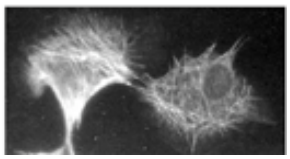


Merritt Microscopy Program

VISION

Unique training in advanced microscopy and in-demand skills which enables students to obtain meaningful, fulfilling, well-paid employement in the major growth fields of the Bay Area, including biotech. Prepares resilient global workers for careers with strong advancement potential, and option of pursuing research tracks.

This program has already been launched and will evolve into the Advanced Microscopy Institute (AMI), which will be part of the Peralta Bioscience Institute (PSI).

SUMMARY

Certificate in Bioscience Microscopy

- already underway, with 45 students (photo above).

IMMEDIATE NEEDS

- **Need at least $615,000 (equipment) and $5,000 (supplies) for current Certificate program.**

- **Need a microscopy technician for "open scope hours."**

- **Staff development funding ($5,200).**
- **Motorized imaging systems up for board approval.**
- **Purchasing acceleration.**
- **Plan for Fall 2008.**

IMMEDIATE NEEDS FOR CURRENT PROGRAM

- **Equipment:** $615,000 (see below)
- **Supplies**: $5,000 (for tissue culture and IHC)

- **Microscopy Technician:**
  - Immediate need for a temporary, part-time technician to hold "open lab hours" so that students have enough hands-on time with the equipment.
  - 32 weekly hours weekly is optimal.
  - We currently have a short-term volunteer who has been invaluable, but he cannot continue for much longer.

- **Staff Development funds:**
  - Intensive Course in Quantitative Fluorescent Microscopy at the Mount Desert Island Biological Laboratory for Melinda Downing $2,850 (of which $500 is due 3/1/08) plus airfare.
  - Focus on Microscopy conference for Gisèle Giorgi, in April, $2,000 including airfare.

- **Motorized imaging systems**, $ 335,000, up for Board approval today, funds are allocated already. Will need to issue P.O. rapidly since they are for the current class.

- **Purchasing acceleration:** Invitrogen, Daigger and Apple orders are needed for current class (and are at the district).

- **Plan for Fall 2008:**
  - Swing space for program.
  - Director or chair position for Gisèle Giorgi.

SUMMARY OF PROGRAMS

Programs already underway

Note: these programs use the fluorescence equipment that we are in the process of purchasing.

FLUORESCENCE MICROSCOPY
Certificate in Bioscience Microscopy (CBM)

- Focus is on Fluorescence Microscopy.
- Comprised of 2 semesters (Spring/Fall), 17 units, night/weekends, summer internship.
- Leads to jobs in biotech and academic research labs.
- Already launched, with 45 students.
- For returning/re-training students with some biology or CIS background.

A.S. in Bioscience Microscopy

- Focus is on Fluorescence Microscopy
- 2 years.
- Same courses as CBM plus courses in CIS, Biology, English, Math, Chemistry, Physics and Research project.
- Planned launch in Fall 2009.
- For students with HS or GED degree.

Basics of Microscopy Course

- 3 units (2 hours lecture, 3 hours lab)
- no prerequisites
- enrichment course for a variety of students
- uses the fluorescence microscopy equipment
- unique course will be a draw for new students
- "feeder" course for the programs
- there is already a high student demand for it!

Planned expansion

Note: these programs will require additional staff and equipment.

Electron Microscopy (EM)

- Focus is on TEM and SEM techniques
- Both a certificate and an A.S. degree
- Leads to jobs in biotech and academic research labs.
- Need to hire a program director/instructor (in 2009).
- Need to purchase equipment (in 2009).
- Planned launch in Spring 2010.
- For all students.
- Extreme high demand and excellent pay opportunities

Pathology Technician

- Focus is on histology.
- A one year certificate.
- Leads to jobs in hospital pathology labs.
- Need to hire a program director/instructor (in 2009).
- Need to purchase equipment (in 2009).
- Planned launch in Fall 2010.
- For all students.
- Possible funding from hospitals, since there is a crisis due to the lack of trained pathology technicians.

