Because interdisciplinary scholarship is often collaborative and its outcomes varied and broad, review of interdisciplinary scholars requires special care and attention, in terms of evaluation criteria, dossier preparation, and evaluation process.

**Evaluation Criteria**

As indicated in the first section of this report, the biggest obstacle in the development of interdisciplinary faculty is lack of appropriate evaluation criteria. Traditional disciplinary criteria cannot measure accurately all aspects of interdisciplinary scholarship and may discourage early-career faculty from developing interdisciplinary research and education activities.

For situations that require significant involvement in interdisciplinary work (i.e. a faculty member with tenure home in a stand-alone interdisciplinary unit—see also Table 2, Stage 1: Structural Considerations), it is appropriate to develop and present in written form interdisciplinary criteria that can accurately contextualize and evaluate the work of early-career faculty members who participate in such work (see Case Studies 7 and 8). Developing detailed interdisciplinary criteria at the scale described below might seem onerous but has significant benefits in terms of the quality of the review process and can save time and energy for all parties involved in the review. Such criteria should clearly state the goals and mission of the interdisciplinary unit, its definition of interdisciplinary work and expectations in terms of interdisciplinary scholarship.

The criteria should present the full scope of research outcomes that are of importance to the unit and establish a meta-metric that allows for calibrated evaluation across the varied outcomes by evaluators of different backgrounds (Rikakis 2009). For many interdisciplinary units, outcomes focus less on innovation in disciplinary theory and methods and more on cross-disciplinary approaches and findings. Greater emphasis is placed on production of new interdisciplinary knowledge, development of new technologies or cross-disciplinary methods, or successful translation of the science for societal use. The criteria may establish quantitative as well as qualitative measures for evaluating all the pertinent traditional outcomes (i.e. impact factor for established, disciplinary publication venues) and non-traditional outcomes (i.e. extent of adaptation of technological innovation by relevant real-world community as shown by the number of frequent users and letters of support from leading practitioners).

The different outcomes and their evaluation measures can then be calibrated though an inclusive meta-metric (i.e. a journal publication in a high impact journal may be shown to be of equal significance to the interdisciplinary unit as a highly adopted technology with strong societal impact). Such calibration may also be necessary within traditional outcome categories. For example, many interdis-

Interdisciplinary Hiring and Career Development

ciplinary scholars publish in new journals that have not developed significant citation indexes. The interdisciplinary make-up of such journals may be used as a way to evaluate its significance (i.e. does the editorial board and already published papers of the journal include leading scholars from the key knowledge fields within the interdisciplinary focus of the journal). A regularly updated reference list of publication/presentation venues that are considered significant within the context of the criteria of the unit may form an appendix to the criteria.

In units where regular co-teaching and co-mentoring of students is expected, the criteria should state how co-teaching is realized, how co-teaching evaluations are performed and how co-mentoring credit is given. Interdisciplinary units must also establish guidelines for assessing the collaboration activity of the faculty and the role of each faculty member in sustaining the interdisciplinary community of the unit. Quantitative measures becoming popular for measuring interdisciplinary collaboration activity (per year and over larger review periods) include:

1. the number of connections to collaborators (broken down into repeat and singular collaborations),
2. the average number of authors per product, and
3. the average number of represented disciplines per product (Wuchty 2007, Guimera 2005, Case Study 9).

Qualitative measures focus on narratives by the faculty member and the personnel committee regarding the integrative activity of the faculty member (see Case Study 9). The criteria should establish standard presentation structures for interdisciplinary connectivity measures (i.e. table of collaborators and their disciplines) and for listing co-taught classes and co-mentored students.

The criteria should also establish grant-raising expectations per type of faculty, taking into account the disciplinary background of the different faculty members (i.e. a faculty member with a humanities background in a sustainability unit should have lower income expectations than a faculty member with an engineering background). The criteria should also discuss the relative prestige of the sources of funding targeted by the different types of faculty (i.e. an NEH or NEA grant may be for a much lower amount than an NSF grant but equally competitive and of similar prestige in the community) as well as the relative prestige of different awards.

Authoring conventions should be addressed within the interdisciplinary field, and within the unit, paying special attention to the issues of author contribution, author order and collaboration structure, since different areas have significantly different conventions. (i.e. the order is not always indicative of contribution).

