WORLD FEDERATION FOR CULTURE COLLECTIONS Newsletter (No. 57)–JULY 2019

NEWS FROM THE PRESIDENT

Dear Members,

Kind greetings from all of us in the Executive Board. Since December 2018's newsletter many different activities took place and they will be listed in the following pages. However, firstly, we would like to remind you the approaching ICCC'15 at Pucón, Chile http://www.iccc15.ufro.cl/ and look forward to seeing you there. In Chile, several training workshops will also take place during the conference http://www.iccc15.ufro.cl/images/documentos/Preliminary-programme-ICCC15.pdf and to secure a place please contact the organizers ASAP.

We have updated our Committee structures, we would like to thank to all those served in different WFCC Committees over the years for their hard work and commitments. We also welcome the new members into the newly structured committees. The names of the committees are: **(1) Access, Policies and Legal-frameworks, (2) Networking, Capacity Building and Education, (3) Postal, Quarantine and Safety Regulations, (4) Standardization and Best Practice Guidelines, (5) IP, Patent and Commercialization and (6) Endangered Collections.** We would like to encourage our members to take part in these committees and forward us their names or nominees' names as soon as possible please.

We have awarded 2019 Skerman Award to Dr Imen Nouioui for her excellence in actinobacterial classification with specific emphasis on the genus *Frankia*. We thank world experts Professors Jean Swings, Erko Stackebrandt, William Whitman, Hans-Peter Klenk, Martha Trujillo and Rob Samson for assisting us with their expertise during the selection process. I also would like to acknowledge the efforts of Dr Marizeth Groenewald in ensuring a fair selection process on behalf of the WFCC Executive Board.

To cement our relationship with the ECCO and the ACM, I participated in their conferences that took place in Italy and Malaysia respectively. You will find the news from these conferences I attended in the "News from the Members" section. I thank both the ECCO and the ACM organizers for the kind hospitality I received during my attendance to their conferences.

ACM participants and Dr. İpek Kurtböke in Kuala Lumpur, Malaysia

We also would like to salute Prof. Nelson Lima for his three-consecutive successful terms of the ECCO presidency and welcome Dr. Gerard Verkleij as the new President of the organization and look forward furthering our fruitful relationship with the ECCO during his term.

GCM 2: 10K Type Strain Sequencing Project has made a significant progress under the leadership of Dr Juncai Ma. For the current status of the project please refer to the upcoming publication in *Microbiology Australia*, volume 4, number 3, September 2019.

The role of microbiology is increasingly becoming important in many different disciplines ranging from human health to environment as well as for the climate change. Microbiology is in fact entering in its new golden era and with the advancing molecular techniques the roles of microorganisms in many different earth functions are being revealed. To align with these developments culture collections are now expected not to stay as static entities but to capture genome level information on microbial genetic resources. Attention should be paid to biosensor and bioindicator organisms as well as to the functional genes of microorganisms. It is also imperative that public understanding of microbiology should be increased. I would like to invite the members to respond to the recent calls made by microbiologists in these aspects:

1. Timmis K, Cavicchioli R, Garcia JL, Nogales B, Chavarría M, Stein L, McGenity TJ, Webster N, Singh BK, Handelsman J, de Lorenzo V. The urgent need for microbiology literacy in society. *Environmental Microbiology*. 2019 May;21(5):1513-28,
2. Cavicchioli R, Ripple WJ, Timmis KN, Azam F, Bakken LR, Baylis M, Behrenfeld MJ, Boetius A, Boyd PW, Classen AT, Crowther TW. Scientists' warning to humanity: microorganisms and climate change. Nature Reviews Microbiology. 2019 Jun 18:1.

In addition, the impact of pollution on beneficial microorganisms or the gases produced during microbial degradation should also be closely monitored.

1. Report related to the destruction of the sea-dwelling, photosynthetic *Prochlorococcus* that generates ten percent of the oxygen we breathe by plastic pollution, thus potentially depriving the Earth of a precious source of breathable air: https://futurism.com/the-byte/plastic-killing-bacteria-oxygen
2. Royer SJ, Ferron S, Wilson ST, Karl DM. Production of methane and ethylene from plastic in the environment. *PloS One*. 2018 Aug 1;13(8): e0200574.

As you know culture collections are the "bodies that public and the policy makers can call upon for objective help in developing regulations and guidelines for the safe and ethical use of biological resources" while ensuring compliance with the three key objectives of the CBD. WFCC is the largest independent global organisation that represents culture collections and will continue to play an integral role in raising awareness toward above listed facts to provide a sound platform of knowledge from which bio-economies and environmentally-friendly and sustainable global development will emerge.

In concluding, I again would like to invite you to the ICCC'15 and we look forward to seeing you in Chile soon to discuss above listed issues further and work in full cooperation with our members to strengthen the roles of culture collections.

Warm regards
İpek Kurtböke
President

http://www.iccc15.ufro.cl/images/documentos/Preliminary-programme-ICCC15-29-08-2019.pdf

Edited by Dr Ipek Kurtböke, University of the Sunshine Coast, Australia

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2019 WFCC-SKERMAN AWARD WINNER DR IMEN NOUIOUI

The WFCC executive board congratulates Dr Imen Nouioui as the winner of the prestigious WFCC Skerman Award for Taxonomy in 2019. The selection was done by six world experts in the field of taxonomy.

In 2014, Dr Nouioui was awarded her Ph.D. in Biology for research carried out between the Facutlé des Sciences et Technologies, Université de Claude Bernard, Lyon, France and the Faculté des Sciences de Tunis, Université Tunis El Manar. Tunis, Tunisia. Since then she has held Research Associate positions at the Leibniz Institute DSMZ – German Collection of Microorganisms and Cell Cultures, Germany (2014-2015) and latterly in the School of Natural and Environmental Sciences at Newcastle University, UK.

