Welcome to UC Davis

Dr. Judy Kjelstrom (aka “Dr. Judy”)
Director, UC Davis Biotechnology Program
Lecturer, MCB and Microbiology
September 2010
“Biotechnology: The Tools to Forge a Better Tomorrow” is our Motto

- The UC Davis Biotechnology Program is a Special Unit of the Office of Research. est. 1986
- Housed within the offices of the Dean of the College of Biological Sciences
- Administrative home for the DEB & ADP graduate programs, NSF and NIH Biotechnology PhD Training Grants
- Links Academia to Biotechnology Industries & Government agencies
- Education Source for Students, Teachers, and Community
  - Summer Technical Short Courses
  - “Train the Trainers” workshops for teachers
  - BioTECH SYSTEM (K-14 outreach consortium) and (TBC) Teen Biotech Challenge (science competition)

www.biotech.ucdavis.edu
UC Davis Wants to Translate “Ideas to the Market” with Cross Disciplinary Teams
Designated Emphasis in Biotechnology
University of California, Davis
established 1997

An inter-graduate program that credits PhD students for training in Biotechnology
Prof. Katie Dehesh is the DEB chair; Dr. Judy Kjelstrom manages the DEB

Mission:
• To coordinate and provide cross-disciplinary training in critical areas of biomolecular research
• Promote interdisciplinary research environments that integrate basic biological science with engineering and computational disciplines
• To provide cross-disciplinary training/trainee experience in a biotechnology company or cross-college laboratory

http://www.deb.ucdavis.edu/

28 Graduate Programs
>100 Faculty Trainers
Over 190 Students

2005-06 Fellows
Best Practices in Biotechnology Education
(Dr. Yali Friedman, editor) March 2008

22 International Best Practices in K-12, College, Certificate, Master's, Doctoral, MBA, Distance Education Programs and Student Groups.

Contents includes:
UCD Biotechnology Program by Judith A. Kjelstrom and Denneal Jamison-McClung

“Best Practices in Biotechnology Education is directed at faculty seeking to start or expand biotechnology education programs; policy-makers and economic developers seeking to help meet workforce needs; and, students, scientists, and business professionals looking to enter the industry or upgrade their existing skills.”

“The cases herein describe a wide variety of programs from high school through Ph.D. programs. Some are in their first years, whereas others are quite mature and have diversified to offer myriad degree and certificate options. There is also strong international representation, with programs from Australia, Canada, New Zealand, South Africa, and the United States.”

Strengths of the DEB (per the Committee):

• The DEB attracts highly talented students …. The DEB is often credited by students as one of the key reasons for selecting UC Davis for graduate studies.
• Students express high regard for excellent mentoring received from the program coordinator.
• Students and faculty are kept well informed by the program via electronic communication.
• Students and faculty benefit from networking with scientists from the biotechnology industry,
• Students benefit from industrial internships

SUMMARY- The DE in Biotechnology is a Successful Program and adds value to the PhD
The DEB Program

The purpose of the DEB is to provide graduate students an opportunity to explore biotechnology through seminars, courses and examine the relationship of academia to industry through internships. Participating graduate programs currently include **28 programs**:

- Agricultural and Environmental Chemistry;
- Animal Science;
- Applied Science;
- Biochemistry and Molecular Biology;
- Biological Systems Engineering (formerly Biological & Agricultural Engineering);
- Biomedical Engineering;
- Biophysics;
- Cell & Developmental Biology;
- Chemical Engineering;
- Chemistry;
- Civil and Environmental Engineering;
- Comparative Pathology;
- Electrical & Computer Engineering;
- Entomology;
- Genetics;
- Immunology;
- Materials Science and Engineering;
- Mechanical and Aeronautical Engineering;
- Food Science;
- Microbiology;
- Molecular, Cellular and Integrative Physiology;
- Neuroscience;
- Nutritional Biology (formerly Nutrition);
- Pharmacology & Toxicology;
- Plant Biology;
- Plant Pathology;
- Soils & Biogeochemistry;
- Statistics.

