SELF-STUDY ANALYSIS OF THE MOLECULAR AND CELLULAR BIOLOGY PROGRAM

University of Washington
and
Fred Hutchinson Cancer Research Center

1999

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Disclaimer: The views expressed in this document are primarily those of the Directors of MCB and the majority of the MCB Steering Committee. These views may or may not reflect the opinions of any other members of the University of Washington or Fred Hutchinson Cancer Research Center.

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I. Context

A. Name of unit authorized to offer degrees:

University of Washington Graduate School

B. Schools and Colleges involved in MCB:

School of Medicine, College of Arts and Sciences

C. Exact titles of degrees offered:

Ph.D., M.S., in Molecular and Cellular Biology; concurrent MS in Epidemiology and Ph.D. in Molecular and Cellular Biology (requested); joint Masters of Management and Ph.D. in Molecular and Cellular Biology (requested)

D. Brief description of the field and history at the University of Washington:

At the national level, it has been apparent for years that progress in biology often comes from interdisciplinary research. The original Interdisciplinary Molecular and Cellular Biology Program (IMCBP) was formed to provide graduate students with training in diverse disciplines and to provide opportunities for pursuing research at the interfaces of multiple disciplines. It accepted its first class of four students in the Fall of 1987. Students declared a departmental affiliation upon entering the former IMCBP and received their Ph.D. degree from the department of their mentor.

In 1989, David Morris (Biochemistry) become the first director and several things occurred. A coherent administrative structure was created with the newly formed Office of Graduate Studies in Molecular and Cellular Biology encompassing both the IMCBP and the MCB Training Grant from NIH. Dr. Morris was also Director of the Training Grant. Although

the IMCBP was not yet degree-granting, an arrangement was established with the help of Dean Gene Woodruff (Graduate School) where first-year students were admitted to the Program with no commitment to a single department. The target size for the first-year class was stabilized at ten students with joint funding from the University and the Fred Hutchinson Cancer Research Center (FHCRC). At the same time, a new curriculum for the first-year IMCBP students was developed. As the resources of the IMCBP and the Training Grant were under the same roof, it was possible to begin joint initiatives such as a vigorous seminar and workshop program with strong involvement of both groups of students. In this same period of time, work towards achieving Ph.D.-granting status was initiated.

Academic year 1993-94 represented another watershed period in the development of the program. MCB received approval for its Ph.D. program from the state and, as part of a new affiliation agreement between the University and the Hutchinson Center, several dozen new faculty members were welcomed into the program. At the same time, Meng-Chao Yao was appointed Co-director to look after the interests of the students and faculty located at the FHCRC, Judi Gray was appointed Assistant Director at the University, and Laima Abele provided the staff support at the FHCRC. A Steering Committee was appointed to represent each unit of the University and FHCRC and to advise the directors. The target size for the entering class was increased to 18 students and the first class was accepted into the new Ph.D.-granting program in the fall of 1994. The 1993 entering class was given the option of transferring to the degree-granting MCB Program and all nine students took this option.

In the summer of 1995, with the Program thriving, both Meng-Chao Yao and David Morris chose to step down from the directorship in order to devote themselves to other challenges. Dr. Lee Huntsman (now Provost) asked Randall Moon (HHMI/Pharmacology) to

serve as Interim Director and eventually Director. He agreed to this position provided that new office space for MCB could be assured and that the position did not also entail being director of the Training Grant (now handled by Dr. David Kimelman). At the same time, Dr. Jonathan Cooper became Co-Director for the FHCRC. The first task pursued by the new leadership was the development of a detailed MCB website so that students and faculty at the two institutions could readily contact one another and have access to all courses and policies of MCB, and prospective students could apply on-line. Also under the current directors, the number of graduate students in the program doubled and MCB negotiated and received permanent remodeled office space in T-466 Health Sciences Building at the University. In addition, new courses were formed, joint degree programs were initiated, and informal mechanisms were developed to enhance graduate student interactions. Administratively, a new Recruitment and Advising Committee (RACOM, see Section II, B, iv., below) was established to guide and mentor students from the time of their application through the end of their first year. Finally, under the new degree-granting status of MCB, students began to graduate and receive their Ph.D. from the program.

At present, MCB is the largest doctoral program in the biological sciences on campus, with 97 graduate students, and 165 faculty (120 from the University of Washington and 45 from the FHCRC). 14 students have graduated with a Ph.D. and 3 with an M.S. since the program became degree-granting (see Appendix E). Acceptance to the program is highly competitive and most students who join the program have multiple offers from other leading research universities. Student training currently consists of three laboratory rotations in the first year (with required oral presentation of the results), 9 graded credits of Conjoint class modules, and 12 additional credits of graded electives. Most classes include students from other programs with the

exception of the Literature Review series that is strictly for first year MCB students. Students must also serve twice as teaching assistants. Students take their qualifying exam in the autumn of their third year and meet annually with their supervisory committee until graduation. The complete list of Program Requirements is contained in Appendix L.

Regarding the appointment of faculty to the MCB, all faculty must be members of the Graduate Faculty, and must send the Directors (1) a letter expressing an interest in joining detailing the relevance of their research program along with a copy of their curriculum vitae, (2) proof of current funding (as students are not allowed to rotate in laboratories that do not have funding to support them), (3) a letter of nomination from their Chair. This material is then sent to the MCB Steering Committee for discussion and a vote.

E. Brief history of the MCB Program from a Hutchinson Center Perspective

The FHCRC was founded as an independent non-profit research institute with no mandate to educate graduate students. The institution was divided into Clinical, Public Health (epidemiological) and Basic Science Divisions. Subsequently, an independent Molecular Medicine Program was established and is now the core of the Human Biology Division. Lacking an independent graduate program, the vast majority of bench scientists in Basic Science and Human Biology laboratories have historically been postdoctoral basic scientists or M.D. fellows. However, there have been small numbers of graduate students at the Center since its inception.

Prior to the advent of the MCB Program, graduate students from UW Departments of Pathology, Microbiology and Pathobiology occasionally entered FHCRC laboratories, with smaller numbers drawn from Biochemistry and Zoology. Larger numbers of MSTP students trained at FHCRC, many choosing the Department of Pathology for the Ph.D. After 1987, the initiation of the MCB Program increased opportunities for students to join FHCRC laboratories.

Some MCB students chose FHCRC labs for their dissertation research, obtaining their degrees through the department of their advisor as was the system at the time.

1994 marked the approval by the State of the FHCRC to run an independent graduate program and award a Ph.D. degree. However, that year also marked the completion of the Affiliation Agreement with the UW that set in motion the approval of MCB as a degree-granting program and specified the financial and administrative commitment from FHCRC. Since that year, increasing numbers of MCB students have rotated through FHCRC laboratories and many have joined FHCRC laboratories for their dissertation research. MSTP students working in FHCRC laboratories now commonly also chose MCB rather than Pathology for their Ph.D. degree.