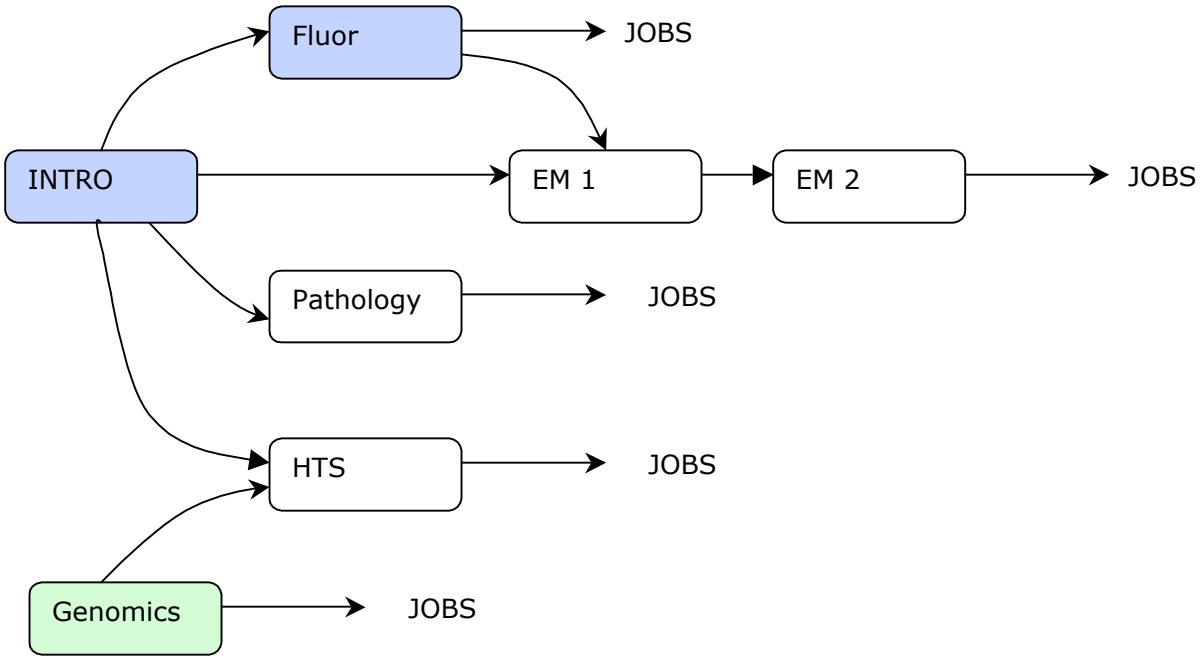
High Throughput Systems (HTS)

- Focus is on fluorescence/robotics.
- A one year certificate.
- Leads to jobs in biotech.
- Need to hire a program director/instructor (in 2009).
- Need to purchase equipment (in 2009).
- Planned launch in Fall 2010.
- For all students.
- Strong intersection with Genomics program.

HTS continued

- Equipment may be used for contract projects from local biotech companies.
  - Invitrogen charges $200,000 per project (estimated 2-3 months of work, 2-3 employees)
  - Students could be employed to run the machines.

Programs (by semester)



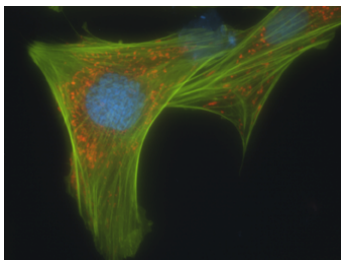
Color= already underway

BUDGET NEEDS

Priority codes
A= bare minimum for basic program
B= necessary for basic program
C= top notch program

Fluorescence Microscopy Track- current

EQUIPMENT



A) Completely critical for CURRENT program:
- Motorized imaging systems $335,000 (already "allocated")
- Zeiss 510 system, with spectral imaging $450,000
- Tissue culture equipment $45,000
- Manual fluorescence systems $80,000
- Metamorph software: $40,000

SUBTOTAL: $950,000 ($615,000 not yet allocated)

B) Essential for current program:
- Image Pro software: $25,000
- Leica SPE system: $200,000
- Live cell perfusion chambers: $45,000
- Olympus spinning disc system $160,000
- Air tables for motorized systems: $30,000

SUBTOTAL: $460,000

C) Strengthens current program:
- Integrated confocal system $350,000
- Zeiss 710 system $650,000
- Nikon biochamber system: $80,000
- Nikon T1 widefield system: $140,000
- Atomic force microscope $140,000
- Multiphoton microscope $600,000
- Polarized light microscope: $60,000
- Zeiss laser dissection system: $200,000

SUBTOTAL: $2.22 million

TOTAL for FLUORESCENCE equipment
✣ Priorities A + B= $1.4 million
✣ All priorities= $3.7 million

Note: only .3 million has been already allocated for necessary fluorescence equipment that we still need to purchase.

What has been purchased so far?
Five manual imaging systems, total of $120,000.

What are the recurrent expenses?
The supplies are the only recurrent expenses.

What is the lifetime of the equipment?
Most of the equipment has an expected lifetime of 20-30 years.

