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INTRODUCTION AND OVERVIEW

The Department of Biological Structure traces its beginnings to the Anatomy Department that predates formation of the School of Medicine just after World War II. Dr. Stan Bennett was the chair of Anatomy in the 1940s and early 1950s, and he had an expansive view of what constitutes the discipline of anatomy. He added cell biologists, biophysicists, and biochemists to the faculty in the areas of X-ray crystallography, radiolabeling, freeze fracture and electron microscopy at a time when it was unclear how these techniques would be useful in the biological sciences. He also added faculty in research areas such a developmental and reproductive biology. As more faculty were added with research areas outside those normally associated with anatomy, the department's name was changed to Biological Structure to reflect the range of biological interests of its faculty.

The Department's academic program consists of the normal mix of research and teaching found in basic science departments within a medical school environment. The Department has continued to develop research areas in cellular, molecular, developmental, structural and neurobiology, vision, and structural informatics and currently the faculty consists of 33 regular, research, joint, and adjunct members. The Department is responsible for teaching anatomy, embryology, histology and neuroanatomy for students in the Medical, Dental and Nursing Schools, as well as for undergraduate anatomy courses for pre-professional students. The research programs in the Department are funded by a mix of externally funded grants (annual research funds: $5,372,877 (2004), $5,731,232 (2005), $4,498,112 (2006)).

For many years, the Department's graduate program has concentrated on training Ph.D. students in the various research fields of its faculty. Approximately six years ago, the Department began recruiting students into its laboratories and its graduate program solely through the interdisciplinary programs. The reasons for doing this are described in more detail below, but the experiment has proven efficient and effective. Currently there are 25 graduate students with Biological Structure faculty as their Ph.D. supervisors. Of these, 10 are associated with interdisciplinary programs and will receive their degrees from the Department. The other students will receive their degrees from other departments or interdisciplinary programs. The interdisciplinary programs are very effective in attracting

students to the University of Washington, and we believe they provide viable and effective access to high-quality graduate students for our faculty.

Section A: General Self-evaluation

1. What are your unit's strengths? In what ways is your unit a leader in your field?

Ph.D. education in the Department of Biological Structure emphasizes multidisciplinary approaches to the relationships between structure and function at the molecular, cellular, tissue and organismic levels of biology. The program seeks to prepare students for professional careers in research and scholarship in the biological sciences and emphasizes modern technology necessary for solving fundamental problems in the basic biological sciences. The Department of Biological Structure is responsible for basic science research and education in the structure-based disciplines of developmental biology, neurobiology, vision, and informatics. It is also responsible for teaching anatomy, embryology, histology, and neuroanatomy to medical, dental, nursing and other students in a variety of clinical areas in Health Sciences Departments and Programs within the Health Sciences divisions of the University.

Several faculty who teach human anatomy, embryology, histology and neuroanatomy courses have repeatedly won teaching awards over the past 35 years from the Medical and Dental Schools and University. The Department has one of the strongest teaching programs throughout the WWAMI regional medical education program and the entire country. The student contact hours at the level of the professional schools are among the highest in the basic science department at the University.

The research programs within the Department are productive. Faculty with strong research programs in immunology, development biology, neurosciences, cell signaling, vision, structural biology and informatics are very competitive for external funding. Research and education in the pre- and post-doctoral programs is state-of-the-art using technologies that include X-ray diffraction, light, electron and confocal microscopy and various imaging modalities. Model systems include *C. elegans*, zebra fish, cell culture, selected rodent models, felines and primates.

The Department has recruited three new faculty members since the beginning of 2003: Rachel Wong, Ph.D. from Washington University in St Louis, MO, is an international leader in the field of life-cell, 3-D real time imaging using confocal microscopy and her standing in the field of neurobiology and vision ensure that the Department's and the School's

research in vision remain internationally recognized. Anitha Pasupathy, Ph.D. joins the Department from M.I.T. in Cambridge, MA where she was a Research Fellow in one of the strongest programs in cognitive neuroscience in the world. She has a joint appointment with the Northwest Regional Primate Research Center. Weiqing Li, Ph.D., Harvard University, Cambridge, Massachusetts is from an internationally known program in *C. elegans* and she strengthens our research programs in vision sciences, developmental biology, neurobiology and cellular genetics.

In additional to the recent success in faculty recruitment, further evidence of the Department's standing is provided by our obtaining two renovation and equipment grants with matching funds of nearly $9 million. The Department received an award of $500,000 for a state-of-the-art confocal microscope which will add to the combined research capability of the Department and its collaborations with researchers in Ophthalmology, Otolaryngology, Bioengineering, Physiology and Biophysics, Biochemistry, Genome Sciences, and Biology.

Also, a grant from the NIH allows renovation of the departmental research laboratories in the Health Sciences Building and addition of approximately five new research laboratories. Over the past 5-10 years, several departments here have obtained such grants, but usually on their second submission. When our turn came (only one proposal per institution per year was allowed), we obtained the funds with our first proposal. Given the tight funding climate, we were most fortunate to obtain this grant that will add approximately 6,000 sq ft of new wet laboratory and update approximately 10,000 sq ft of wet laboratory. Construction will start in the spring of 2007, with a completion date sometime in early 2009. Modern, updated research space will be necessary to attract the strongest faculty and pre- and post-doctoral trainees.