It should be noted that the MCB Program is presently the only formalized route for students to train in FHCRC laboratories. Costs for the coming year are estimated, divided between FHCRC and UW, and approved by the respective budgetary authorities. Departmental students operate under ad hoc arrangements. This is partly for technical reasons. Departments invest in their students for the first year, and those Departments that view students who join FHCRC laboratories as "lost" to the Department (even though the Department will get the credit when the student obtains a Ph.D.) would like to be reimbursed for the first year costs. Investigator's NIH budgets do not allow retroactive salary/stipend payment and FHCRC budgets need to be approved in advance. For MCB students, FHCRC pays in advance for the possibility of students working with FHCRC faculty.

The MCB Program encourages students to pursue interdisciplinary research and FHCRC makes every effort to promote interdisciplinary research interactions. The gathering of Basic Science into a single division and human biology and disease research in another breaks down

traditional barriers between what would ordinarily be multiple departments. In addition, cross-over between Divisions is common and is being vigorously encouraged in the form of training grants and joint appointments by the FHCRC Director, Dr. Leland Hartwell. Laboratories are not clustered according to research discipline but are mixed so as to promote interactions within the Basic Sciences and Human Biology laboratory buildings. In addition, a training grant supports students and postdoctoral fellows that specifically have joint mentors drawn from different administrative units (divisions at FHCRC or departments at UW). One mentor is the actual chair of the student's Advisory Committee, while the other is a committee member but both mentors participate actively in the student's research and the student is expected to spend time learning techniques in both disciplines (e.g., molecular biology and epidemiology).

II. Unit Roles and Responsibilities

A. What is the principal role and mission statement of MCB and should this change?

The University of Washington and the FHCRC collaborate to offer a program of graduate studies leading to a Ph.D. degree in Molecular and Cellular Biology. The program uses the extensive research facilities of the individual departments on the University campus, the University of Washington Medical Center, and the nearby Lake Union campus of the FHCRC. The participating faculty of the University campus are located in the Departments of Biochemistry, Bioengineering, Biological Structure, Botany, Environmental Health, Genetics, Immunology, Microbiology, Pathobiology, Pathology, Pharmacology, Physiology and Biophysics, and Zoology. Participating members of the FHCRC have positions in the Division of Basic Sciences and the Division of Human Biology on the Lake Union campus of FHCRC as well as holding affiliate faculty positions at the University.

As stated to prospective students on the MCB website, the goals of the MCB Program are to facilitate the development of independent and highly motivated students into creative molecular and cellular biologists. The guiding philosophy of the program is that students should be actively involved in designing a program of graduate studies that meets their individual needs, coupled with the notion that ongoing and challenging dialogue between students and faculty is an integral part of higher education.

With regard to the question of whether this mission should change in the foreseeable future, we feel that this mission statement continues to aptly define what any outstanding graduate program should seek to achieve. As we expect to be preparing our students for both academic and non-academic career paths and giving them considerable exposure to both, we do not see that any major changes are necessary in the mission statement.

The National Research Council report, *Trends in the Early Careers of Life Scientists,* (1998, chaired by Dr. Shirley Tilghman), made five recommendations, four of which are relevant to graduate students. We address the issue raised by each in turn:

Recommendation 1: Restraint of the rate of growth of the number of graduate students in the life sciences. Response: MCB is a highly selective program, admitting 15-25 students per year from 250-300 applicants. Selection is predicated on the anticipated excellence of the candidates and there is no mandate or requirement to admit a specific number to fill teaching or research needs. Virtually all admitted students have multiple alternative offers from the best research universities in the country. MCB is therefore training students who will succeed, rather than creating an artificial demand for less qualified students. We strongly believe that there are many graduate programs at less successful institutions that should indeed be reduced or

eliminated, but the way to reduce growth rates is not to uniformly decrease admission across the board.

Recommendation 2: Dissemination of accurate information on the career prospects of young life scientists. Response: The MCB website, under the Courses and Training section, has a very detailed and informative section on Career Development. This provides dozens of links and reports and updated information on the subject. In addition, during their initial recruitment visit, prospective students are told by the Directors that a) only about half of the students can expect to find academic jobs and b) MCB expects to provide outstanding training for students interested in non-academic as well as academic pursuits.

Recommendation 3. Improvement of the educational experience of graduate students. Response: MCB students receive both formal and informal training (see Section C, below) including didactic course work, literature review classes that demand critical thinking, required public speaking and presentation, and informal educational ventures with their peers. Students receive travel funding from the MCB Program, and significant counseling from faculty other than their research advisor. Specifically, MCB students have a faculty advisor from the RACOM committee (see Section IIB, below) to insure that their best interests are being pursued and MCB students are engaged in fairly constant two-way e-mail exchanges with the Directors to identify new opportunities and to identify desired new directions.

Recommendation 4: (not applicable as it pertains to postdoctoral fellows).

Recommendation 5: Alternative paths to careers in the life sciences. Response: MCB has been extremely aggressive in this area (see also Section H, below). We initiated a Biotechnology Externship course to give students 10 weeks in a biotechnology company to allow them the opportunity to decide if this is a viable future career option for them in general. We

also initiated contact with the Masters of Management degree program on the UW Bothell Campus to allow more senior students to receive a joint degree to prepare them for high tech business management. Third, we initiated contacts with the Program in Entrepreneurship and Innovation (PEI) on campus and have paved the way for MCB students on the UW Seattle campus to participate in their business courses and meetings. Fourth, we have sponsored seminars and informal events (e.g., breakfast with the head of research for Merck, Ben Shapiro) to provide students with exposure and contact with professionals from nonacademic institutions.

B. Does the administrative organization of MCB foster its meeting its goals?

i. University oversight: The administrative organization of MCB, in terms of the University of Washington, is that all interdisciplinary programs are administered through the Graduate School. Thus, MCB interacts with the Dean of the Graduate School, Dr. Marsha Landolt. In practice, the MCB Director also simultaneously engages the School of Medicine through the Associate Dean for Research and Graduate Education, Dr. Dan Dorsa, because the School of Medicine was responsible for the affiliation agreement with the FHCRC. Where appropriate, the Director also contacts the Dean of the College of Arts and Sciences. Finally, the MCB UW Director directly interacts with the Chairs of the participating departments via e-mail when appropriate.

This web of interactions is overly cumbersome and is not used by all parties at all times. For example, in June, 1999, the MCB Program found itself needing to match student salary increases authorized by the School of Medicine Basic Science Departments without any warning that they were forthcoming. This committed the FHCRC and the UW College of Arts and Sciences departments to salary payments without participation in the decision. We feel that the

UW needs to establish better communication between all relevant parties. Reciprocally, there have been times the MCB Program has wished to move forward on salary changes and the process of obtaining concurrence of the Chairs could have been easier.

Second, administrative oversight of the MCB Program personnel should be reconsidered. While the MCB Program reports to the Graduate School, the program personnel issues currently fall under the Health Sciences Personnel Office. Historically, departments and units on campus are assigned to specific personnel representatives for personnel issues. For academic departments and programs, these assignments traditionally fall along college lines so that departments/programs within a college have the same personnel representative as those of the college to which they report. This allows for consistency of application of policies and procedures within colleges.

