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REPORT
OF THE
INTERDISCIPLINARITY
TASK FORCE

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Interdisciplinarity Task Force

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ELEMENTS OF SUCCESSFUL INTERDISCIPLINARY CENTERS AND PROGRAMS

INTRODUCTION

Interdisciplinary research and education have long been part of the university programmatic structure. More recently, however, university interdisciplinary projects, programs, centers, and institutes have grown in number, diversity, and complexity. This growth generally reflects the need for new combinations of disciplinary knowledge and research methods to solve new and complex problems, and the educational value for students of analyzing important issues from multiple perspectives.

The growth in interdisciplinary activity raises important challenges for university administrators. They must identify ways to encourage promising interdisciplinary initiatives and provide conditions under which those initiatives can flourish, while discouraging efforts unlikely to prove fruitful. Moreover, administrators need to incorporate interdisciplinary activities into the institution's programmatic structure in ways that encourage collaboration over competition and advance the mission of the university.

Given the growing importance of interdisciplinary activities in universities, AAU created a task force to examine the issue of interdisciplinarity and identify

actions university administrators can take to promote interdisciplinary activities that expand knowledge and understanding and enrich education. To carry out this charge, the AAU Interdisciplinarity Task Force undertook a variety of activities including Task Force meetings, a plenary session panel discussion at an AAU meeting of presidents and chancellors, and a survey of Task Force-member campuses to identify both successful and unsuccessful programs and the factors that contributed to their differential outcomes. In addition, Task Force members and other academic colleagues identified a number of interdisciplinary centers outside their own institutions that are widely regarded as successful. In-depth discussions were then held with the directors of those centers to identify factors that contributed to the success of their centers, the criteria they used to measure success, and any changes they thought would make their centers even more effective.

This report draws on information collected and evaluated by the Task Force to provide what members hope will be a useful checklist of factors to consider in creating, maintaining, and modifying or terminating interdisciplinary programs or centers.

TASK FORCE CONCEPT OF INTERDISCIPLINARITY

Interdisciplinary work encompasses a wide range of activities, from self-initiated collaborations involving a small number of faculty members that do not draw significantly on institutional resources, to major institutional centers that engage substantial investments from faculty, students, and institutional resources. Inasmuch as this is a report to university presidents, chancellors, and other senior administrators, the Task Force has focused on major interdisciplinary centers, institutes, or programs; the report generally uses the terms "program" or "center" to encompass all such activities.

The Task Force has not developed a formal definition of interdisciplinarity. As a working guide, the group has agreed that interdisciplinarity includes one or more of the following elements:

- activities that engage more than one discipline to accomplish research or educational objectives that cannot be accomplished through those same disciplines operating separately,

- centers designed to function as an integrated discipline at the boundaries of fields, such as biophysics and political philosophy,

- centers for the study of a large subject, such as religion, where scholars continue to work in their own disciplines but benefit from working on or discussing issues with colleagues from other disciplines, and

- centers that revolve around a specific tool or set of tools, such as nanotechnology and high-end computing, which are applicable to many kinds of science.

The following sections of the report discuss aspects of the creation, support, management, and evaluation of major interdisciplinary programs or centers that warrant attention by university central administration. The discussion identifies practices that have proven effective in promoting successful endeavors and in avoiding, modifying, or terminating unsuccessful ventures.

Along with interdisciplinary activities on their own campuses, universities may also participate in interdisciplinary programs that involve multiple universities or other research and education institutions. These collaborations allow them to achieve programmatic outcomes that cannot be accomplished by the individual participants separately and that advance the missions of all participants. For example, the University of Southern California has partnered with the nearby Huntington Library to create two programs—in the study of California and the West, and in Early Modern History—which

would have been difficult or impossible for either institution to create on its own. Although this report focuses on the management of interdisciplinary programs within a single institution, inter-institutional initiatives are mentioned here both to note the promise of such arrangements and because many of the issues discussed in the report will also apply to such inter-institutional arrangements.

