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PROFESSOR, LABORATORY OF CELL CYCLE GENETICS

Cell cycle control involves coordinated production and destruction of proteins that activate cyclical events required for precise cell duplication. Cross uses a variety of approaches to investigate cell cycle control at the molecular level.

Using budding yeast as a model system, Cross uses both genetic and biochemical approaches to investigate the molecular basis of cell cycle control. He seeks to understand how critical regulatory proteins called cyclins control cell cycle progression, both through their timely degradation and through their ability to be highly selective of the molecules with which they interact.

The laboratory is interested in systematic approaches to cell cycle control, including mathematical modeling. Researchers in the Cross lab are developing mathematical models that represent control of the cell cycle and are creating single-cell imaging methods for regulation of gene expression and protein localization through the cell cycle.

A second project concerns cell cycle control in the green alga *Chlamydomonas*, which is a good microbial genetic model for the plant superkingdom. Plant genetics is challenging because of long generation times, diploid genetics, and ancient polyploidizations that result in many genes being present in multiple functional copies, masking loss-of-function phenotypes. *Chlamydomonas*, with essentially a full plant genome with respect to core cell biology including cell cycle regulation, has almost all of its genes in single copy, is haploid, and is amenable to classic microbial genetics, as well as modern molecular methods. The lab is creating a systematic collection of mutations in all genes involved in *Chlamydomonas* cell cycle control, and is using these mutants and other tools for focused studies on similarities and differences in eukaryotic cell cycle control across kingdoms.

EDUCATION

B.A., 1978
Swarthmore College
Ph.D., 1984
The Rockefeller University

POSTDOC

Fred Hutchinson Cancer Research Center, 1985–1989

POSITIONS

Assistant Professor, 1989–1993
Associate Professor, 1993–1995
Professor, 1995–
Dean, Graduate Studies, 1999–2000
The Rockefeller University

AWARDS

Lucille P. Markey Scholar, 1988–1992
The Rockefeller University Distinguished Teaching Award, 2006

SELECTED PUBLICATIONS

Rahi, S.J. et al. The CDK-APC/C oscillator predominantly entrains periodic cell-cycle transcription. *Cell* 165, 475–487 (2016).
Tulin, F. and Cross, F.R. Cyclin-dependent kinase regulation of diurnal transcription in *Chlamydomonas*. *Plant Cell* 27, 2727–2742 (2015).
Tulin, F. and Cross, F.R. A microbial avenue to cell cycle control in the plant superkingdom. *Plant Cell* 26, 4019–4038 (2014).
Lu, Y. and Cross, F.R. Periodic cyclin-Cdk activity entrains an autonomous Cdc14 release oscillator. *Cell* 141, 268–279 (2010).
Bai, L. et al. Nucleosome-depleted regions in cell-cycle-regulated promoters ensure reliable gene expression in every cell cycle. *Dev. Cell* 18, 544–555 (2010).