Fluorescence Microscopy track
Supplies

- **Fluorescence supplies: $10,000-$20,000 per year**
- **Tissue culture: $20,000- $30,000 per year**
- **Service contracts: $10,000-$30,000 per year (or 10% of any equipment over $100k)**

TOTAL for Fluorescence Supplies
Estimate of $40,000 or more per year

Note: I am working on developing a "per student" estimate for the supplies.

PROGRAM EXPANSION

ELECTRON MICROSCOPY TRACK (2009)

Equipment:

A) Completely critical
- Transmission Electron Microscope $450,000
- Scanning Electron Microscope $ 350,000
- Microtomes and electron auxiliaries: $ 100,000

SUBTOTAL: $900,000

B) Essential
- Alternate Electron Microscope: $450,000
- Alternate Scanning Electron Microscope: $350,000
- Microtomes and auxiliaries: $80,000

SUBTOTAL: $880,000

B) Strengthens program
- More electron microscopes, up to 1 per 8 students.

SUBTOTAL: ~ $ 2.5 million

Total for EM equipment (once)
✤ Priorities A + B= $1.8 million
✤ All priorities= $4.3 million

Total for EM supplies (recurrent)
Estimate of $30,000 per year

PATHOLOGY (2009)

Estimated cost of equipment (one time): $ 400,000
Estimated cost of supplies per year: $20,000

HIGH THROUGHPUT SYSTEMS (2009)

Estimated cost of equipment (one time): $600,000
Estimated cost of supplies per year: $60,000

Note: a certain amount of flexibility is necessary to respond as new technologies develop, in all fields.

Miscellaneous Expenses

Staff development:

- $5,000 per faculty per annum (includes MSA, MIC and other conferences and training courses).
- $3,000 per technician per year (for training and conferences).

Student travel to SACNAS conference: $2,000 per student

Advisory Board meetings: $1,500 per year in supplies and food.

Marketing: $5,000-$25,000 per year for brochure and website and other promotional materials.

Our goal is to generate enough revenue through grants and these other sources to cover the yearly expenditures (i.e. supplies) for the MMP.

GRANTS

NIH Bridges to the Baccalaureate grant: up to $200K/year, 5 years. GG has worked on a grant proposal to fund

- salary and supplies for undergraduate researchers
- stipend to faculty research mentors
- community events
- networking with UC mentor students
- student travel to SACNAS conference to present research.

Genentech: varying amounts (up to $100K/one time); can fund small equipment, supplies for undergraduate research.

OTHER SOURCES OF REVENUE

CONTRACT EDUCATION

- we have already had several requests for training workshops from biotech companies, vendors (for their clients) and graduate students.
- Training is usually limited by resources: vendors, for instance, prefer to use their time to make new sales, and it is unusual to find a facility with enough equipment to train an entire class.
- Once we have the equipment, we will be a prime training facility.
- Currently vendors charge their clients around $1,000 for a day of training.

USER FEES

- Several of the more advanced microscopes can be rented out to researchers from academic labs on an hourly basis.
- Impacted imaging cores at UC Berkeley would very much like to send us their overflow clients, and we have already had several inquiries.
- The local recharge rate for using a confocal microscope is $100/hour.

INDUSTRIAL PROJECTS

- The EM and HTS equipment can be used for contracted projects
- Invitrogen charges $200,000 for a project which takes about 3 months, and 1-2 employees.

STUDENT ART

- The students will generate hundreds of beautiful images.
- These images can put used to create calendars, mugs, scarves, ties, t-shirts, prints, jewelry and such.
- These products can be sold at local museums and online.
- All the products would include the Merritt logo, generating good exposure for the school.
- Art and business instructors at Merritt College are interested in having their students work on these projects, also.
- Several of our current students have experience in similar projects and they have already expressed an interest in participating in this project.

STAFFING NEEDS

CURRENT (for Fall 2008)

A) Director of MMP (Gisèle Giorgi)

Current duties

- job development and placement (this is critical since most positions in this specialized field are filled by word of mouth)
- develop and oversee internships
- purchase, install and maintain equipment
- produce and update promotional materials (website, brochure)
- develop curriculum
- teach certificate courses or AS courses
- convene, organize and run Advisory Board meetings
- outreach (build bridges to Allied Health and High Schools)
- develop and execute a communications plan
- write grants (at least one per year)

- strategic planning
- perform individual educational/career consulations with students in the program
- correspond and meet with prospective students
- research labor and salary statistics
- maintain currency in microscopy
- speak about the program at professional conferences
- participate in relevant committees and professional societies
- meet regularly with campus and district administration
- disseminate frequent updates to community

Expected growth
- administer grant funds
- perform scientific research
- organize faculty research
- oversee student research
- oversee program chairs
- teach contract ed courses
- hire, oversee, mentor, evaluate, and train part-time instructors

