

# MAJOR NEW RESEARCH INITIATIVE TO TACKLE LIFE THREATENING FUNGAL INFECTIONS



The Manchester Fungal Infection Group (August 2015).

The impact of life-threatening human diseases caused by fungi has been severely under appreciated. Estimates of the number of people dying from fungal diseases are greater than 1.5 million, which is more than the numbers that die from malaria or tuberculosis. Unfortunately there are few antifungal drugs to treat these deadly fungal diseases and resistance against antifungal drugs, particularly azoles, is increasing. As a result of a major investment by the University of Manchester, the Manchester Fungal Infection Group (MFIG) was established in 2013 to address these extremely important problems. The MFIG joins the National Aspergillosis Centre, headed by David Denning, and the Mycology Reference Centre Manchester, led by Malcolm Richardson, which are both based at the University Hospital of South Manchester. There are currently over 75 clinical and non-clinical researchers working on human fungal diseases in Manchester, and it is now the main global centre for research on aspergillosis and *Aspergillus fumigatus*.

The MFIG is focused on performing basic and translational research, which is being integrated with clinical research on fungal diseases in Manchester. A significant component of their work is also on antifungal drug discovery and target validation through collaborations with industry. The MFIG's research programme

is primarily concentrated on *A. fumigatus* as an experimental system and the research complements the outstanding work being performed in other UK centres of excellence focused on studying human fungal diseases, particularly the Aberdeen Fungal Group that is mainly working on *Candida*. The research at the MFIG is covered in four main themes: (1) Cell and molecular biology of the fungal-host pathogen interaction; (2) *Aspergillus* genetics and genomics; (3) antifungal drug discovery, mode of action and resistance; and (4) the genetic basis of human susceptibility to fungal disease. The MFIG group is led by its Director, Nick Read, supported by the Deputy Director Elaine Bignell and Principal Investigators Paul Bowyer and Mike Bromley. Currently the MFIG is home to over 40 postdoctoral researchers, PhD students, and technical and administrative support staff. Recently, Jorge Amich has joined the MFIG after being awarded a prestigious 5-year Medical Research Council (MRC) Fellowship. The MFIG's research is well supported financially by grants from the MRC, Wellcome Trust, the European Union, Blackberry Therapeutics, Du Pont, Genon Laboratories, the Global Action Fund for Fungal Infections (GAFFI), and the Fungal Research Trust.

The MFIG was officially launched on 9 September 2015 and the launch event was attended by over 100 academics and

representatives from industry, including many collaborators. The scientific programme covered the significance of fungal diseases, recent advances in our understanding of their mechanistic basis, and how this understanding is being applied to develop novel antifungal therapies. Beside the MFIG Principal Investigators, the invited speakers were Jack Edwards (University of California at Los Angeles) who described the trials and tribulations of developing a fungal vaccine, and Gerald Bills (University of Houston) who spoke on the latest class of antifungals, the echinocandins, now selling nearly \$1 billion annually. The Keynote Lecture was given by Keith Gull (University of Oxford) who highlighted our current lack of knowledge about infectious diseases in general. Overall, it was an extremely successful, high profile event that exemplified the range of interdisciplinary skills, specialised resources and critical mass of researchers necessary to bring about major breakthroughs in tackling life-threatening fungal diseases. It also illustrated how much exciting interdisciplinary science is now being undertaken in the field of medical mycology and how critical it will be to communicate the this important area of research to other scientists, the general public and policy makers.

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# FUNGAL CONSERVATION AND IUCN RED LISTING

Awareness of the importance of fungal conservation has steadily increased following establishment of the International Society for Fungal Conservation (ISFC) at IMC9 in Edinburgh in August 2010. Today, the ISFC has over 400 members from more than 70 countries, and acts as a coordinator and point of focus for fungal conservation initiatives worldwide. Membership is currently free; please submit details to "Membership" at: [www.fungal-conservation.org](http://www.fungal-conservation.org).

While ISFC members have been active at national level, two initiatives are highlighted here of global and regional scope.