CREATION OF CENTERS

The creation of interdisciplinary centers of significant size will necessarily involve the university administration as well as the faculty. The initial animating idea or conceptual framework may often come from the faculty in a "bottom-up" process. In other cases, creation of an interdisciplinary center starts with a vision and commitment from the university administration in a "top-down" process. Although there is considerable debate about which approach is preferable, there are ample cases of success from both approaches. The fundamental point is that the successful creation and continuation of an interdisciplinary center or program requires both faculty engagement and administration commitment.

An example of an interdisciplinary initiative that began as a bottom-up faculty effort is the set of education and research programs in human development at the University of California, San Diego. The programs were proposed by a group of faculty members from the divisions of Social Science, Biological Sciences, and Arts and Humanities who had an extensive history of productive collaboration. The group first developed an interdisciplinary Bachelor of Arts program in human development, which the Faculty Senate and the administration approved in 1995. The faculty members then formalized their research collaborations, working with the administration to create the Center for Human Development as a campus Organized Research Unit in 2000. Key to the success of the center was the involvement of these senior, eminent faculty members who had standing in their respective fields, were able and willing to devote time to the creation of the programs, and had a history of working together productively. The university administration responded to faculty interest by providing additional faculty positions for the programs. As a result, the growth of the Human Development initiative was not viewed as coming at the expense of participating departments. These research and education programs now have affiliations with eleven departments and academic programs. The educational activities have expanded to include a new interdisciplinary Ph.D. program in Human Development approved this year.

In contrast, at The Pennsylvania State University, the central administration formed a faculty committee to determine mechanisms for significantly enhancing life sciences at the university. As an outgrowth of that exercise, the administration committed to create the Huck Institutes of the Life Sciences, developed in collaboration with the deans of all colleges with life sciences activity. In the initial years, deans were invited to submit a set number of proposals each year in support of faculty lines for the Institutes. These proposals were developed by having the departments in each college submit proposals to the deans, from which the deans selected those that best fit the missions and goals of their colleges. A faculty steering committee then reviewed the proposals,

principally on the basis that a given proposal for a faculty line would augment institutional strengths in the life sciences and capitalize on national priorities and opportunities in a given field. The steering committee submitted a prioritized list of proposals to an executive committee comprising the deans, the Vice President for Research, and the Director of the Huck Institutes. Thus, a process initiated and managed by the administration was built upon proposals developed by departments and their faculties.

The idea for the Beckman Institute of the University of Illinois at Urbana-Champaign was conceived initially by university administrators, but the final plan for creation of the Institute was based on two proposals developed by faculty in engineering and the physical sciences and in the life and biological sciences.

Some universities have successfully employed a variant of the top-down model by funding seminars in interdisciplinary areas that the administration believes would be promising for the institution. The seminars provide a sort of pilot test of faculty interest in a given topic, and the administration can decide to proceed or not based on the degree of interest that emerges from the seminars.

Whatever the source of the initial idea for a new interdisciplinary venture, it is critical to determine that sufficient faculty interest and commitment exist before proceeding. At one institution, an interdisciplinary initiative regarded by the university administration as having extraordinary potential has thus far failed to come together. The program was designed to tap existing strengths across five schools and divisions, and the administration provided

additional faculty and operating funds. However, the schools and divisions have had difficulty reaching consensus on priorities such as target areas for faculty recruitment.

In addition to establishing faculty interest and commitment in a new interdisciplinary program, university administrators may wish to answer a number of additional questions before proceeding, including:

1) Will the new entity encourage scholarship that would otherwise not occur within the existing departments?

2) Will the new entity have an education mission? If so, will the new center expand curricular offerings in existing departments or is the interdisciplinary area of sufficient maturity to support a full curriculum leading to undergraduate degrees, graduate degrees, or both? If the new entity will grant degrees, has there been a determination that a realistic market exists for the graduates of the program?

3) How will the institution and the program or center handle space, resources, faculty, staff, tenure, governance, evaluation, and continuation?

