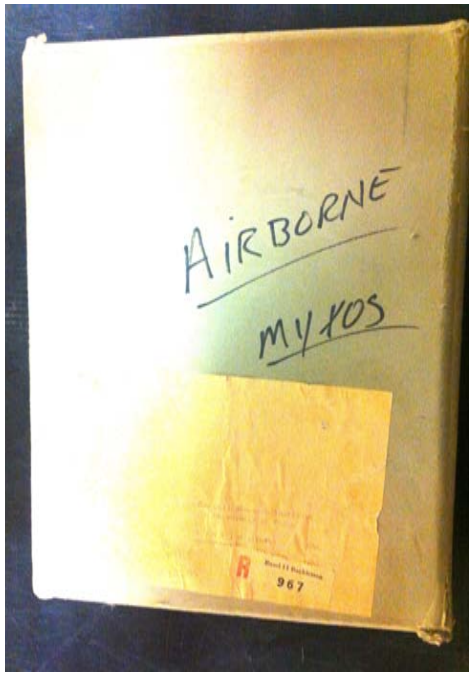
Fungi in the built environment:

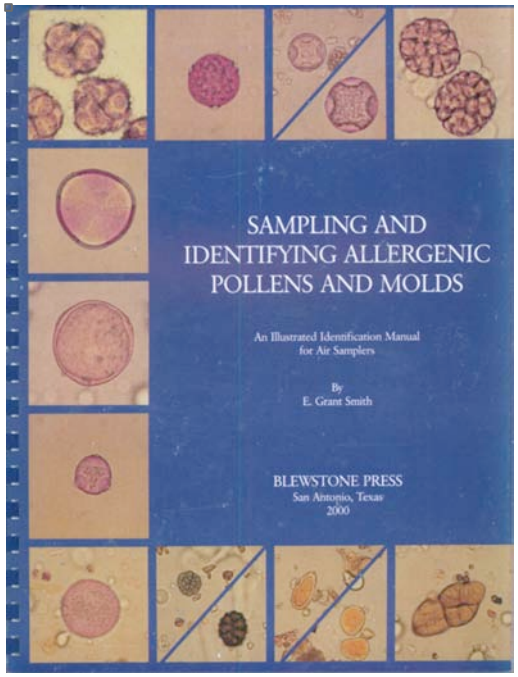
next steps

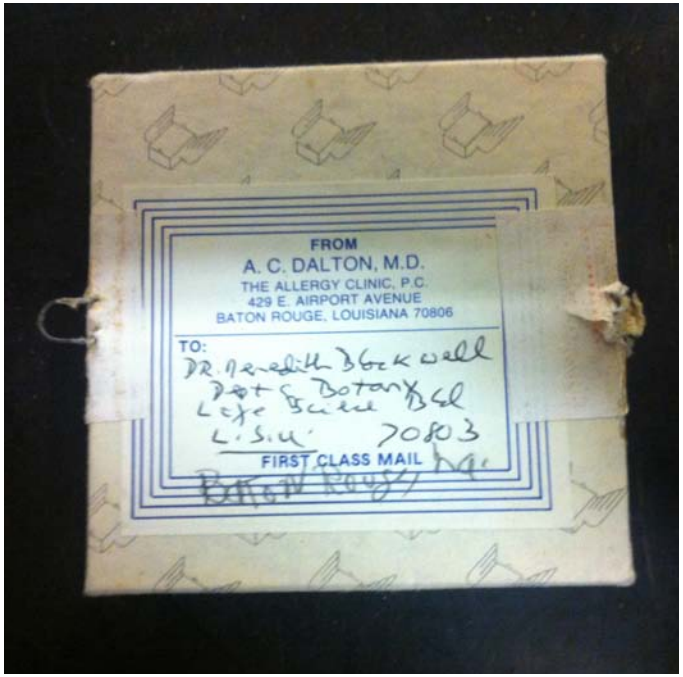
September 22-23
Berkeley, California

Disembodied spores

Meredith Blackwell. Identification of airborne myxomycete spores. AIBS, Athens, Georgia, August 1978. Invited Symposium Speaker. First talk!