Anders Dahlberg and Michael Krikorev (Sweden), and Greg Mueller (USA) have developed a mechanism to promote Red Listing of fungi. The Global Fungal Red List (GFRL) Initiative comprises a website ([www.iucn.ekoo.se](http://www.iucn.ekoo.se)) where mycologists of all nations are invited to nominate threatened fungi that might qualify for IUCN Red Listing and to collate all information necessary to support a Red List application to IUCN. Anders and Greg also personally assist mycologists with their proposals for Red Listing to ensure that all criteria

and support arguments are of a standard acceptable to IUCN.

Why should we consider Red Listing fungi? IUCN Red Listing is a globally recognised alert for governments to value and protect designated taxa, knowing that their threat status has been formally recognised internationally according to agreed criteria. While fungi constitute the second largest kingdom of multicellular life, they barely rank in most conservation efforts, in part because few have been considered for Red List status. In fact, IUCN (2015) includes just 5 Red Listed species of fungi (1 agaric and 4 lichens), compared with 11,877 species of animals and 10,896 plants. Through the GFRL Initiative and practical guidance in the application of IUCN assessment criteria to fungi (e.g. Dahlberg & Mueller 2011), mycologists now have a supportive mechanism by which to engage with fungal Red Listing. Anders and Greg have collaborated with mycologists globally to develop over 25 fungal species Red List proposals for submission to IUCN by December 2015.

Meanwhile, regional mycological congresses provide the opportunity to

bring mycologists together to discuss and raise awareness about fungal conservation needs. Membership of ISFC is highest among Indian mycologists, and the Asian Mycological Congress in Goa, October 2015, provided a venue to engage this topic. A symposium on fungal conservation was co-organised with KV Sankaran (India), comprising nine speakers and attracting the largest audience of five concurrent sessions. Papers included case studies of threatened Asian species, molecular detection, culture collection preservation of fungi, information resources for fungal conservation in India, red listing, and an introduction to the ISFC – the latter presented remotely by ISFC President Dave Minter (UK) via a downloaded video file.

All mycologists with concern about the threat status of fungi are encouraged to join ISFC, to support inclusion of fungi in national Red Lists ([www.nationalredlist.org](http://www.nationalredlist.org)), to participate in the GFRL Initiative for global IUCN Red Listing, and to submit articles about in-country or regional initiatives in fungal conservation to Paul Cannon ([p.cannon@kew.org](mailto:p.cannon@kew.org)) for the ISFC society newsletter.



Participants at the Fungal Conservations symposium held during the Asian Mycological Congress in Goa.



Dahlberg A, Mueller GM (2011) Applying IUCN red-listing criteria for assessing and reporting on the conservation status of fungal species. *Fungal Ecology* 4: 147–162.

IUCN (2015) *The IUCN Red List of Threatened Species. Version 2015-3.* (<http://www.iucnredlist.org>).

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## VOLKSWAGEN FOUNDATION SUPPORTS THE AFRICAN MYCOLOGICAL ASSOCIATION (AMA) TO BUILD MYCOLOGICAL CAPACITIES IN WEST AFRICA

Mycology is presently regarded as a megascience that includes various aspects such as ethnomycology, food mycology, medical mycology, mycorrhizal symbiosis, taxonomy, systematics, phylogenetics, and ecology of fungi. Although modern mycology becomes a routine in temperate and boreal countries, very little is known about mycodiversity in the tropics. It is expected that tropical areas host a high diversity of fungi of nutritional, pharmaceutical, ecological, and agricultural significance. Tropical African mycodiversity can efficiently be used to face numerous food and health problems, and environmental degradation when human capacities have been generated, and when mycological teaching and research are integrated into native academic systems. In the present project, the Volkswagen Foundation (Germany) financially supports the University of Frankfurt (Germany), the University of Parakou (Benin), and the African Mycological Association (AMA), to reinforce mycological capacity in West Africa. From 2015 to 2017, a series of three summer schools of two weeks each will be organised at the University of Parakou. Target groups are composed of West African and German students and junior scientists working on different aspects of mycology. The coaching staff is composed of expert mycologists and



botanists from Europe and West Africa. Through this project, we expect to sustainably promote a north-south transfer, but also a south-south exchange of mycological know-how among West African and European junior scientists. The overall goal is that the trained native West African and German students, but also the trainers, will establish a network of mycologists, and will thereby perpetuate tropical mycological teaching and research in order to sustainably launch

West Africa in the mycological sphere. The Volkswagen Foundation also supports the improvement of mycological infrastructure at the University of Parakou.