The Department's standing as a "leader in its field" is well established as a result of its strong multidisciplinary commitments to many of the most important areas of biological research in neurobiology and vision, developmental biology, molecular structure and structural informatics. It is unusual that very strong basic science research programs are coupled with such strength in human biology teaching in one department. This creates some special problems and opportunities that need to be addressed in a revised curriculum as described below.

While human anatomy, embryology and histology are the basis for much of clinical medicine, they are not major research areas for modern biomedical scientists. There is an enormous demand for qualified educators in structural biology, but resources for educating potential faculty in these areas are extremely limited. The combined strengths of our multidisciplinary research and education programs and clinically relevant educational programs have generated a department of tremendous potential that needs to be realized in the face of limited space, funding and rewards for education. The current Departmental objectives include reorganization of the educational programs to accommodate our commitment to strong education of both research scientists and health sciences professionals. An important component of this plan is that the individual faculty, with their efforts focused on excellence in research and teaching, should be well recognized for their academic efforts, and thus bring credit to the Department.

2. How do you measure the success of your unit as a whole? What teaching, research and service performance criteria are typical in your field? Which units nationally do you consider to be your peers along these dimensions?

Success of the educational program is measured through the excellence in teaching programs and the productivity of pre-doctoral trainees. Overall, research success is measured by international recognition of research productivity which includes publications, invited lectures, honors, and funding.

For pre-doctoral students in particular, grades and laboratory rotations are evaluated in year 1 of their program. The General Examination is expected in year 2 and is a good measure of progress. Progress on a thesis project is evaluated by the thesis committee in years 3 and 4. The student's thesis committee also monitors awards, recognition and other honors when appropriate. The committee recommends additional coursework, new laboratory skills, publication of scientific reports and other skills (e.g. writing, new techniques or language) as needed. Abstracts and presentations at national and international meetings, publications, and competitive funding are also important measures of progress for students.

The success of individual faculty members is most often represented by their contributions in teaching and research and is the example that most students can and will follow to prepare for their professional career. Teaching awards, research grants, papers in top-line journals, and promotions provide hard evidence for that success.

3. What are your unit's weaknesses? No unit is perfect. Where could yours most use improvement? What challenges or obstacles make it difficult for you to overcome these weaknesses? What further challenges do you foresee in the coming years?

A strong Departmental community is needed to integrate students in the multidisciplinary areas of research and teaching. This will be a difficult challenge for the next two years during renovation of the Departmental space. The current proposals for improvement in this area are: schedule regular seminars for trainees, schedule participation in a Departmental retreat, have better integration of teaching and research activities in the multidisciplinary directions of the scientific interests in the Department.

The Department needs to attract underrepresented minorities. Because we recruits through the interdepartmental programs, special programs for underrepresented minorities are implemented through these programs. While the number of female faculty is 11 out of 33 (including adjunct faculty, see Appendix D) and the number of female pre- and post-doctoral trainees is 16 out of 40, further efforts are needed to increase opportunities for women in the Department. Similarly, the record on underrepresented minorities needs to be improved.

A major weakness in the Department is the need for faculty commitment to building a strong community for our research and education programs. The problem is not unique to this Department, and it reflects the poor funding climate and the need to dedicate so much effort to development of resources for our teaching and research missions. The source of new resources to address these weaknesses is uncertain.

4. What changes have occurred in teaching, research and service in your field over the past decade that have influenced your conception of the unit's role?

Over the past 10 years, we have found it increasingly difficult to obtain adequate resources to support our teaching programs. Funds are limited for teaching, as are rewards for achievement in this aspect of academic life. A consequence of this is that the faculty's commitment to their teaching is eroding. Rewards and resources are more available for their research programs, so they are shifting their efforts in that direction.

At the same time, increasing demand for and the limited availability of skilled educators in Anatomy and Embryology is a major challenge for all medical schools. It is difficult to find junior faculty who have the expertise to teach in the major medical programs and are capable of developing strong research programs. This promises to be a continuing problem for some time. Funding pressures and promotion policies that

emphasize research productivity limit the opportunities for individuals dedicated to traditional teaching in human biology. Curriculum reform within the Medical School that could help with this problem is offset by an increasing demand for Anatomy to respond to the increasing need for health care workers. Unfortunately, the addition of instructors to concentrate on anatomy, embryology, histology and neuroanatomy is of limited success because of the cost and the inequity in the status of the faculty who are not competitive for advancement and promotion. New approaches in histology that reduce the need for laboratory contact time have helped in those courses. Fortunately, at the current time, the neuro-anatomy courses are adequately staffed by neuroscientists in the Department.

The need for instructors in the anatomical sciences might be an issue that the Department could address through a special educator pathway in our graduate program. This would be in addition to the research efforts of our students, so funding to support them while they were developing their teaching skills would need to be available.

Advances in educational technology and the associated changes in the learning modes of our students will affect our teaching activities over the next 10-20 years. The Department is increasing efforts to use web-based programs in education to improve the efficiency of our teaching. However, it is not yet clear that technological advances are more effective in education than low student:faculty ratios. We anticipate that efforts by faculty and staff to generate web-based educational resources modules will continue, but major improvements in education will be limited by the available resources and by faculty enthusiasm.