When the MCB Program was initially established, it was assigned to the Health Science Personnel Office as a unit within the School of Medicine. When the MCB Program obtained degree-granting status in 1994, its reporting structure changed to the Graduate School but the personnel functions were never transferred to the Graduate School. This has caused confusion for both the MCB Program and the personnel offices when filling positions, requesting salary increases and dealing with personnel issues. To be consistent with the traditional reporting structure on campus and other units under the Graduate School, the personnel functions for the MCB Program should be transferred to the same personnel representative as the Graduate School.

ii. Cost sharing with the FHCRC: The structure for sharing operating costs between the University and the FHCRC for this joint graduate program presently does not work well. This is a unique feature of this program and has required creative solutions to solve problems between

two different funding structures and accounting systems. While the original affiliation agreement between the two institutions laid the groundwork for the sharing of costs, the mechanics of how this would be accomplished was left to the administrative staff at the University and the FHCRC.

The original agreement specified that the FHCRC would be granted a tuition credit for each MCB student who joined a permanent lab at the FHCRC. The credits would continue for each quarter until the student graduated. These tuition credits would be deducted from the amount FHCRC owed for their portion of the operating costs. The FHCRC share of the operating costs for each year from July 1 through June 30 are calculated as follows:

one half of the projected annual operating costs (determined in March)
less: FHCRC estimated direct costs
less: tuition credits for students in permanent labs at the FHCRC
equals: amount of payment by FHCRC

During the first year (1994) of the MCB Program as a degree-granting unit, it became apparent that the billing of the FHCRC for joint costs with a "contract" would no longer work. There was no mechanism for making adjustments in the amount owed by FHCRC when students graduated early and costs were over or under estimates. In 1995, the School of Medicine Finance Office established a system of billing that allowed for adjustments to be made throughout the year and billing invoices reflected these adjustments on a quarterly basis. The amount received from the FHCRC matched expenditures for that year. This system eliminated the problems of the old "contract" system and matched revenue with corresponding expenditures.

In the summer of 1998, an amendment was negotiated between the School of Medicine and the FHCRC which reverted to the old "contract" system and the original problems resurfaced. The revision specified that the amount owed by FHCRC was set at the beginning of the year and any deficit or credit carried forward to the following year. The problems are:

- there is no adequate way to predict which first-year students will elect to participate in a 4th rotation or in the Biotechnology Externship Program (both funded by the MCB Program) for the following academic year
- first-year students do not declare a permanent lab until June and there is no way to predict in March which students will joint an FHCRC lab
- students graduate at various times throughout the year and the tuition credit ends at graduation thereby changing the amount owed

As a result, all of the figures used to calculate the amount of the contract are "best guess" estimates and can change radically throughout the year. As an example, one student graduating one quarter earlier than projected would be $6,365 including salary, benefits and tuition and this must be made up from the following year's budget with the current "contract" arrangement. While actual operating costs remain constant or increase in the following year, the amount of funds available are less if there is a credit owed to FHCRC which has historically been the case. The program may find that it does not have sufficient funds to operate because of a previous year's debt. In the early years of the program, the amounts were manageable because students were in the early years of their graduate studies and graduation was years away. The program is now in it's 5th year and this will become more acute as students begin to graduate.

The problem with the current system could easily be solved by returning to the system used prior to the amendment of the summer of 1998. Alternatively, a new system should be created which allows for adjustments as actual costs are billed and students graduate, thereby matching actual costs with corresponding revenue.

iii. MCB Steering Committee: To insure that the Directors of the MCB Program have appropriate liaisons with existing departments and to receive advice, the MCB Steering Committee was initially composed of Chairs of participating units. While this was effective, the chairs decided to re-formulate the Steering Committee with one appointed representative from each participating UW department and FHCRC unit. The Steering Committee meets on average once a year and engages in e-mail discourse quarterly. This level of oversight and interaction with the Directors seems appropriate from the standpoint of the Directors learning about departmental concerns (see comments from departmental Chairs, Appendix N - MCB administration). However, information flow in the opposite direction, from the MCB Directors to the departments, has often not worked as well, or the Steering Committee did not have the authority to make a decision. This generally results in the MCB Directors needing to contact departmental Chairs directly. Since the MCB Directors end up contacting the Chairs anyhow, and the Steering Committee rarely meets in person, the simplest solution would be to replace the MCB Steering Committee members with departmental Chairs. This idea should be considered by the Graduate School, and is *highly recommended by the MCB.*

For a few years, we had student members sit on the Steering Committee who were required to leave when faculty appointments were discussed. Since then, we have decided to simply e-mail and poll all students about all potential changes to the program rather than have only a few represented on a committee that meets infrequently. This mechanism of receiving student input has worked well.

In general, the MCB Program is more free to pursue new ventures and new directions than are departments or department-based graduate programs. The Directors can develop an idea, pass it by the Steering Committee via e-mail, and with general consensus, the plan can be

quickly implemented. This freedom has allowed the Directors to initiate a number of projects that might not have survived a typical departmental evaluation process (see Section H, below).

iv. MCB Recruitment and Advising Committee: We felt that incoming graduate students suffered from having no first year advisor other than the head of the lab in which they were rotating. Moreover, they received little guidance on what courses to take during their first year. Finally, there was little continuity in personal contact between recruitment in the spring to when the student arrived in the fall. The RACOM addresses these needs by having committee members be responsible for recruiting in the spring, then handling the transition of each of their students to graduate school. Finally, the RACOM committee members meet with each student throughout the first year until the student selects a laboratory. Thereafter, the committee members serve as unofficial student advocates, outside of the bounds and responsibilities of the formal thesis committee. Members of this committee serve for two years with the 6-8 members equally derived from both the UW and FHCRC. So far, this committee seems to be serving a need and it is expected to continue.

v. MCB Admissions Committee: This committee of four, with two members from each institution, changes each year by appointment of the Directors. All committee members review each of the 250-300 applications under review, rank order them, and then meet to decide which students shall receive invitations for interviews. The UW MCB Director presides at this meeting and discusses selection and evaluation criteria. Interviews are scheduled at two times in February, two weeks apart, and students receive offers after the interview and evaluation by the faculty, the admissions committee, the RACOM, and the Directors. Final decisions to invite students and to extend offers are made by the Directors. This committee has worked well and no changes are planned. Appendix I contains the *Summary of Fall 1999 Recruitment*, our most

recent completed admissions cycle, which describes the statistics of the admissions process in detail.

C. *What is the expected program of study of an MCB student, and how are students monitored and advised? Is this appropriate for the next 10 years of the program?*

There are both formal and informal mechanisms employed by the MCB Program to foster its training goals and they are addressed in turn below.