For more information contact Nourou S. Yorou (AMA Vice-President; [n.s.yorou@gmail.com](mailto:n.s.yorou@gmail.com)), Meike Piepenbring ([piepenbring@bio.uni-frankfurt.de](mailto:piepenbring@bio.uni-frankfurt.de)) or Karen Hahn ([karen.hahn@bio.uni-frankfurt.de](mailto:karen.hahn@bio.uni-frankfurt.de)).

## FUNGEN – A NATIONAL FUNGAL GENETIC RESOURCE FOR INDIA ?

Genetic resource collections of fungi play a key role in conserving fungal biodiversity and making it available for research and exploration. Now a road map as to how the rich fungal resources of India might be made available on a national scale has been put forward (Suryanarayanan *et al.* 2015). This is envisaged as a complement to the

existing collections in India, by focussing on securing fungi from little-explored habitats. FUNGEN (Fungal Genetic Resource of India) would be engaged in training graduate student mycologists in colleges and universities in isolation techniques, and operate on a crowd-sourcing model with “mini-collections”

developed at participating centres. Initial screening would then be undertaken at a national centre in one of the major cities. The development of a major collection is reminiscent of Subramanian’s (1982) vision and call for action, and now needs the financial commitment of government and state agencies to make FUNGEN a reality.

With the increased global concern over the sustainable use of natural resources, the need to find novel bioactive compounds of pharmaceutical interest, and the possibilities afforded by modern molecular technologies, it would be an opportune time to see such an initiative implemented.

Subramanian CV (1982) Tropical mycology: future needs and development. *Current Science* 51: 321–325.  
Suryanarayanan TS, Gopalan V, Sahal D, Sanyal K (2015) Establishing a national fungal genetic resource to enhance the bioeconomy. *Current Science* 109: 1033–1037.

## CZECH CULTURE COLLECTION OF FUNGI (CCF)

### CCF Culture Collection of Fungi



The Czech Culture Collection of Fungi (CCF) celebrated its 50<sup>th</sup> anniversary in 2015. The collection was started at Charles University in Prague in 1965 by Olga Fassatiová and now includes about 3400 isolates, mostly of ascomycetes and

zygomycetes. Congratulations to Alena Kubátová and her staff, who continue the long tradition of microbial culture collections in Prague. The first ever collection of bacterial and fungal cultures selling isolates is reputed to be that started

by František Král (1846–1911) at the Czech Technical University in Prague in 1885. Král's collection was moved to Vienna after his death; some cultures were later taken to the USA and a few can be found in different collections today, but those left in Vienna were sadly lost in World War II (Ainsworth 1976). Today the CCF has a diverse and active taxonomic research programme, including Karel Prášil, Miroslav Kolařík, Ondřej Koukol, and Vít Hubka as well as Alena.

Ainsworth GC (1976) *Introduction to the History of Mycology*. Cambridge: Cambridge University Press.

## STATE KEY LABORATORY OF MYCOLOGY (SKLM) IN CHINA CELEBRATES 30 YEARS

The State Key Laboratory of Mycology (SKLM) of the Chinese Academy of Sciences (CAS) was first granted Key Laboratory status in 1985, then as the State Key Laboratory of Systematic Mycology and Lichenology. Located in Beijing, the Laboratory grew out of the former CAS Department of Mycology and Plant Mycology which dates back to 1953. In order to celebrate the occasion, the September 2015 issue of *Mycosystema*, 34(05), show-cases its work through 13 review and seven original research papers contributed by research groups from the Laboratory. The range of topics illustrates the impressive diversity of the

Laboratory's current research: taxonomic revisions, biodeterioration due to lichens, insect mutualisms, photoreceptors, fungal products, antifungal resistance, autophagy, quarantine lists, endophytes, heat tolerance of lichen bionts, and batch fermentation of *Ophiocordyceps sinensis*. Almost all papers are in Chinese, but are made more widely accessible by being accompanied by English abstracts and English legends to figures and tables. It has been a great pleasure for me to see the Laboratory develop since my first visit there in 1987, how the journal has gone from strength to strength, and for this to become one of the foremost world centres for mycology today.