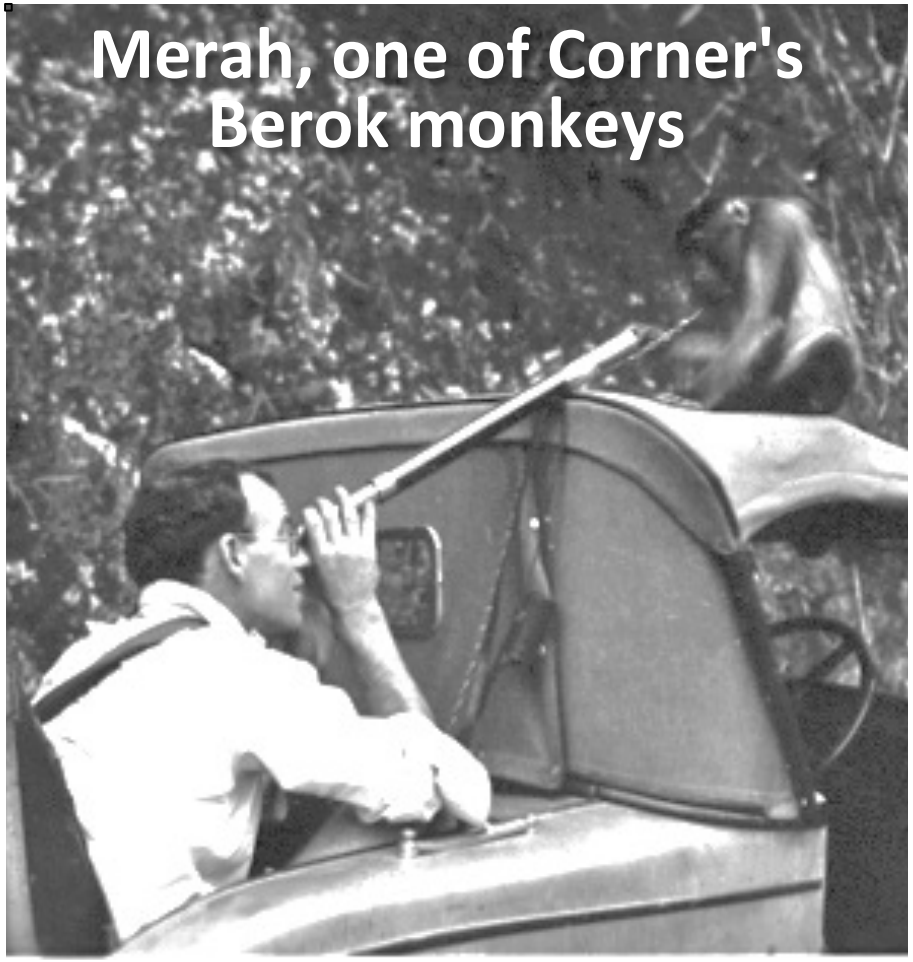






"I have several reference books I use for mold identification. Three books will be a good start. E. Grant Smith's book on fungal and pollen spores is a must read for persons looking at Air-o-cell cassettes...." http://sustainablemycology.blogspot.com

Environmental sampling: fungi you never knew were in leaves



E.J.H. Corner
(1906-1996)

Monkey's New Career

FINDING it impossible to obtain specimens from points on trees that could not be reached by ladders or on branches too slender to support a man, Mr. E. J. H. Corner, assistant director of the Colony's botanical gardens, set out a few weeks ago to find a coconut-picking monkey of more than average ability.

In Merah, whom he located in Bereh kampong in Kelantan, Mr. Corner made a discovery. Scaling up a tree, with his leash threading behind him through the foliage, Merah implicitly follows intructions conveyed to him by means of tugs on the cord and by orders in Malay.

Nipping off the specimen pointed out to him, he drops it to the ground, clambers down himself and hands it to Mr. Corner, leaning himself against Mr. Corner's hand with one paw and handing up the leaf or flower with the other.

If the specimen catches on a branch on the way down, Merah's master just has to call "lepas" to him and the monkey frees the object.

CONFUSED

Singapore Malay only confuses Merah. He looks bewildered if addressed in anything but pure Kelantan Malay. The Merah understanding is confined to such expressions as turun, duduk, ambil ini, lepas, naik, and, most important of all, jangan gigit.

As soon as he left his remote jungle home in Kelantan, glory surrounded Merah. General Dobbie travelled south in the same train.

LISTENS FOR BANG

Mystified at first by the trappings of civilisation confronting him in Singapore, the hairy little fellow from the wilds now gets his greatest thrill when he is not climbing trees, in tugging at roller blind cords at the botanic gardens offices and listening for the bang.