During the orientation upon joining the program, students meet individually with the Recruitment and Advising Committee (RACOM). This meeting helps students determine suitable courses based on their backgrounds and serves to identify possible course deficiencies. The Directors inform the students that they are expected to be responsible for designing and pursuing their own goals in graduate school. That is, the MCB Program is here to provide a framework for the individual pursuits of the students. We will help and cajole where necessary, but in the end each student must accept responsibility for their own careers. Students are also told they can meet with the Directors at any time and that MCB is an interactive program, without a top-down administrative structure. Thereafter, students meet quarterly with the RACOM member who recruited them to the program to monitor progress and resolve problems. First year students complete three or four laboratory rotations with oral presentation at the end of each quarter to the faculty and fellow students and submission of a rotation report.

First year students enroll in Conjoint modules (Appendix K) which include students from other programs. Students are required to select 9 credits worth of Conjoint modules (1.5 credits each). To provide an opportunity for MCB students to form friendships and peer contacts and further their critical thinking, all first year MCB students enroll in the year-long MCB Literature Review course which meets weekly. In total, MCB students are required to have 21 graded

credits to graduate with electives chosen from courses offered throughout the University. At the end of the first year, students choose a laboratory, form and meet with their thesis committee, and begin their thesis work. Some students elect to use the summer after their first year for the MCB course 560, Biotechnology Externship, in which they work on non-thesis research in a local biotechnology company (see course description, Section H, below).

Second year students meet their two-quarter teaching requirement by serving as a Teaching Assistant in a course or by enrolling for one quarter in the Science Education Partnership program (SEP, see Section H, below). By the end of their second year, students are expected to have a well-formulated thesis project.

At the start of their third year, students take their qualifying oral exam and continue to meet with their thesis committee once a year until they graduate. Students may, if they wish, continue to use their RACOM advisor as a non thesis-related advisor for general issues. This provides students with an important advisor external to their thesis and thesis advisor.

It is the hope and expectation of the MCB Program that students will graduate by the end of their fifth year, though this varies with discipline, students, and laboratories. Students are provided with an overview of the typical progress of a student through the program by which they can monitor their own progress (Appendix N). Students entering their fourth year receive an e-mail from the Directors indicating that the annual thesis committee meeting should be a forum for outlining how to finish the thesis. Students entering their fifth year, and their advisors, receive an e-mail indicating that they should be graduating that year. Students still in the program after five years, and their advisors, receive fairly frequent contacts from the Directors seeking to establish what is necessary for the student to finish. Since many students and their

advisors are rather happy with the status quo and in no particular hurry, the MCB Program has relatively little leverage to enforce target graduation dates.

Oversight of student progress is achieved by the MCB Program through the UW MCB Office. All requirements and dates of required meetings and exams are monitored, and the MCB Office quickly contacts students, advisors, and the MCB directors when any student is delinquent. Student requirements for each year in the program are clearly posted for students and advisors on the MCB website.

In terms of informal education and development, MCB students voluntarily participate in a student-organized research seminar/discussion series that is restricted to just MCB students. Though they receive no formal credit for this, it provides speaking experience, feedback from fellow students, and again fosters interactions. Second, MCB students hold their own off-site annual retreat funded by the MCB Program. This two-day retreat has speakers and posters, and again promotes interactions and a sense of community. Third, MCB students are encouraged to organize an annual symposium of local and national speakers, and have done this intermittently with considerable success. Fourth, the MCB Program has provided each student with travel funds to attend national and international meetings. Fifth, students have been told that they can use some of their travel funds to pay for on-campus computer classes to learn new computer skills.

Is this program of study likely to be appropriate for the future? What is often not apparent from a summary of a program is its general philosophy and tone. In brief, the MCB Program is run as a very interactive venture, meaning that the Directors constantly come up with new ideas for courses, seminars, or educational activities, then ask the students if they are interested or if they have better ideas. The students are made to feel that they are active members

in their own education and that their voice is heard in the program. Thus, it is not run as a hierarchy with mandates streaming down from the top. This has allowed the MCB Program to quickly move in new directions and to influence departmental education as well. For example, the MCB Program instigated the complete review and reorganization of the CONJOINT classes that serve both departmental and MCB students. While there used to be just 3, 10-week classes, there are now 11 5-week modules from which students can choose. Overall, it is expected that the non-hierarchical nature of the MCB Program is one well suited for adapting to change in the future, hence no specific changes are required at this time.

D. Research Environment for MCB students at FHCRC

The breakdown of students in FHCRC laboratories as of July 1999 is: 54 students total, 2 visiting, 33 MCB Program, and 19 departmental. Microbiology supplies the most departmental students (8). Of the 33 MCB Program students, 5 are MSTP. MCB students at FHCRC are in a total of 19 laboratories, out of a total of 39 FHCRC faculty with MCB Program appointments.

FHCRC faculty have less experience and fewer resources for advice when it comes to mentoring graduate students. Students choosing FHCRC laboratories do so after the first-hand experience of a laboratory rotation and presumably accept the ratio of students to postdocs in their chosen laboratory. Thus students choosing FHCRC laboratories may have a more independent attitude and more self-confidence than those choosing laboratories at UW. Nonetheless, good mentoring is essential for all students. FHCRC has taken several steps to provide a rich environment for students and to promote good mentoring.

To try to build a sense of community among graduate students at the FHCRC, all students (MCB and others) are invited to a Friday lunch meeting that they organize. Faculty do not attend

the meeting which is an opportunity for networking and confidence-building as well as a chance for gaining input from other students into research directions and results. FHCRC also presents occasional seminars and workshops directed at students such as orientation to research resources available at the center and ethics/mentoring seminars. Visiting seminar speakers typically meet with students during the lunch period after the seminar. The Center also includes students in all research and social events including: Monday night seminars (presented by postdocs and students and occasional faculty), annual Basic Science and Human Biology retreats, and Friday afternoon social hour. In a new venture, the Center is initiating an annual symposium where all invited speakers will be graduate students. Speakers will be selected by competition from universities and research institutes across the nation with a maximum of one from any given department. One speaker will be selected from FHCRC students. The symposium will be open to all Seattle area scientists, and it is hoped that the exposure of our students to the research of outstanding graduates from other programs will serve as encouragement.

To help faculty mentor students, the FHCRC Graduate Affairs Committee has recently instituted an annual review of all students in FHCRC laboratories. Advisors and students are mailed a simple form requesting information on progress and their anticipated timeline to graduation. Other faculty who may be on a thesis committee or who know a student are asked for input. The responses are collated and discrepancies and instances of slow progress noted. There is then a faculty meeting that advisors are required to attend. The anticipated results of this review are: to provide advisors with information about other students against which to judge their own student's progress; to alert the leadership about which students need watching so they can intervene with the student's Advisory Committee members or the program or departmental

director; and to provide all faculty with information that they can use to offer encouragement or advice to students.

E. How has MCB taken advantage of its status as a non-departmental degree-granting program?

MCB is the largest Ph.D. program in the biomedical sciences on campus with a steady-state of about 100 students and 165 participating faculty at two independent institutions. Having one doctoral program cover both an academic university and a research-oriented cancer center is fairly unique nationally and this has allowed the MCB Program to attract outstanding students. It is also a magnet for new faculty who contact us soon after joining the UW or FHCRC to inquire about joining the MCB Program. As a result, it has thus lived up to its image of being a premier doctoral program.