Much of Dr. Nouioui's research has been directed towards improving the classification and identification of actinobacteria of agricultural, industrial and medical importance. Using cutting edge whole genome sequencing methods and associated bioinformatics tools, as exemplified by her ground-breaking work on members of the genus *Frankia* which form mutualistic associations with numerous commercially significant dicotyledonous plants. Her pioneering work on these difficult to grow bacteria has opened-up the potential of using authenticated representative *Frankia* strains to promote the growth of plants such as *Alnus* that are used as windbreaks in many countries.

As a leading expert in *Frankia* biology, Dr. Nouioui was one of the organisers of the 19th *International Conference on Frankia and Actinorhizal Plants* and was subsequently one of the Guest Editors of a Special Issue of *Antonie van Leeuwenhoek* based on papers presented at this meeting. However, these studies, while outstanding, need to be seen within the context of other significant contributions she had made to improving the classification of other actinobacterial taxa, such as the industrially important genus *Streptomyces* and the highly significant, medically important genus *Mycobacterium*. Finally, Dr. Nouioui is the lead author of "*Genome–Based Taxonomic Classification of the Phylum Actinobacteria*", a paper that is already been highly cited and is likely to become a benchmark paper for those working on the prokaryotic systematics. Dr. Nouioui is currently employed on an industrially sponsored contract at Newcastle University.

As the winner of this prestigious award she will receive a price of $2000 together with a return economy class airfare and registration costs to attend the ICCC15 in Chile, November 2019. There she will deliver the Skerman Award Lecture on her research.

NEWS FROM CONFERENCE PARTICIPATIONS AND WORKSHOPS

XXXVIII MEETING OF THE ECCO

The 38th ECCO took place in Turin, Italy in 12-14 June 2019. The University of Turin together with the Mycotheca Universitatis Taurinensis (MUT) and the Turin University Culture Collections (TUCC) hosted the conference. The focus of the ECCO 2019 was on "Microorganisms as tools to win the current societal challenges and support European strategies in bio-economy", aligning with the long-term goal of the European Commission to develop a competitive, resource-efficient and low-carbon economy by 2050. The Executive Board of the ECCO also aimed at providing an insight into the influence of CCs in policymaking and sustainable bio-economy development within the European Union, whose market is currently about € 2.4 billion and employs 22 million people. They also emphasised the importance of microbial Biological Resource Centres (mBRCs) that are fundamental to gain access to a broad range of high quality bioresource material and

the latest technologies as well as fostering knowledge transfer, education and training.

ECCO-2019 Chair Prof. Varese, Dr. İpek Kurtböke and the past President of the ECCO Prof. Lima together at the closing ceremony

14th century university setting provided a magnificent background to the conference and under such antiquity conference lunches and poster presentations took place.

Conference lunch

Poster presentations

Organizers also set up a display for general public, composed of many beautiful microbial photographs provided by many scientists in the city centre of Turin. Overall, it was a productive and well-organized conference with lots of quality talks and we thank Prof. Varese and the organizers for including the WFCC where Treasurer Dr Andrey Yurkov was also present.

Public display of microbial photos in Turin

Edited by Dr Ipek Kurtböke, University of the Sunshine Coast, Australia

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2ND REGIONAL CONFERENCE ON CULTURE COLLECTIONS 2019 (RCCC 2019) AND 16TH MEETING OF THE ASIAN CONSORTIUM FOR THE CONSERVATION AND SUSTAINABLE USE OF MICROBIAL RESOURCES (ACM16) AT MICROBIAL CULTURE COLLECTION UNIT (UNICC), UNIVERSITI PUTRA MALAYSIA ON 23 – 25 JULY 2019

Tan Geok Hun[1,2], Musliyana Mansor[2] and Nor Umaira Abu Asan[2]

[1]Department of Agriculture Technology, Faculty of Agriculture, [2] Microbial Culture Collection Unit, Institute of Biosciences, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia

The conference was organised by the Microbial Culture Collection Unit (UNiCC), Institute of Bioscience, Universiti Putra Malaysia (UPM) in collaboration with Faculty of Biotechnology and Biomolecular Science and Faculty of Agriculture, chaired by Associate Prof. Dr. Tan Geok Hun. Co-organisers including Asian Consortium for the Conservation and Sustainable Use of Microbial Resources (ACM), WFCC-MIRCEN World Data Centre for Microorganisms (WDCM) and State Key Laboratory of Microbial Resources (SKLMR), China. The event was officiated by Prof. Dr. Zulkifli Idrus, Deputy Vice Chancellor (Research and Innovation), UPM. The officiating of this event was followed by the ceremony on MoU Exchange between UPM and WFCC-MIRCEN World Data Centre on Microorganisms (WDCM) and also with Institute of Microbiology, Chinese Academy of Sciences (IMCAS). This MoU will strengthen the role of UNiCC and visibility as microbial culture collection in the country and the region.

During the event, a new book entitled “Preservation of Microorganisms, A Laboratory Manual” published by UNiCC was also launched. The ceremony was also attended by Dr. İpek Kurböke, the President of the World Federation of Culture Collection (WFCC) as well as the Director of the WDCM Dr Juncai Ma.

The RCCC 2019 was attended by students and researchers from various universities, research institution and industries. There were 5 keynote and plenary speakers, and scientific sessions with 21 orals and 15 poster presentations.

Opening, WDCM MOU signing and book launch ceremonies

On the 2nd and 3rd day, there were parallel programmes carried out, one was 16th Meeting of Asian Consortium for the Conservation and Sustainable Use of Microbial Resources (ACM16) and 2nd Post-Conference Workshop on Phylogenetic Tree Analysis. The ACM'16 meeting was attended by 40 delegates from Malaysia, Japan, China, South Korea, Thailand, Philippines, Vietnam, Indonesia and Taiwan. For the workshop, there were 29 participants of the workshop.

A post conference tour to Melaka was successfully organised on the 26th July 2019. Besides that, the leisure activities such as visiting to Beryl's Chocolate & Confectionary Sdn. Bhd. and exotic fruits tasting (durian, cempadak, Mangosteens, rambutan and some other local fruits) took place at the end of the conference.