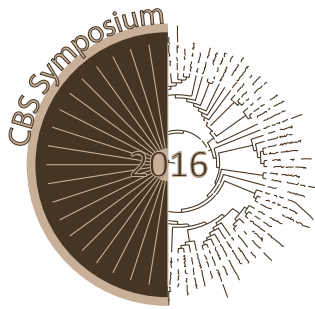


## FUNGI AND GLOBAL CHALLENGES

Previous important and successful CBS Spring Symposia, One Fungus = One Name (2011), One Fungus = Which Name (2012) and One Fungus = Which Genes (2013), Genera and Genomes (2014), and

the Second International Workshop on Ascomycete Systematics (2015) had a great impact on the mycological community. The CBS-KNAW Fungal Biodiversity Centre has now planned the 2016 Spring

Symposium, "Fungi and Global Challenges" which will take place on 14–15 April 2016. One of the main topics of the symposium will be on how global and climate change impact on fungi, specifically those involved



## Fungi and Global Challenges

with plant and human diseases, as well as food and forest security.

This meeting will also see the launch of the International Fusarium Research Centre (IFURC), and several talks will focus on *Fusarium* systematics, impact, and relevance. In addition new developments on fungal taxonomy, as well as novel and emerging fungal applications, will also be considered. Contributed papers are welcome, and they will be selected for poster presentations. For more information

visit: <http://www.cbs.knaw.nl/index.php/meetings/659-fungi-and-global-challenges-2016>

The symposium will include sessions on: Fungi, global and climate change; Fungi and human health; Taxonomic challenges: Fusarium; Fungi and food production; Fungi, novel and emerging applications; and New developments in fungal nomenclature and taxonomy. Some of the speakers who have already agreed to speak are shown in Box 1.

Takayuki Aoki (Japan)  
Balazs Brankovics (The Netherlands)  
Amanda Chen (The Netherlands)  
David Denning (UK)  
Geoff Gadd (UK)  
David Geiser (USA)  
Francine Govers (The Netherlands)  
Sarah Gurr (UK)  
David Hawksworth (Spain and UK)  
Fahimeh Jami (South Africa)  
Yanping Jiang (China)  
André Lévesque (Canada)  
Lorenzo Lombard (The Netherlands)  
David McMullin (Canada)  
Naresh Magan (UK)  
David Miller (Canada)

Kerry O'Donnell (USA)  
Corné Pieterse (The Netherlands)  
Jack Pronk (The Netherlands)  
Martijn Rep (The Netherlands)  
Margarita Hernandez-Restrepo (The Netherlands)  
Keith Seifert (Canada)  
Anton Sonneberg (The Netherlands)  
Marc Stadler (Germany)  
Emma Steenkamp (South Africa)  
Joey Tanney (Canada)  
Paul Verwey (The Netherlands)  
Cees Waalwijk (The Netherlands)  
Xuewei Wang (China)  
Patricia Wiltshire (UK)  
Mike Wingfield (South Africa)

## ADVICE TO MYCOLOGISTS CONCERNING ARTICLE 57.2

Article 57.2 was a new article in the Melbourne *International Code of Nomenclature for algae, fungi and plants* (McNeill *et al.* 2012), introduced as part of the package of changes in the move from dual nomenclature to 'one fungus : one name'. The Article requires a specific but rather confusing action by the Nomenclature Committee for Fungi (NCF) prior to taking up an earlier anamorph-typified name over a later synonymous teleomorph-typified name. That action is rejection by the NCF of a proposal to: (1) conserve the later name over the earlier name; or (2) reject the earlier name outright.

In the short time that it has been in operation, there have been a number of issues around the need for and application of Art. 57.2. It now seems quite clear that it should be removed from the *Code* and Hawksworth (2015) has formally published a proposal to delete the Article, on the

basis of almost unanimous support for this action in the questionnaire distributed as part of the Nomenclature Section at the 10th International Mycological Congress in August 2014. Abolishing the Article also has unanimous support from the International Commission for the Taxonomy of Fungi (ICTF) and near unanimous support from the NCF.