Merah is here destroying a pencil. He has removed the indiarubber, half of which is in his left hand, the other half rolling round his tongue.

Merah holds aloft a leaf he has taken from the top of a tree.

Fungal identification

Arnold, A. E., Z. Maynard, G. Gilbert, P.D. Coley, and T. A. Kursar. 2000.

Are tropical fungal endophytes hyperdiverse?

Ecology Letters 3:267-274

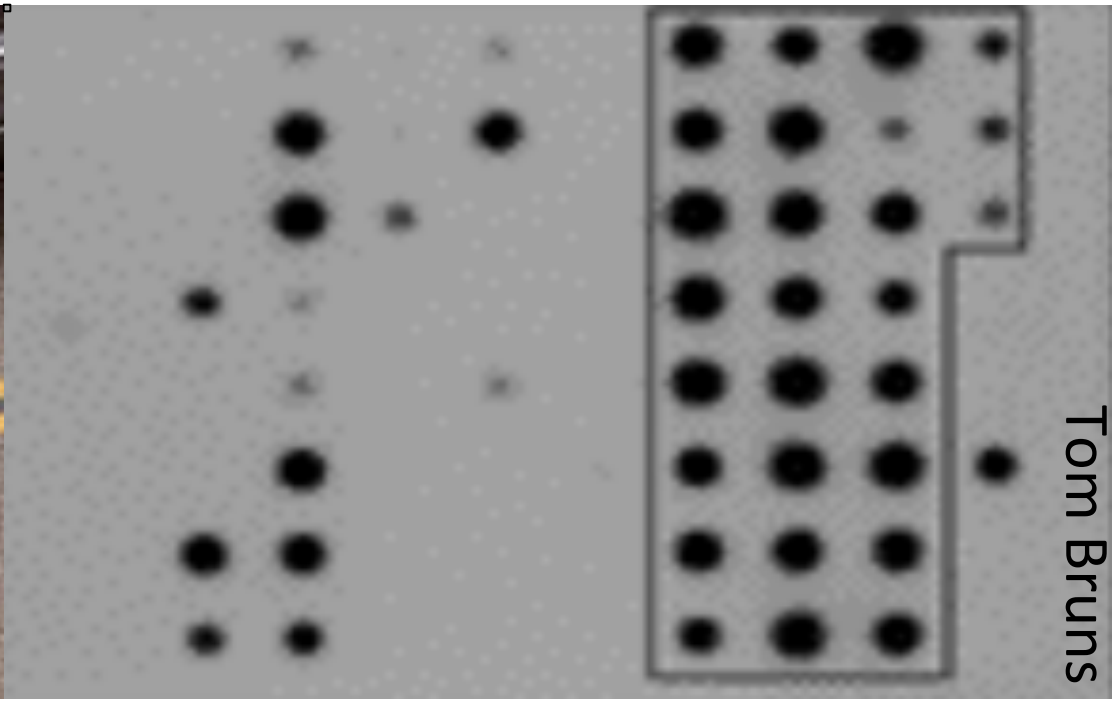
418 morphospecies from 83 leaves

Photos from Vega et al. 2010. Fungal Diversity. Coffee endophytes

California inventions & applications

Botts' Dots

Dot Blots



Berkeley: More tools for environmental sampling

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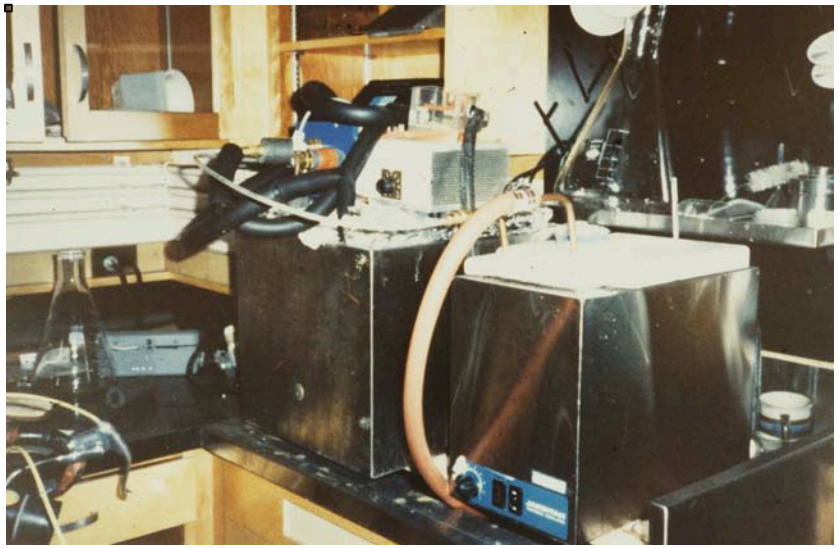
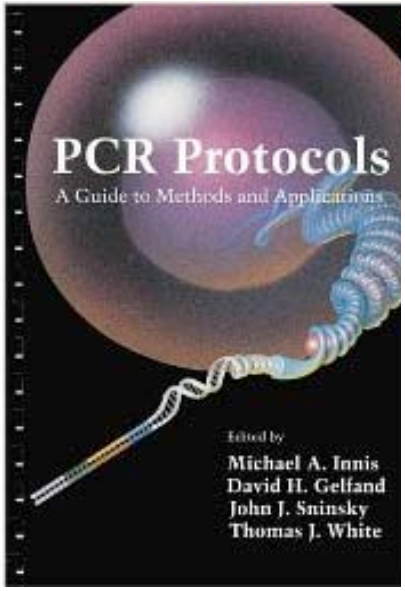
- Bruns TD, Szaro TM, Gardes M et al. 1998. A sequence database for the identification of ectomycorrhizal basidiomycetes by phylogenetic analysis. Molecular Ecology, 7, 257–272.
- Horton, TR & Bruns TD. 2001. The molecular revolution in ectomycorrhizal ecology: peeking into the black-box. Molecular Ecology 10:1855-1871.

White TJ, Bruns TD, Lee S, Taylor J. 1990. Amplification and direct sequencing of fungal ribosomal RNA genes for phylogenetics. In: Innis MA, Gelfand DH. (eds). PCR Protocols: A Guide to Methods and Applications. Academic Press: London, pp. 315-322.



Early PCR machine made from kitchen appliances



Cited by 14,138

21 September 2014

Most scientific papers are cited just a few times, but seldom 100 times, and rarely a few thousand. The papers that earned Nobel prizes for UC Berkeley physicists Saul Perlmutter and George Smoot, for example, have been cited 8,882 and 2,260 times, respectively, according to Google Scholar. Berkeley News Center, September 14, 2012

Nuclear ribosomal internal transcribed spacer (ITS) region as a universal DNA barcode marker for Fungi. 2012. Proceedings of the National Academy of Sciences 109:6241-6246.