Malacca Trip

Beryl Chocolate Factory Trip

Testing locally produced durian, cempadak, Mangosteens, rambutan and some others local fruits

Edited by Dr Ipek Kurtböke, University of the Sunshine Coast, Australia

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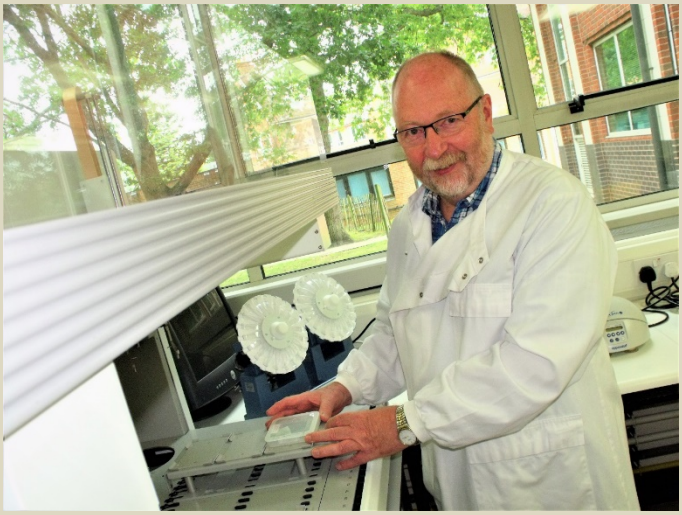
NEWS FROM THE MEMBERS

FORMER WFCC PRESIDENT Dr DAVID SMITH CELEBRATES NEARLY HALF A CENTURY IN SCIENCE AT CABI



Dr David Smith at CABI's laboratories in Egham, UK

When microbiologist Dr David Smith started work for CABI in 1974 the world was a very different place. Abba had won the Eurovision Song Contest with 'Waterloo' and went on to become a global pop sensation, a Renault 16TX car would have set you back £1,894.75 (£20,682 in today's money) and Richard Nixon became the first US president forced to resign amidst the Watergate Scandal.

Now 45 years later, and with no intentions to retire just yet, Dr Smith, CABI's Director of Biological Resources has a CV to envy having clocked-up almost 200 publications including 103 peer-reviewed papers, chapters and books and presented at 163 papers at 152 conferences in 30 countries.

Indeed, his book '*Preservation and Maintenance of Living Fungi*', co-written with his former boss Agnes H.S. Onions (whom he succeeded when she retired in 1987), is regarded as the 'holy grail' of texts on the preservation of fungi having been cited over 500 times. Meanwhile the PLOS Biology-published paper 'Genomic Encyclopaedia of Bacteria and Archaea: Sequencing a Myriad of Type Strains', to which he contributed his expertise to, has been cited on nearly 150 separate occasions.

Dr Smith, a Fellow of the Royal Society of Biology and a member of various bodies including the World Federation for Culture Collections, was also awarded a Japanese Government Fellowship in 1989 and in 2011 was the recipient of the American Society Microbiology and US Federation for Culture Collections Roger Porter Award. This was in recognition of 'outstanding efforts by a scientist who has demonstrated the importance of microbial biodiversity through sustained curatorial or stewardship activities for a major resource used by the scientific community.'

Dr Smith at CABI's National Culture Collection

"I set out to become an applied microbiologist and achieved this fairly early in my career. I keep setting myself goals and I would say that I have achieved much more than I could ever have imagined," Dr Smith said. "CABI has given me the opportunity to travel the world with 34 countries visited on their behalf. In my spare time this has also allowed me to see the Great Wall of China, the Taj Mahal and go on seven safaris."

Dr Smith, who currently supports CABI's microbiology staff in project development and leads a team of CABI Access and Benefit Sharing 'Champions' in 11 countries including Kenya, China, Brazil, Pakistan and Switzerland, worked at the cutting-edge of early technology – having developed a format for a culture collection database on microcomputer in 1982.

Under the Microbial Information Network Europe (MINE) EC BAP project, which ran from 1986 to 1994, he also played a lead role in developing the

database format and participated in the standardisation of data of the 40 participating collections as a member of the responsible committee. This is in addition to helping 19 countries establish their own culture collections throughout his career.

Dr Smith – who was also a work package leader and member of Executive Board for the European Marine Biological Research Infrastructure Cluster (EMBRIC) with the specific task of identifying and finding solutions to the biodiscovery pipeline – was presented with an award in recognition of his 45 years long service at CABI by CEO Dr Trevor Nicholls.

Before joining CABI, Dr Smith's only other two jobs in science were "sandwich course" placements working on liquid nitrogen storage and the electrophoresis of blood samples at the Metropolitan Police Forensic Science Laboratory for six months in 1972 and the freeze-drying of flu virus at the Microbiological Research Establishment, Porton Down, for 8 months in 1973.

Married to Susan for 40 years on 22 September and father to James and Katharine, Dr Smith is a grandfather to Jackson, son of James and wife Lauren, and in his spare time enjoys woodwork, Hornby train sets and watching films.

Dr Smith's career in numbers

- **198** publications including **103** peer reviewed papers, chapters and books
- Presented **163** conference papers at **152** conferences in **30** countries
- Edited two editions of 'Preservation and Maintenance of Living Fungi' cited over **500** times
- **148** citations for PLOS Biology-published paper 'Genomic Encyclopaedia of Bacteria and Archaea: Sequencing a Myriad of Type Strains'
- Worked under **3** organisational name changes – CMI, IMI and CABI, not including departmental name changes!
- Served under **5** Director Generals – the latter whom became CEO
- Had **6**-line managers, undergone **9** office changes
- Worked on **11** successive EU projects
- Involved in teaching in **15** countries
- Travelled **1.3 million** kilometres in the air – equivalent to **32** times around the world
- Worked with **36** culture collection technicians

Relevant projects/news stories

Project

The Microbial Resource Research Infrastructure (MIRRI): improving access to microbial resources, services and data

