



Sino-British Forum on Algal Biotechnology



In September 2018, a contingent of PHYCONET members from the UK attended the 1st Sino-British Forum on Algal Biotechnology and Biological Resources at the Institute of Hydrobiology, Chinese Academy of Sciences (IHB-CAS) in Wuhan. This was preceded by a visit to the SDIC Microalgae Biotechnology Center (MBC) near Beijing. These visits, sponsored by PHYCONET, IHB-CAS and an international workshop grant from BBSRC, were hosted by Dr Qiang Hu (MBC) and Dr Cheng Cai Zheng (IHB). The workshop brought together algal researchers and industry representatives from the UK and China to discuss progress and opportunities in the exploitation of microalgae. The 17-member UK delegation comprised leading academics, postdoctoral researchers and students, together with representatives of four SMEs from the algal biotech sector: Varicon Aqua, TeeGene Biotech Ltd, ufraction8 and Algenuity. Approximately 25 Chinese presenters joined the 2-day forum in Wuhan and comprised algal researchers from the IHB-CAS and other institutes of the Chinese Academy of Sciences, Chinese universities and biotech companies from across China.

During the 1-day visit to the MBC, Dr Qiang Hu (Director of the Microalgae Biotechnology Center and the Center for Microalgal Biotechnology and Biofuels at IHB-CAS) gave an introduction to the MBC, which is a research institute wholly owned and funded by the State Development & Investment Corporation Ltd (SDIC). The introduction was followed by overviews of algal biotechnology research in the UK by Saul Purton (PHYCONET Director, UCL), Michele Stanley (PHYCONET Co-Director, SAMS), Claudio Fuentes-Grunewald (Swansea University), Marco Lizzul (Varicon Aqua) and Andrew Spicer (Algenuity). Lirong Song, in his role as Director of the Freshwater Algae Culture Collection at IHB-CAS, gave a presentation on the collection, Danxiang Han (Vice-Director of the Center for Microalgal Biotechnology and Biofuels at IHB-CAS) presented her research on triacylglycerol biosynthesis in *Chlamydomonas*, and Zanmin Hu (Institute of Genetics and Developmental Biology, Chinese Academy of Sciences) discussed the use of microalgae as an efficient bioreactor.

We were then given a tour of the impressive state-of-the-art facilities at the MBC, which included raceway ponds, different designs of tubular photobioreactors, and a suite of facilities for cell harvesting, downstream processing and analytics.



The SDIC Microalgae Biotechnology Center, near Beijing



UK and Chinese delegates at the SDIC MBC

After the visit to the MBC, we travelled to Wuhan in Hubei province, the most populous city in central China, and known as one of the “Four Furnacelike Cities” along the Yangtze river. The 2-day 1st Sino-British Forum on Algal Biotechnology and Biological Resources was held at the IHB-CAS, a research institution with 6 research centres, including the Center for Algal Biology and Applied Research. We were welcomed by the Academic Director of the Key Laboratory of Algal Biology at the IHB-CAS, Jindong Zhao, and Qiang Hu gave the introductory presentation: “Microalgal biotechnology and industry in China: current status and future perspectives”. This was followed by talks from UK and Chinese researchers who presented their work on topics as wide-ranging as genetic engineering of cyanobacteria and microalgae, bioconversion of wastewater and microalgae cultivation, harvesting and dewatering (the full list of presentations is provided on pages 4-5).

The meeting also included a panel discussion, comprised of Qiang Hu and Danxiang Han (IHB-CAS), Dong Wei (South China University of Technology), Marco Lizzul (Varicon Aqua), and Alison Hughes (University of Strathclyde), in which the panellists discussed the scientific and commercial challenges to the emerging microalgal sector, and how UK-Chinese engagement and cooperation can help to address these challenges.

Posters were displayed throughout the 2-day forum, and provided a platform for further networking.

Following the meeting, we were given a tour of the IHB-CAS and had a chance to see their algal growth and development facilities.

The meeting was concluded with visits to the Baiji Dolphinarium and Donghu (East) Lake.

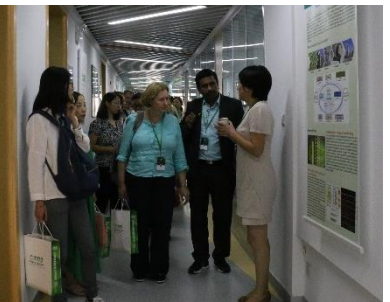
Many thanks to all of the organisers, both at the SDIC MBC and IHB-CAS, for a very productive meeting, and we look forward to hosting a second Sino-British forum in the UK next year, to be held in Oban.



