ICDB
Institute for Cell Dynamics and Biotechnology: a Centre for Systems Biology

INICIATIVA CIENTIFICA MILENIO

Institute for Cell Dynamics and Biotechnology: a Centre for Systems Biology

UNIVERSIDAD DE CHILE

SEMINARIO

"From ethanol and butanol fermentations to cell- and tissue-culture … and back to biofuels, 100 years of bioreactor design, operation and challenges"

Prof. Invitado E. Terry Papoutsakis

Department of Chemical Engineering & the Delaware Biotechnology Institute University of Delaware - USA

MARTES 24 DE MARZO – 10:30 HRS.
(habrá jugos, café y galletas)

FACULTAD DE CS. FISICAS Y MATEMATICAS
SALA MULTIMEDIA I
BEAUCHEF 850 - SANTIAGO

"From ethanol and butanol fermentations to cell- and tissue-culture … and back to biofuels, 100 years of bioreactor design, operation and challenges"

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Ethanol fermentations were established industrial process in late 19th and early 20th century prior to the formal genesis of biochemical engineering and bioprocess engineering. Biochemical engineering had its genesis in the mid 1940s in resolving the bottleneck for the development of large-scale, oxygenated, deep-tank fermentations for antibiotic production. This effort and the classical now work by Elmer Gaden and co-workers, and, separately, by R. H. Wilhelm and his Merck co-workers constitutes the foundation of biochemical engineering as a distinct discipline. The late 1950s and 1960s brought to fore a wealth of new challenges and ideas with the concepts of bioreactors for immobilized enzymes and cells for biotransformations and whole-cell biocatalysis, in addition to the concept of computer-controlled fermentors. The 1970s saw an explosion of ideas on new bioreactor designs (including the various air-lift designs, many of which are now widely used), and numerous bioreactor-operation policies and their optimization including the now widely employed concept of fed-batch fermentations. The 1980s were marked by the realization that the design of bioreactors for growing animal cells (whether on microcarriers or in free suspension) was a new major challenge that required fresh analysis and new mixing concepts and scale up. This challenge was met with characteristic success leading to the growth of the now dominant animal-cell biotechnology for the production of protein therapeutics. This was followed by more specialized challenges at smaller scales to develop bioreactors for tissue engineering applications, and scaled-down technologies for the development of small or microbioreactors for parallel or high-throughput bioprocessing. Now, as we face the urgency to develop sustainable technologies for the production of chemicals and biofuels from renewable resources, there is a fresh set of challenges for efficient bioreactors and processes to meet perhaps the most diverse set of needs and applications.