As at other institutions, there is considerable emphasis on interdisciplinary studies that address major biomedical problems. The faculty and Department are associated with all of the interdisciplinary graduate programs and training grants within the Health Sciences. As mentioned above, (and described below), the Department revised its graduate student recruitment activities to benefit from recruitment through interdisciplinary programs. Further benefits of interdisciplinary programs can be expected to grow over the next 10 years with the continued emphasis on multidisciplinary science to address modern medical needs.

This will affect Departmental decisions in a number of ways. One of these is that promotion pathways and criteria might need adjustment as faculty become more committed to interdisciplinary programs. Also, as the basic sciences consider international

needs in biomedical problems related to development, neurobiology, vision, structural biology, broader views and definitions of faculty achievement might become necessary.

Expanding our multidisciplinary efforts will also affect the areas in which we hire new faculty. New research areas the Department may want to add include 3-D real time life cell imaging, stem cell research, structural informatics, and structural studies of signaling molecules.

5. Do you observe differences between your view of your role and college and university expectations of your unit? If so, what are these? Do you see any ways to resolve these differences?

As mentioned before, the overlap between the responsibilities in the health sciences education and Departmental research programs is minimal as it is in many basic science programs. The increasing demand for education in the structural sciences is recognized in the School of Medicine but the impact of the teaching load on research productivity is not. It is clear that faculty who concentrate their efforts on teaching activities have a difficult time in obtaining promotions and improving their salaries which are heavily dependent upon external funding. Appreciation for teaching activities is increasing, but strong research continues to be a very important factor for progressing in an academic career at the UW.

6. Describe faculty participation in the process of unit governance, self-study, and strategic planning. How do your faculty participate in governance and strategic planning?

Faculty are involved in most of the major decisions and planning for the Department. Faculty participation occurs in faculty meetings, committees and through one-on-one meetings with the chair. The Department has standing committees for FTE planning, for education and for research planning. Currently, the space and renovation committee is the most active and meets in part or in total nearly every week to address planning needs of the Departmental renovation which will begin in the spring of 2007. Another example is the Education Committee, a large committee involving all faculty members interested in how the Department will deal with its teaching duties. The FTE Planning Committee considers strategic needs and new hires in the Department. Subcommittees include the Faculty Development Committee to review the progress of individual faculty annually, selected mentoring committees, and committees to recruit new faculty. Time and effort

spent in committee and faculty meetings is kept to a minimum so faculty can concentrate on their individual research and education programs.

7. Is mentoring junior faculty identified as a priority? Outline your unit's approach to mentoring junior faculty, graduate students, undergraduate students.

Mentoring junior faculty is a high priority for the faculty in Biological Structure. Each year, a Faculty Development Committee is formed, usually made up of three full professors. They review an annual report filled out by each faculty member, as well as their curriculum vitae. At a subsequent faculty meeting, consistent with procedures in the faculty handbook, the record of each faculty member is reviewed by those senior in rank. The main issue addressed in these reviews is whether the faculty member is making appropriate progress with their research and teaching to ensure their promotion within the required timeline. Points that need more attention and effort to produce a good case for promotion are discussed, and suggestions are made to the chair for further discussion with the junior faculty member. After that meeting, the chair meets with the faculty members to discuss their evaluations and work out ways to address any points needing improvement. In particular cases, small ad hoc mentoring committees might be formed to help provide concentrated guidance for the junior faculty member in a more intensive way.

While the Department mentoring for junior faculty is well organized, mentoring of post-doctoral fellows and graduate students is an informal process organized largely by the research supervisor. In the office of Research for the Medical School, an administrator for predoctoral trainees was recently appointed, so this issue is one that the School is aware of. There are School and University-wide seminars and programs aimed at mentoring of graduate students, but the Department has no specific activity addressing this issue.

Section B: Teaching

1. For each faculty member in your department, please list: number of courses taught per year, number of credits taught, and total student credit hours. Numbers may be approximate and should illustrate a typical year.

Core Faculty	Course	quarter	credits	# students	student credit hours
Baskin	NONE	---	---	---	---
Brinkley	CSE590 MEBI534	Autumn Autumn	1-3 3	3 6	9 18

Broderson	BSTR 431 BSTR512/541 CONJ480 HUBIO511/BSTR530	Winter Autumn Winter Autumn	2 4 5 13	55 55 33 165	110 220 165 2145
Byers	NONE	---	---	---	---
Clark	HUBIO511/BSTR530	Autumn	13	165	2145
Cook	NONE	---	---	---	---
Dacey	HUBIO 532	Spring	8	100	800
Fan	NONE	---	---	---	---
Farr	HBIO510 HUBIO553	Autumn Winter	6 4	105 174	630 696
Graney	HUBIO553	Winter	4	174	696
Hol	BIOC405 BIOC530 BSTR520 BSTR521 BSTR557 BSTR591	Autumn Autumn Winter odd yrs Winter even yrs Autumn, Winter, Spring Autumn, Winter, Spring	3 3 3 4 1 2	516 37 13 3 2 1	1548 111 39 12 2 2
Li	NONE	---	---	---	---
Muller	HBIO510	Autumn	6	105	630
Mulligan	BSTR580 CONJ480 HUBIO 511 HUBIO 532 HUBIO 532 (WWAMI-MSU) NBIOL NURS301	Autumn Winter Autumn Spring Spring Autumn Autumn	1-7 5 13 8 8 3 3	3 33 165 100 20 46 96	21 165 2145 800 160 138 288
Pasupathy	NONE	---	---	---	---
Pittack	BSTR301 BSTR 431 HUBIO510 HUBIO 511 NURS301	Spring Winter Autumn Autumn Autumn	4 2 6 13 3	380 55 105 165 96	1520 110 630 2145 288
Raible	CONJ 542 HUBIO532	Winter Spring	1.5 8	16 100	24 800
Reh	BSTR584 NEUBEH 510 NEUBEH 526	Autumn Autumn, Winter Autumn, Winter	2 .5 4	1 35 17	2 17.5 68
Reuveni	NONE	---	---	---	---
Robinson	BSTR 431 HUBIO 532 NBIO 401 NEUBEH 502	Winter Spring Autumn Winter	2 8 3 4	55 100 46 27	110 800 138 108
Roelink	BSTR 531	Autumn	2	5	10