Stories

CABI scientists showcase their expertise in microbiology at European Parliament

Conserving and using genetic resources as part of CABI's commitment to the Nagoya Protocol

Dr Smith with colleagues after being presented with his long service award by CABI CEO Dr Trevor Nicholls

NATIONAL AGRICULTURALLY IMPORTANT MICROBIAL CULTURE COLLECTION (NAIMCC): A NATIONAL REPOSITORY OF ICAR-NATIONAL BUREAU OF AGRICULTURALLY IMPORTANT MICROORGANISMS

Sushil Kumar Sharma, Pawan Kumar Sharma and Anil Kumar Saxena

ICAR-National Bureau of Agriculturally Important Microorganisms, Kushmaur, Maunath Bhanjan-275 103, Uttar Pradesh, India

Microorganisms represent the richest gamut of molecular and chemical diversity in nature, as they comprise the most diverse forms of life. India is home to billions of microbes and is one among 12 mega-biodiversity countries and 25 hotspots of the richest and highly endangered eco-regions of the world. Interest in the exploration of microbial diversity has been spurred by the fact that microbes are essential for life since they perform numerous functions essential for the biosphere that include nutrient cycling and environmental detoxification. The exploited microbial activities are augmentation, supplementation and recycling of plant nutrients, so vital to sustainable agriculture. Microbial diversity and its richness to the environment provide a huge reservoir of resources, which we can utilize for our benefit. Owing to the deterioration of environmental conditions, sustainability in crop productivity has remained an ever-challenging task for the scientists all over the world. Therefore, for agriculture, microbial diversity is one of the most fundamental aspects to maintain the global ecological balance and sustain soil health. It is of great concern that how and to what extent such environmental degradation affects microbial abundance and population dynamics. Therefore, cataloguing and preservation of agriculturally important microorganisms, become necessity of the present time for judicious microbial resource management, bio-prospecting and fundamental scientific research. Indian Council of Agricultural Research (ICAR) under the aegis of Department of Agricultural Research and Education (DARE), Government of India established ICAR- National Bureau of Agriculturally Important Microorganisms (NBAIM) in the year 2001 for collection, maintenance, conservation and supply of agriculturally important microorganisms (AIMs) all over the country. A landmark development of ICAR-NBAIM was the establishment of NAIMCC (National Agriculturally Important Microbial Culture Collection) in the year 2004.

National Biodiversity Authority (NBA), Ministry of Environment, Forests and Climate Change, Govt. of India has recognized ICAR-NBAIM culture collection (NAIMCC) as one of National Repositories of India. At present, NAIMCC is holding 6663 microbial accessions which include 3877 fungi, 2541 bacteria and actinomycetes and 245 cyanobacteria isolated from various extreme and unique ecological niches including arable land (Fig. 1).

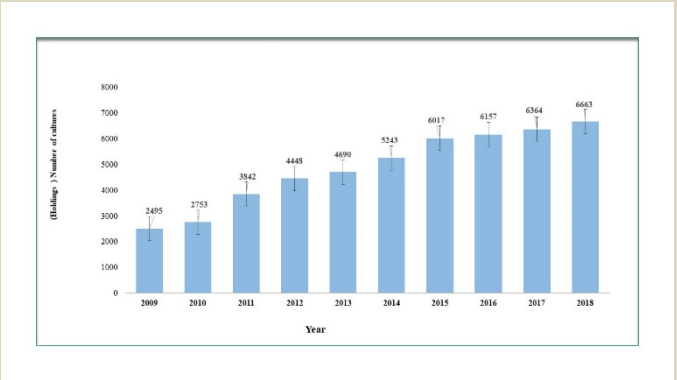


Fig.1: Year-wise status of microbial holdings in NAIMCC

ICAR-NBAIM offers the facility for registration of elite microbial germplasm to facilitate the exchange of such germplasm among different national institutes/organizations under MoU for further research and commercialization. The NAIMCC has been registered as an affiliate member of WFCC and follows the guidelines and principles of WFCC and OECD (www.wfcc.info/ccinfo/collection/by_id/1060).

NAIMCC has state-of-art facilities for the maintenance, conservation and characterization of microorganisms. AIMs are preserved and maintained by at least two methods depending on type of microorganisms, i.e. short-term preservation through storage of microbial cultures in glycerol stock at -80ºC (fungi & bacteria) and mineral soil (fungi); long term storage through lyophilization (up to 25 years) and cryopreservation (Fig.2).

Cyanobacterial cultures are exclusively being maintained by cultivation under active state. The cyanobacteria are exclusively being maintained under active culture. In addition, the Bureau has established a new Culture Storage Facility in the

building of ICAR-National Bureau of Plant Genetic Resources, New Delhi for safe upkeep of the duplicate set of microbial cultures.

Fig.2: A view of National Agriculturally Important Microbial Culture Collection (NAIMCC)

NAIMCC is also engaged in supply of pure cultures to various research organizations and provides microbial identification services along with associated knowledge. In 2008, Microbial Genomic Resource Repository (MGRR) was added to ICAR-NBAIM. MGRR is a facility that preserves the genetic materials of the agriculturally important microorganisms, maintained in selected hosts or cloned and maintained in plasmids, accompanying the data details.

Currently, NAIMCC is providing following services to cater the need of all stakeholders:

(a) Accessioning of microbial cultures deposited by different researchers of the country under 'general deposit' / 'open deposit', 'safe deposit' and 'deposit for registration'.
(b) Services for safe deposit of cultures are being extended to researchers and private partners to develop microbe-based product for commercial purposes.
(c) Developed guidelines for registration of elite microorganisms and extend services for registration of elite microbes having commercial or biotechnological or agricultural potential.
(d) Microbial cultures for research, academic, teaching and for commercial purposes are being supplied to all stakeholders. During last 5 years, NAIMCC has supplied approximately 700 cultures to public and private sectors for research purpose only.
(e) ICAR-NBAIM through NAIMCC is facilitating services for identification of cultures received from industry and researchers for research purpose and for registration of microbial biopesticides for commercialization in compliance with Department of Plant Protection, Quarantine and Storage (DPPQ&S), Faridabad, India (http://www.ppqs.gov.in). ICAR-NBAIM is a nodal agency designated by Central Insecticides Board and Registration Committee (CIB & RC) for developing DNA fingerprints of microbial cultures to be registered as biopesticides and safe upkeep of registered microbes in NAIMCC for future reference.
(f) NAIMCC is facilitating DPPQ&S for import of cultures from abroad by Indian stakeholders for research and commercial purpose.
(g) NAIMCC is also conducting trainings and educational programme for dissemination of

knowledge to the all sectors of the societies for creating awareness of biodiversity, conservation and utilization of microbes.