The MCB Program has tried to take advantage of its large size and considerable autonomy to assume a leadership role in new experiments in education (see Section G, below). In addition, the MCB Program has served a valuable role for departments in that many qualified students who do not receive offers of admission from the MCB Program are quickly routed to appropriate departments (see replies to question 7, Appendix N).

F. What changes have occurred in the past decade that have influenced the conception of the role of MCB as an Interdisciplinary Program? What changes and challenges are expected in the next ten years?

Ten years ago the MCB Program was not degree granting. Having two institutions participate in the program has been a major positive advance for the MCB Program, promoting

interdisciplinary research at the intersection of basic science and clinical science, and fostering closer ties between faculty at the two institutions. Becoming a Ph.D.-degree granting program with consistent requirements for the students independent of what laboratory they join has greatly increased the attractiveness of the program to prospective students. On a more general level, in the past ten years the obvious has become even more obvious—many of the breakthroughs in science come at the interfaces of various disciplines. This has only enhanced the importance of offering interdisciplinary graduate training. For example, the interdisciplinary nature of the MCB Program has helped our students to take extremely diverse courses as part of their training and for new elective courses to be added simply upon request by the student and quick review by the Directors.

There are a number of challenges for the next decade of the program:

First, maintaining competitiveness at a national level for the best students is the highest priority. The MCB Program goes to considerable lengths to recruit the best students possible, with our major competitors now being Harvard, MIT, Stanford, UC Berkeley, UCSF, and UCSD. Given the high quality of this group and the fact that none of them are resting on their laurels, the MCB Program needs to be concerned with all comparisons made by students. This includes insuring that faculty members work in modern laboratories and have sufficient space for their research. While there are areas of excellence at both the UW and FHCRC in terms of physical infrastructure, the State of Washington could do more to enable the UW to remain competitive compared to the top research universities.

Second, are adequate numbers of new faculty appointments being made in cutting-edge areas which is necessary for attracting the best students? The faculty at the FHCRC are generally

more junior than at the UW. While this does not imply that the UW lags in terms of cutting-edge research, many students prefer to work in laboratories of less senior faculty.

Third, given the success of the interdisciplinary programs including the MCB Program, it may be timely to ask why faculty laboratories at the UW are still organized in departmental units rather than according to their research areas? One could make a strong argument that many laboratories in different departments would benefit and synergize from working in shared interdisciplinary space. Such interdisciplinary groupings of research groups would say to prospective interdisciplinary students, "Not only do we believe that interdisciplinary training is good for graduate students, but it is also one way of stimulating the best research." At present, the UW lags far behind many institutions in this respect. Having research groups housed in interdisciplinary space need not disrupt the departmental organization of the University (faculty members could still belong to different departments), and this model has worked fine on the 5th floor of K Wing of the Health Sciences Building. In this example, labs from many departments share a common theme of Neurobiology research which has fostered considerable interactions that otherwise might not have occurred. The FHCRC seems in many ways to have adopted the philosophy of promoting interdisciplinary research which, in part, may explain its popularity among MCB students.

G. *What criteria are appropriate for evaluating the success of MCB? Has MCB been successful?*

Evaluation by the Directors: Success of the MCB Program can be monitored in terms of its ability to attract some of the best students nationally, the success of these students during graduate school, and the long-term success of the students after they leave the program. Based on

the criterion of attracting outstanding students, the MCB Program is one of the top national interdisciplinary programs (see also, evaluation by students below in terms of their competing offers). Based on the success of the students while enrolled in the program, the MCB Program seems on track to be a successful program as the students have been publishing their research in leading journals (see Student Publications, see Appendix P). However, as the MCB Program is only now beginning to graduate its first students who entered since the program became authorized to grant degrees, it is likely that much of the thesis research of the earliest entering classes has yet to be published. With regard to the last criterion, it is too soon to tell how successful the students will be. Given that the faculty of MCB have been training students for decades who have gone on to become successful faculty throughout the country and who have become leaders in companies, it is likely that MCB students will also be successful.

Evaluation by the Chairs of the Participating Departments: In May of 1999, the MCB Program sent a survey to the Chairs of all participating departments. Following are the questions sent. The reviewers of the MCB Program are encouraged to read the replies in Appendix N, as it would seem inappropriate and biased to attempt to summarize them here.

1. What is unique about the potential role of MCB as a graduate program?
2. How successful has MCB been in fulfilling this role locally, and how does this compare to programs at other major research institutions?
3. What unique mission should MCB have in the future and how does this differ from other graduate programs?
4. Has MCB facilitated UW-FHCRC interactions?
5. Has MCB had any impact on the department other than recruiting students?
6. Is MCB the right size? Should more or fewer students be admitted?

7. Have department graduate programs benefited from referrals from MCB?

8. What are the subjective impressions of MCB students?

9. Should MCB continue to test new processes and programs?

10. Is MCB properly run?

11. Do you have any forward-looking suggestions?

Evaluation by the current MCB graduate students: In June of 1999, the MCB Program sent a survey to the current graduate students of MCB. The results are compiled in Appendix O.

H. In what ways is MCB a leader?

On-line Admissions: Starting in 1995, the MCB UW Director worked with the Graduate School to develop one of the first on-line admissions processes on campus. This involved dedicated development by the Office of Admissions and the Graduate School and a considerable number of meetings with the MCB Director and staff. The MCB Program, and now other departments, have successfully used this on-line admissions procedure and it is an integral part of the MCB Webpage.

Biotechnology Externship Course: We conceived and now offer a very unique course that, in essence, lets students gain exposure to life in a biotechnology company while paid as a student with no cost to the company. All intellectual property remains with the company and the expressed goal is simply to expose students to nonacademic career paths. The general plan is for students to work in a company the summer after their first year—after choosing a research laboratory but before beginning their thesis research. The MCB 560 Biotechnology Externship course is headed by MCB UW Director Randall Moon and all interactions with companies and

student placements are made through the Office of Industrial Relations in the Office of the Dean of the UW School of Medicine. The course has enjoyed the support of Dan Dorsa, Associate Dean, Research and Graduate Education, the School of Medicine, Marsha Landolt, Dean of the Graduate School, and Lee Huntsman, Provost. This demonstrates a university-wide commitment to this type of training for non-academic careers. The first student to take the course was in Autumn, 1998, and three completed the externship in the Summer of 1999. Some of the participating companies are Pathogenesis, Corixa, Immunex, and ICOS. The MCB Program has informed department chairs that non-MCB students may enroll in the course but to date no department has put forward any students to enroll in this course.

Recruitment and Advising Committee (RACOM): See Section IIB, above, regarding this novel committee.