	BSTR 584 CONJ542 MCB514	Autumn, Winter, Spring Winter Autumn	1 1.5 2	1 16 28	1 24 56
Sherk	NEUBEH 502	Winter	4	27	108
Stenkamp	BSTR 515 BMSD 541	Winter Winter	3 2	14 15	42 30
Verlinde	NONE	---	---	---	---
Wong	NONE	---	---	---	---
Xu	BMSD540 B STR515 BSTR521 CONJ 524 MEBI534	 Winter Winter even yrs Winter Autumn	.5 3 4 1.5 3	30 14 3 11 6	15 42 12 16.5 18

Note: Many of these courses are team taught.

2. How are teaching responsibilities allocated?

Teaching assignments are defined by the chairman. This approach has worked well. Several faculty who are heavily involved with the Human Biology teaching programs have little or no research responsibilities. Two senior lecturers are educators only. Other faculty have taken on more educational responsibilities as their research programs decreased. Faculty with strong research programs have minimal involvement in the human biology teaching. In most instances, faculty with strong research programs have limited ability to teach in the large service courses but are strong supervisors for Ph.D. education.

An added complication with respect to health sciences education is the faculty who have major research commitments and teaching duties in the large courses. In general, the Department of Biological Structure recognizes teaching assignments in the interdisciplinary programs as equivalent to teaching assignments in Departmental programs.

3. Other than classroom teaching, how are faculty involved in undergraduate student learning and development

The Department does not offer an undergraduate degree, but our faculty participate in and run a number of undergraduate courses in anatomy and neurobiology and participate in courses in chemistry, bioengineering, computer sciences and biology. Adjunct and joint appointments often provide opportunities for interacting with undergraduates in other programs. There are numerous opportunities for undergraduates to participate in research

laboratories and the Department often has 10 to 15 undergraduate students working in the research laboratories. The University offers funding to support undergraduate research.

4. How do faculty involve undergraduate students in research and scholarship?

During the past year, faculty members have provided research opportunities in their labs for 24 undergraduate students. Undergraduate research is strongly encouraged at the University, consistent with its role as a major research institution. Our faculty make use of various advising mechanisms provided by the University to make their research projects and interests known to potential undergraduate researchers. The University encourages undergraduate research with stipends and small awards for supplies.

5. How does the department evaluate the instructional effectiveness of faculty?

Teaching evaluations are required for promotion. Teaching evaluations of the major courses are conducted by the office of Medical Education and Biomedical Informatics. Small courses can request evaluation through the Office of Educational Assessment. Seminar courses often survey students and/or request peer review by departmental faculty. Issues requiring attention are dealt with largely via discussions between the chair and the concerned faculty.

6. Please summarize the data you collect, possibly using OEA or CIDR, to evaluate the impact of your teaching on student learning.

The major teaching load is in the Medical and Dental Schools which evaluate teaching through the Department of Bioinformatics and Medical Education. Monthly meetings of the Curriculum Committees review the performance of each course and plan revisions in the curriculum to improve the teaching programs. For example, during the past five years Anatomy and Embryology for medical and dental students has been condensed into a six week course emphasizing laboratory dissection and small group learning. A separate course in human embryology was established. In neurobiology, molecular mechanisms were introduced.

7. What procedures, such as mentoring junior faculty, does the department use to help faculty improve undergraduate teaching and learning? What training and support is provided to TAs to help them be effective in their instructional role?

As required by the School of Medicine, all Assistant Professors are reviewed annually by the Faculty Development Committee. Mentoring groups are established to assist new faculty to understand the responsibilities and activities necessary for advancement and

promotion. Senior faculty are reviewed every three years. Only the undergraduate course has a single TA who is mentored by the course director, Dr. Catrin Pittack. Teaching is a requirement for all interdisciplinary programs and is an option for all students in all Ph.D. programs.

8. How does the unit track and promote innovations and best practices in undergraduate and graduate student learning?

The Department encourages its faculty to implement new approaches and techniques in their teaching. The driving force for this is a concern that students be given the best opportunities possible to learn the structural information covered in our courses. Three-dimensional structural information ranging from anatomy to molecular structures is difficult for students to master. Assessment of student learning is handled on a course-to-course basis, usually using midterm and final exams to monitor the students' progress. The Department becomes aware of effective innovations largely by word-of-mouth and informal discussions among its faculty.