>190 students are in the DEB as of August 2010
DEB Program Requirements

• MCB 263 - Biotechnology Fundamentals and Application (winter qtr)
  – team projects with biologists and engineers are required

• MCB 294/ECH 294* - Current Progress in Biotechnology Seminar.
  (3 quarters needed). Speakers come from industry as well as academia.
  - *MIC 292 ( “From Discovery to Product”: An Introduction to
    Industrial Biotechnology – a series of seminars from scientists from
    Novozymes Biotech in Davis) may be substituted for 1 quarter.
  - Opportunity for faculty and students to interact with industry
    scientist as well as arrange internships and possible fellowships

• MCB 282- Internship (usually done after QE)  industrial positions are paid
  – A minimum of 3 months internship at a biotechnology company,
    national lab or cross-college: biology ↔ engineering)

• GGG 296 (Scientific Professionalism & Integrity) – bioethics
  – ECL 290 , BIM 209, PLP 298 or PMI 250 are approved substitutions (due
to increased increased enrollments in the DEB)

Attendance at the annual Biotechnology Retreat (many industry partners attend)
& monthly informal Pizza “Chalk-Talk” Seminars (student and mentor
discuss their research) is also expected.

Must complete MCB 263 and Bioethics course before QE
The DEB Program

• In addition to offering academic courses, the DEB program:
  – Provides **guidance and assistance** in:
    • Locating Internships
    • Career Explorations,
    • Creation of Oral Presentations,
    • Composing a Cover Letter and Curriculum Vitae, especially for non-academic positions
  – Offers **networking opportunities** for students and faculty with industry & government scientists as well as business leaders
  – Acts as a **facilitator** to help resolve other issues that arise during the student’s tenure.

The Biotechnology Program provides a Home for the DEB
DEB students have FUN WITH SCIENCE & CONNECT WITH PEOPLE

Genentech supplied the Colorful Shirts. We wear them with UCD Aggie Pride

Genentech, Roche, Monsanto, Agilent and Novozymes donate shirts, pens, reagents for experiments, etc. so we have give-aways for our visitors….we get over 1000!
A PhD scientist needs to understand the world of industry research as well as academic research. Only 15-20% will get tenure track faculty positions!

How do you network with industry scientists?
Networking with Industry is Fun!

UCD Bus Trip to Genentech in South SF on April 10, 2007 and June 9, 2009

Having Fun at the Biotech Training Retreat in Napa.

Many industry scientists were present and interacted with the students

Sitting on the Famous Red Couch with Steve Watkins, President & CEO of Lipomics Technologies
DEB Program: Internships

Over the last 18 years (even before the formal DEB program was established), we have placed over 120 PhD students in a variety of biotechnology companies for their 3-6 month industrial research internship experience. They include:

- AgraQuest
- Agilent
- Alza
- Amgen
- Amyris
- Bayer
- Berlex Biosciences
- BioMarin Pharmaceuticals
- Celgene
- Chiron (now Novartis)
- DuPont
- Exelixis
- Genencor
- Genentech
- ICOS
- Maxygen
- Monsanto, Calgene Campus
- Novartis AG (Vacaville)
- Novozymes, Inc
- OncoMed
- Scios (now part of Alza)
- Roche Biosciences
- Ventria Biosciences
- and a few others.

Most have donated at least $20,000 per year for a fellowship, have offered an internship site and have presented at the annual Biotechnology Retreat.
Internships are Win-Win Partnerships

What Industry Partners Gain from Internships

1. Access to highly talented creative researchers
2. Opportunity to gain inside tract on future employees
3. Through students, further collaboration with scientists on campus
4. Participate in the annual retreat to meet UC scientists & students, and other company scientists
5. Potential to use UC facilities through the collaboration
6. Opportunity to participate in weekly campus seminars

What Students Gain from Internships

1. Opportunity to work in highly creative non-academic environment and participate in industry seminars.
2. Opportunity to participate in focused team approach to defined research goals
3. Opportunity to use equipment and facilities not available on campus
4. Access to potential employment opportunities
5. Discover the type of environment that would be appropriate for future career
Monsanto Biotechnology, Calgene Campus offers DEB internships

Biotech Retreat 2006
(Juan Pedro Sanchez & Dr. Alberto Iandolino (a DEB grad who interned at Calgene and now works there) make a connection).

