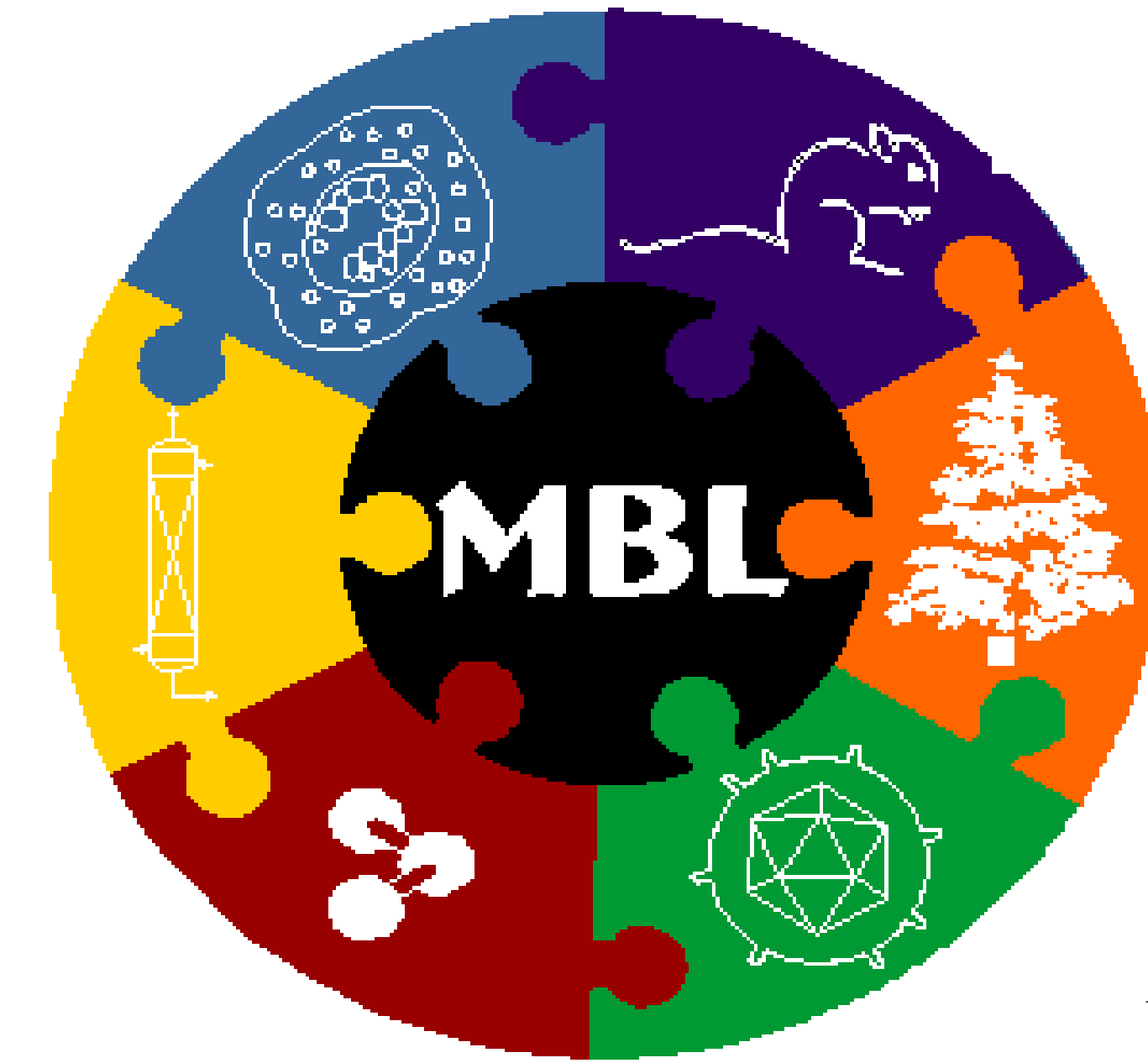


Career Preparation Through Multidisciplinary Education:

A Multidisciplinary Bioprocessing Laboratory (MBL) Course

Introduction

- Multidisciplinary teams allow a broad range of expertise to be applied to complex problems, but require effective communication across disciplinary boundaries.
- Conventional educational models do not provide interaction between students of diverse disciplines.
- New educational programs are needed to teach students skills for multidisciplinary teamwork.



