# Breakout-Group: Interdisciplinarity in Cyber-Trust Research

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In March 2008, I chaired a breakout-group discussion about "Interdisciplinarity in Cyber-Trust Research" at the NSF Cyber-Trust PI Meeting. This document summarizes the main points made by participants in that discussion.

**The Cyber-Trust agenda is inherently interdisciplinary.**

Intellectually, there are many research problems that cannot be solved with the tools of only one discipline. For example, there is widespread agreement that, in today's networked environment, security and privacy cannot be achieved simply by *hiding* sensitive information but, rather, must be achieved by ensuring *appropriate use* of such information. Determining, in context, which uses are appropriate is an inherently interdisciplinary undertaking.

In terms of personnel, we are indeed an interdisciplinary community. The Cyber-Trust PI meeting of March 2008 was attended by people with advanced degrees not only in Computer Science but also in Economics, Mathematics, Operations Research, Electrical Engineering, Law, Philosophy, Political Science, Psychology, Linguistics, and Information Systems. Within Computer Science, Cyber-Trust (CT) researchers come from AI, algorithms and complexity theory, program languages, operating systems, networking, HCI, databases – indeed from almost all research areas.

Structurally, interdisciplinary organizations (*e.g.*, the I-Schools at Berkeley, Michigan, and Syracuse) are emerging and appear to be receptive to hiring faculty and admitting students who are interested in CT research.

**Interdisciplinary research should not be oversold.**

Sometimes, solicitations for proposals, calls for papers, job ads, and other descriptions of the CT agenda appear to be promoting interdisciplinarity as though it were a panacea. Participants in this discussion group were unanimous in their disapproval of this trend. The point is not to be interdisciplinary for the sake of being interdisciplinary; rather, it is to approach technical problems with all of the tools needed to solve them. Here and at other points in the discussion, participants agreed that the way forward is to do *problem-driven research rather than technique-driven research*. (See below.)

**Interdisciplinary research can be hard to evaluate.**

Participants agreed that NSF panels, program committees, hiring committees, and basically all groups formed to judge research, researchers, and research proposals should *not* be put together simply by choosing representatives of two or more fields that use the same keywords. People have to have shared and appropriate values in order to be able to work together and make good choices. A panel composed of two disjoint groups of people from two different fields that both claim an interest in, say, "privacy" will have

completely bi-modal assessments of the proposals (based on completely different understandings of what privacy is) and may wind up rejecting the proposals that *either* group thinks are the best; instead, it may fund the mediocre proposals that both groups find unobjectionable. The solutions to this problem are community formation and problem-driven research. (See below.)

In general, it is important when evaluating interdisciplinary research to recognize that some of the most influential and ingenious early contributions are broad rather than deep, horizontal rather than vertical (in that they connect two previously disjoint lines of inquiry rather than extend a previous line in a technically impressive manner), and seminal rather than definitive.

**Opportunities to publish interdisciplinary CT research are mixed.**

Many high-quality conferences and workshops seem to welcome contributions from the interdisciplinary parts of CT research. These include but are not limited to security conferences (such as ACM CCS and IEEE Oakland) and conferences in the emerging area of Econ-CS (such as ACM EC, WEIS [the Workshop on Economics of Information Security], WINE [the Workshop on Internet and Network Economics], and NetEcon).

Opportunities to publish journal papers on interdisciplinary CT research are not as easy to come by. Editors and referees often don't embrace the criteria discussed and the end of the previous section and, more generally, often apply conservative and narrow standards that may not be appropriate in new, interdisciplinary fields.

**Because of these potential problems of evaluation and publication, it may be harder for junior people to succeed in interdisciplinary CT research than it is for senior people.**

(Self-explanatory.)

**The best hopes for resolution of the problems identified are senior leadership, community formation, and problem-driven research.**

Once a technical problem has been formalized and is widely regarded as worth solving, many of the aforementioned difficulties fade away: Few will quibble that a conference submission is not technically impressive enough if it solves a problem that has been blessed by leaders in the field. Toward this end, participants in this breakout group agreed that senior leadership and community formation are essential for progress on interdisciplinary CT research. These two need not proceed hand in hand: Communities can form bottom-up as well as in response to senior leadership.

These communities should form around unsolved research problems that are inherently interdisciplinary. It is relatively easy to staff NSF panels, editorial boards, and conference program committees with people who have shared and appropriate values once there is a well defined community, led by senior people, that has agreed on a set of central, unsolved problems. Similarly, it is relatively easy to make hiring and tenure decisions once these preconditions have been met; this clears the way for junior people to enter the field.

All of these elements (senior leadership, community formation, and problem-driven research) are in place in the emerging field of Econ-CS (including the part of

Econ-CS that overlaps with CT), which is indeed a field in which junior people can get hired and get tenure and in which journal papers are regularly published. Breakout-group participants agreed that Economics and Computer Science have taken many of the steps necessary for effective interdisciplinary CT research and encouraged leaders of other fields represented at the CT PI meeting to take similar steps.