Each of these questions is discussed in greater detail in the ensuing sections.

At Duke University, the process of answering these and related questions has led to the development of a formal application procedure. This process involves first discussing the idea with appropriate faculty and deans, followed

by discussion of the intellectual agenda and financial arrangements with the Vice Provost for Interdisciplinary Studies. The discussion with the Vice Provost focuses on how the center would allow the university to accomplish something different or better than what can be done within existing departments. If this discussion is positive, the next step is an application process that involves preparing a prospectus, bylaws, and a planning budget. The application is then reviewed by the Vice Provost and Provost, in consultation with the relevant deans, resulting in either approval with a five-year review date, or denial.

FUNDING AND RESOURCE SUPPORT

The university should have an explicit plan for funding an interdisciplinary center before it begins operation. Some institutions require that funding be secured before the center is operational, while others may provide start-up funding with the expectation that the center will be responsible for securing its continued funding. In such cases, a clear written expectation of funding responsibilities established from the outset can avoid later confusion or charges of abrogation of commitment.

While multiple sources of funding are valuable for universities and their academic programs generally, they are particularly important for interdisciplinary programs that are likely to draw on transitory or episodic funding. An example of success at tapping multiple sources of support is the MIT Media Lab, which encompasses a wide range of disciplines at the interface of computation and the arts, conducting research in areas such as software agents, machine understanding, childhood learning, human and machine vision, tangible media, interactive cinema, and digital expression. The Lab's research is funded by a combination of corporate sponsors, government agencies, nonprofit organizations, and subcontracts with other universities. The facility's strong corporate support reflects an emphasis on collaborative research and technology transfer, made possible by its wide range of research areas and the applications resulting from them.

Illinois' Beckman Institute supports research primarily in biological intelligence, human-computer intelligent interaction, and molecular and electronic nanostructures. The Institute began with the construction of its own building, four-fifths of which was funded through a gift, the rest by the state. At the outset, the state and university pledged to provide continued operations and maintenance support for the Institute. However, ninety percent of research funding comes from federal research agencies and industry. In addition, the Institute receives about five percent of its funding from the Beckman Foundation; these funds are fully discretionary and are currently being used to fund postdoctoral and graduate fellowship programs.

The MIT Media Lab and the Beckman Institute are examples of interdisciplinary centers operating in areas for which substantial external funding from government, industry, and foundations is available. However, interdisciplinary centers in humanities and social science fields confront different challenges because of the relative scarcity of external funding sources in those areas. Such interdisciplinary centers tend to rely more heavily on institutional support through fundraising for endowment funds, term funds,

or other centrally provided university resources. At one institution, for example, newly approved interdisciplinary programs are provided with five years of funding, after which the programs must compete for continued funding for infrastructure support, which is provided from a pool of institutional funds. In deciding how those institutional funds are distributed, the university differentiates between those interdisciplinary programs that can generate infrastructure support from external sources—through indirect cost recovery from research grant funding, for example—and those in areas such as the humanities where the institution often is the only source of available support.

The Michigan Society of Fellows is an example of an interdisciplinary program that is supported through a mixture of endowment funds and cost-sharing with departments. The Society uses an endowment grant from the Ford Foundation to fund three-year postdoctoral fellowships for scholars from all arts and sciences and professional fields who are pursuing interdisciplinary research. Fellows are appointed as assistant professors in appropriate departments and as Postdoctoral Scholars in the Society. The Society funds two years of the three-year fellowship; the department funds one.

The dual source of funding for the Society's postdoctoral fellows is mutually beneficial to the Society and the departments: the Society is able to use endowment funding to help support its program, so it is not viewed as taking away potential funding sources for departments. The departments, in turn, gain access to highly talented people for one-third of the cost of their support. Since some of the fellows stay on in their departments, the departments also view the Society's program as

an effective recruiting mechanism for future Michigan faculty.