Section C: Research and Productivity

1. How does your unit balance the pursuit of areas of scholarly interest by individual faculty with the goals and expectations of the department, school, college and University? How are decisions involving faculty promotion, salary and retention made?

One goal of the department is to facilitate and help the faculty achieve their individual career goals. This is done mainly through the chair's efforts to provide additional funding and time when the faculty request assistance for particular projects. Decisions about allocation of department resources in this way are made by the chair. Decisions about promotions are made by the entire faculty (see section A-7). The faculty provide only general guidelines and advice to the chair on salary and retention decisions, who then recommends salary or retention raises.

2. How are junior faculty members mentored in terms of research and creative productivity?

See section A-7.

3. What has been the impact of your research on your field and more broadly over the past five years?

This is a multidisciplinary Department and our achievements are generally through collaborative efforts with interdisciplinary research programs throughout the University and institutions outside the University.

4. In what ways have advances in your discipline, changing paradigms, changing funding patterns, new technologies, or other changes influenced research, scholarship, or creative activity in your unit?

As is the case for all modern, active biomedical science departments, the intellectual environment is constantly changing as advances are made in selecting and solving research problems. The tools available to us have drastically changed over the past 20 years. Confocal microscopy has revolutionized biological research at the cell and tissue levels. Advances in molecular structure analyses have provided detailed structural information in most, if not all, fields of biology and biological chemistry. Structural informatics is improving our ability to organize structural databases to identify patterns in structure and their molecular basis. Phenotype analysis can be combined with genomics, proteomics and microarrays to consider phenotype/genotype relationships. Hypothesis testing remains fundamental for the advancement of the biological sciences. Formulation of a hypothesis requires an understanding of the existing research on a subject and the technological methodologies appropriate for testing it. Given the technological potential to accumulate enormous amounts of experimental information, database management and analysis has become increasingly important. This is reflected in the current funding environment where it is increasingly difficult to obtain support for taxonomical or descriptive science. Systems biology provides an opportunity to integrate large databases in different disciplines to understand basic associations between biological structure and function. As evidenced by our strong, funded research groups, we continue to adjust to new technology and new scientific questions.

5. Some units are more heterogeneous than others. What variations exist among your faculty in terms of methodologies, paradigms, or subfield specializations? Are faculty offices all in the same building, or are they geographically dispersed? What strengths and weaknesses for the unit as a whole are generated by differences among its faculty? Do any of these differences generate obstacles to communication? If so, what strategies has the unit developed to promote communication between different constituencies, and how successful have these strategies been?

It is difficult to imagine a more heterogeneous Department than Biological Structure. Our faculty use a great range of methodologies to study organs, cells, and molecules. Histological approaches are still used in some labs, molecular biology techniques are found in use throughout the Department, different microscopies (light, confocal, electron) are used in different labs, and crystallographic methods are used by other groups. In addition, computational approaches vary across the labs. Some labs limit their use of computers mainly to word-processing and e-mail while other labs would be unable to pursue their scientific objectives without substantial use of computer graphics.

As large as the variation in methodologies is the variation in our backgrounds and approaches in posing and solving questions. Faculty backgrounds vary from physical chemistry to physical therapy. This is a challenge with respect to Departmental responsibilities, faculty expectations and policies on appointment and promotion. To date there have been few concerns with respect to salary because increases have been applied equally across all faculty levels.

Most of the faculty, maybe 80%, are located in contiguous wings of the Health Sciences building. A few, mainly members holding joint or adjunct appointments, are located elsewhere in the building or at hospitals in Seattle connected with the School. Renovation of the departmental space will permit more sharing of laboratory space among the faculty, and it should also lead to enhanced scientific collaboration as well.

The range of interests and backgrounds of the faculty affects our ability to talk about our science with one another. This has also led most of us to satisfy our need for faculty colleagues through joint or adjunct appointments in other departments. It has also contributed to our commitment to the interdisciplinary programs in the School and University.

New approaches to seminar organization are needed. The multidisciplinary nature of our research results in a broad variation in seminar interests. Over the years, the Department has tried various seminars, evening faculty talks, retreats, etc to enhance communication among the faculty. We've not been able to sustain these efforts, either due to a perception that the level of communication achieved is sufficient or due to conflicting demands on our time, i.e., grant proposals, research projects, etc. Given the development of a core group of development biologists who regularly talk and share ideas, the need for

special events to build faculty cohesiveness seems to have been reduced. We anticipate that future additions to the faculty will be made to build on this core.

6. What impediments to faculty productivity exist, and do you see ways of reducing these?

The greatest barrier to faculty productivity is that more and more administrative demands are made on individual faculty. Committee responsibilities take faculty away from students and laboratories. Paperwork necessary both for educational and research efforts has become overwhelming while the number of support staff has remained the same or decreased. Improvements in accounting services will help with some of this workload, but clearly the job specifications for faculty are going to have to change to reflect the increase in managerial duties. Administrative tasks take time away from teaching and research, and we need to continue to seek support for the faculty in allocating their time productively. Improvements are coming from the University in administering grants, so that should help. Also, the system for generating grant proposals runs fairly smoothly. The Department provides support staff for parts of that process that it appears other departments don't provide.

7. What steps has your unit taken to encourage and preserve productivity on the part of all segments of your staff? How are staff recognized and rewarded? What programs are in place to support professional development of staff?