Michigan State University 2000/2001 ISPE Student Chapter

Jessica L. Okonkowski
 •2000/2001 ISPE MSU Student Chapter President
 Aaron J. Matrone
 •1999/2000 ISPE MSU Student Chapter President
 Professor Mark Worden
 •Chemical Engineering Professor / ISPE Faculty Advisor
 Professor Daina Briedis
 •Chemical Engineering Professor

Chapter Website: www.egr.msu.edu/ispe
 MBL Course Website: www.egr.msu.edu/html98/classes/491/

Development of the MBL Course is sponsored by the
 NSF Combined Research/Curriculum Development Program
 (Grant EEC-9872431)

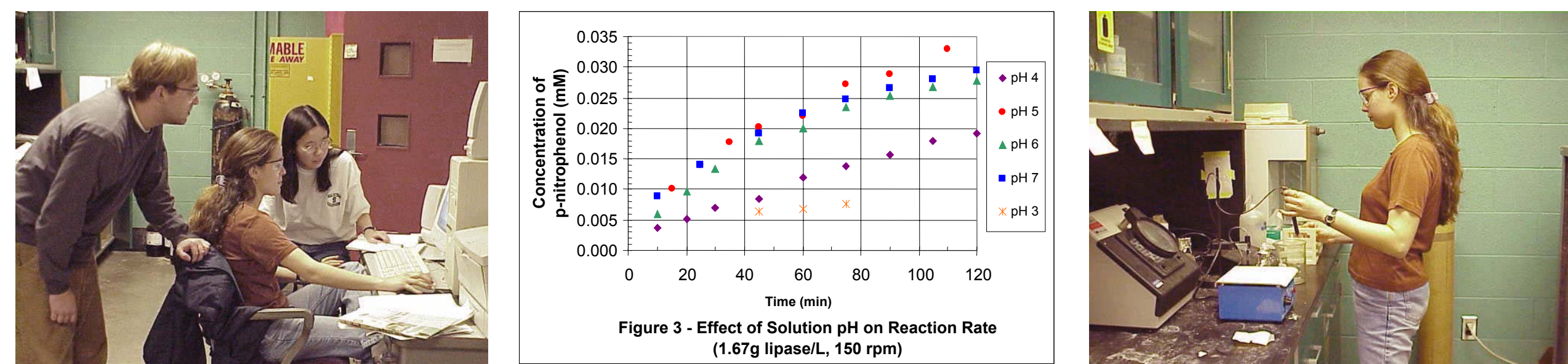


Purpose of MBL Course

- The purpose is to enable students to:
 - function effectively in a multidisciplinary team
 - solve a biotechnological research problem
 - conduct experiments in a multidisciplinary lab
 - be proficient in advanced research methods
 - exercise project management skills
 - communicate well in interdisciplinary settings
 - efficiently use technical resources/databases

Examples of Student Research

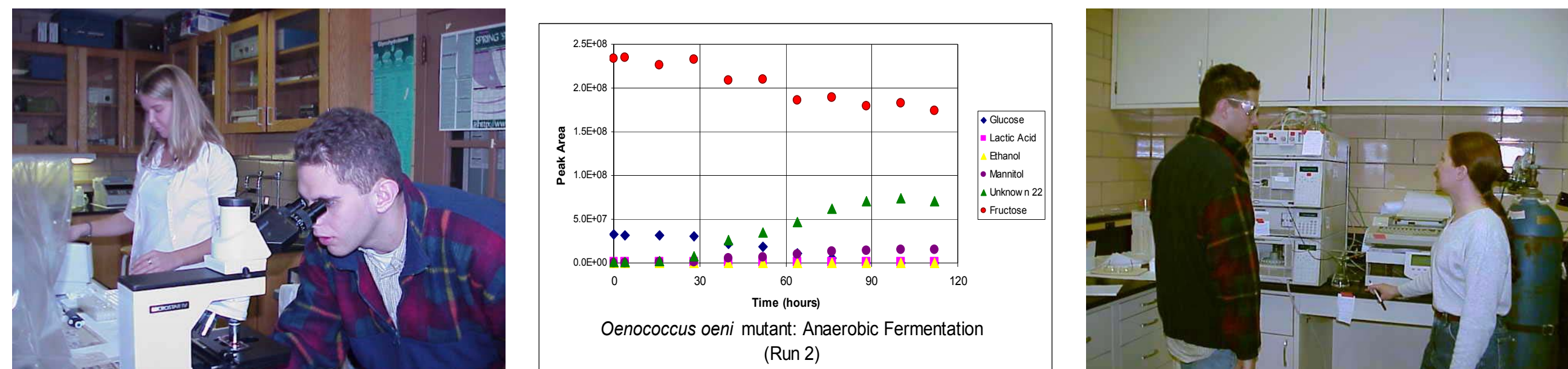
Optimization of Enzyme Reaction Utilizing Colloidal Liquid Aphrons



Objectives of Research

- Determine the optimum reaction conditions for the hydrolysis of p-nitrophenyl Caprylate (pnp-caprylate) with lipase
- Optimize the enzyme reaction rate by using colloidal liquid aphrons to increase interfacial surface area available for substrate-enzyme interaction
- Model a reaction rate equation to the system and determine the parameters of the equation
- Teach students to perform research efficiently in a multidisciplinary-team environment.