The criteria should establish the expected CV outline and annotation procedures (Appendix III). The CV structure should assist external reviewers of different backgrounds in placing the production of the faculty member in the context of the unit’s interdisciplinary criteria. For example, all outcomes that may be considered of significance in terms of unit expectations, regardless of the nature of the outcome (i.e. a major publication or a highly embedded technology) may be listed under the same category in the CV (i.e. significant research outcomes). Each ranking category (i.e. significant outcomes, supportive outcomes) may include appropriate subcategories (publications, embedded activities, products of societal impact etc). A CV annotation protocol should be established that allows external reviews to
easily determine the role of the faculty member in each collaborative product listed and quickly identify the outcomes in which the faculty member has a lead role. Multi-author outcomes produced through usual author hierarchy (first, second etc) must be distinguishable from collaborative outcomes with multiple lead authors. For all collaborated products it is recommended that the faculty member provide a short description of their contribution.

To facilitate faculty review by evaluators of different backgrounds, the criteria could also include a section that discusses key differences of interdisciplinary and disciplinary scholarship. The goal of such a section in the criteria is not to excuse sparse productivity or poor quality work, but rather to shift the emphasis of reviews towards intellectual achievement and leadership, rather than traditional metrics that may emphasize the number of publications. Disciplinary colleagues may be accustomed to higher productivity, citation rates and journal standings. They may prefer early-career faculty who stay focused on a constrained set of problems first tackled in their PhD. This section of the evaluation document should discuss how a complex interdisciplinary career path may not be homogeneous in activity and outcomes and may require additional time for forming the required collaborations and maturing the interdisciplinary scholarship. It should also address the difficulty of review and publication when research spans multiple disciplines and the challenges of contributing to a new field (lack of extensive prior work on which to build, lack of long-standing journals with high impact factor etc). That said, the Web of Science can be used in innovative ways to demonstrate interdisciplinary impact: as one example, reviewers can look at the number of subject categories (e.g. Porter et al. 2007) represented by journals with papers that cited the research.

There are a number of other standard questions that disciplinary reviewers may raise when evaluating an interdisciplinary record: What is the significance of this area of scholarship? Why did the reviewers not know everyone on the comparison list? Why is the candidate not on the top of the comparison list? The criteria can assist in addressing such concerns by including a list of these FAQs along with general explanations (Pfirman et al. 2005b) so that reviewers are aware that these questions are frequently raised for interdisciplinary scholars and do not reflect any deficiencies specific to the individual candidate.

Such criteria can help early-career faculty understand the expectations of the unit and prepare a dossier that can be easily reviewed by evaluators of different backgrounds. The chair does not have to prepare an overly long and complex letter to reviewers for each early-career faculty member review. Letters with complex instructions may be hard to follow and may create the false sense that the chair is requesting special handling of a faculty member. If detailed interdisciplinary criteria are available, the chair’s letter need only highlight the key points of the criteria and ask for a review in the context of the criteria. The external reviewers get a clearly established context for their review without having to do extensive personal research into the conventions of the interdisciplinary area.

This report and the references given can help units develop interdisciplinary criteria that follow national trends. A strong departure point is for faculty to agree to shift from using “discovery” and “teaching” as the critical scholarly issue to assessing faculty using the broader set of Boyer criteria: “discovery,” “integration,” “application,” and “teaching” (Boyer 1990). Case Study 9 gives a good example of Boyer-based interdisciplinary criteria at multiple levels of review.

When an interdisciplinary faculty appointment is not in the context of an interdisciplinary unit (i.e. joint appointment between two disciplinary units or a disciplinary unit and an interdisciplinary research entity), development of interdisciplinary evaluation criteria may not be possible. In such cases,
all the points outlined above for inclusion in the criteria can be instead covered in a detailed Memorandum of Understanding (MOU) developed specifically for the interdisciplinary faculty member and attached to their letter of appointment (see Stage 2: Position Creation and Institutional Acceptance and Appendix IV).

