

REPORT OF THE DEPARTMENT OF GENETICS REVIEW COMMITTEE

June 19, 2000

Summary

The Genetics Department at the University of Washington has been among the best Genetics Departments in the world. The accomplishments of its faculty have brought great renown to the University of Washington and to the State of Washington. Many students trained by this department hold faculty positions at prestigious universities and are employed in biotechnology companies throughout the country. It is a jewel, but is quickly losing its luster due to sharply limited resources. Without an *immediate* infusion of resources, the University is in danger of losing one of its greatest assets. We hope to sound the alarm and suggest actions to reverse the decline.

The Review Process

The Review Committee consisted of three internal members: Stan McKnight, Department of Pharmacology, Lynn Riddiford, Department of Zoology, and Trisha Davis, Department of Biochemistry, and two external members: Jasper Rine, University of California at Berkeley and Mark Johnston, Washington University. We met with a majority of the members of the Department over a two day period including: the chair, 2 emeritus faculty, 4 senior faculty, 3 junior faculty, 5 joint faculty, 4 adjunct faculty, 2 research faculty, 5 research scientists, 3 postdoctoral fellows, 18 advanced graduate students and 11 first and second year graduate students. The internal committee members also met with the Chair Review Committee consisting of Raymond Huey and Elizabeth Van Volkenberg.

Department of Genetics in Y2K

It is rare that a department achieves the high level of camaraderie and participation found in the Department of Genetics. The Department started as a close-knit group of faculty working with Herschel Roman. These close interactions continue to this day and are fostered by the frequent interactions afforded by the weekly research reports and journal club that seem to be regularly attended by nearly all department members. These are uniformly highly valued by faculty and students and should be continued and nurtured. In addition to the collegiality of the Department, the level of intellectual pursuit is of the highest quality. Faculty and students cherish the intellectual stimulation, and certainly benefit from it.

While the collegial and intellectual environment of the Department is very special, the fragility of the situation was obvious to all of us on the Review Committee. The Department suffers from three fundamental and serious problems: 1) the faculty are dramatically underpaid (60% of the peer group identified by the University of Washington); 2) the space available for each faculty member (1200 square feet or less) is barely adequate and in desperate need of renovation; 3) the number of active regular faculty is decreasing to a level below that necessary to maintain 'critical mass' and fulfill the Department's teaching responsibilities. Although the teaching loads (45 hours per year) are not heavy by comparison to other departments in the College, they are twice that of peer departments, most of which are situated in medical schools. For all these reasons, the faculty are ripe for recruitment elsewhere. That they still remain can only be explained by the strong sense of identity in the Department. We are amazed there has been no attrition of the faculty, and that the Department has even been able to recruit a few new

faculty members under these conditions. We suspect this situation will not long continue. Indeed, morale is low and a few faculty mentioned that they are considering leaving. Because of the small size of the Department, the loss of Lee Hartwell to the Hutch, and the imminent retirements of Walt Fangman and Jon Gallant, the Department is in a particularly precarious position. Loss of only two of the current faculty would so weaken the Department that the College would virtually have to start from scratch to recover the glory of the Genetics Department.

There is a clear sense that the Department changes slowly. Issues are discussed thoroughly and carefully, and changes are made only after careful deliberation. While several faculty commented on the success they have at reaching consensus, it comes at a cost of slow change.

Steps to Ensure a Strong Future for the Genetics Department

Quick decisive action should be taken on several fronts to retain and develop the outstanding faculty the Department already has. First, their pay should become commensurate with their peer group. Pay raises could be implemented over several years, and could include some monies from the researcher's own grants, but action should be taken now, not put off to the next biennium. Waiting for the faculty to receive outside offers is a dangerous tactic, which could easily backfire and result in the ultimate demise of the Department. Second, the first and second floors of J-wing must be remodeled as soon as possible. Since this is unlikely to occur as quickly as necessary, simple renovations and repairs of the existing space should begin immediately. Reshuffling of the existing space so that the most active groups have the space they need is also required.