1st Sino-British Forum on Algal Biotechnology and Biological Resources, at the Institute of Hydrobiology in Wuhan

第一届中英藻类生物技术与生物资源双边会议

The 1st Sino-British Forum on Algal Biotechnology and Biological Resources
September 18-21, 2018



1st Sino-British Forum on Algal Biotechnology and Biological Resources - presentations, posters, panel discussion and visit of IHB facilities

Sino-British Forum Presentations – 19th September 2018

Title	Presenter
Engineering the algal chloroplast using synthetic biology	Saul Purton (UCL, UK)
Sugar production and stress tolerance of a fast growing <i>Cyanobacterium synechococcus elongates</i> UTEX2973	Xuefeng Lu (QIBEBT-CAS, China)
ABACUS – Algae for the production of added value compounds	Michele Stanley (SAMS, UK)
Anatoxins producing cyanobacteria: distribution, toxicity and detection in Chinese waters	Renhui Li (IHB-CAS, China)
PHYCONET: high value products from microalgae	Janet Waterhouse (UCL, UK)
<i>Chromochloris zofingiensis</i> , an astaxanthin-producing oleaginous alga for studying lipid metabolism and carotenogenesis	Jin Liu (Peking University, China)
Efficient gene editing and DNA replacement in unicellular algae	Attila Molnar (University of Edinburgh, UK)
Bioconversion and recycling utilization of wastewater coupled with production of animal feed by green microalgae <i>Chlorella</i>	Dong Wei (South China University of Technology, China)
The <i>Chlamydomonas reinhardtii</i> chloroplast as a platform for the production of next generation antibiotics	Henry Taunt (UCL, UK)
Identification and feeding characteristics of mixotrophic flagellate <i>Poterioochromonas malhamensis</i>	Yingchun Gong (IHB-CAS, China)
Size of microalgae biomass production in the UK, challenges and future	Claudio Fuentes-Grunewald (Swansea University, UK)
<i>Porphyra</i> aquaculture technology in China: a critical review on its history and current status	Guangce Wang (IO-CAS, China)
Expression of antimicrobial peptides in the nucleus and the chloroplast of <i>Chlamydomonas</i>	Kaiyao Huang (IHB-CAS, China)
Algal bioprocesses and commercial opportunities	Pattanathu Rahman (TeeGene Biotech Ltd., UK)
Large scale cultivation and downstream processing technology for microalgae	DongMei Zhang (IPE-CAS, China)
Making algae work – identifying and solving industry problems and new opportunities to unlock the global algal industry	Andrew Spicer (Algenuity, UK)
Future road of <i>Spirulina</i>	Zhigang Gao (Ci Bainan Biotech Co. Ltd., China)

Abbreviations

UCL: University College London

QIBEBT: Qingdao Institute of Bioenergy and Bioprocess Technology, Chinese Academy of Sciences

SAMS: The Scottish Association of Marine Science

IHB-CAS: Institute of Hydrobiology, Chinese Academy of Sciences

IO-CAS: Institute of Oceanology, Chinese Academy of Sciences

IPE-CAS: Institute of Process Engineering, Chinese Academy of Sciences

Sino-British Forum Presentations – 20th September 2018

Title	Presenter
Microalgal biofuel – biology and applications	Qiang Wang (IHB-CAS, China)
Ufraction8 – scalable, sustainable and efficient microalgae dewatering	Monika Tomecka (ufraction8, UK)
Thermophilic cyanobacteria as a chassis organism for CO ₂ capture and valorisation	Maurycy Daroch (PKUSZ, China)
Delivering algal production systems globally	Marco Lizzul (Varicon Aqua, UK)
<i>Chlamydomonas</i> as a model to study mechanisms underlying cilia-related human disorders	Junmin Pan (Tsinghua University, China)
Commercialization practice of astaxanthin from <i>Haematococcus pluvialis</i>	Siyu Pan (Stone Forest Astaxanthin Biotech Co. Ltd., China)
Non-coding RNAs as regulators for photobio-H ₂ production in green microalga <i>Chlamydomonas reinhardtii</i>	Hui Li (Shenzhen University, China)
Droplet microfluidics for high-throughput algal analysis and screening	Ziyu Yu (University of Cambridge, UK)
Environmental condition of cyanobacterial soil crusts in application	Chunxiang Hu (IHB-CAS, China)
Enhancing polyunsaturated fatty acid production in algae: cutting out the competition	Richard Smith (Rothamsted Research, UK)
Effects of photosystem II manganese-stabilizing protein succinylation on photosynthesis in the model <i>Cyanobacterium synechococcus</i> sp. PCC 7002	Mingkun Yang (IHB-CAS, China)
Photobioreactors for efficient microalgae cultivation	Jing Cui (University College London, UK)
Identification of astaxanthin acyltransferase in the green microalgae <i>Haematococcus pluvialis</i>	Haiyan Ma (IHB-CAS, China)
Effect of environmental stressors on the production of specialised metabolites by marine microalgae for biotechnological applications	Alison Hughes (University of Strathclyde, UK)
Exopolysaccharides production by <i>Synechocystis</i> PCC 6803	Stefan Semerdzhiev (University of Glasgow, UK)
CyanoGate: a golden gate modular cloning suite for engineering cyanobacteria based on the plant MoClo syntax	Ravendran Vasudevan (University of Edinburgh, UK)
Microalgal harvesting using membrane filtration: challenges and perspectives	Xuezhi (IHB-CAS, China)
Efficient genetic manipulation of cyanobacteria using CRISPR-Cpf1	Juyuan Zhang (IHB-CAS, China)