Funding for interdisciplinary centers, whether provided by the university or generated primarily by center fundraising, can create friction between centers and traditional schools and departments. Penn State's Huck Institutes in the Life Sciences have dealt with this potential problem by having relevant schools and departments participate in the development of proposals for faculty lines, as described earlier, and by having start-up funding and permanent funding of faculty positions jointly funded, with half of the funding coming from the Institutes, half from the colleges. The positions are "owned" by the colleges for a five- to six-year period, and tenure resides in the colleges. For each faculty position, an agreement is developed between the Institutes and colleges or departments indicating the expectations of the Institutes regarding development of a research area and the provision of graduate and undergraduate instruction. If expectations are met at the end of the period, the agreement is renewed; if a faculty member's performance does not meet the expectations of the Institutes but satisfies the college, the dean and department head will need to assume the Institutes' 50% share of the faculty salary.

These arrangements reduce the likelihood of competition and foster collaboration through joint college/Institute financial support and joint identification of faculty members, research areas, and teaching responsibilities.

FACULTY

The quality and engagement of the faculty is the reason most consistently given to explain why highly successful interdisciplinary centers achieve their success. Conversely, perhaps the most frequently cited reason for the failure of interdisciplinary efforts is the failure to attract and fully engage strong faculty. It is noteworthy that, when asked what changes might be instituted to increase the effectiveness of their centers, directors of several successful centers answered: more control over faculty hiring.

Talented faculty are of course key to the quality of any academic program, but they are particularly critical to the success of interdisciplinary initiatives. New interdisciplinary ventures are by definition untested and lack a grounding in disciplinary history; established interdisciplinary programs or centers need flexibility in making and terminating appointments to maintain faculty talent in the more fluid boundaries of interdisciplinary work.

Joint appointments between an interdisciplinary center and a department frequently create tension. To avoid misunderstandings, joint appointment arrangements should be addressed when a center is created, defining expectations for faculty, the department, and the center. In this respect, Duke's formal application procedure for creation of a center, described earlier, provides a mechanism for specifying joint appointment procedures in writing. If

Duke faculty members take on added responsibilities in a center or a secondary department, they are required to inform relevant center directors, department chairs, or deans in both units about those added responsibilities in order to avoid an unsustainable increase in workload.

Because the reduction in departmental commitment can cause resentment over the expropriation of its resources, departments should be compensated in some way when such a resource reduction occurs. Such situations are best handled by having the center director negotiate and consult with deans and department heads to identify and agree on terms that provide mutually beneficial outcomes. For example, a reduction in departmental teaching load for jointly appointed center faculty members may be offset by the center providing research space and administrative support that would otherwise be drawn from the department. This can free up departmental resources to fill the teaching gap and, in the process, provide a home for a faculty member's interdisciplinary research in ways that benefit the department and the center. Other forms of compensation to departments and schools may include providing indirect costs from research grants, offering center-supported programs that enhance the intellectual mission of the department or school, or developing collaborative research and teaching that extends the offerings of the department or school.

There are a number of important considerations in recruiting outside faculty for an interdisciplinary center, particularly if the faculty members are untenured. Because it is rare that faculty members are granted or hold tenure within an interdisciplinary center, faculty recruited from outside the institution generally must find a departmental home. That is not always straightforward for a scholar whose work lies at the boundary between fields. Thus, the center director needs to negotiate with deans and department heads to identify jointly accepted objectives for the recruitment process.

Three examples illustrate some of the solutions to appointing faculty to interdisciplinary centers. All faculty at Illinois' Beckman Institute have home departments and are "visiting" at Beckman. Full-time and part-time Beckman faculty conduct all or part of their research at Beckman and occupy space in the Institute; affiliate faculty collaborate in Beckman research but do not occupy space there. The departments control hiring, tenure, salary and teaching assignments, although the Institute Director is consulted on some faculty recruiting. Because the departments hire and provide the tenure home for Beckman faculty, the Institute Director maintains close ties with department heads, meeting with them regularly to discuss future research directions and related topics. To attract departmental faculty to Institute research projects, the Director can offer space for research, funding for start-ups and other costs, unique research facilities, and strong administrative support.