B) Fluorescence instructor (Melinda Downing)
- teaches basics courses
- teaches certificate/AS courses/contract ed
- curriculum development

C) Fluorescence lab technician (full-time)
- prepares lab materials
- maintains open lab hours
- maintains equipment
- submits requisitions, receives orders
- schedules external users

D) Part-time instructors for GLP, business, cell culture courses, contract education

GROWTH

E) EM chair/instructor
- develops program, purchases equipment, teaches courses

F) EM Lab technician

G) HTS program chair/instructor
- develops program, purchases equipment, teaches courses

H) HTS lab technician

I) Pathology program chair/instructor
   - develops program, purchases equipment, teaches courses
J) Pathology lab technician

K) Internship coordinator
L) Placement specialist
M) Admin assistants
N) Purchasers
O) Grant administrators
P) Counselor
Q) Communications consultant

Optimal ratio: no more than 1 instructor per 12 students.

FACILITIES

Current need (for swing space)
A) instructional lab/lecture room
B) computer lab (15 computers) for digital image analysis
C) tissue culture instructional lab (2 large hoods)
D) small tissue culture room (one hood)
E) instructional room for manual systems (20 students)
F) instructional room for motorized systems (20 students)
G) small room for confocal system

Specifications for microscope rooms (E,F,G)
- the imaging systems have a small footprint each (roughly the size of a standard desk), but about 4 students need to be able to access each system at a time.
- the rooms need to be fairly light tight, and vibration-free.
- security is a concern.

Growth
- 2 research labs
- more instructional labs (3 for EM, 1 for HTS, 1 for Pathology)
- instructional lecture rooms (2-4)
- another computer lab
- faculty offices
- conference room (shared)
- small equipment rooms (2 for EM, 1 for HTS, 1 for Pathology)

TIMELINE

Program timeline:

Spring 2008
- Launch program with first cohort of Certificate in Bioscience Microscopy (CBM)
- Purchase fluorescence equipment.

Summer 2008
- Intenships for first cohort of CBM
- Move to new location during renovation of building D.

Fall 2008
- MMP is separate program; program director position begins.
- Launch 2 or 3 "Basics in microscopy courses"
- Run second semester for the pilot cohort of the CBM; students obtain employment.

Spring 2009
- Second cohort of CBM begins.
- Continue to hold "basics" courses every semester (and eventually in summer).
- Hire EM director.

Summer 2009
- Internships for second cohort of CBM.

Fall 2009
- Second cohort of CBM continues, finishes, obtains employment.
- Launch A.S. degree in bioscience microscopy.
- Purchase EM equipment
- Hire HTS director
- Hire Pathology director

Spring 2010
- Continue with CBM and AS in Microscopy
- Launch EM program (both certificate and A.S. degree)
- Purchase HTS equipment
- Purchase Pathology equipment

Fall 2010
- Continue with CBM and AS in Microscopy
- Continue with EM program
- Launch HTS program
- Launch Pathology program

PARTNERS

Advisory Board for MMP

- Holly Aaron, Molecular Imaging Center, UC Berkeley
- Dr. Susan Catalano, President, Drug Discovery Imaging
- Annette Chan, San Francisco State University Imaging core
- Dr. Danielle Crippen, Buck Institute for Age Research
- Dr. Viktor Kharazia, Ph.D. Ernest Gallo Center, UCSF
- Derek Leong, Technical Instruments
- John Revere Jordan, Olympus America, Inc.
- Damir Sudar, Lawrence Berkeley Laboratory
- Dr. Mark A. Voelker, BioTime, Inc.
- Alexander Wahl, Carl Zeiss MicroImaging
- Delilah F. Wood, USDA
- Amy Berry, Communications consultant/Merritt College student
- Liz Epstein, former Berkeley City Manager/Merritt College student

Judy Murphy, former director of SJDC Microscopy Program

GLOSSARY

Microscope: generic word for a wide range of equipment, much as "building" can describe anything from a yurt to a skyscraper.

Fluorescence microscope: an advanced instrument which allows us to look inside cells and see individual molecules.

Confocal: a very powerful type of fluorescence microscope which uses lasers to create very thin sections. It's like an MRI machine, only for cells!

Electron microscope: uses electrons rather than light to see extremely small details of cells. Can be TEM (for thin sections) or SEM (for 3-D surface scans).

Tissue Culture: growing cells in an incubator. A skill that is in high demand in biotech.

HTS (High Throughput Systems): use of fluorescence and robotics to generate new pharmaceuticals.

Pathology: tissues from biopsies and other medical screens are stained and sectioned for analysis under a light microscope.

IHC (immunohistochemistry): technique of fixing and staining cells with fluorescence probes.