NAIMCC has developed linkages with Indian collections namely MTCC, Chandigarh, NMRC, Pune, NFFCC, Pune, VTCC, Hisar etc for exchange of information for developing policy of access benefit sharing of microbial resources under Nagoya Protocol with National Biodiversity Authority (NBA). ICAR- NBAIM organized two meetings to develop network among microbial culture collections in India (Fig.2). The bureau extended know-how for development of "Microbial Genetic Resource Bank" to a delegation from National Institute of Biotechnology, Dhaka, Bangladesh in 2014.

In recent years, ICAR- NBAIM has also started working on the utilization of microorganisms conserved in NAIMCC. The cultures have been used to develop formulations for nutrient management and soil health. Several formulations namely BioPhos, BioPhos+, BioZinc, Biopotash, RhizoNBAIM, Bio NPK and BioGrow have been developed that can be used to curtail about 25-30% of the chemical fertilizers besides improving the soil health. NAIMCC maintains a collection of cultures used for biocontrol of insect pests and fungal pathogens. BioPulse, a flyash based formulation consisting of *Trichoderma harzianum* and *Bacillus amyloliquefaciens* for control of *Fusarium* wilt in chickpea was developed. Treatment with formulation could suppress wilt disease by 40% and increased the grain yield by 15% in chickpea on farmers' field.

Eco-Green Fungicide, a vermi-based bioformulation of *Trichoderma viride*, Eco-Pesticide, a talc based bioformulation of *Pseudomonas fluorescens* and Green Fungicide a talc based bioformulation of *Trichoderma harzianum* were also developed that could suppress different plant pathogens. The Bureau organized two workshops on "Problems and Prospects for Commercialization of *Trichoderma*" and "Microbe based Technologies for Soil health and Plant nutrition" on May 24 and 25, 2018 respectively (Fig.3). The workshop was attended by academia, entrepreneurs and policy makers. In a short span of time, NAIMCC is going from strength to strength and has attained the status of acclaimed repository for agriculturally important microorganisms.

Fig.3: Organised a group meeting of Indian microbial culture collections

Fig.4: Organized workshops on "Problems and Prospects for Commercialization of *Trichoderma*" and "Microbe based technologies for Soil health and Plant nutrition" in May 2018

UPDATE FROM THE US CULTURE COLLECTION NETWORK

By Kevin McCluskey and Kyria Boundy-Mills

The USCCN has entered its 8th year in a period of significant change. Funding from the US National Science Foundation has been re-organized and emphasizes new projects or modest support for long-standing infrastructure. This funding opportunity is open to digital collections, natural history collections, and any other biologically relevant collection. The total amount of funds available is very modest and emphasizes that the NSF has encouraged collections to become self-sustaining.

For many collections this means fee increases and reduces the numbers of strains distributed; researchers are more likely to engage in peer-to-peer exchanges when the cost of obtaining materials from collections is increasing. Similarly, the impact of the Nagoya protocol means that research laboratories, both at universities and companies, are more likely to look locally for strains as compared to utilizing resources from another country, even if they have been in a collection for many years.

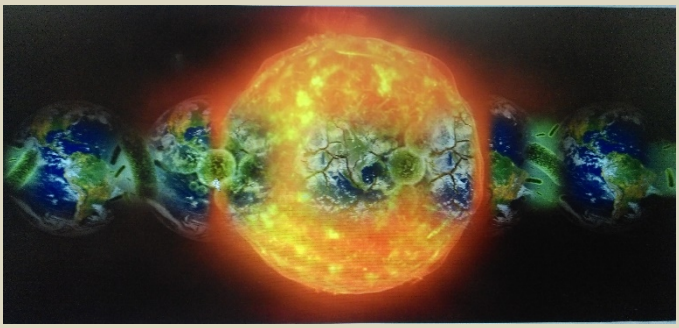
Meanwhile, several organizations are looking at the impact of scientific collections including the US National Academy (https://www8.nationalacademies.org/pa/projectview.aspx?key=51270), the US Department of Agriculture (https://www.ars-grin.gov/ngrac/), and the US Office of Science and Technology Policy (https://www.whitehouse.gov/ostp/). One question that these studies will address is how to decide which strains should be in a public collection. While the historical answer is that anything described in published research should be in a public collection, this does little to advance the question of who should pay for the collections. Public collections like the ATCC or Add gene have made significant impact in this area but lack the capacity or mandate to handle the tremendous volume of materials being generated or described.

Among US stock collections, the Fungal Genetics Stock Center, the *Bacillus* Stock Center, the *E. coli* Genetic Stock Center, and the USDA NRRL collection are facing existential crises as funding declines. These collections have supported fundamental research across multiple disciplines and over many decades. Technological advances, including next generation genome sequencing and Crispr/Cas genome manipulation, mean that the historical materials, and especially model organism strains, are less important. Mutants can be made in the exact genetic background and model organisms are less important when you can do research with the actual organism that has demonstrated or potential economic impact. In this context, biodiversity and type strain collections take on increased value. The USCCN will continue to work to represent culture collections and stock centres in the US and provide a forum for engagement with the broader living collection community, in the US and internationally.