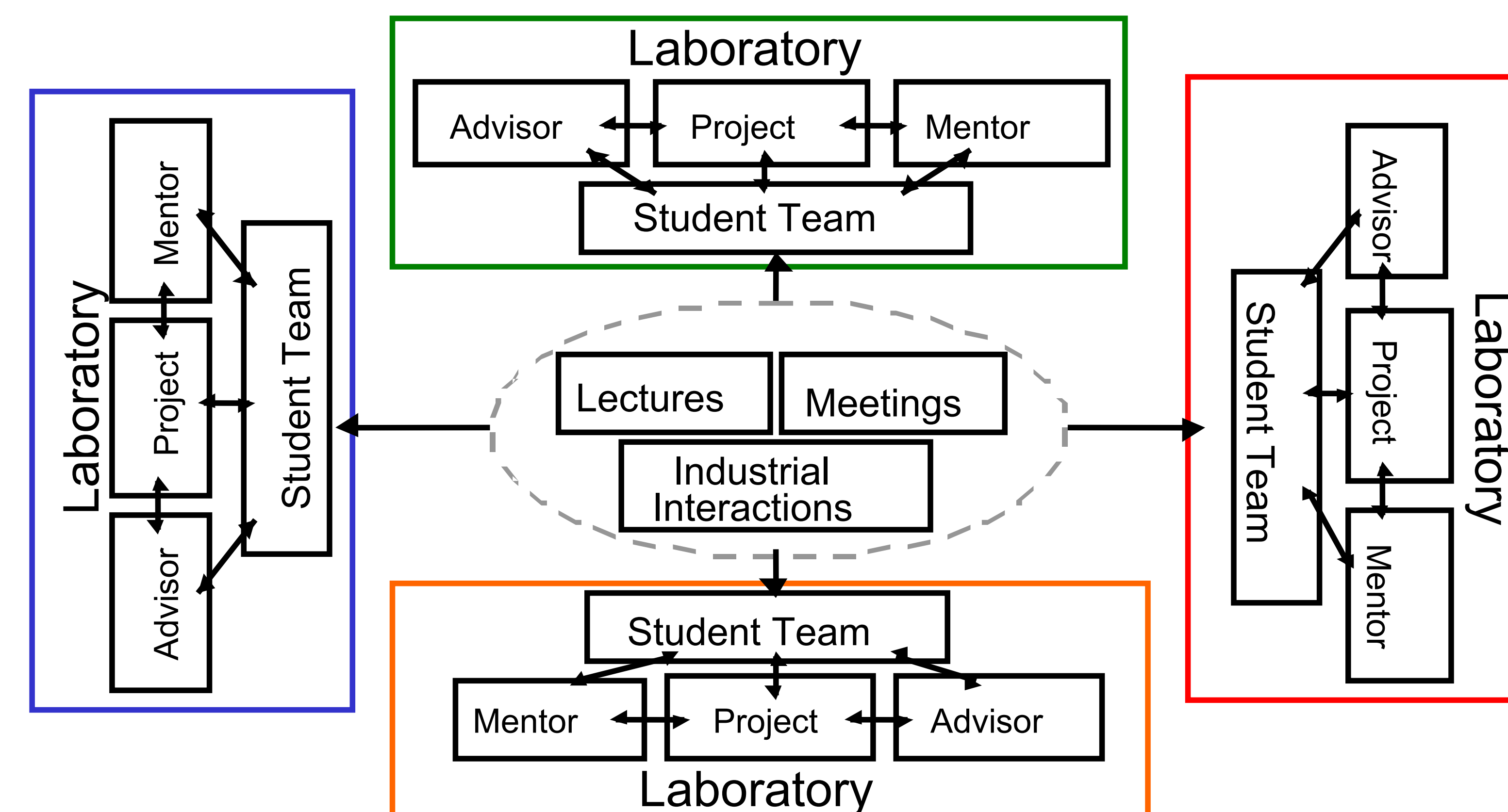
Malolactic Fermentation in Cherry Juice by a Genetically Engineered Strain of Oenococcus oeni



