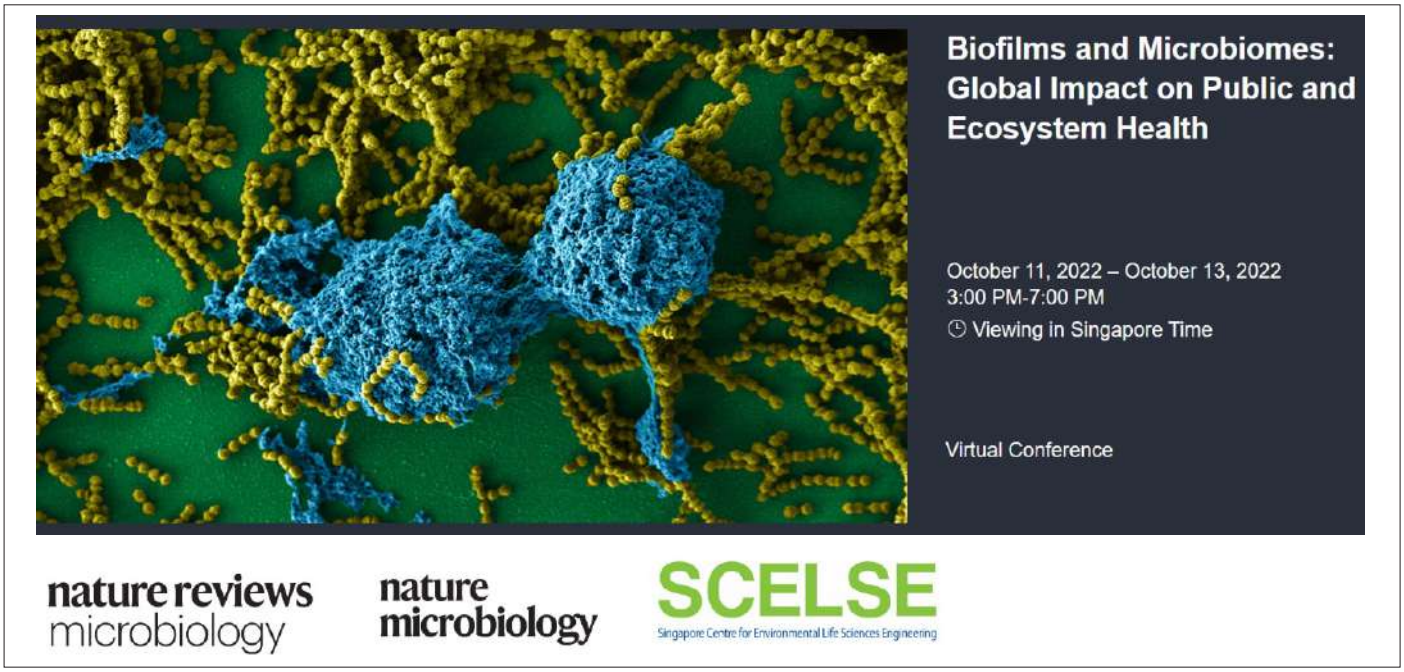
This RCA was signed on 7 Jul 2022 at NTU and is a further example of how public-private partnerships can deliver more impactful outcomes.

EVENTS

SNBC is three! Come celebrate with them as they thank YOU, SNBC members and ecosystem stakeholders, for supporting them (in spite of the pandemic) and enabling them to achieve above and beyond expectations in their vibrant ecosystem.

This in-person event on 30 September at OneNorth will showcase a number of the projects funded by SNBC across industry segments as well as a presentation by Dr Darla Goeres of the US based Center for Biofilm Engineering, CBE, the oldest biofilm research centre globally.

Register today for deep insights by experts & SCELSE scientists and a much-awaited face-to-face networking session.



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