This detailed MOU can serve in place of, or in addition to, the traditional unit evaluation criteria and can accompany the chair’s letter to external reviewers. The chair’s letter can explain the function of the MOU and highlight the key points of the MOU in terms of review. The faculty member’s CV should be annotated based on the conventions and expectations outlined in the MOU. There must be a process in place for amending the MOU if the structure of the appointment of the faculty member is changed during the probationary period.

Unit level interdisciplinary criteria, or an interdisciplinary evaluation MOU, are critical for the proper evaluation of interdisciplinary faculty. It is also important that higher-level evaluation bodies (College or University level committees) update their criteria and processes to address interdisciplinary faculty. Provost level guidelines for the evaluation of interdisciplinary faculty can help guide reviews at all levels and create university wide support for interdisciplinary scholarship (see University of Michigan, 2004 and University of Illinois, 2008). Chair letters to external reviewers can point to those guidelines to contextualize unit level criteria or MOUs for interdisciplinary faculty.

**Dossier preparation**

Detailed interdisciplinary evaluation criteria (in the form of formal unit criteria or an MOU) can greatly facilitate dossier preparation. When such criteria or MOU are available, the dossier of a faculty member should be structured so as to clearly show how their scholarship fulfills the outlined expectations.

The personal statement of the faculty member should present their overarching plan or theme, connect their plan to the need for interdisciplinary scholarship (i.e. the key problems of this complex area of investigation require collaboration amongst multiple disciplines) and discuss their approach to collaboration and knowledge integration. Approaches to co-teaching and co-mentoring, when appropriate, should also be discussed. The statement should help reviewers place the scholarship and output of the faculty member in the context of the criteria/MOU provided. Comments from reviewers on the plan and the candidate’s response to them can be incorporated in the next review, providing continuity for both the candidate and the reviewers.

Many interdisciplinary scholars follow complex career trajectories enabling them to bring a wealth of experience to their position. These different stages might focus on different types of outcomes. The candidate’s statement should discuss how the different stages of his/her career have contributed to their interdisciplinary scholarship and what types of outcomes each stage produced. The complexity of an interdisciplinary career path may also warrant an extension of the tenure clock of the candidate. Units should be prepared to support the need for such extensions. The chair’s letter to external reviewers should identify and explain extensions granted for interdisciplinary scholarship reasons.

Some interdisciplinary scholars may have spent considerable time outside academia. Most positions outside the academy have lower (or no) expectations, or offer fewer opportunities, for publication. Since some reviewers focus on the number of publications after receiving the PhD as a measure of
productivity, it may be useful to separate career experience into two or more categories so that the time periods when research and publication was possible are clear and that scholarly contributions other than peer-reviewed publications are also evident.

The chair should discuss with the candidate the type(s) of external reviewers that might be approached for the candidate’s evaluation at least a year ahead of the dossier submission. This allows the candidate to prepare a dossier and personal statement that can cover the full scope of reviewers.

If interdisciplinary evaluation criteria, or an MOU with such criteria, are not available then the candidate’s dossier and the chair’s letter should provide much of the information and context discussed in the criteria section above. For example, because many reviewers of interdisciplinary scholars will not be familiar with all the journals, the CV could be annotated with information on journal standing, and reasons for selecting that particular journal as the publication venue. CV annotation guidelines given in Appendix II can also be used when customized guidelines are not provided by the unit’s interdisciplinary criteria or by an MOU.

**Review committees and letter writers**

In most cases, it is best if the promotion and tenure process for early-career faculty and research scientists involves interdisciplinary review committees. Possibilities include:

- the personnel committee of a stand-alone interdisciplinary unit;
- a joint committee from more than one department;
- one department with letters from others where the candidate has an affiliation;
- or (probably least desirable), separate reviews by two departments. If the review will involve several departments, it is important to state from the outset what each department’s decision-making role will be—whether it will be independent and equal or whether one will have a subordinate, perhaps a consulting, role.

Avoiding joint appointments of a 50%-50% structure can facilitate the review process (see *Stage 2*). Appointments should be structured so that one unit has a higher percentage of the appointment and the lead role in the evaluation (Pollack 2005). It is strongly recommended that the lead unit incorporates the input of the supportive unit and produces one integrated evaluation for the candidate. This should hold true at all levels of review (personnel committee, Chair, Dean) with the candidate receiving one integrated review at each level.