The University of California, Berkeley offers a Ph.D. program in Jurisprudence and Social Policy (JSP), which is designed for students interested in teaching law-related subjects in humanities and social science departments, law schools, and legal studies programs, and for those interested in applied policy research. The program is housed in and primarily funded by the university's Boalt School of Law. JSP core faculty are humanists and social scientists who combine teaching and research in their areas of expertise with the study of law. Faculty at JSP conduct searches for new faculty, but appointments must be approved by the law school. The law school makes tenure decisions with substantial input from JSP. The provision of tenure within the law school is a strong attraction in recruiting excellent faculty.

Because the overall goals of Penn State's Huck Institutes are shaped in part by the deans of the participating colleges, the research success of jointly funded Institute faculty also advance college and departmental goals as well. As noted earlier, faculty lines for the new Institutes were drawn from departmental proposals submitted through the deans of the colleges. In addition, indirect costs and institutionally provided research incentive funds are allocated in part to the colleges, so Institute research success produces financial resources for the colleges. The colleges maintain exclusive control over tenure decisions.

When untenured faculty members with a departmental home conduct their research in an interdisciplinary center, care must be taken to ensure that such research is recognized and valued within the department. Tenure decisions for such faculty often may call for interdisciplinary tenure committees. Duke University, for example, has modified its tenure policies to accommodate faculty members involved in interdisciplinary research. Under the

new policies, deans and department chairs, not the candidates, have responsibility for ensuring that interdisciplinary areas are represented on tenure committees. Tenure committees may be co-chaired by someone from the home department and by an interdisciplinary representative. These procedures for handling interdisciplinary tenure decisions are specified in the faculty handbook.

In some cases, it may be appropriate to extend the tenure clock for faculty working in interdisciplinary areas. Such an extension recognizes the longer time that may be needed to establish a track record across the multiple dimensions of interdisciplinary work. Carnegie Mellon University, which has a longstanding tradition of interdisciplinary collaboration, has a nine-year tenure clock for all faculty. The policy was initially implemented for interdisciplinary faculty, but was then extended to all faculty in the interests of comparability across disciplines in recruitment.

LEADERSHIP AND ADMINISTRATION

Perhaps second only to the quality of faculty in contributing to successful interdisciplinary centers is the quality of leadership. Center leadership draws on a diverse array of attributes, including intellectual vision as well as management, diplomatic, and negotiating skills. These attributes are not necessarily found in the same person: the faculty member who develops the intellectually rich interdisciplinary concept may not be adept at the management of a complex interdisciplinary program. In such cases, dividing responsibilities among more than one person can help assure that all aspects of center leadership and administration are met. Even when the founding leader has all the attributes necessary to conceive and launch a successful interdisciplinary venture, center leadership may encounter problems of succession. For example, a protégé trained by the initial director may be able to carry on successfully, but the center can lose momentum and direction with the third generation of leadership. Avoiding such problems requires a clear understanding of the attributes needed to direct a given center and a careful search for a successor with those attributes.

One critical function that is usually handled by the center director is coordinating center activities with affiliated departments and schools. This task often calls for diplomatic skills, particularly where joint support, shared personnel, or other shared or transferred assets raise the possibility for competition or disagreement. Such conflicts are best minimized through the initial design of the structure, operation, and support of the center and how that design defines its relationship with departments and schools. For example, if an interdisciplinary center is created with new faculty lines, established departments are less likely to see the center as drawing resources away from them. If, however, a new interdisciplinary initiative is created wholly or in part by a reallocation of existing resources, some care must be taken to create a set of arrangements that are mutually beneficial for the center and departments.