Retaining the current faculty is the first step toward rejuvenating the Genetics Department. The next steps are equally important and raise interrelated issues:

- 1) Appoint a new interim chair.
- 2) Hire an outside chair.
- 3) Hire 5-6 new faculty over the next 5 years.
- 4) Find creative solutions to house these new faculty until a new building can be built.
- 5) Work to ensure that Life Sciences I is built within 5 years and provide generously for Genetics in this new space.

A New Chair

The Department of Genetics needs new leadership. While the current chairman has done a good job of marshaling the Department's forces and extracting maximum return on its relatively meager resources, the Department needs to be reinvigorated. The Department of Genetics has been guided by essentially the same vision since its inception more than 30 years ago. The current chairman is a direct scientific descendant of the founder of the Department, as were all previous chairmen. It is clearly time for a new generation of leadership. The long and continuous line of internal succession has contributed to the sense among many people (both within and outside the UW) that the Department is resistant to change and somewhat insular.

We strongly recommend that the next chair be from outside the Department. It would be best if a chair could be recruited from outside the University. Bringing in a leader from outside the University sends the message that the University is committed to maintaining the excellence of the Genetics Department; tapping a person from within the University is more likely to be seen as continuing the *status quo*. In addition, a chair from the outside will be better able than

someone promoted to the position from within the University to aggressively take the Department in new directions, and make the Genetics Department the focal point for scientists working in this important area throughout the Seattle area. We acknowledge that recruiting a chair from outside the University will be challenging given the limited space and resources that seem likely to be available. However, we strongly believe that a department with the reputation of this one should be able to attract an outstanding chair who will bring substantial new resources (both material and intellectual) to the University.

Hiring of New Faculty

The Department has 10 regular faculty who actively participate in all aspects of the Department from governance to graduate student training to undergraduate training. Two of these (Fangman and Gallant) have announced they will retire next year. The loss of Lee Hartwell to the Hutchinson Cancer Center 5 years ago was also a significant loss to the Department. In the last ten years three outstanding joint faculty (Fields, Olson and King) have been hired. These appointments have strengthened ties with Medical Genetics and strengthened the Department overall. In addition, 4-5 adjunct faculty regularly participate in Departmental activities. The Department requires a significant commitment of time from the joint and adjunct faculty, but this seems appropriate to maintain the high quality of intellectual activity in the Department. While these outside faculty certainly strengthen the Department, they cannot replace the core faculty. A department is defined by its core faculty, who do most of the work and form the nucleus that attracts outside faculty, students, and postdoctoral fellows. By next year, with only 8 core faculty remaining, the Department could easily slip below a critical mass.

The hiring of 5-6 new faculty over the next 5 years is justified at every level. The new junior faculty would provide a needed increase in breadth of the Department. They would enhance the graduate program by providing additional advisors and new foci of study for the graduate students, which would result in enhanced graduate student recruitment. New faculty are also required to maintain the undergraduate program. As discussed below, 6 of the 15 undergraduate courses are taught by temporary staff. The addition of 6 new faculty would mean that all the undergraduate teaching would be done by regular faculty active in research. Note that three new faculty are required just to replace Lee Hartwell, Walt Fangman and Jon Gallant. The external reviewers stated that a standard competitive recruitment package for a top junior faculty member is \$60,000-\$70,000 per year salary, \$250,000 in set up funds (more if specialized equipment is required) and 1200 square feet of space.

Solving the Space Problem

New faculty and a new chair require new space. Currently, the Department occupies all of the first floor of J-wing and two-thirds of the second floor of J-wing. One-third of the second floor of J-wing is controlled by Medical Genetics. Consolidation of the space held by emeritus faculty might provide the space for one junior faculty member, (although the space would have to be remodeled). Thus, a new building is required to provide the space needed for a healthy Department. The decision not to fund Life Sciences I was a major setback for the Department, and a severe blow to its morale. Everyone, from the first year graduate students to the senior faculty, commented on the severity of this loss. Genetics cannot wait ten years for a new building to hire new faculty or hire a new chair. It will be too late. Creative short term solutions must be found, which likely will require contributions from the Medical School. The faculty members themselves should be enlisted to discuss possibilities.