Most importantly, all review levels of all involved units should perform their review in the context of the interdisciplinary criteria or interdisciplinary MOU provided to the candidate at the beginning of their appointment. For example, in the case of a joint appointment between an interdisciplinary and a disciplinary unit, the disciplinary unit should not use its traditional disciplinary criteria for the evaluation but should use the customized criteria outlined in the appointment MOU. Accordingly, the candidate should not be asked to prepare two sets of evaluation documents but only one set that follows the MOU guidelines.

Promotion and continuing-status committees should be made up, to the degree possible, of individuals in similar positions or with considerable experience in working with and reviewing people in similar roles (i.e. people active in the same interdisciplinary area of scholarship as the candidate). Where
a sufficient pool of such individuals does not exist, the committee should include persons with a similar title and set of job responsibilities, even though the actual scholarly focus may be in an unrelated area as they will be familiar with the challenges of working in an interdisciplinary field.

It is often also helpful to bring in an external reviewer who is familiar with the state of the interdisciplinary field and the candidate’s scholarship at the time of tenure review. Even if it is not possible to take this formal step, someone from the review committees could call outside scholars to get their feedback informally so that they are better able to apprise the candidate of how the community is assessing their strengths and weaknesses. There may be cases where it is desirable to keep the composition of the review teams, in terms of departments, disciplines and even individuals, as similar as possible along the candidate’s career trajectory, in order to provide continuity in application of criteria.

It is often challenging to identify external reviewers who have sufficient background to fairly assess contributions generated through interdisciplinary scholarship. In selecting letter writers for emerging interdisciplinary fields, it is important to have both interdisciplinary scholars who work on closely related problems, as well as eminent disciplinary scholars who are aware of this area of research and are able to comment on its significance.

Because some interdisciplinary scholarship includes community and stakeholder interaction, reviews may also be solicited from individuals outside of the academe. Some schools solicit more than the usual number of letter writers for interdisciplinary scholars in order to account for their broader range. The Chair’s letter and the candidate dossier should be prepared with the breadth or reviewers in mind. The language and terms used should be readily understandable by all reviewers contacted. Some standard questions to reviewers used in disciplinary cases may need to be adjusted for interdisciplinary faculty. For example, language that asks the reviewer to rank the candidate in the reviewer’s field or state whether the candidate would receive tenure in the reviewer’s unit may need to be amended as follows: “If you are able to, please comment on the candidate’s standing in their interdisciplinary scholarship area and on the candidate’s suitability for tenure in a leading unit in their interdisciplinary field.”

The interdisciplinary criteria, MOU or guidelines provided to the candidate for being successful (see Evaluation Criteria section above) should be included in the letter that goes out to external evaluators. The position announcement could be included as well. The Chair’s letter should ask the reviewers to perform their evaluation in the context of the attached customized criteria and expectations. Letter writers should be specifically asked to comment on interdisciplinary contributions and impact. This will serve as a reminder to reviewers of the differences and challenges of reviewing an interdisciplinary as compared to a disciplinary candidate.

Case Study 10: Boyer Tenure criteria Implementation at multiple levels of review — University of Wisconsin, Madison

The Gaylord Nelson Institute for Environmental Studies adopted in August 2006 a set of “Guidelines for Merit Evaluation and Criteria for Excellence in Interdisciplinary Scholarship” that are
based on a) Boyer’s approach for evaluating faculty through “a portfolio of scholarship types, which he identifies as scholarship of discovery, integration, application and teaching” and b) the recognition that institutions are communities and adding “community” as a dimension to the possible evaluation structures.

Consequently, each year, the Nelson Institute requires its faculty to submit a merit review that includes their role within both the Institute and their disciplinary home; a self-assessment of their recent activities with respect to their individual roles at Nelson and their disciplinary home; and an assessment of the broader impacts of their role and activities in relation to the mission of Nelson.