The proposal to delete Art. 57.2 will be dealt with at the Nomenclature Section of the International Botanical Congress in 2017. In the interim, the Nomenclature Committee for Fungi will bundle up all situations covered by Article 57.2 and deal with them en masse (whether or not formal proposals have been submitted). The intent of author/s in regard to choices among competing names that fall under Art. 57.2 will be followed. This process will be carried out several times between now and the 2017 Congress, and reported on in *IMA Fungus*.

Therefore, mycologists are instructed not to submit formal proposals under Art. 57.2. However, it remains useful for the morph state to be indicated when making a choice among anamorph- and teleomorph-typified names, so that situations falling under Art. 57.2 can be identified by the NCF and dealt with en masse.

By sidelining Art. 57.2 during the period of its operation (and eventually removing it), the choice of names for fungi since dual nomenclature was removed on 30 July 2011 can be based strictly on priority, whatever the morph state of types of names. However, it should be remembered that if a later name is deemed preferable then conservation or rejection (individually) or 'protection' or 'suppression' (through a list) is, of course, still available as a means of taking up a later name, whatever the state present in its type or in those of competing names (anamorph or teleomorph; or indeed if the state of the type is uncertain).



Choice among competing anamorph- and teleomorph-typified names can be made by an individual author, but is most commonly being dealt with by international working groups. These working groups have been set up in consultation between the NCF and the ICTF to deal with the transition to one name : one fungus in important groups of fungi such as *Dothidiomycetes*, *Leotiomycetes*, *Diaporthales* etc. There are also working groups covering Phytopathogenic Fungi and Medical Mycology, that can deal with names that fall outside of the taxonomic scope of the other working groups. The working groups

ensure that choice of competing names is dealt with by a community of experts in the particular group, taking into account both the usage of competing names and the views of user groups about the optimum choice of name.

In the case of any confusion about the application of Art. 57.2, authors are encouraged to contact the NCF Secretary.

Hawksworth, DL (2015) Proposals to clarify and enhance the naming of fungi under the International Code of Nomenclature for algae, fungi, and plants. *Taxon* 64: 858–862; *IMA Fungus* 6: 199–205.

McNeill J, Barrie FR, Buck WR, Demoulin V, Greuter W, *et al.* (eds) (2012) *International Code of Nomenclature for algae, fungi, and plants (Melbourne Code) adopted by the Eighteenth International Botanical Congress Melbourne, Australia, July 2011*. [Regnum Vegetabile no. 154.] Königstein: Koeltz Scientific Books.

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## FUNGAL BIODIVERSITY CALENDAR 2017

In April 2013 the CBS-KNAW Fungal Biodiversity Centre launched its fungal calendar series, focusing on the beauty of fungal biodiversity.

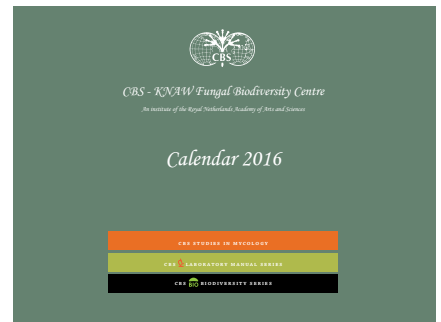
The next calendar is scheduled for April 2016, and will be handed out at the “Fungi and Global Challenges” Symposium (14–15 April) in Amsterdam. To this end we invite all those making photographs or micrographs to submit their most beautiful fungal illustrations. Photographs of fungi cultivated in the laboratory, or observed in nature will be considered. Illustrations should be identified by the species name. Images should be in landscape layout, at least 300 dpi (3600 x 2400 px) and in full colour.

The mycologist who submits the most beautiful picture (selected by a CBS panel),



will receive one CBS publication of choice. All submissions will subsequently also be added to MycoBank.

The publication of the 2017 calendar is scheduled for April 2016 and the submissions for the 2017 calendar are welcome until 26 February, 2016.



### SHOW US YOUR FUNGI!

Submissions can either be sent to p.crous@cbs.knaw.nl or r.samson@cbs.knaw.nl. For large files we recommend using www.wetransfer.com, dropbox, or any other service that will allow you to share large files.