Stanford University's Institute for International Studies has about 150 faculty, researchers, and visiting scholars. Most are senior Stanford faculty drawn from all seven of Stanford's schools with either limited term appointments— typically five years—or joint appointments. The emphasis in the Institute is on research, which it supports through fundraising, and jointly appointed faculty have reduced departmental teaching loads in order to accommodate research at the Institute. To minimize conflicts with departmental faculty over possibly competitive fundraising and reduced teaching loads, the Institute Director works directly with deans of the schools to reach mutual agreements. The Director also draws on a faculty executive committee to help shape Institute policies and practices in ways that incorporate the needs of the schools and the broader institutional goals.

Another important dimension of center administration is establishing clear reporting channels. Such reporting channels help clarify the placement of the center in the institution's structure, provide a locus for resolution of issues that cannot be resolved through direct negotiation, and create pathways of support for initiatives that may need assistance in overcoming initial hurdles.

In addition to the leadership skills and reporting arrangements that apply to the director of an interdisciplinary center, the organization and training of administrative support staff also can be important for the operation of an interdisciplinary center, particularly given the diversity of people and disciplines involved. Duke's John Hope Franklin Center for Interdisciplinary and International Studies houses 25 programs, primarily in the humanities and social sciences, in a single, overarching consortium. The Center employs shared administrative staff, including a center director, building manager, financial manager, receptionist, and technology staff. The use of shared staff can provide cost-effective administrative support for interdisciplinary units that are not large enough to sustain separate staffs.

Duke has created an Interdisciplinary Administrators Working Group to provide support for interdisciplinary program administrators, including both faculty directors and non-faculty executive or associate directors and program coordinators. The group meets monthly to share information and opportunities for collaboration and discuss such issues as managing budgets, working collaboratively with other units, development, grant writing, barriers to interdisciplinary research, and staff evaluation.

GOVERNANCE AND EVALUATION

The governance and evaluation of interdisciplinary centers play critical roles in their overall operation. Since interdisciplinary centers are created in a new institutional context spanning multiple disciplinary cultures and traditions, effective governance and evaluation also help fit the interdisciplinary activity into the larger institutional mission.

The nature of governance clearly will vary with the scale of the interdisciplinary program. A relatively small program may achieve adequate governance simply through reporting arrangements—for example, the head of a program reporting to a dean or vice president for research. But interdisciplinary programs or centers of significant size benefit from having a steering or advisory committee to provide oversight and direction. Drawing on highly respected faculty members or other persons from the disciplines involved in the center, such advisory groups can both provide valuable direction and help establish credibility for the work of the center. An example of the value of such groups is Princeton University's Center for the Study of Religion. The Center has a 10-member Executive Committee of dedicated, prominent senior faculty members from a range of humanities and social sciences disciplines who work closely with the Center's director to shape the ongoing program. The active engagement of these eminent individuals not only provides broad and informed guidance, but also helps the Center attract attention and interest from faculty and students.

Periodic evaluation is particularly important for interdisciplinary activities, which always begin as new combinations of people and disciplines pursuing new combinations of research and educational objectives. As with governance, evaluation of small-scale interdisciplinary initiatives may be comparatively simple, carried out through straightforward reporting and performance reviews between a program director and the one or more individuals to whom the director reports. However, larger scale programs will benefit from more formal evaluations, including both regular internal reviews and periodic external evaluations. Regular internal reviews can help direct new ventures toward their stated objectives and provide feedback supporting effective mid-course corrections. Periodic external evaluations, when positive, can provide important validation for programs. When negative, such evaluations can provide the rationale for a serious examination by the university central administration about whether to modify or discontinue the interdisciplinary program.

Appropriately, a wide variety of effective arrangements for evaluation exist, varying by size and scope of the interdisciplinary program or center, by the broad disciplinary areas involved, and by the culture of the institution. Berkeley's Ph.D. program in Jurisprudence and Social Policy is the responsibility of the law school faculty, but the program operates under

the guidelines of the graduate division, which periodically reviews the JSP Ph.D. program. Illinois' Beckman Institute is evaluated every three or four years by an external team composed of people outside of the Institute but within the university, and experts outside the university. The team review focuses on two basic questions: (1) what is the quality of the research being conducted within the Institute, and (2) are faculty members' research taking advantage of the Institute as an interdisciplinary facility? If the answer to the second question is negative for a given researcher, that faculty member might be moved back into his or her home department. This procedure provides an informed external assessment of the overall quality of work at the Institute and an evaluation of individual work in a manner that allows the Institute to maintain flexibility and a capacity to change over time.