Conrad L Schoch, Keith A Seifert, Sabine Huhndorf, Vincent Robert, John L Spouge, C André Levesque, Wen Chen, Elena Bolchacova, Kerstin Voigt, Pedro W Crous, Andrew N Miller, Michael J Wingfield, M Catherine Aime, Kwang-Deuk An, Feng-Yan Bai, Robert W Barreto, Dominik Begerow, Marie-Josée Bergeron, Meredith Blackwell, Teun Boekhout, Mesfin Bogale, Nattawut Boonyuen, Ana R Burgaz, Bart Buyck, Lei Cai, Qing Cai, G Cardinali, Priscila Cha[illegible]ri, Brian J Coppins, Ana Crespo, Paloma Cubas, Craig Cummings, Ulrik[illegible]amm, Z Wilhelm de Beer, G Sybren de[illegible]oog, Ruth Del-Prado, Bryn Dentinger, Javier Diéguez-Uribeondo, Prad[illegible]o K Divakar, Brian Douglas, Ma[illegible]ueña[illegible]Duc[illegible]ula[illegible]rdt, [illegible]dward[illegible]S El[illegible]Katerina Fliegerova, [illegible]noha[illegible]urtado, Mi[illegible]el A[illegible]cía, Za[illegible]Wei Ge, C[illegible]eth W[illegible]ffi[illegible]K Gri[illegible]s, J[illegible]anne Groenewald[illegible]Marize[illegible]Gro[illegible]ewa[illegible]Ma[illegible]n Grub[illegible]Marieka[illegible]zenho[illegible]Li[illegible]-Dong[illegible]uo,[illegible]y Hagen, Sarah Hambleton,[illegible]ar[illegible]Har[illegible]in,[illegible]n H[illegible]sen, Pa[illegible]arrad,[illegible]ory[illegible]eller,[illegible]ar[illegible]era,[illegible]zuyuki Hirayama, Yuuri Hirooka, Hsiao-Man Ho, Kerstin Hoffmann, Valérie Hofstetter, Filip Högnabba, Peter M Hollingsworth, Seung-Beom Hong, Kentaro Hosaka, Jos Houbraken, Karen Hughes, Seppo Huhtinen, Kevin D Hyde, Timothy James, Eric M Johnson, Joan[illegible]E Jo[illegible]son, Pe[illegible]er R Jo[illegible]ston,[illegible]B Ga[illegible]en[illegible]one,[illegible]ara J[illegible]elly, Paul M Kirk, Dániel G Knapp, Urmas Kõljalg, Gábor M Kovács, Cle[illegible]us P Kurtzman, Sara Landvik, Steven D Leavitt, Audra S Liggenstoffer, Kare Liimatainen, Lorenzo Lombard, J Jennifer Luangsa-ard, H Thorsten Lumbsch, Harinad Maganti, Sajeewa SN Maharachchikumbura, María P Martin, Tom W May, Alistair R McTaggart, Andrew S Methven, Wieland Meyer, Jean-Marc Moncalvo, Suchada Mongkolsamrit, László G Nagy, R Henrik Nilsson, Tuula Niskanen, Ildikó Nyilasi, Gen Okada, Izumi Okane, Ibai Olariaga, Jürgen Otte, Tamás Papp, Duckchul Park, Tamás Petkovits, Raquel Pino-Bodas, William Quaedvlieg, Huzefa A Raja, Dirk Redecker, Tara L Rintoul, Constantino Ruibal, Jullie M Sarmiento-Ramírez, Imke Schmitt, Arthur Schüßler, Carol Shearer, Kozue Sotome, Franck OP Stefani, Soili Stenroos, Benjamin Stielow, Herbert Stockinger, Satinee Suetrong, Sung-Oui Suh, Gi-Ho Sung, Motofumi Suzuki, Kazuaki Tanaka, Leho Tedersoo, M Teresa Telleria, Eric Tretter, Wendy A Untereiner, Hector Urbina, Csaba Vágvölgyi, Agathe Vialle, Thuy Duong Vu, Grit Walther, Qi-Ming Wang, Yan Wang, Bevan S Weir, Michael Weiß, Merlin M White, Jianping Xu, Rebecca Yahr

barcode

150 participants

What do we want to learn at the workshop? more about databases/which fungi

- Adams RI, Amend AS, Taylor JW, Bruns TD. 2013. A unique signal distorts the perception of species richness and composition in high throughput sequencing surveys of microbial communities: a case study of fungal endophytes. Microb Ecol 66:735-741.
- Amend AS, Seifert KA, Samson R, Bruns TD. 2010. Indoor fungal composition is geographically patterned and more diverse in temperate zones than in the tropics. Proc. Natl. Acad. Sci. U.S.A. 107:13748-53.
- Amend AS, Seifert KA, Bruns TD. 2010. Quantifying microbial communities with 454 pyrosequencing: does read abundance count? Mol. Ecol. 19:5555-5565.

Fungal bioinformatics

Sampling fungi

Where/how to sample

ITS only?

More DNA regions

Single cell genomics

Fine-scale sampling

What do we want to learn at the workshop? more about databases/which fungi

Microbiome of the Built Environment Data Analysis Core (MoBeDAC)

The data analysis core is a consortium among four different institutions to provide tools and a data archive for analyzing molecular sequence data and for visualizing ecological and functional similarities between microbial communities in the indoor environment and other field sites. This group will integrate the functional capabilities of several different toolsets and databases. These include MG-RAST, VAMPS, QIIME, and FungiDB.