THE MICROBIOLOGISTS' WARNING: A WARNING FROM ALL MICROBIOLOGISTS' TO HUMANITY

by Rick Cavicchioli, UNSW, Australia

The Microbiologists' Warning is a Consensus Statement proclaiming that microorganisms are so critical to achieving an environmentally sustainable future that ignoring them risks the fate of Humanity. It aims to raise awareness of the microbial world and make a call to action for microbiologists to become increasingly engaged in, and microbial research to become increasingly infused into, the frameworks for addressing climate change.



Anyone with microbiology training, professionals and students alike are encouraged to become part of the Microbiologists' Warning by individually endorsing the Consensus Statement. In addition to individuals, organizations are endorsing the statement – as of mid-August, four academies and 23 societies have done so, including the Australian

Society for Microbiology and the Australian Academy of Science.

The profile of the Consensus Statement has grown rapidly with the publisher website showing >60,000 accesses and an Altimetric score that is considerably higher than any other of the more than 2000 articles published by *Nature Reviews Microbiology*.

The Microbiologists' Warning is intended as vehicle for ALL microbiologists to motivate change in many and varied ways. The Consensus Statement is Open Access and is intended to be freely distributed and used. A power-point presentation is available for making presentations for conferences, teaching and outreach purposes – contact me (r.cavicchioli@unsw.edu.au) to obtain a shared drop-box link. Translations of the Consensus Statement are useful for allowing more scientists to read the article and are particularly valuable for enabling members of the media and general public to read and contemplate – even if the content is not fully comprehensible it will prompt questions to scientists and hence provide an important means of education and public understanding of the issues.

Currently, translations are being written in Chinese, Spanish, French, Portuguese, Greek and Turkish. A Word doc version of the publication to help translators is available – perhaps you or someone you know would like to translate into another language – if so, please contact me (r.cavicchioli@unsw.edu.au) to discuss and obtain the Word doc.

Things you can easily help with:

- Read the Consensus Statement
- Endorse individually
- Request organizations you are a member of to endorse
- Distribute widely – amplify the message
- Twitter, Facebook, LinkedIn

Things that will take a little more effort:

- Translate the Consensus Statement into another language
- Motivate the writing of additional statements emphasizing a national focus

Food for thought:

- An urgency exists for improving understanding about the links between microbes and climate change, and also more generally for improving microbial literacy in society – the two go hand-in-hand. One avenue for achieving this is for funding agencies to enact schemes to specifically address the microbiology of climate change and microbial literacy. A priority of the scheme would be linkages to national (ideally) or international businesses/organizations that demonstrate tangible incorporation of microbiology into their 'thinking' and improved public understanding of microbes. Another priority would be interdisciplinary research (e.g. microbiologists with modellers and physical scientists) linking microbiology to non-microbiology disciplines so that the research collectively targets the microbial dimensions that are currently missing. Also see the Call to Action (Box 2) in the Consensus Statement.

OBITUARY

Prof. Jovita Martínez Cruz

(1944-2019)

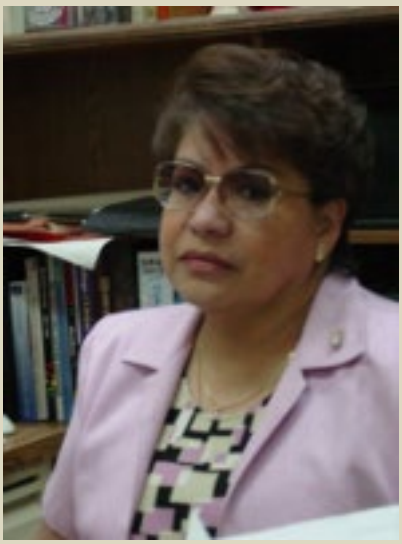
She was born in México City on December 1, 1944. Chemical bacteriologist Parasitologist (1962-1966) by the National School of Biological Sciences. IPN., Master of Science in Ecological Biotechnology by Biotechnology and Bioengineering department of Center for Research and Advanced Studies of the

National Polytechnic Institute (CINVESTAV) (1975-1978). She obtained a specialty in Aquatic Microbiology by Cornell's University. New York, USA. (1975-1976). During 3 decades, she worked as a teacher of the academic program of the Master of Science in Biotechnology of department of Biotechnology and Bioengineering in CINVESTAV-Mexico. She was also a member of the Mexican Society of Mycology, the American Society of Microbiology, the Mexican Society of Microbiology, the National Academy of Pharmaceutical Sciences, the World Federation of Culture Collections (WFCC) and Latin American Federation of Collections (FELACC). As a professor at the department Biotechnology and Bioengineering in CINVESTAV she was responsible for integrating a Microbial Culture Collection in 1974 by initiative of Dr. Carlos Casas Campillo, founder of the Collection and Head of the Department in CINVESTAV in that time, a task that she kept until 2017.

Due to research and service activities in microbial collections field, was decentralized from the Department of Biotechnology in the year 2000 and relocated as part of the General Services Coordination under the responsibility of Dr. Jose Tapia Ramírez. Her preparation in microbial collections field was thanks to participation in training courses on techniques of management and maintenance of microbial cultures in international institutions such as the Department of Microbiology of the University of Queensland in Brisbane, Australia in 1977 and her participation in several International Conferences on Microbiology Collections organized by WFCC worldwide. The World Data Centre for Microorganisms recognized the Collection in 1977 (WDCM) identified by the acronym CDBB-500 (Collection of Biotechnology and Bioengineering Department). In 1981, it was affiliated into WFCC and it is maintained to this date.

Academic spirit of the Prof. Martinez and the need to make the country's scientific community aware of the importance of microbial collections led her coordinate and participate in a large number of related events in this field, which highlight the organization, coordination and teaching of the 1st, 2nd and 3rd International Theoretical-Practical Course on Taxonomy, Genetics, Yeast Conservation topics and its Biotechnology application which was hosted by the Graduate Center of the Technological Institute of Merida in 1984; CINVESTAV 1986 and at the UNAM Research Centre for Genetic Engineering and Biotechnology in 1989); the 1st National Conference on Collections of Microorganisms and its importance in teaching, research and in Biotechnology and the 1st. National Theoretical-Practical Course on Conservation of Microbial Cultures at the Faculty of Biological Sciences, Universidad Autónoma de Nuevo León, Monterrey 1992).