Stanford's Institute for International Studies has established a two-tiered structure for governance, evaluation, and support. The Institute is run by a 20-person Executive Committee, chaired by the Institute Director. The Executive Committee meets regularly during the academic year to discuss Institute business and to determine faculty appointments to the Institute. The Institute's Board of Visitors, which is composed of persons outside Stanford with ties to the work of the Institute, reviews the Institute and advises the Director on long-range plans and development opportunities. The Board also serves as an informed advocate for the Institute both within the university and in parts of the world that would benefit from the Institute's work, enabling it to provide a bridge between scholarship conducted within the Institute and the

application of that scholarship outside the university.

A key element of evaluation may be the existence of a sunset provision established when an interdisciplinary center is created. Particularly when accompanied by a set of thoughtful and explicit goals for a new center, sunset provisions establish from the outset a set of criteria on which the success of the center will be judged, and an explicit timetable and process for reaching such judgments. At Duke University, all interdisciplinary programs, when approved, are established with five-year sunset provisions. Every program or center is formally reviewed at the end of five years, with the default outcome being termination unless the program can demonstrate through the formal review and related evidence a clear basis for continuation.

At some point, a center may become so large that a formal sunset provision may not be feasible: the MIT Media Lab and Illinois' Beckman Institute each have their own buildings, and the Media Lab is building a second facility; the Beckman Institute has more than 100 faculty members from nearly 30 departments working at the Institute. In such cases, periodic reviews, informal and formal, internal and external, can help steer research and education programs in evolving, continually productive directions.

STUDENT ISSUES

GRADUATE STUDENTS

Graduate students may be admitted into and fully housed in interdisciplinary centers or programs, or admitted into departments but carry out all or most of their research work, and perhaps course work, in an interdisciplinary program. In the case of graduate students admitted into departments but whose graduate program is interdisciplinary, the interdisciplinary center or program should, as with untenured faculty housed in departments, take steps to assure that their center work is appropriately recognized. Such steps may include the use of interdisciplinary dissertation committees.

Conferring graduate degrees in interdisciplinary programs should occur only when the institution has determined that a robust market exists for graduates with such interdisciplinary degrees. In some cases, the market may have known limitations. For example, an interdisciplinary Ph.D. degree may be in demand in the private sector, but not in the academic career market, where there may be a preference for discipline-based degrees. Students should be advised of such circumstances when they apply to interdisciplinary programs.

One way that universities can recognize interdisciplinary work without granting interdisciplinary degrees is to grant certificates in the interdisciplinary area in conjunction with degrees in a traditional department. In Duke's

Center for Medieval and Renaissance Studies, for example, students from 10 departments participate in the Center's graduate program and may earn a certificate in Interdisciplinary Medieval and Renaissance Studies. The Center has an excellent track record of job placement for graduate students.

Penn State's Huck Institutes of the Life Sciences support and oversee an Integrative Biosciences (IBIOS) Graduate Degree Program that provides fellowships and teaching assistantships for first- and second-year students. The balance of students' support is provided by the departments in which their mentors reside or from their mentors' research grants. Students can select among nine different "tracks," and all students enroll in a first-year colloquium and a course in bioethics. The Huck Institutes support a recruiter who recruits graduate students for the Institutes and also works with officials in other inter-college graduate degree programs and departmentally based life sciences graduate programs to assist with their recruiting. Although IBIOS students receive much of their research training through the Institutes, their Ph.D.s are granted by the graduate school either directly through IBIOS, through an inter-college graduate degree program, or through a department graduate degree program that participates in the IBIOS requirements and philosophy.