The Graduate Program

The Genetics Department has run an extremely successful Doctoral Program and has maintained a continuously funded predoctoral training grant that was recently renewed and is entering its 22nd year. Many graduates from this program now hold tenured positions at major universities including Harvard, Stanford, Wisconsin, and Yale and 2 of their Ph.D. students were recently elected to the National Academy of Sciences. The Department does not admit students who are only interested in a Master's degree but a Master's Degree has been an option for students who decide not to continue towards a Ph.D. and have satisfied the appropriate course requirements and research objectives.

While recognizing the past glory of the Genetics Ph.D. program, the Review Committee focused most of our attention on the current state and the outlook for the future. It is our view that the graduate program has declined slightly in several ways although this has not been precipitous. However, the outlook is for further and more rapid decline unless remedial measures are initiated rather quickly.

Recruitment of Genetics graduate students

The Department has relied on its strong reputation to speak for itself and continues to receive around 100 applications each year to fill a class of 5-8. This year 20 offers were made and the Department has 6 acceptances from students that will start next year. This is a very reasonable record and the overall quality of those students that come to the program is still very high although the consensus was that they are not the outstanding students that were once attracted to the Department. This may partly be due to the fact that research activity in the field of genetics has expanded significantly in recent years and the Department no longer plays the central role in genetic research at the University that it once did. In addition, many students are now searching for broader graduate programs with more choices and flexibility and turn either to other schools or to our interdisciplinary programs such as the Molecular and Cellular Biology Graduate Program.

The Genetics Department has been slow to respond to the changing needs of incoming students for a more comprehensive and flexible program. Thought should be given to expanding the Genetics graduate program to include faculty in other departments that would make appropriate mentors and bring in areas of genetics research not currently represented. These adjunct faculty should be invited to attend retreats, journal clubs, research reports, and teach in the curriculum as appropriate for their expertise and other commitments. New tenure track appointments in Genetics are also essential as discussed elsewhere if the Department is to continue to offer reasonable choices to incoming students. A major problem at the moment is the rather small number of regular faculty who are actively training students and the consequent overcrowding of these few labs with most of the students. Students being recruited will quickly realize that their options for labs to work in are quite limited and this will encourage them to look elsewhere.

Training Environment

The Department has always fostered a very strong training program for its students. Both faculty and student participation in research report meetings and journal clubs is legendary and demonstrates the strong commitment that faculty have towards their students. Many of the students we talked with mentioned this intense nurturing environment as one of the strongest assets of the program. However, serious problems have been noted in the past in terms of the

lack of timely graduation and the limited publications of some Genetics Ph.D. graduates. The Department is addressing some of these concerns by changing general exam requirements and attempting to get graduate classes finished sooner in a student's career. The Department should also adopt a proactive stance towards publications and emphasize the importance of timely publication of a graduate student's work. The issue of TA appointments also needs to be reexamined and every effort should be made to have students complete all course and TA requirement by the end of their second year.

Interaction with other Degree Programs

The Genetics Department has historically adopted a somewhat insular attitude towards their graduate program but has recently chosen to participate fully in emerging multi-disciplinary programs such as the MCB program. Further efforts need to be made to insure that the current MCB graduate students feel completely integrated into the Department's graduate student community.

With additional faculty, the Genetics Department could serve as a strong core for a broader Genetics Training Program encompassing research in human, mouse, and fish genetics that is developing outside of the primary Genetics faculty.