Joint Degrees: The MCB Program has initiated two joint or concurrent degree programs with the expectation that this will serve the needs of a subset of students each year (see also, Section III). The reasons for pursuing a joint Masters of Management (Appendix C), or a concurrent Masters of Epidemiology (Appendix C), was presented to the Graduate Program Coordinators at the February, 1999 meeting. In brief, the Masters of Management is an existing two-year evening set of business classes at the UW Bothell campus seeking to train people to enter high-tech business management. The Epidemiology program is an existing UW program as well. A non-degree granting Program in Entrepreneurship and Innovation, run jointly by the School of Business and the Center for Bioengineering, has also made itself available for participation by MCB students.

Science Education Partnership (SEP) program: The FHCRC runs an SEP program which enables state high school teachers to work in a scientific lab to learn how to conduct

simple molecular biology experiments that they can export to their high school science classes. MCB students are authorized to participate in this program to serve as mentors to the high school students and to count this as one of their two teaching experiences required for graduation (see also, Appendix C).

I. How do MCB students fare at each of the two participating institutions?

One issue that merits continued attention is the success of MCB students based on which of the two institutions they join for their doctoral research. This issue arises since the University by nature is focused on students while the FHCRC by its nature is more focused on basic research. Both have considerable strengths and are very attractive to students. At present, there are too few MCB alumni on which to base any conclusions regarding long-term success.

Besides monitoring success of students from each institution, we are also monitoring premature departures from the program. Such departures are generally due to a) the recommendation of the thesis committee that the student pursue a different career, b) transfer to another department or program, or c) personal (often financial) reasons. In terms of MCB students who have left the program, five left during their first year, two left UW laboratories in their second or later year, and five left FHCRC laboratories. Given that there are approximately equal numbers of MCB students at each institution, students have left the FHCRC at a somewhat higher rate than from the UW. However, it is too early to tell if this is a significant trend though we shall monitor this in the future. It is also quite plausible that the FHCRC attracts students who are less inclined to accept an academic setting and life at the outset. In this case, one would predict that students would leave the FHCRC at a disproportionate rate no matter what steps might be taken to address the issue.

J. What is the relationship of MCB to other interdisciplinary programs on campus, and to departmental doctoral programs?

A major challenge for the next ten years is redefining the relationship of the MCB Program and other interdisciplinary programs to departmental doctoral programs. There are many very successful departments that participate in the MCB Program that attract excellent students who seek focussed training and education in a specific area such as Biochemistry or Pharmacology. A strong argument can be made that these and other strong departmental programs serve a valuable purpose and should be continued as independent degree programs. On the other hand, a compelling argument can be made that the interdisciplinary programs attract better students than many departments. In the interest of training fewer overall students and focusing on only training those with the brightest long-term career prospects, it would seem appropriate to consider having these departments suspend their own graduate programs and rely on growth in the interdisciplinary programs. Although this is a potentially sensitive issue for some departments, it would be valuable for internal and external reviewers to comment upon this matter and to make specific recommendations. For example, do data support the possibility that once a department has a degree program, it will feel an obligation to take a certain number of students every year simply to justify the existence of the program, independent of whether the students are really excellent prospects? Are students emerging from interdisciplinary programs more successful, or less so, 5-10 years after leaving when compared to students from each department at the University?

A second, albeit lesser, challenge is for the MCB Program to define itself with respect to newer and smaller interdisciplinary programs on campus. Since the inception of MCB, the

Neurobiology and Behavior program has become a degree-granting program and the Biomolecular Structure and Design program is likely to request this in the foreseeable future. Since most of the faculty of these interdisciplinary programs are also members of the MCB Program, does this dilute MCB? At first glance this has not been a problem given that the three interdisciplinary programs are largely competing for different student populations. However, there is a need to keep overlap to a minimum, otherwise the programs would be trying to serve the same audiences.

The MCB Program could do a better job in identifying on-campus programs where liaisons might be desirable. For example, better training of MCB students in bioinformatics should be pursued.

K. How does the MCB Program foster student diversity to meet federal mandates while remaining within the boundaries of Washington State law?

The role the program played in the recruitment of underrepresented minority students prior to degree granting status was to participate in organized forums to recruit for all disciplines in the biological sciences since students had to transfer to a degree-granting unit after their first year of graduate study. From 1987–1994, MCB staff and students participated in the California Minority Graduate Education Forum and three National Minority Research Symposiums.

After receiving degree-granting status, the Program decided to expand minority recruitment efforts and assume a leadership role in innovative methods for the identification, admission and retention of students from underrepresented minority groups. Our initial efforts focused on identifying prospective minority graduate students and the admission process. This

included targeted mailings to students from underrepresented minority groups and attendance at fairs/symposiums.

Identification of students for targeted mailings included the use of:

- GRE Locator Service of the Educational Testing Center
- Western and National Name Exchange, a cooperative system of exchanging names of prospective minority Graduate Students
- Pathway Program of the School of Medicine designed to identify prospective minority students through contacts at institutions with high minority populations, national society meetings and MARCS programs
- Directors of MARCS (Minority Access to Research Careers) Programs throughout the United States
- Basic science undergraduate advisors identified through the Peterson's Annual Guide to Graduate Study

The standard MCB application materials are accompanied by a letter stating our commitment to a diverse student population, describing campus-wide services for minority students, and encouraging them to apply for admission to the Program. A follow-up contact is made to answer questions and provide the names and e-mail addresses of current minority students they could contact.

One of the most effective methods of recruiting students from underrepresented minority groups is attendance at fairs and symposiums, particularly when attended by current minority students. To facilitate this, MCB Program attendance at fairs/symposiums included:

- Marianne Nicol (Native American), MCB Program Specialist attended the National Minority Research Symposium in Miami, Florida (November, 1996)
- Mike Wright (African American), MCB graduate student attended the 7th Annual California Minority Graduate Education Forum in San Bernadino, California (April, 1997)
- Brandon Willis (African American), MCB graduate student attended the UCLA Minority Recruitment Conference in Los Angeles, California (October, 1997)
- Clarissa Dirks (Latino), MCB graduate student attended the SACNAS (Society for the Advancement of Chicanos and Native Americans in Science), in Houston, Texas (October, 1997)
- Liz Balow, Program Specialist presented at the UW Undergraduate Biochemistry Club (Spring 1998 and the Interdisciplinary Graduate Symposium (Spring 1999)
- Liz Balow, Program Specialist presented a poster at the Native American Career Night (Fall 1998)

In 1997, MCB instituted new measures to assist prospective minority students during the application process. The first was to pay the application fee for students identified as being from underrepresented minority groups. The second was to arrange a meeting with the Director of the Pathway Program and current minority students from MCB, Immunology, Genetics, Zoology and Microbiology during their recruitment visit. At this meeting they learn of services and programs for minority students available at the University, address issues of concern and are given an opportunity to ask questions.

The Admissions Committee continues its policy of giving special attention to applications from minority students recognizing that their backgrounds and grades may not accurately reflect

their ability to succeed in the program. Their statement of purpose and letters of recommendation are carefully reviewed to give equal weight to their interest in science and potential as recognized by their instructors.

