

Preface

The Yeast Genetics and Genomics course is a modern state-of-the-art laboratory course designed to teach the full repertoire of genetic approaches needed to dissect complex problems in the yeast *Saccharomyces cerevisiae*. The course is designed for researchers who wish to use budding yeast as a model to study multiple cellular processes. The curriculum for this course embodies three components: (1) a rigorous and comprehensive set of laboratory experiments; (2) a series of detailed theoretical lectures by the instructors describing current knowledge, concepts, techniques, and strategies used in yeast genetics and genomics research; and (3) a series of seminars by invited speakers describing their research, with an emphasis on unique and imaginative approaches at the forefront of the yeast genetics and genomics field.

The 11 experiments included here are designed to showcase a foundation of methods needed in any modern-day yeast laboratory. Combinations of classical and modern genetic approaches are emphasized, including the isolation and characterization of mutants, two-hybrid analysis, tetrad analysis, complementation, and recombination. Molecular genetic techniques, such as yeast transformation, mating-type switching, gene replacement by polymerase chain reaction (PCR), construction and analysis of gene fusions, and generation of mutations, are also covered. Experiments take advantage of the yeast gene deletion collection to identify various kinds of genetic interactions including a genome-wide synthetic genetic array screen. Additional experiments introduce fundamental techniques in yeast genomics, including both performance and interpretation of multiplexed sequencing and comparative genome hybridization to DNA arrays. Comparative genomics using different yeast strains is introduced as a powerful approach to studying natural variation, evolution, and quantitative traits. Modern cytological approaches are also core, such as epitope tagging and imaging yeast cells using green fluorescent protein (GFP)-protein fusions and a variety of fluorescent indicators for various subcellular organelles and transcriptional readouts. Overall, the goal of the experimental section is to provide sufficient experience to allow investigators to use the techniques in any laboratory. Please note that some methods have been condensed due to the time limitations of the course.