Another of its great achievements was the invitation by the National Commission for Knowledge and Use of Biodiversity, Mexico (CONABIO) in 1994 to develop, through an inter institutional project, a database system to generate a catalogue of microbial strains as a generator of microbial information in México.



Research activities of Prof. Martínez on yeasts field allowed to build strong academic background and friendship ties was forming working groups in different places of the México as he was with Dr. Ricardo Vazquez Juarez of Biological Research Northwest Center Baja California, MSc Miriam Cortes Noh of Oaxaca Technological Institute Patricia, Dra. Patricia Lappe Oliveras of Biology Institute UNAM just to mention a few; international personalities in yeast taxonomy such as Dr. Cletus Kurtzman (RIP) of ARS Culture Collection (NRRL) USDA, USA; Dr. Jack W Fell of University of Miami FL (UM); Dr. Marc-Andre Lachance of Biology Department of the University of Western Ontario, and Dr. Sally A. Meyer of Biology Department of

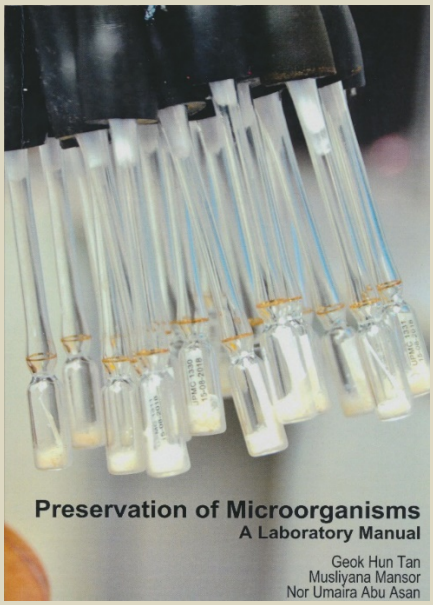
Georgia State University USA, great colleagues and close friends. The influence of the relationship of advisory activities with different companies where microorganisms play the primary role created awareness in the protection of cultures as inoculum in the fermentation processes of food industry and production of alcoholic beverages, specifically the tequila industry. As a professor at CINVESTAV, she always showed her full willingness to support research and teaching in institutions in different states of the country and as a friend, she always supported and willing to help in situations of vulnerability of her loved ones… Always ready to offer its knowledge to young people interested in the field of microbiology.

Professor Jovita Martínez Cruz died on 10 February 2019. As the legacy of Prof. Jovita Martinez Cruz continues the National Collection of Microbial Strains and Cell Cultures now under the direction of Biol. Juan Carlos Estrada Mora, Research Assistant whom since 1991 collaborated in the service and research activities offered by the unit. Considered as collection of microorganisms of importance for the development of biotechnology in Mexico currently holds more than 2000 microbial strains, filamentous fungi, yeast, bacteria and microalgae; some of these strains have been isolated in our country and others acquired from exchange with scientists, inside and outside Mexico and other collections. The collection offers strains and information to the scientific community, educational institutions, research centers and industry in Mexico and the world.

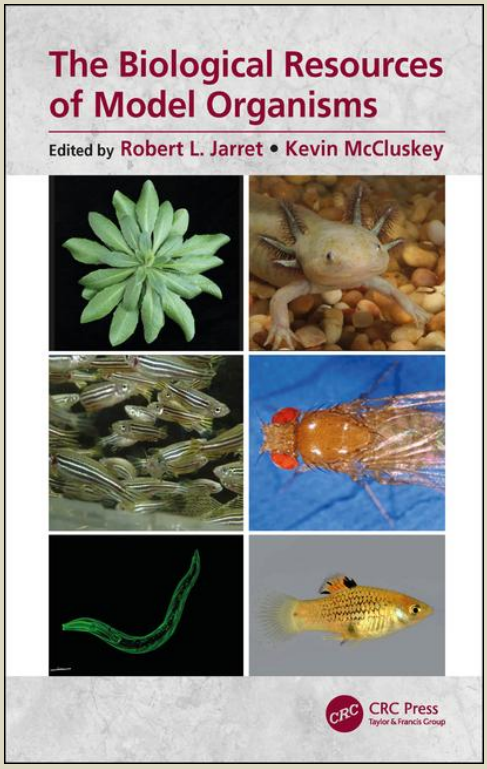
By Juan Carlos Estrada Mora (Curator Mexican Culture Collection WDCM CDBB-500)

BOOKS

1] Preservation of microorganisms: A laboratory manual by G.H. Tan, M. Mansor and N.U. Abu Asan



2] The Biological Resources of Model Organisms by R.L. Jarret and K. McCluskey



WDCM ANNOUNCED PARTNERSHIP WITH IJSEM AND BERGEY'S MANUAL TRUST

On March 5th, 2019, WFCC-MIRCEN World Data Centre for Microorganisms (WDCM) signed an official cooperation agreement with *the International Journal of Systematic and Evolutionary Microbiology (IJSEM)* and *Bergey's Manual Trust*, which runs *Bergey's Manual of Systematic Bacteriology*, at Institute of Microbiology CAS, Beijing, China. Liu Shuangjiang, director of the institute, Ma Juncai, director of WDCM, Martha E. Trujillo, chief editor of IJSEM, and Fred A. Rainey, president of BMT, attended the meeting as representatives.