This annual review mechanism provides explicit guidance and criteria for evaluating interdisciplinary scholarship and teaching. Professor Nancy E. Mathews, who is current chair of the personnel committee at the Nelson Institute and past chair of the ad hoc committee that drafted the criteria, says that “the approach of measuring impact and synergy, rather than only numbers of publications and research funding, stirred much debate among our governance faculty but ultimately passed unanimously.” These guidelines are spelled out in greater detail at: http://nelson.wisc.edu/assets/docs/about/criteria.pdf

**Research Criteria**

- Evidence of innovative individual research in an interdisciplinary context
- Evidence of engagement in building long-term interdisciplinary collaborations
- Evidence of attracting research support for cross-cutting activities
- Evidence of productivity of interdisciplinary endeavors

**Teaching Criteria**

- Evidence of training and mentoring students for interdisciplinary research or praxis
- Primary responsibility for teaching one or more interdisciplinary courses and evidence of integrating innovative pedagogy that is well-adapted to interdisciplinary learning

**Outreach Criteria**

- Evidence of outreach through application
- Evidence of integration into a broader body of knowledge and practice

**Institute Citizenship Criteria**

- Evidence of active engagement in efforts to integrate a diversity of perspectives into all aspects of scholarship
- Evidence of leadership to the Institute through participation in building and maintaining the infrastructure necessary for the Institute to accomplish its mission

Early-career faculty within the Nelson Institute who work across disciplinary boundaries have concrete guidance from within, and also extensive guidance and mentoring to ensure their development as both interdisciplinary scholars and teachers.

After the unit/department level review, the majority of faculty members active in the Nelson Institute select to be reviewed by the Biological Sciences Divisional Committee (Division Committees
serve as College/University level committees at University of Wisconsin, Madison). The criteria of the Biological Sciences Divisional Committee integrate expansive views for evaluation that parallel some of Boyer’s recommendations and complement elements of the Nelson Institute criteria. The opening section of the criteria states: “To achieve tenure, a candidate must demonstrate an ability to: (1) generate new knowledge or develop new approaches to problem solving and/or teaching that indicates creativity and has substantial impact on the intended audience; (2) effectively communicate scholarly information orally and in written form to students, colleagues and the public; and (3) enhance the scholarly environment of the University community. The criteria identify three areas in which a faculty member may excel—research, teaching, or outreach/extension—rather than the traditional two (research and teaching). The criteria are available at http://www.secfac.wisc.edu/divcomm/biological/TenureGuidelines.pdf.

Having the key issues of interdisciplinary scholarship addressed at both levels of review (unit, University), shows the University’s commitment to interdisciplinary scholarship, encourages faculty to develop interdisciplinary activity and facilitates fair and accurate review of interdisciplinary faculty. Interdisciplinary faculty at the University of Wisconsin Madison achieve promotion and tenure at an equal or better rate than disciplinary faculty (see internal report at http://www.secfac.wisc.edu/divcomm/InterdisciplinaryProgramsReport.pdf)

Acknowledgements: Professor Peyton Smith, Assistant Vice Chancellor for Extended Programs at the University of Wisconsin, provided much of the information for the compilation of this case study as well as overall input on evaluation of interdisciplinary faculty.

**Case Study 11: Interdisciplinary Evaluation Criteria at the Level of the Unit, School of Arts, Media and Engineering (AME), Arizona State University**

The criteria incorporate six of the proposed evaluation practices: i) using a four category metreric for calibrating evaluation standards across diverse research outcomes and practices; ii) replacing the traditional author hierarchy with group authoring practices for collective research products, iii) evaluating and rewarding the size, strength and diversity of a faculty member’s network of collaborators (the category of “connectivity” carries 25% of the weight of the evaluation), iv) providing guidelines for balancing interdisciplinary and disciplinary components of the evaluation for faculty with joint appointment between interdisciplinary and disciplinary units, v) incorporating input from the two units of joint appointments into one integrated review (at all levels or review); vi) using interdisciplinary evaluation committees. The principles and processes for the development of the criteria are discussed in Rikakis (2009). The criteria can be found at http://ame4.hc.asu.edu/resources/images/7/76/Ame_faculty_evaluation_criteria_and_procedures.pdf

Acknowledgements: The criteria were recently updated using input from AME faculty members and edited by the current personnel committee (Hari Sundaram, Chair; David Birhfield, Todd Ingalls). The on-line system for the implementation of the criteria was developed by Loren Olson.