

Guest lecture

"Towards a fully populated tree of life"

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11AM in the BMB seminar room

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Abstract: Small subunit (SSU) ribosomal RNA (rRNA) genes have been the standard phylogenetic markers for the study of microbial evolution and diversity for decades. However, the essential reference databases of full-length rRNA gene sequences are underpopulated, ecosystem skewed, and subject to primer bias; which hampers our ability to study the true diversity. In this talk, I will present our latest method development that combines poly(A)-tailing and reverse transcription of SSU rRNA molecules with synthetic long-read sequencing, to generate millions of high quality, full-length SSU rRNA sequences without primer bias. We applied the approach to complex samples from seven different ecosystems and obtained more than 1,000,000 SSU rRNA sequences from all domains of life. The novel diversity is overwhelming and includes several potentially new archaeal phyla of the deeply branching Asgard Archaea, which are previously suggested to bridge the gap between prokaryotes and eukaryotes. This approach will allow expansion of the rRNA reference databases by orders of magnitude and will enable a comprehensive census of the tree of life. With a fully populated SSU tree of life, it will be possible to prioritize efforts towards making a fully populated genome tree of life. To demonstrate the progress of these efforts, I will also discuss our recent progress on the extraction of complete (closed) genomes from metagenomes using high-throughput long-read Nanopore.

References:

1. Karst et al. 2018. Retrieval of a million high-quality full-length microbial 16S and 18S rRNA gene sequences without primer bias. *Nature Biotechnology*. <https://www.nature.com/articles/nbt.4045>
2. Albertsen et al. 2013. Genome sequences of rare uncultured bacteria obtained by differential coverage binning of multiple metagenomes. *Nature Biotechnology* 31533-538 <https://www.nature.com/articles/nbt.2579>

Host: Kedar Natarajan, Functional Genomics and Metabolism Unit, Department of Biochemistry and Molecular Biology, SDU