Objectives of Research

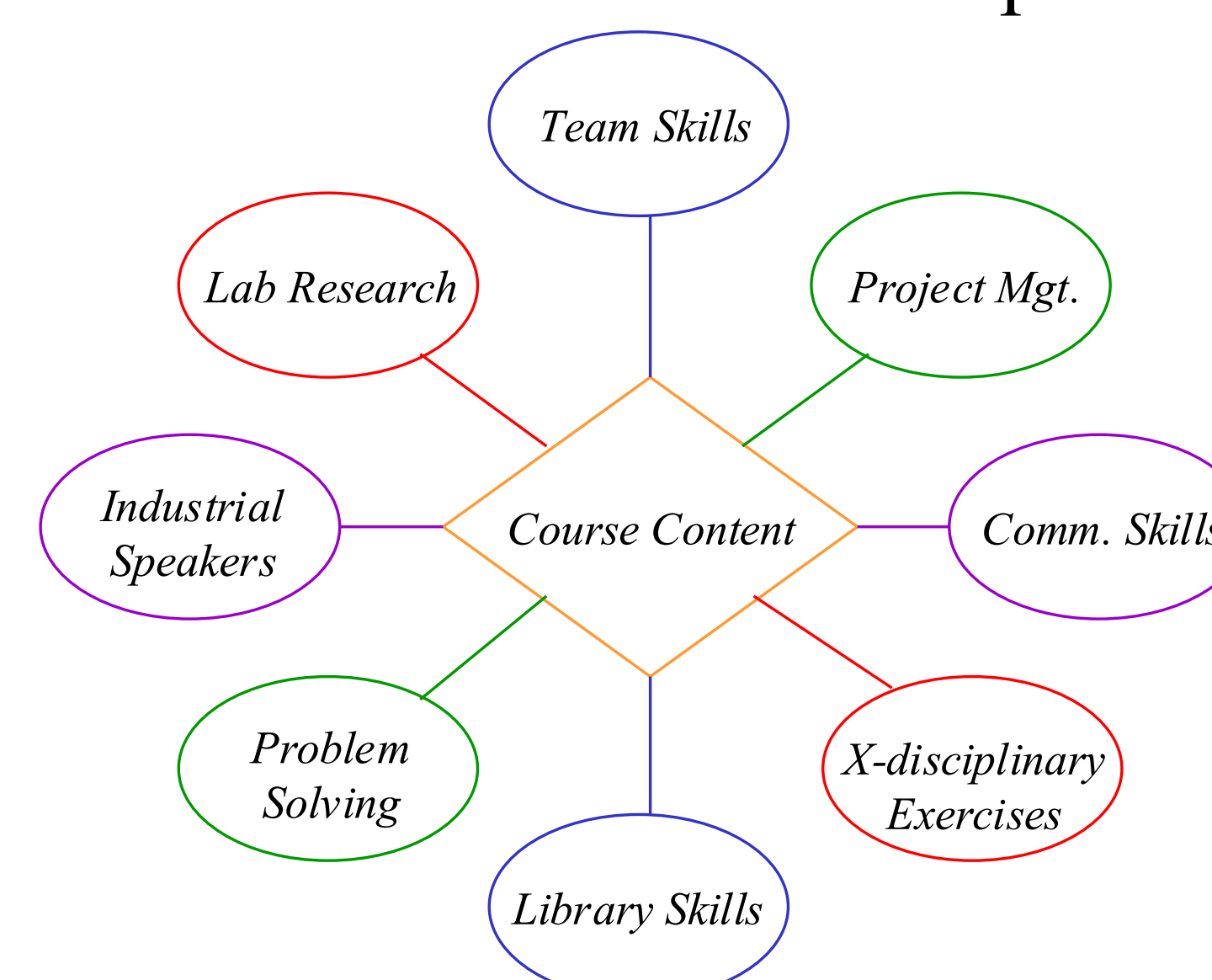
- To obtain and characterize a strain of *Oenococcus oeni* capable of heterolactic fermentation
- Perform large-scale fermentation to characterize yields of ethanol and lactic acid
- Introduce students to bacterial fermentation as a method for creating bio-based products
- Improve students problem-solving abilities through a multidisciplinary approach

Course Structure



MBL Student Enrollment

- 1999
 - eleven students
 - six disciplines (CHE, BOT, BCH, CEM, MIC, PSL)
- 2000
 - eleven students
 - four disciplines (CHE, ZOO, BCH, MIC)
- 2001
 - required for MSU graduate training programs:
 - Multidisciplinary Graduate Training Program in Technologies for a Biobased Economy
 - Professional M.S. Degree (MSU Microbiology Dept.)
 - effort to cross-list course in science departments



Expected Industrial Benefits

- Graduates who are valued by the pharmaceutical industry
- Graduates who can solve multidisciplinary problems
- Graduates who function effectively in multidisciplinary teams
- Graduates who are able to plan and manage complex projects
- Graduates trained in advanced research methods

In-Class Training Exercises

- Teams practice creative problem solving
 - lecture, handouts on creativity/problem solving
 - presented realistic, complex problem
 - multidisciplinary teams develop solutions



- Teams prepare oral and written reports
 - lecture, handouts on effective communication
 - two team oral presentations (videotaped)
 - final team written report on research project

- Industrial speakers cover additional topics
 - “Multidisciplinary Teams in the Pharmaceutical Industry” (Dr. John Shabushnig of Pharmacia)