Underrepresented Populations
Application History
1994-1999

Year	Applications *	Visits	Admission Offer	Matriculating
1994	13	5	5	4
1995	12	6	5	1
1996	26	6	4	2
1997	17	10	10	3
1998	22	9	9	2
1999 **	19	13	4	1

*students not invited had GPAs considerably below the admission standards set by the Graduate School and would have difficulty succeeding in graduate studies
** reflects change in policy mandated by the passage of State Initiative 200

A measure of success of these approaches is evident from the number of minority students in the MCB Program, which has been consistently higher than other graduate programs in the biological sciences.

Molecular & Cellular Biology Program
Underrepresented Minority Students

Year	Total Students	Underrepresented Students	Percentage
1994	39	8	20.51
1995	46	8	17.39
1996	59	9	15.25
1997	76	11	14.47
1998	89	9	10.11
1999	105	10	9.52

To expand our efforts and join in the efforts of existing programs, MCB staff met with administrators throughout campus to determine what the Program could do to assist and complement their efforts. These contacts included:

1) Julius Debro, Director of Minority Education of the Graduate School

2) Pat Stayton, Director, Pathway Program of the School of Medicine

3) Karlotta Rosebaugh, Director, Health Sciences Minority Student Program

4) Julian Argel, Director of the Educational Talent Search Staff Program

5) Director and staff of the Minority Science and Engineering Program (MSEP) in the College of Engineering

6) Tom Colonnese, Assistant Vice President for Administrative Services for the Office of Minority Affairs

7) Franklin Donahue, President of Graduate Student Council

As a result of these contacts, the MCB Program decided to focus on community outreach efforts and programs for undergraduate students to generate interest in science at an earlier stage of their education.

- At the request of Pat Stayton, Director of the Pathway Program of the School of Medicine, MCB organized a group of minority students which formed the Student Coalition that plans and coordinates the Speaker for Diversity in Science seminar series, a highly successful seminar series that brings leaders in science from education and industry to campus.
- In the summer of 1998, MCB instituted a summer research program for undergraduates with funds provided by the STAR (Stipends for Training Aspiring Researchers) Program of the Health Sciences Minority Student Program through a grant from NHLBI. In the summer of

1998, 2 students were placed in MCB faculty labs and this expanded to 6 students in the summer of 1999.

- In the summer of 1998, MCB staff visited the high school science teacher at the Yakima Tribal School in Toppenish, Washington. As a result of this visit, an MCB student, Gina Stivahtis, designed the curriculum and scientific experiments for the high school biology classes.
- In April 1998, the MCB Program joined a group of schools participating in a federally funded summer research program at Bethune-Cookman College in Dayton Beach, Florida, a school with a traditionally high population of minority students. This program funds students interested in a summer research experience in labs at various universities and colleges throughout the United States.
- In October 1998, MCB students and staff participated in the 15th Annual Washington State Indian Education Association Conference sponsored by the Washington State Indian Education Association, Education Talent Search of the University of Washington and Huchoosedah Indian Education Program in cooperation with the Office of Superintendent of Public Instruction. An MCB student, Gina Stihavtis, met with students to provide information and answer questions. A panel of MCB students met with Native American educators throughout the state to discuss education in science.
- MCB staff met with Franklin Donohue, UW Student Body President, to discuss a combined effort between the MCB Program, the College of Engineering and the Business School to visit local community colleges and sponsor campus visits for undergraduate students interested in science.

- In 1997-1998, the MCB Program joined in the planning and writing of the BRIDGES Grant to NIGMS that was funded in the Spring of 1998. MCB will participate in the goals of the program which aims to identify undergraduate students in their first year of undergraduate studies who are interested in science and provide a program of academic assistance, research opportunities, mentoring, and skill development (technical writing, lab skills, presentation skills and mentoring) to assist them in successfully entering graduate school. The first part of the program to be implemented was the summer research presentations by faculty to undergraduate students. To facilitate this endeavor, MCB arranged for 10 MCB faculty members to give presentations during the summer of 1998.

In addition to the previously mentioned efforts, contacts were made with educators at various Washington Indian Reservations to sponsor visits by Native American students to the University of Washington including panel discussions with current minority students and tours of labs. Also in the planning stage was contact with the Education Officer at McCord Air Force Base to arrange for a visit of various University representatives to determine what services and assistance we could provide for students interested in science to continue their education.

To determine what measures the Program should take to retain current minority students, comments and suggestions were solicited from current minority students in Molecular & Cellular Biology, Zoology, Genetics, Immunology, Microbiology, and Medical Genetics. From these discussions, two consistent points were apparent: (1) the University was already providing a wealth of services and there was no need to duplicate these efforts at the program level, and (2) due to the demands of time required in the lab to complete their research projects, most of these services were not utilized. All of these students expressed an interest in the recruitment of other

minority students and were willing to assist as time allowed. These offers of assistance were accepted and utilized in some of the previously mentioned efforts.

Due to limited resources available at the program level and in order to avoid duplicating existing services already available on campus, the MCB Program decided to concentrate its efforts and resources on those measures already underway.

The Program's efforts toward a diverse student population have been hampered by the passage of Initiative 200 in November 1998, and the 1% UIF (University Initiative Fund) reduction of departmental budgets for the 1999-2001 biennium. The 1% UIF reduction of department budgets eliminated operating funds available to send students to fairs and symposiums.

The effects of the passage of I-200 were evident in the 1999 recruitment of minority graduate students to the Program. While the number of minority applicants decreased slightly, the number of acceptances compared to offers of admissions dropped dramatically. This is consistent with the decline experienced by the University in general and comments from current minority students who predicted that prospective students would view the University as a "unfriendly environment" for minority students. Efforts in the planning and development stage were suspended pending determination of the effects and restrictions of I-200.

With these restrictions in mind, the Program focused on those measures that it could accomplish with limited available resources. These include the summer research programs for undergraduate students and the BRIDGES Program, both of which are federally funded and excluded from the restrictions of I-200.

MCB remains committed to a diverse student population and recognizes that its greatest asset is the commitment of the students and faculty in the Program. Current minority students have

consistently demonstrated a willingness to assist other minority students in their educational pursuits. Eight MCB faculty members have participated in the summer research program for undergraduates and this is expected to increase with funds available through the BRIDGES Program. In the past, we have been limited by the number of positions funded through the STAR Program, not by the number of faculty willing to provide a research experience in their labs for undergraduate students. Although the effects of these efforts will not be immediately visible in recruiting graduate students to the MCB Program, it will allow us to continue our efforts to increase the number of students who pursue graduate studies in science.

Initiative 200 prohibits giving special consideration to applications from underrepresented minority students. However, we are allowed to continue our efforts to identify qualified minority students through the previously described methods. We will continue to target these prospective graduate students and encourage them to apply to our Program with a clear statement of our commitment to providing graduate education for all qualified applicants.