As a result, Juan did his DEB internship that summer with Alberto

Nov 2007- Ms. Ying Peng was offered a research scientist position after completing her internship

Other DEB interns:
Chris Simmons, Pradeepa Gunilake, Andres Schwember, Ying Peng, Brad Niles, Mike Plesha, Tamara Holst, Mary Kalamaki & others
Entrepreneurship Opportunities

• The Graduate School of Management (GSM) in collaboration with the Office of Research offers a one year Certificate Program in Business Development for graduate students and postdoctoral fellows in science and engineering. A one week bootcamp is also offered.

  This program provides an introduction and hands-on experience in developing new business ventures designed to commercialize research.

• The Program offered through the new Center for Entrepreneurship (directed by Prof. Andrew Hargadon) provides the range of skills necessary to commercialize research, whether in new venture start-ups or in corporate research and development settings.

• The Big Bang Business Plan Competition is another way for entrepreneurial faculty and students to obtain hands on skills and even launch a Company!

Many of our DEB students have participated in these entrepreneurial activities.
Entrepreneurship Opportunities

- DEB faculty/students participants:
  - **GSM’s Business Development Certificate Program**
    - 2008-09 – Vann Leang (Chemical Engineering)
    - 2006-07 – Riccardo LoCascio (Microbiology)
    - 2004-05 - Ying Peng (Genetics)
  - **Big Bang Business Plan Competition**
    - 2010 – First Place – Inserogen (Lucas Arzola)
    - 2006 - Co-winner – Mesolytics (Zane Starkewolfe)
    - 2005 - Second Place - All Best Materials (Jien Ren “Jerry” Ku)
    - 2004 - Arete Therapeutics (Prof. Bruce Hammock)
    - 2003 - People Choice Award - (Young “Lauren “ Lee)
  - **Little Bang Poster Competition**
    - 2008 winners:
      - Clean Energy: Quantum Solar Technologies (Zane Starkewolfe)
      - Medical & Biotech: Arcus (Alan Smzodis, Matthew Hoopes, etc.)….. also took 2nd place in the Big Bang
    - 2006 winner of nanotechnology category: Mesolytics
    - Other DEB participants: Li Peng, Daniel Scott, Erica Andreozzi
DEB Links to Training Grants

• We have been successful in recruiting outstanding graduate students and faculty trainers by being linked to PhD Graduate Training Grants (provides financial support)
• Currently the DEB is the formal training program for:
  – The prestigious NIH Training Program in Biomolecular Technology
  – The NSF CREATE-IGERT Training Program
• Many of the DEB students are involved in the Howard Hughes Medical Institute-Med into Grad Initiative: Integrating Medicine into Basic Science (IMBS) Training Program (1 of only 22 programs in US)….. This grant was renewed for another 4 years 2010-2014 (UC Davis received the top score on the submissions). Expanded to 3 clinical areas: cardiovascular, cancer and neuroscience.
The name, **Biomolecular Technology**, was chosen to reflect the emphasis of the training program on areas of scientific endeavor characterized by the following three elements:

- 1) emphasis on the analysis of model systems of obvious significance to medicine and biotechnology;
- 2) synthesis of information and research approaches from disciplines such as cellular physiology, genetics, physical biochemistry, and chemical engineering;
- 3) translation of biological information into a quantitative framework.

Through these three foci, the program provides well-coordinated, multidisciplinary training of pre-doctoral graduate students in **critical areas of biotechnology research that address public health**.

It also provides an administrative structure for creating interdisciplinary research environments that integrate basic biological science and engineering disciplines, as well as academic and industrial experiences.

The program is designed to recruit and support pre-doctoral trainees who show exceptional promise, **coupled with the drive to reach out across disciplines and forge new research directions in biotechnology.**

Must be a DEB member in order to apply
Biotechnology Training Retreat at the Christian Brothers Retreat & Conference Center in Napa, Calif.

Biotech Fellows – they must do cross-disciplinary research, linking life science with physical sciences or engineering after their presentations.