Abbreviations

IHB-CAS: Institute of Hydrobiology, Chinese Academy of Science
 PKUSZ: Peking University ShenZhen Graduate School

Sino-British Forum Participants

UK	China
Jing Cui (UCL)	Wei Cong (Institute of Process Engineering, Chinese Academy of Sciences)
Claudio Fuentes-Grunewald (Swansea University)	Maurycy Daroch (Peking University ShenZhen Graduate School)
Alison Hughes (University of Strathclyde)	Zhigang Gao (Ci Baina Biotech Co. Ltd.)
Marco Lizzul (Varicon Aqua Solutions Ltd.)	Yingchun Gong *
Attila Molnar (University of Edinburgh)	Danxiang Han *
Jane Purton (Algenuity)	Chunxiang Hu *
Saul Purton (PHYCONET Director, UCL)	Qiang Hu *
Pattanathu Rahman (TeeGene Biotech Ltd.)	Kaiyao Huang *
Stefan Semerdzhiev (University of Glasgow)	Hui Li (ShenZhen University)
Richard Smith (Rothamsted Research)	Janhong Li (Nanjing Normal University)
Andrew Spicer (Algenuity)	Renhui Li *
Michele Stanley (PHYCONET Co-Director, SAMS)	Jin Liu (Peking University)
Henry Taunt (UCL)	Xuefeng Lu (Qingdao Institute of Bioenergy and Bioprocess Technology, Chinese Academy of Sciences)
Monika Tomecka (ufraction8)	Haiyan Ma *
Ravendran Vasudevan (University of Edinburgh)	Junmin Pan (Tsinghua University)
Janet Waterhouse (PHYCONET Network Manager, UCL)	Siyu Pan (Stone Forest Astaxanthin Biotech Co Ltd.)
Ziyi Yu (University of Cambridge)	Lirong Song *
	Guangce Wang (Institute of Oceanology, Chinese Academy of Sciences)
	Qiang Wang *
	Mingkun Yang *
	Chengcai Zhang *
	Dongmei Zhang (Institute of Process Engineering, Chinese Academy of Sciences)
	Juyuan Zhang *
	Xuezhi Zhang *
	Jindong Zhao *

Comments from some of the UK delegates

The conference at the Institute of Hydrobiology (IHB) was a great success with excellent talks and lots of networking, and appears to have led to a number of opportunities for UK-Chinese collaborations. Indeed, the conference was judged to be such a success with many new friendships formed that the "2nd Sino-UK Algal Biotechnology Conference" is already being planned by Algae-UK (the successor of PHYCONET).

Saul Purton, PHYCONET Director

The facilities in Beijing provided an excellent backdrop to high level discussion about the research interests of the institute and their plans moving forward. I was particularly impressed with the quality of science that is being undertaken, as well as the scale of their bio-processing facilities. As an active technology supplier globally we look forward to the potential opportunities our new found Chinese contacts will bring; and look forward to a return conference in the UK.

Marco Lizzul, Varicon Aqua Solutions Ltd.

Meetings in Beijing and Wuhan were extremely useful for development of our business for the Chinese market. We have not only understood the scale and the methods of microalgae production in China, but we have also connected with potential distributors and agents for that market. On top of that, we have met customers interested in collaborations and purchasing our technology when it's ready.

Monika Tomecka, ufraction8

[The Sino-British forum] was a good opportunity to communicate with other delegates. Specifically, after my talk Prof Qiang Hu kindly passed me some of his experience on the microalgae cultivation. Overall, it was a good opportunity for young researchers like me to build connections and also begin to consider how my project would fit better in both research and industry sides.

Jing Cui (PhD student), University College London

It was most interesting to see the pilot scale plant at the Institute of Microalgae, and the discussion on how the various glass tubes of the photobioreactor and the shape of the raceways were designed to improve biomass production.

Jane Purton, Algenuity

I made some excellent links in the Chinese Academy of Science-Institute of Hydrobiology (CAS-IHB) & SDIC for future collaborations in 'Novel Algal Biosurfactants and Bioemulsifiers' and some new contacts from our delegates. Looking forward to attend the 2nd Meeting.

Pattanathu Rahman, TeeGene Biotech Ltd

As a first year PhD student in microalgal biotechnology, this trip was a great introduction to the UK and international community working on microalgae. The visit to the culturing facility in Beijing was incredibly interesting, especially the combination of autotrophic and heterotrophic culturing methods used to generate microalgal biomass. I think the forum really showcased the research being carried out in the UK, especially considering our budgets are miniscule compared to that in China. I was grateful for the opportunity to present my own research through a poster and oral presentation. I received great feedback and advice from both the UK and Chinese contingent. It was a great networking experience and a number of PIs from the Chinese groups offered to host me should I wish to visit for a research placement. It was very exciting for me to take part in the panel discussion on the past lessons and future directions of the microalgal field.

Alison Hughes (PhD student), University of Strathclyde