L. Benefits to UW/FHCRC interactions

The MCB Program has boosted interactions between faculty at UW and FHCRC. Graduate Student Advisory Committee work, teaching, recruiting events and organization of the Program all augment personal interactions between faculty at the two institutions. This is a considerable side benefit of the Program. In addition, some students catalyze the exchange between institutions. For example, two MCB graduate students in the Stoddard laboratory at FHCRC have been interacting closely with the Monnat laboratory at UW, under essentially joint mentorship from the two PIs. In addition, pre-existing research interest groups, such as the Seattle Area Yeast Group, the Translation Group, the Backbone Club, and biological structure

groups have been invigorated by the increased interactions between the institutions. It is noticeable that inter-institutional research groups seem to be most successful for developmental and structural biologists and it is a hope for the future that interest groups in areas of molecular and cellular biology will also become established.

MCB has also helped the coordination of FHCRC training grants with UW training grants. For example, training grant applications are synchronized where possible and ranking of applicants by a single committee can be used to identify recipients of both FHCRC and UW training grant positions.

III. Additional MCB Degree Programs

A. Masters program

The MCB Program offers a Masters degree for students who wish to leave the program early, or at the recommendation of their supervisory committee. No students are admitted with the goal of pursuing a Masters from the MCB Program.

B. Concurrent MCB Ph.D., Epidemiology MS

Jonathan Cooper, Co-Director from the FHCRC, identified Epidemiology as a program that offered a Masters degree that might be suitable for a concurrent degree. The basis for this idea was the fact that several faculty in the MCB Program pursue research at the fringes of molecular and population biology, for example, studying human retrovirus evolution or identifying cancer predisposition genes. Students interested in laboratory research in these areas would benefit from a formal course in Epidemiology. With the assistance of Dr. Emily White (Graduate Program Advisor, Department of Epidemiology, School of Public Health) a four to five quarter program was developed suited to MCB Ph.D. students. Students are admitted into

the Epidemiology MS program on this accelerated track while in their first year with MCB. The studies for the Epidemiology MS are completed during the second, and possibly part of the third, year. During this time and for a further two years of laboratory research, students would typically be supported by a training grant ("Interdisciplinary Training in Cancer Research "; Dr. Leland Hartwell, PI) that is directed towards training interdisciplinary students (see Appendix C) for a short description of the concurrent degree in Epidemiology).

C. Joint MCB Ph.D., Masters of Management

Many MCB students wish to have access to courses and programs leading to non-academic careers. The proposal to the UW to authorize this joint degree is in Appendix C.

IV. Summary: Future Plans

a. The MCB Program has responded to the national need to help train doctoral students for non-academic as well as academic careers. This has involved creating a novel Biotechnology Externship Course, establishing a joint degree program in business management and a concurrent degree with epidemiology, and establishing informal ties with the Program in Entrepreneurship and Innovation. The MCB Program plans to continue to respond to this need to broaden the doctoral experience of its students by considering similar joint degrees, certificates, or courses in the future.

b. The MCB Program has doubled its size in the past few years and has now reached its steady-state cap of 100 students. There are over 160 faculty in the Program as well (see Appendix D for selected CVs). It is expected that future graduate student recruitment

will continue to focus on identifying excellent candidates who think creatively and independently. The MCB Program will continue its policy of not accepting anyone simply to reach a set quota. The MCB Program will also continue its policy of seeking students from diverse backgrounds.

From the perspective of most FHCRC MCB faculty, a modest increase in the number of students would be readily absorbed by the large number of laboratories that have space, resources, and projects for graduate students. However, the standards for entry should not be lowered in the expectation of increasing numbers. Rather, if the program continues to improve and outstanding graduates continue to apply, the size of the entering class may increase. At most universities, junior faculty fuel their new independent research careers with graduate students but the historical pattern at the FHCRC has been incremental growth of laboratories staffed only with postdoctoral fellows and technicians. There is little doubt that FHCRC junior faculty have suffered early in their careers due to the dearth of graduate students. Nonetheless, the FHCRC Basic Science and Human Biology Divisions have been successfully recruiting excellent Junior Faculty and these appointees have been obtaining MCB appointments since 1993. Thanks in large part to MCB, these faculty now have an improved chance of recruiting graduate students to their laboratories. To contrast: in 1985-87, 6 junior faculty started in Basic Sciences (Cooper, Miller, Meneely, Levis, Gallatin, StJohn), and none of these faculty had any students for 3 years. Cooper and Miller then had one student each. The development of the MCB Program has started to redress this problem but the number of students in the program relative to the number of laboratories that have space and resources for a student is still low. Junior faculty still commonly go several years before a

student joins the lab. These faculty have plenty of time to devote to research and students and are inexperienced but energetic and ambitious potential mentors. Therefore, further growth in the Program will be beneficial. There are no concerns that students will be unable to find laboratories with creative mentors and exciting projects.

c. Given the generous support of the MCB Program by the Graduate School, the School of Medicine, the College of Arts and Sciences and the FHCRC, no major space needs or changes in levels of support of the program are anticipated unless there is an expansion in the number of students.

V. Summary: Future Needs and Issues

a. Administrative interactions should be simplified as follows:

i. As noted in Section IIB, the MCB Program could benefit from improved communication (directly or indirectly) with the chairs of the Basic Sciences of the School of Medicine. These Chairs also commented upon this (see Question 10, Appendix N). The simplest solution would be to have the Chairs, rather than their delegates, serve as the MCB Steering Committee.

ii. As noted in Section IIB, the personnel functions for the MCB Program should be transferred from the School of Medicine to the Graduate School to be consistent with all other reporting activities of MCB.

iii. As described in Section IIB, the structure for sharing costs between the UW and FHCRC needs to be revisited and clarified as soon as possible.

b. The Co-Directors of MCB, some of the chairs of participating departments (see Question 6, Appendix N), and the faculty of the FHCRC (see above Section IV) feel the MCB Program should accept a larger class size. The mechanism to achieve this is unclear given that the Program has already reached its mandated enrollment size and is thus capped.

c. We propose that the University could benefit from considering interdisciplinary research space in which faculty from multiple departments and colleges interact and share resources. The present department-based organization seems relatively inflexible and unable to adapt to rapid changes and opportunities in scientific fields. In the absence of state funding, the University could be more creative and aggressive in seeking private or corporate funding.

d. The growth of interdisciplinary programs should continue to be monitored to reduce dilution of the niche occupied by the MCB Program. If too many small specialized programs are authorized, there may be too much overlap with the mission of the MCB Program.

e. Other programs and departments could benefit from making more use of FHCRC faculty. The signing of the Affiliation Agreement also marked the formalization of criteria for mentoring Departmental students with many departments deciding that FHCRC faculty should be Adjunct or Research, but not Affiliate, if they are to mentor Departmental students. Most FHCRC faculty did not request a switch to Adjunct or Research track since they are not based on campus, are not paid by the State to teach undergraduate or medical students, and do not feel it is appropriate to vote at faculty meetings on UW issues. The Affiliate track seems more appropriate since experience suggests that FHCRC

faculty do not resist graduate teaching and committee work related to teaching, but are not regular participants in faculty meetings or UW administrative committees. The bar to Affiliate faculty having access to Departmental students should be reconsidered, but generally has not impacted the MCB.