The Department is fortunate in retaining experienced staff capable of dealing efficiently with the University's bureaucracy. We have provided as positive an environment for their efforts as possible. The major improvements in their jobs have come with increasing dependence on computing networks to aid in accounting and document control. No special programs are in place for recognizing and rewarding staff members. The faculty interact with the staff in collegial ways, and many make a point of thanking the staff for their efforts. There are no departmental programs for supporting staff development, but the Department has encouraged staff members to make use of University-wide programs to enhance their skills and capabilities.

Section D: In what ways do you collaborate with units at other institutions or at the University of Washington? What are the impacts of these collaborations?

Interdisciplinary approaches are the standard in modern biomedical science and education. The Department is fully committed to using whatever methods and techniques

are most effective for addressing its education and research goals. While we are responsible for and chair the anatomy, histology and neuroanatomy courses in the Medical School, staffing needs for those courses are such that additional instructors from other departments and programs are asked to help with the classes. This inter-departmental collaboration in teaching becomes inter-institutional through the WWAMI program. We collaborate with instructors at the non-Seattle sites elsewhere in Washington, Wyoming, Alaska, Montana and Idaho in this program, and occasionally our faculty give lectures at the remote sites. Additionally, some of the instructors at the remote sites have affiliate appointments in our Department which allow them access to the research resources available at the UW.

The Department is fully engaged with the interdisciplinary graduate programs. This is described more fully below in connection with our Ph.D. program.

Do members of your unit engage in or have opportunities to engage in interdisciplinary research? Do ties to other units or other kinds of interdisciplinary opportunities aid you in recruiting new faculty and graduate students? In what ways, if any, do they improve your graduate and undergraduate education?

The Department's faculty are committed to interdisciplinary research in many, many ways, as is necessary in today's research environment. They collaborate with researchers in other departments and fields both within the University and around the world. One of the greatest benefits of electronic communications via e-mail or the internet is the ease with which interdisciplinary collaborations can be organized and sustained. Virtually every faculty member in the Department is involved in interdisciplinary activities, and the Department promotes and supports these in every way possible.

It is unclear if interdisciplinary opportunities assist us in recruiting, since nearly every research institution needs to provide those capabilities. What is fairly certain is that without them, our ability to recruit students, and possibly faculty, would be considerably more difficult.

Interdisciplinary approaches are so much a part of modern scientific research and education that it's difficult to define how they improve our education programs. The increased emphasis on addressing biomedical questions with a full arsenal of experimental techniques and methods requires interdisciplinary approaches. This is an important component of graduate and undergraduate education. Our collaborations with researchers

using additional approaches enable us to pass that experience and outlook to our students.

Do you face impediments to developing interdisciplinary research or connections with other units? Expansion of interdisciplinary programs is an emerging issue. Describe your unit's relationships with other units and work with other units to plan future initiatives. How could the university aid you in strengthening such ties?

Biological Structure is a multidisciplinary Department and the faculty have no difficulty developing interdisciplinary connections. The problem for many faculty is limiting their research interests to focus on the most productive opportunities. We are fortunate in the Health Sciences that the departments recognize the need for interdisciplinary programs and work to encourage their faculty to participate in them. In Biological Structure, interdisciplinary teaching is encouraged and credited in the promotions process. Interdisciplinary studies are simply the way science is done now, and it is counterproductive to attempt to hinder developments in those programs.

With the large number of interdisciplinary programs available at this point, there are only a few new developments that the Department needs to support. One area where attempts are underway to create a new program is in developmental biology. Departmental faculty are involved in the planning for that initiative, and the Department is supportive of their efforts. It is not clear what more the University can do to strengthen the interdisciplinary programs other than to increase its financial support for them. Some of the programs have yet to become degree-granting units, and efforts to help them achieve that would be helpful.

There is an expectation of faculty participation in the governance of the Department, the College or School, and the /University. How do faculty members within your unit meet this expectation? How is participation in shared governance encouraged and valued?

Faculty from the Department participate in a number of committees and councils in the Department, the School and the University. We also participate in various admissions and selection committees for the interdisciplinary programs and training grants. Little is done to encourage this aspect of academic service, but it is not discouraged. Participation in many of the committees is left to the discretion of individual faculty members as they balance their interests in research, teaching and service.

Section E: Diversity

1. Describe for your unit the inclusion of underrepresented groups for students (by entering cohort), faculty (by rank) and staff.

We have no students or faculty from underrepresented groups (Hispanics, Native Americans, African Americans or Pacific Islanders). We have one African American post-doctoral fellow, one Filipino research associate, one Indonesian research associate, and one Filipino staff member.

2. Please provide data comparing the teaching loads and other duties of any members of underrepresented groups in your unit to others of comparable professorial rank.

Not applicable.

3. What steps, including outreach and recruitment, has your unit taken to ensure an environment that values diversity and supports all faculty, students and staff, including members of underrepresented groups? Have you been able to retain students and faculty from these groups once you have recruited them? What factors aid or impede your efforts to recruit and retain members of underrepresented groups? Is there anything the University can do to help you with recruitment and retention?

The Department welcomes all suitable candidates for faculty, staff or student positions, and we particularly encourage their candidacy in the case of members of underrepresented groups. Since the Department recruits students through the interdisciplinary programs, we depend on their efforts to recruit under represented minorities into our graduate programs. The Department's record in hiring and retaining women and non-caucasian faculty continues to be positive. We clearly provide an environment where people are welcomed and encouraged in their career development.