The University of Rochester recently established a formal interdepartmental graduate degree program in biomedical engineering. The program is based in the Department of Biomedical Engineering but draws on faculty from other departments in the

College of Arts, Sciences, and Engineering and in the School of Medicine and Dentistry. Participating faculty from multiple departments serve on the governing committees that handle the recruitment and admission of graduate students, as well as oversight of the graduate curriculum and student progress. Administration of the Ph.D. program and the granting of degrees are managed by faculty in the Department of Biomedical Engineering, working with faculty from other departments who have been designated as graduate faculty for the interdepartmental program. All students fulfill a small set of common course requirements and choose elective courses appropriate to their research interests. Students may pursue research with any of the interdisciplinary program faculty identified as graduate trainers, but all students receive the same degree. This arrangement has proved to be a particular benefit to research programs housed in clinical departments, where problems relevant to biomedical engineering often arise but access to graduate students has been difficult to establish.

UNDERGRADUATE STUDENTS

The Task Force understands undergraduate interdisciplinary programs to be more than multidisciplinary survey courses. In line with the Task Force working guide for the term interdisciplinarity, undergraduate interdisciplinary courses involve learning how multiple disciplines converge on a set of issues or combine to address particular problems. Undergraduate interdisciplinary educational programs can range from coursework added to a traditional major to formal interdisciplinary majors.

Interdisciplinary research centers and programs can provide valuable opportunities for undergraduate students to broaden their perspectives, inform their decisions about future academic or career pursuits, and become directly engaged in such contemporary issues as environmental science, law and social justice, and globalization.

The University of California, San Diego's interdisciplinary undergraduate program in Human Development is one of the university's most popular undergraduate majors, with an enrollment of about 350 students. The curriculum emphasizes development as a key perspective from which to understand human behavior. The courses cover a broad spectrum from brain and perceptual development, to reasoning and problem solving, to social interaction and the evolution of cultural systems. The strong interest of students has stimulated strong faculty participation in the program.

Although MIT's Media Lab does not offer a formal undergraduate degree, it does conduct a freshman-year program involving Media Lab researchers and faculty. In addition, more than 150 undergraduates work at the Lab through MIT's Undergraduate Research Opportunities Program, making the Lab MIT's largest employer of undergraduate students.

Interdisciplinary programs should grant undergraduate degrees only where private sector markets and graduate and professional school admissions requirements support them. For those areas where such demand does not yet exist, undergraduate interdisciplinary programs can employ the same strategy as graduate programs: provide a combination of an undergraduate degree in a traditional major with a certificate for interdisciplinary work.

CONCLUSION: ELEMENTS OF SUCCESSFUL INTERDISCIPLINARY PROGRAMS AND CENTERS

Because interdisciplinary initiatives differ so widely by their research and educational goals, the disciplines involved, and their size, it is difficult to identify elements of success that apply to all. However, in deciding whether to establish a new interdisciplinary program or center, there are several threshold questions that apply in some respect to virtually all such initiatives:

- How will this program support or advance the mission of the institution?

- What will this program do that cannot be accomplished by existing schools and departments?

- What assurances exist that the program will elicit strong faculty interest and engagement?

- Have steps been taken to establish relationships between the center and affiliated or affected departments that will promote cooperation and minimize competition?

- Has the center identified leadership capable of providing the intellectual vision, diplomacy, and management skills necessary to direct a successful center in the context of a disciplinary-based institution?

- Are responsibilities for the initial and continuing funding of the center clearly understood between the center and the institution?

- Are reporting requirements, governance, and evaluation procedures clearly understood?

- Does the center have a sunset provision? If so, are the review processes and criteria which will determine the center's future clearly specified? If the center does not have a sunset provision, are there mechanisms to periodically evaluate the success and trajectory of the center?

None of these questions is surprising, and a number of additional questions—some discussed in the foregoing text—should also be considered. However, answering these few questions satisfactorily at the outset can significantly increase the likelihood that a new interdisciplinary venture will succeed by making valuable contributions to new knowledge and its dissemination, and advancing the mission of the university.

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