Training grant for predoctoral students

The recent review of the predoctoral training program in genetics (Nov. 1998) notes serious concerns about publication rate, time in the program, and the modest quality of the students and has decreased the training slots to 16. If the Department does not address these issues and improve the strength of their program this long-standing training grant is in jeopardy. Increased competitiveness for a slot on this training grant would help to ensure that the best students are being supported. The Department should consider making positions on the Genetics Training Program competitive and open to all students that are training with faculty in Genetics. This would allow MCB students to participate and also stimulate incoming Genetics students to realize that competing for grant funding is a way of life in academic research. Such a move is likely to increase the chances of continued success for the training grant.

Summary

As mentioned at the beginning, we have focused on issues where the Genetics Department needs to strengthen its graduate program to regain the lead that it once enjoyed as one of the finest Genetics Departments in the country. Overall, the graduate program is still very healthy and is successfully training students that are going on to postdoctoral training and jobs in either academics or biotechnology. We strongly recommend the continuation of the Genetics Graduate Program and are confident that with proper resources and leadership, the Department of Genetics will continue to train the exceptional graduate students for whom they are renowned.

The Undergraduate Program

An understanding of basic genetics is central to the biological sciences, and required for an educated public that can deal with the many applications of the genetic revolution to human health, and agriculture. Although the Genetics Department does not have an undergraduate major, they play an extremely important role in the education of Biology, Zoology, and Botany majors in the College of Arts and Sciences. They provide one-quarter of core genetics in the introductory biology series (Biology 201), a required introductory genetics course (Genetics 371

or 372) for these majors, a 300 level human genetics course, and several 400 level courses. Nine of the 12 regular Genetics faculty members (not including the joint appointees), routinely participate in this teaching; the only ones not teaching are the Chair and senior faculty nearing retirement.

With increasing numbers of majors in the biological sciences, the Department's undergraduate teaching load has nearly tripled over the past 10 years. Genetics faculty teach 2 of the 4 quarters of introductory Biology 201. The main introductory genetics course, Genetics 371, is now offered five times a year to about 150 to 200 students, but only involves one regular faculty member. Gene Function, Genetics 372, is taught twice a year by regular faculty, one of whom is retiring. The increased teaching load has been met by using temporary faculty, primarily postdoctoral fellows in the Department, most of whom teach the course only once. While this provides a good teaching experience for the postdoctoral fellows, we agree with the Genetics faculty that these fundamental courses should be taught by regular faculty members. Our recommendation for hiring of 6 new junior tenure-track faculty should alleviate this situation if each were expected to be involved in one of these key courses.

Currently there is only one undergraduate laboratory course in microbial genetics, taught in collaboration with the Department of Microbiology, which has space for such a laboratory. Some faculty feel that a lab with their introductory genetics course is important. A faculty member, laboratory space and one support staff would be necessary for such an addition.

One concern for the Biology Program is that none of the Genetics faculty teaches in the 100 level courses that serve as general introduction to biological sciences for the nonscience major. Considering the increased need for an understanding of genetic principles by the general public, input into this level of teaching from the Genetics Department would be beneficial to undergraduate education, but is not possible until the Department becomes substantially larger.

The Future of Genetics

The historical strength of the Genetics Department has been a focus on function driven discovery in genetically tractable model organisms, from phage and fungi in the beginning to worms, flies and mice more recently. Looking back, this was clearly a great idea and one that distinguished this department from its inception until the mid 80's.

However, with respect to outside competition from other campuses and departments, the Genetics Department is becoming a victim of its own success. As others have adopted this focus, the uniqueness of the Genetics Department's research focus has evaporated, although the uniqueness of its training program remains. There are a variety of ways in which the future of this department can move to regain its position of preeminence. We suggest some possibilities below which vary from conservative modifications to more radical departures from the Department's current mode. The important thing is that the Department look to the future in creating a new niche for themselves in the genomics and beyond era. All such suggestions require new faculty and new space as discussed above.