Social Interactions are Critical to the Development of Interdisciplinary Teams as well as developing Professional Networks.

Prof. Bruce Hammock interacting with faculty, industry scientists, UCD staff and students.
This multi-institutional IGERT (directed by Prof. Karen McDonald) establishes a research and educational partnership between UC Davis, Tuskegee University, University of Ireland, Maynooth and the Teagasc Oak Park Research Center in Carlow, Ireland.

• To address these major societal problems, the CREATE-IGERT graduate training program will focus on the development and use of transgenic plants, crops and/or in vitro plant based systems for the production of non-food products and for bioremediation within three application thrust areas:
  1) Rapid Vaccine Production and Cost Effective Therapeutics (Plant-made Products)
  2) Biofuels and Biorefineries
  3) Environmental Sustainability

• As with any emerging technology, there are a variety of scientific, technical, regulatory, environmental, economic, societal, and legal questions that must be addressed through research, analysis, communication, debate, and discussion.
CREATE-IGERT Training Program

August 2007 Announcement:

• Due to the strong effort of a multidisciplinary faculty team – led by Karen McDonald, College of Engineering Associate Dean and Professor of Chemical Engineering and Materials Science, with the assistance from Office of Graduate Studies and the Office of Research – we are proud to announce that the campus has received a new Integrative Graduate Education and Research Traineeship (IGERT) award from the National Science Foundation (NSF).

• The award was based on the team’s project: “Collaborative Research and Education in Agricultural Technologies and Engineering” (CREATE). This multi-institutional IGERT establishes a research and educational partnership between UC Davis, Tuskegee University, University of Ireland, Maynooth and the Teagasc Oak Park Research Center in Carlow, Ireland.

• Out of 443 IGERT pre-proposals received this year, 98 full proposals were selected, and out of those only about 20 received the prestigious award. This award is a continuing grant and will be awarded $600,000 in the first year and up to $3.1 million over the five-year period.

The UC Davis Biotechnology Program serves as the Administrative Home. Dr. Denneal Jamison McClung is Program Manager. CREATE trainees will also be members of the DEB.
The HHMI-IMBS Training Program in Translational Research is a Great Team Building Effort

- It is a key component of UC Davis Heath System’s institutional strategy to create a groundbreaking translational research program that embraces cross-disciplinary teamwork.

Our ultimate Goal is to Bring Ideas at the Bench to the Bedside

May earn a DETR-Designated Emphasis in Translational Research

These PhD students network with Deans, MD and Clinical Researchers

www.ucdmc.ucdavis.edu/imbs/
People Skills are Critical to Teams

- To create effective cross-disciplinary teams, students must value the so-called “soft skills”.
- The DEB and DETR graduate programs stress both academic expertise and “social awareness”
  - Deep, narrow expertise, gained through doctoral research, must be balanced with broad, global perspectives to be an effective leader in the 21st century

Good references:
- “The Speed of Trust” by Stephen M.R. Covey
- “A Whole New Mind” by Daniel Pink

These skills are critical in Translational Research
Genentech Values other Competencies beside Technical Skills (per Caryle Vann, PE at Genentech in Vacaville):

- **Emotional**
  - Self awareness
    - Emotional awareness
    - Accurate self-assessment
    - Self-confidence
  - Self Regulation
    - Self control
    - Trustworthiness
    - Conscientiousness
    - Adaptability
    - Innovation
  - Motivation
    - Achievement Drive
    - Commitment
    - Initiative
    - Optimism

- **Social**
  - Social Awareness/Empathy
    - Understanding others
    - Attunement
    - Empathetic accuracy
    - Social Cognition
    - Developing Others
    - Service Orientation
    - Political Awareness
  - Social Facility/Skills
    - Influence & Leadership
    - Communication
    - Conflict Management
    - Building Bonds
    - Collaboration, Cooperation, teamwork
    - Self presentation
    - Concern

 Taken from Goleman’s books: Working with Emotional Intelligence (1998) and Social Intelligence (2006)

Genentech likes UC Davis DEB Grads! They have the Right Stuff
Thank You…

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