The goals of this consortium are to:

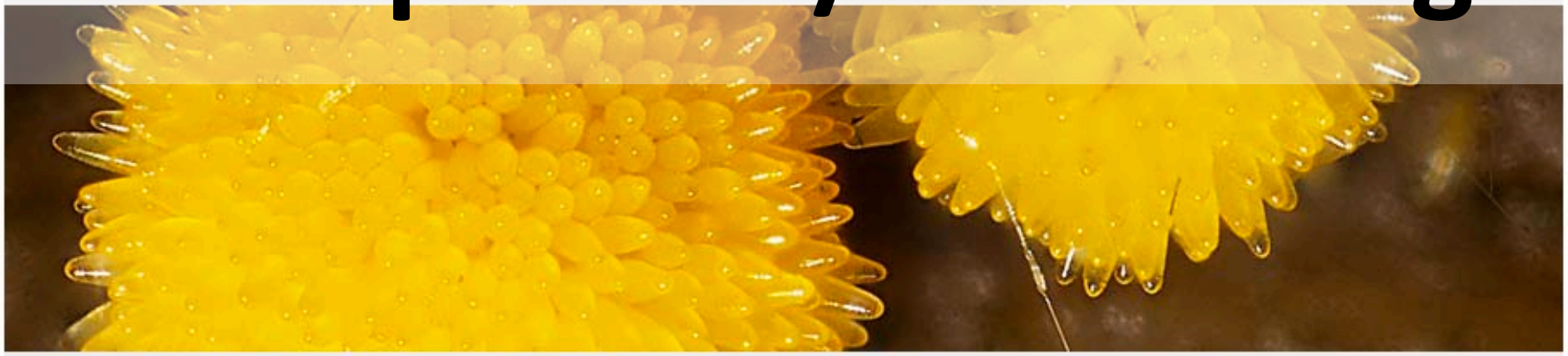
1) Develop a data archive
2) Establish an interoperative environment for disparate websites and analysis tools
3) Establish appropriate metadata standards
4) Develop visualization and new analytical techniques for comparing microbial communities, especially those from indoor environments

Principle Investigators:

Folker Meyer, University of Chicago
Mitch Sogin, Marine Biological Laboratory
Rob Knight, University of Colorado Boulder
Jason Stajich, University of California, Riverside

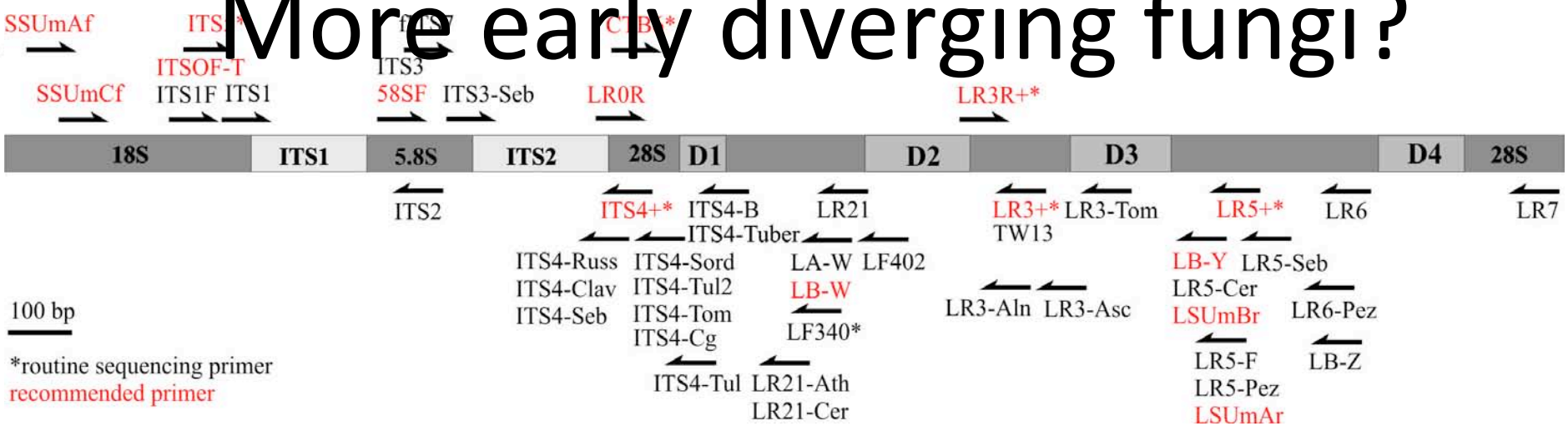
What do we want to learn at the workshop? more about databases/which fungi

More primers/ more fungi



Current version: **6.0**; Release date: pre-release (**read more**)
Number of UNITE fungal Species Hypotheses: **52 062** (based on 98.5% threshold value, see also SH statistics below)
Number of fungal ITS sequences in current version (UNITE+INSD): **352 704**

