Special issue: Physiology and Systems Biology of the Fungal Cell

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By all accounts, fungal biologists should be a pretty happy lot (except perhaps for the perpetual pursuit of funding). The past decade has witnessed an unprecedented explosion in the public availability of complete and annotated fungal genome sequences. Beginning with the model yeast *Saccharomyces cerevisiae* in 1996, there are now over 100 such sequences available (Stajich *et al.*, 2009). Each subphylum is represented by at least one completed sequence, many genera have multiple sequenced species, and for some species, numerous individual isolates have been sequenced. All these data sit atop a foundation of insight into the basic cellular, molecular and developmental processes of fungal cells acquired through decades of investigation primarily using model fungi and notable pathogens of humans and plants. What to do with this wealth of information? The advent of post-genomic tools and resources means that fungal biologists can now probe the inner workings of the fungal cell in a comprehensive manner that could barely be imagined a generation ago (i.e. when I was a graduate student). This type of endeavour, broadly termed systems biology, traces its roots back to fungal physiology. To honour the past, to anticipate the future, and to recognize the integral role that *Microbiology* (and its predecessor the *Journal of General Microbiology*) has played in the promotion of fungal physiology, we have solicited a special collection of research papers and reviews that are presented in this issue under the title 'Physiology and Systems Biology of the Fungal Cell'.

By the middle of the last century, the experimental investigation of fungal physiology was sufficiently mature to support the publication of at least two books that comprehensively summarized the field (Cochrane, 1958; Ainsworth & Sussman, 1965). Following Beadle and Tatum's pioneering work on the biochemical genetics of *Neurospora* in the 1940s, fungal physiology gradually merged with fungal genetics, resulting in the emergence of fungal molecular biology. Robert Brambl summarizes this period of exciting and significant discoveries in a historical perspective that accompanies the collection of papers in this issue. As we proceed into the future, equally exciting and significant discoveries will be made using a diverse array of post-genomic technologies that comprehensively survey fungal transcriptomes, proteomes, metabolomes, etc. Rich Wilson and Nick Talbot survey these

technologies and their future promise in a second perspective. The special collection of research papers found in this issue spans a range of topics and organisms. Topics covered include primary metabolism (Heyland *et al.*, 2009; Domin *et al.*, 2009; Dawe *et al.*, 2009) and its regulation (Teves *et al.*, 2009; Vongsangnak *et al.*, 2009; Wong *et al.*, 2009), as well as the cellular and systems biology of key processes that underlie fungal growth (Bormann & Tudzynski, 2009; Hutchison *et al.*, 2009; Etexbeste *et al.*, 2009; Janus *et al.*, 2009; Eisenman *et al.*, 2009; Gale *et al.*, 2009; Avanzo *et al.*, 2009; Mukaiyama *et al.*, 2009; Zara *et al.*, 2009). Organisms include well-known model systems (*Saccharomyces cerevisiae*, *Schizosaccharomyces pombe*, *Neurospora crassa*, *Aspergillus nidulans*), human pathogens (*Candida albicans*, *Cryptococcus neoformans*), plant pathogens (*Claviceps purpurea*, *Cryphonectria parasitica*, *Fusarium solani*) and industrial producers (*Penicillium chrysogenum*). If nothing else, the breadth of the papers presented in this issue highlights the diversity of fascinating subjects that fall under the umbrella of physiology and systems biology in fungi.

As I look back through my old files full of worn-out photocopies of seminal papers focusing on the fungal cell cycle and morphogenesis, I realize how many were published in the *Journal of General Microbiology* (notable examples include Clutterbuck, 1970 and Fiddy & Trinci, 1976). In anticipation of resurgent interest in fungal physiology and systems biology as investigators begin to leverage their newfound bounty of "omics" information, our hope is that this special issue will draw attention to *Microbiology* as a venue for these investigators to present their results. Indeed, we would like authors to consider *Microbiology* as a natural home for any significant paper in this field.

I would like to thank all of the authors who responded to our call for manuscripts and those who agreed to allow their papers to be published in this issue. I am also grateful to the many reviewers and the Associate Editors who processed the manuscripts in a timely manner.

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