4. Does your unit work with the Graduate Opportunity Minority Achievement Program (GO-MAP) or Office of Minority Affairs (OMA) on student recruitment and retention? How is your unit involved in collaborative or university-wide efforts to increase the diversity of students and faculty?

Currently all students are recruited through the interdisciplinary programs.

5. Has the increased diversity of the student body and/or faculty in your department generated any changes in your curriculum? In your unit's academic culture or climate? If so, what are the impacts of these changes? Is there anything the University or College can do to help you with these efforts?

No major changes in the department culture or curriculum have come with diversification of the student body. The emphasis in our educational programs is to

provide experience in basic research, scholarship and education required for a successful professional career in the biological sciences. Currently, this means a very strong background in multidisciplinary science. Members of the Department are sensitive to diversity issues. We have regular educational sessions with the Ombudsman on diversity.

Section F: Degree Programs

1. Doctoral program.

a. Describe the objectives of your doctoral degree program(s) in terms of student learning and other relevant outcomes, as well as its benefits for the academic unit, the university, and region. Compare your objectives with those for programs at institutions you think of as peers.

The objective of our Ph.D. program is to provide an environment where students can develop the research, scholarship and educational skills necessary for a successful professional career. A student obtaining a Ph.D. from the Department of Biological Structure needs to be able to ask important scientific questions about biological systems and formulate a research plan for answering those questions. When they leave our program, they should be able to function as independent researchers with a broad understanding of biological principles and techniques and a well-developed critical sense of what constitutes valid, logical scientific research.

As mentioned above, we are using the interdisciplinary programs for recruitment of students. Course requirements are defined by the interdisciplinary programs and the advisory committee for each student. In this sense, our Ph.D. program is directed to the development of each individual based on the strengths of their research laboratory. At the UW, when a department agrees to participate in an interdisciplinary program, they have to review the program's requirements and agree that these would be sufficient to obtain a Ph.D. from the department. We're active participants in several interdisciplinary programs, and we've listed the curricula for those which currently have students in our labs (see Appendix I).

b. Describe the standards by which you measure your success in achieving your objectives for your doctoral program. Using these standards, assess the degree to which you have met your objectives. Indicate any factors that have impeded your ability to meet your objectives and any plans for overcoming these impediments.

Our first measure of success is whether students complete their research and obtain their Ph.D. degrees in a reasonable period of time. Students recruited through the

interdisciplinary programs are generally well qualified, conscientious, ambitious, and capable, and with guidance from their research advisors, they seldom take more than five years to complete their dissertation.

c. How do you inform your students of and prepare them for the breadth of opportunities and career alternatives available within and outside of the academy? This would include careers in industry, for instance, as well as academic careers in institutions other than research-intensive universities.

Students learn about academic and non-academic job possibilities through formal advertisements in major journals, on the web and through informal contacts. The Department provides minimal vocational advising other than that provided by research advisors and committees. Periodically, there are seminars given by various groups on campus explaining job options for Ph.D. scientists in academic as well as other settings.

d. How are you staying informed of the career options that graduates of your program typically pursue and the success they are obtaining? How are you using this information in departmental planning?

The Department periodically contacts past students to see where they are located and what they are doing. However, this information has little effect on departmental planning for the graduate program. Market forces seem quite effective in providing potential students with information about faculty and laboratories in the Department. If past students from a particular lab are having trouble finding positions, that information will be readily available through informal discussions and will be used by in-coming students to make choices about which research groups to join.

2. Master's degrees

a. If applicable, show the relationship of master's degree programs to the undergraduate and/or doctoral degree programs in your unit.

The Department offers masters degrees on rare occasions in special circumstances when completion of the Ph.D. is impractical.

3. Bachelor's degrees

The Department does not offer bachelors degrees.

Section G: Graduate Students

1. Recruitment and retention

a. Please describe recruitment/outreach programs to attract graduate students. Specifically address outreach to underrepresented groups. Describe the measures you use to assess the success of your efforts. How successful have they been?

PhD students are admitted through the interdisciplinary programs, which recruit very high quality candidates. This policy has a number of benefits including a very large pool of excellent candidates and decreasing costs with respect to applications, processing and admissions. In general, the pool of students applying directly to Biological Structure was smaller in number and weaker in academic background. As you can see from the record, the students admitted in recent years are excellent.

This is possible because all faculty in Biological Structure interested in PhD education have appointments in one or more interdisciplinary programs. We are satisfied with our use of the interdisciplinary programs for recruiting students. All faculty with projects appropriate for graduate students have sufficient numbers of students in their labs. In addition, we benefit from the well organized and operated recruitment processes of the interdisciplinary programs as well as their efforts to recruit students from underrepresented groups.

b. What are your retention rates for master's and doctoral programs? To what do you attribute attrition? What steps are taken to minimize attrition?

Our retention rate for the doctoral program over the past three years is 100%. This record supports the decision to use the interdisciplinary programs to recruit students. No Master's degrees have been awarded in the past 10 years.

2. Advising, Mentoring and Professional Development

a. In what ways do you communicate academic program expectations to students? Such information should include: timelines, phases and benchmarks of the degree program; procedures for committee formation; coursework, exam and presentation requirements; and standards of scholarly integrity.