More early diverging fungi?



y diverging fungi?

http://unite.ut.ee/

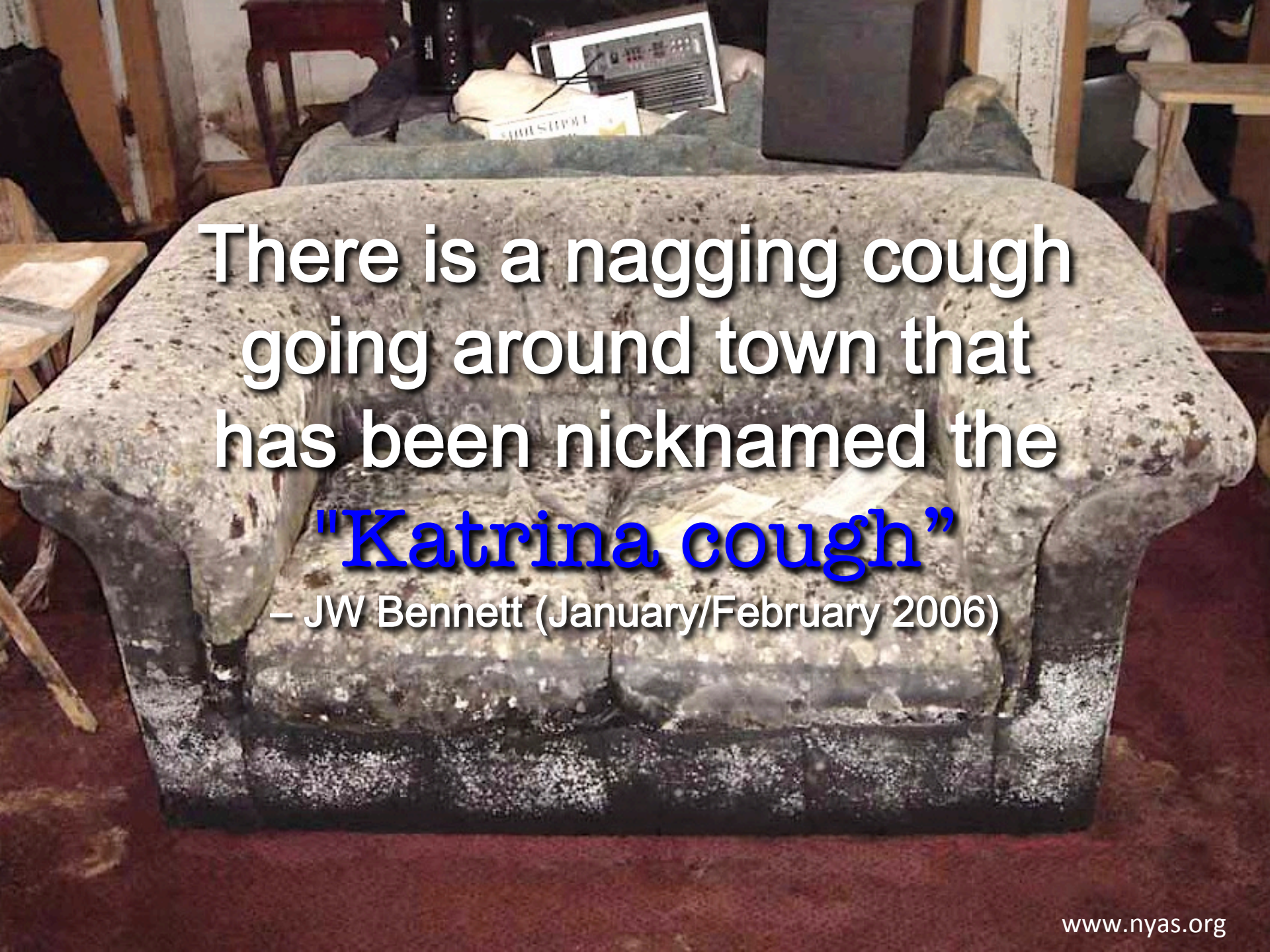
What do we want to learn at the workshop? more about