Fred A. Rainey, Ma Juncai, Liu Shuangjiang and Martha E Trujillo

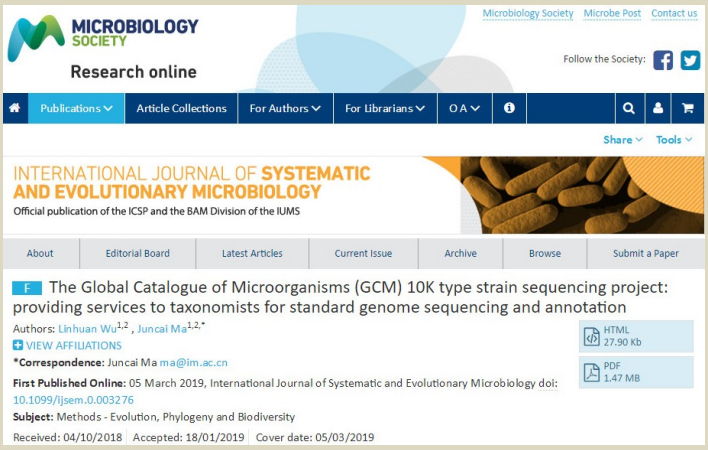
Fred A. Rainey, Ma Juncai, Liu Shuangjiang

WDCM will cooperate with IJSEM and BMT under the framework of Global Catalogue of Microorganisms (GCM) 2.0, which was founded by WDCM and IMCAS, with the support of microbial resource conservation centres in 12 countries. The GCM 2.0 project has launched in 2017, and now works with 25 microbial resource conservation centres in 16 countries since then, such as ATCC, BCCM, CBS, CCUG, CGMCC, DSMZ, FGSC, JCM, KCTC, MUM, NBRC and TBRC.

IJSEM is a leading international science journal of microbial systematics. According to *the International Code of Nomenclature of Bacteria* (ICNB), valid publication of new species names for prokaryotes requires its description to be published in the IJSEM, or the name be listed in its validation list, then the naming would be recognized and accepted as legit. Since January 2018, type strains are required by IJSEM for new species publication.

Bergey's Manual of Systematic Bacteriology is one of the most valuable and systematic reference books of bacterial species. First published in 1923 as *Bergey's Manual of Determinative Bacteriology*, the manual has released 9 editions so far.

Cooperation with these two organizations will materially facilitate the development of Sequencing Project for Type Strains. Via the platform provided by IJSEM and BMSB, WDCM will be able to work with microbiologists and researchers from all over the world and have in-depth collaboration in sequencing for type strains, data collection and data analysis.



IS_MIRRI21: A new project funding by European Commission to support the European microbial Biological Resource Centres

A great news for the European Culture Collections is the recent project approved by the European Commission, under the call "Research and Innovation Actions - INFRADEV-03-2019" and entitled **Implementation & Sustainability of Microbial Resource Research Infrastructure for 21st Century (IS_MIRRI21)**.

This IS_MIRRI21 project was built on the top of the preparatory phase European project Microbial Resource Research Infrastructure (MIRRI) and subsequent work done by the Interim National Coordinators Forum (INCF) and Assembly of prospective Members (AM).

In brief, IS_MIRRI21 will push forward all work done so far under the MIRRI umbrella in order to establish this organisation as a European Research Infrastructure Consortium (ERIC) which is a specific legal form that facilitates the establishment and operation of world-class research infrastructure (RI). In addition, IS_MIRRI21 aims to implement the Microbial Resource Research Infrastructure (MIRRI) and secure its long-term sustainability. With this in mind, the mission of IS_MIRRI21 is to serve Bioscience and Bioindustry by providing (a) a broad range of high-quality biological resources and associated data, (b) long-term sustainability of microbial biodiversity, and (c) knowledge and professional development.

This mission will be achieved by offering users from academia, governmental laboratories and the private sector access to a portfolio of microbial Biological Resource Centres´ (mBRC's), services, expertise, education and training build-up and synergistically on the top of mBRC's proficiencies.

To accelerate innovative research processes in life sciences and biotechnology using microorganisms, or their derivatives, IS_MIRRI21 will set up a single-entry point portal (Collaborative Work Environmental) to promote its services, resources, expertise and knowledge transfer activities, as well as to provide access to partners´ resource associated data made interoperable for data searching and data mining. The continuously increasing knowledge will be transferred to users via expert clusters (e.g., for legal framework, for biosecurity, to support training and education programmes, information and cut edge technology, etc.). It will promote cross-disciplinary and innovative solutions (industry and academic) research collaboration through the transnational access offer (pilot study) in different microbial topics defined in pipeline services. With this project IS_MIRRI21 envisages to be a sound partner of the ESFRI landscape on the Biological and Medical Sciences Research Infrastructures, consolidate the operation of MIRRI and enlarge the membership and European coverage and beyond.

The IS_MIRRI21 will be coordinated by Nelson Lima from Micoteca da Universidade do Minho (MUM; Braga, Portugal) with a total of 14 partners distributed by 10 countries (see Table) and a budget of with 5 million euros for 3 years. It is expected that in upcoming times IS_MIRRI21 will inform all WFCC members about the main achievements and outcomes that this new project will deliver. At the same time, the IS_MIRRI21 expects enlarge its partnership inviting EU Member States, associated countries, third countries other than associated countries and intergovernmental organisations to be become a Member or an Observer of MIRRI.

Participant No	Participant organisation name	Participant org. short name	Country
	University of Minho (Coordinator)	UMinho-MUM	PT
	Sociedade Portuguesa de Inovação	SPI	PT
	Universitat de València-Estudi General	UVEG-CECT	ES
	Institut National de la Recherche Agronomique	INRA	FR
	Institut Pasteur	IP	FR
	Universidad de Las Palmas de Gran Canaria	ULPGC	ES
	Koninklijke Nederlandse Akademie van Wetenschappen	KNAW-Westerdijk Institute	NL
	Service Public Federal de Programmation Politique	BELSPO	BE
	Institute of Agriculture and Food Biotechnology	IAFB	PL
	University of Latvia	UL-MSCL	LV
	National and Kapodistrian University of Athens	NKUA	GR
	Associação CCG/zgdv – Centro de Computação Gráfica	CCG	PT
	Universita Degli Studi Di Torino	UNITO	IT
	All-Russian Collection of Microorganisms, Institute of Biochemistry and Physiology of Microorganisms, Russian Academy of Sciences	IBPM RAS	RU

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