Each of the interdisciplinary programs advises the students admitted through their programs during the first year about the program requirements. Following the first year, the research advisor and supervisory committee advise the students. Supervisory committees are expected to meet at least once each year with the students to ensure timely progress toward their degrees. Scholarly integrity is stressed by required

attendance at a School-wide integrity seminar series given in the summer quarter. This consists of presentations and small group discussion sessions on ethical issues of importance for biomedical scientists.

b. In what ways do you inform students of your unit's graduation and placement record? Such information should include time to degree; average completion rates (Master's and Ph.D.); and employment of graduates two and five years after degree completion.

We are unaware of students who have wanted that information. More important to them are the graduation and placement records for each faculty member, and that information is most readily and informally obtained from other students in the lab or past students.

c. Please attach an example of your departmental mentoring/advising plan. Such information should include evidence that each students' work and progress are being evaluated on at least an annual basis and that the results of the evaluation are communicated to the student.

The current plan exists in practice but not in policy. The responsibility for advising and mentoring each student resides with the interdisciplinary program that admitted the student and with the research advisor and supervisory committee. The annual meetings of the students and their supervisory committees provide opportunities for student assessment and advising. This has been a very effective plan to date that emphasizes the student progress within the laboratory that provides support for their research and education.

d. Please attach a copy of your professional development plan. Such a plan should address questions such as: "What are the career opportunities for a master's or Ph.D. graduate in your field?" "What skills/experiences contribute to success in the various academic and non academic career paths listed above?" Include information on conferences students are encouraged to attend and how they are prepared for the experience.

Due to the breadth of the research fields in the Department of Biological Structure and the interdisciplinary nature of our students, a common professional development plan that applies to all the subfields has not been developed. It has been most effective to have the students obtain that information from their advisor, their supervisory committees and other students.

3. Inclusion in governance and decisions

a. In what ways do you include graduate students in the governance of your department?

Graduate students participate in Departmental governance through their faculty advisors. With rare exceptions, most students prefer to dedicate their time, energy and effort to completion of their thesis work rather than with Departmental governance.

b. Please describe your grievance process and characterize the nature of any grievances that have been lodged over the past 3 years. If the characterization is likely to reveal any students' identities, please address this issue in a separate but accompanying document addressed to the Dean of the Graduate School.

There are several pathways for grievances: (1) Discuss the grievance with the supervisor and/or the supervisory committee. (2) When a grievance involves the supervisor, members of the supervisory committee can be approached. (3) The Office of the Chair is a pathway available to all students and faculty for grievances and, unless requested to do otherwise, all communications remain confidential. (4) Many students are members of interdepartmental programs such as MCB, NeuBeh, BMSD and MSRTP. The directors of these programs are resources for students who have grievances. (5) The Graduate School has a pathway for grievances. (6) The Deans Office will respond to student grievances and provide assistance when the grievance is unresolved through other pathways. (7) The office of the Ombudsman is an excellent resource for grievances, which we encourage students to use when other pathways have been unsuccessful. No student grievance has been unresolved through pathways 1 through 4 in the past three years.

4. Graduate student service appointees

Biological Structure has not made service appointments. In rare cases, student volunteers have served directly on committees throughout the school at their own initiative.

FUTURE OPPORTUNITIES

The current Departmental Ph.D. program is effective, and the current recruitment policy through the interdisciplinary programs is effective. The number and quality of the graduate students meshes with the opportunities in our individual research programs. Biological Structure believes the advantages of recruitment through interdisciplinary programs should be considered and adapted by other Departments in the School.

Students are embracing the multidisciplinary nature of modern bioscience, as are the faculty researchers. It might be appropriate if the academic bureaucracy did likewise.

Generation of this self-study document has pointed out that the Department's oversight of the students and their progress could be strengthened some with a minimal effort. When Biological Structure adapted the new recruiting model and transferred much of the responsibility for each student to the interdisciplinary programs and the supervisory committees, the communication between students and supervisors and supervisory committees became more direct. The Graduate Affairs Committee was dissolved. While the current practices are effective, written policies of the Department's expectations, a means of recording the students' progress, and a description of a grievance procedure needs revision and updating. Biological Structure suggests that the current programs are effective and are accompanied by low overhead in terms of bureaucratic procedure. Rather than with external monitoring committees or groups, direct interactions between students and their supervisors and supervisory committees are encouraged.

There is a need for improvement in the sense of community among the students coming from different interdisciplinary programs. There are limits to the time and energy faculty and students can invest in building community when there are great pressures to concentrate on their other academic duties. In particular, graduate students benefit from becoming closely identified with their research labs, collaborators, and interdisciplinary programs and those should be the first priorities for their time and effort. The benefit of a departmental community is in providing common resources on a daily basis for the exchange of both scientific information and information on professional careers, opportunities and social activities. More effort is needed to draw students together for their collective interactions with other students, postdoctoral fellows and faculty.

We should also note that discussions within the Department are underway to revise the pathways for research and education as new faculty are appointed. One area of great need is educators in the areas of traditional anatomy and embryology. As the need for health care professionals increases, the demand for basic education at all levels increases. Human embryology is in demand as genetic and molecular medicine advances our understanding of the complex basis for human development. While approaches to new pathways are under consideration, to date the resources for new programs have been inadequate. It can be expected that that discussion will continue.