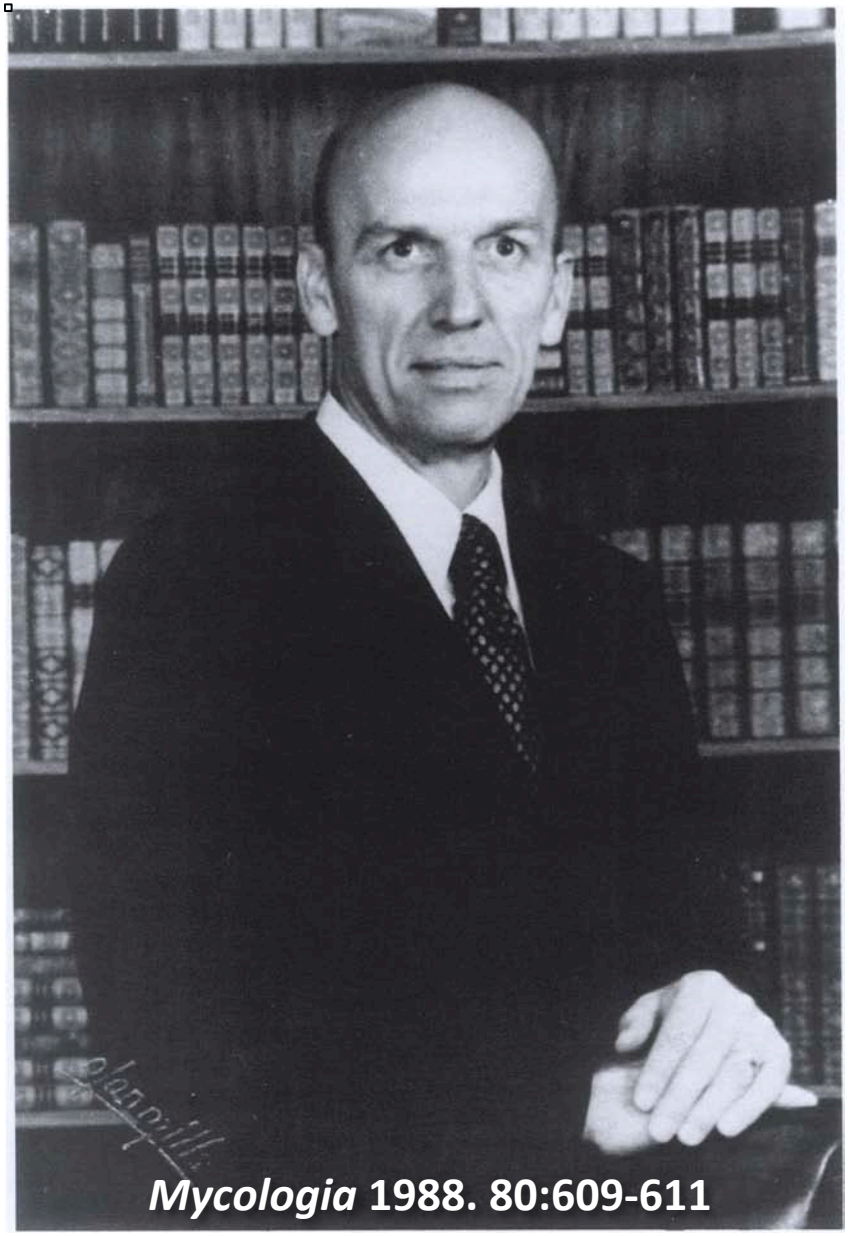
Fungi and health

Fungi indoors and their chemical products

Keith Seifert & Rob Samson

David Malloch


There is a nagging cough going around town that has been nicknamed the
"Katrina cough"
– JW Bennett (January/February 2006)



Kenneth E. Papa (1931-1986)

- Papa, K. E., 1973. Parasexual cycle in *Aspergillus flavus*. Mycologia 65 1201–1205. Papa, K. E., 1979. Genetics of *Aspergillus flavus*—complementation and mapping of aflatoxin mutants. Genet. Res. 34 1–9.
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- Papa, K. E., 1984. Genetics of *Aspergillus flavus*—linkage of aflatoxin mutants. Can. J. Microbiol. 30 68–73.
- Papa, K. E., 1986. Heterokaryon incompatibility in *Aspergillus flavus*. Mycologia 78 98–101.


We need to learn more about solutions?


Are there easy fixes for
inside?
ถนนพระรามที่๑
Thanon Rama I

Thanks

Rachel Adams

Paula Olsiewski