1. Increase the scale of its historic approach:

The world of model organism genetics has expanded greatly and is now well established at other institutions where the labs pursuing these lines of research are large, and well funded. The Genetics Department can continue along these routes if it can find ways of increasing the size of the labs and increasing the pool of graduate students to populate these labs. In addition, important model organisms like Arabidopsis and zebra fish are not represented in the

Department, and the Department's ability to expand into mouse genetics as that organism's genome sequence becomes completed is compromised by the lack of clearly definable space under control of the Genetics Department for housing mice. Somatic cell genetics is not represented in the Department and is becoming an important area in genetics. Although there is a microbiology department at UW, and there is one strong faculty member in the Department that uses bacterial genetics to study membrane protein topology, the rapid proliferation of microbial genome sequences has opened many opportunities for an invigorated approach to bacterial genetics.

2. *Focus on the genetics of natural variation:*

The Department has pioneered one approach to genetics that has become the orthodox approach, so the Department could once again consider pioneering a new approach to genetics and once again become the leader. As one example, the model organism approach relies on the ability to have homogeneous genetic backgrounds against which mutations are isolated that define the function of genes. However, in most species on earth, the differences between individuals of the same species reflect the admixture of many differences in a variety of genes. To harvest the genetic lessons available in the majority of species will require developing new approaches to dissecting complex phenotypes into simpler ones. In previous years, this concept was simply too technically daunting to be considered seriously. However, the advances in genome sequences and ancillary genotyping technology make this field now ready for development. In fact, the situation is not that conceptually different from the conditions at the time that Roman established the Genetics Department.

3. *Create a new focus in human genetics:*

Traditionally, the focus on human genetics has been on the underlying basis of inherited disease, as reflected in the present interests of the medical geneticists in the medical school. However, the pending completion of the human genome sequence and ancillary technologies has opened the door to the study of all human variation, and not just that associated with frank disease. This focus could cover the range of human phenotype from psychological differences between people, to variation in the response to drugs, to studies of the population structure of humanity and its evolution. Such a focus would be unique in academia, provide a logical link with other activities in the medical school, with the possibility of associated resources, and with other campus departments. Medical Genetics could be part of this new vision, taking care that the addition of medical geneticists does not cause an expansion beyond that size at which a department can efficiently function as a department with a strong training program.

4. *Develop a closer link to Molecular Biotechnology:*

Looking back over the last 20 years, the major advances in genetics were fueled by advances in molecular technology, such as the development of molecular cloning, the polymerase chain reaction, automated sequencers, and mass spectrometers. It logically follows that a department or administrative structure that more closely linked these activities would have astounding potential. The University should explore quickly whether the absence of leadership in the Molecular Biotechnology Department, and the need for new leadership in Genetics provides a combined recruiting opportunity that is stronger than that offered by either alone. The administrative hurdles associated with a unit derived from two colleges can be surmounted, as it has been at other campuses such as UC Berkeley and U. Wisconsin. Although the purview of

Molecular Biotechnology justifiably extends beyond an interface with Genetics, that particular interface may offer the greatest synergy over the next decade. Care would have to be taken to ensure that such an alliance does not limit the range of areas represented in Molecular Biotechnology.

Why Rejuvenate Genetics?

Why should the University pursue aggressive measures to propel the Genetics Department through this transition time into the future? First, excellence in departments is much easier to maintain than to attain from scratch. The Department of Genetics trains outstanding geneticists, has the strong participation of outstanding faculty, and has the magical component of a successful, cohesive, working department. Rejuvenate now and that can all be kept and expanded. Merely the desire to promote excellence is sufficient reason, but the payoff is much larger. We face the dawn of the post-genomic era. The DNA sequence of the genomes of yeast, flies, worms, and many pathogenic bacteria are completed; the sequence of the human genome will be finished soon. The opportunity represented by this vast new information is fueling a scientific revolution. A rejuvenated Genetics Department will be positioned to lead this revolution, bringing new intellectual and financial resources to the University and the State that far outstrip those required for its rejuvenation.