EDUCATION

Risks and Rewards of an Interdisciplinary Research Path

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Interdisciplinarity has become synonymous with all things progressive about research and education, not because of some simple philosophic belief in heterogeneity but because of the scientific complexity of problems currently under study (*1*). In many fields, it is argued, the easy work is finished as scholars are confronted with questions that defy easy categorization in or solution by traditional disciplinary frameworks. In response, myriad interdisciplinary programs have arisen, from federal-level initiatives such as the National Institutes of Health Roadmap and the National Science Foundation Integrated Graduate Education and Training program to campus-based endeavors like the University of Illinois Beckman Institute and the Stanford University Bio-X Program.

The rise of interdisciplinarity has also spawned a vast literature on how interdisciplinary research and training should be organized, how scientists and students will behave, and how activities of such programs could be facilitated (*2*–*6*). There have been, however, fewer studies that seek to understand empirically the links between institutional initiatives, individual attributes, and professional implications (*7*, *8*).

Between January 2002 and June 2003, we conducted surveys and interviews to analyze the interdisciplinary activities of researchers in five university-based programs funded under the NSF Environmental Research and Education portfolio (*9*). Entry into these programs was by application, invitation, and/or appointment.

We expected that because younger scientists are likely to have had more interdisciplinary exposure and less intellectual commitment to a particular field, they would be more predisposed toward these programs than their senior colleagues. At the same time, because senior faculty have accumulated greater professional freedom and more social resources, we thought that they would be more likely than their junior counterparts not only to affiliate with but also to collaborate in these programs.

Graduate students and full professors were indeed overrepresented in these programs as compared with other tenure-track researchers (see the table below) (*10*). However, apart from principal investigators who dominated large shares of interdisciplinary activity, graduate students demonstrated higher rates of interdisciplinarity than professors. Whereas 61 of 99 (62%) graduate students reported at least one interdisciplinary collaboration, only 72 of 147 professors (49%) claimed the same (*11*, *12*).

But, graduate students were also most likely to associate professional costs with interdisciplinarity. About 16% reported "negative" career effects of the program's "interdisciplinary" design (see the table). In describing real or perceived effects, graduate students indicated long-term costs. One described his position as "non-traditional, highly beneficial, but completely risky in the long run." Another explained: "For those of us who begin interdisciplinary, we get to design a [personal] renaissance to meet the needs of real-world problems. This renaissance, however, comes at a price—it may take us longer to establish ourselves in our careers." Several pointed to the greater prevalence of interdisciplinary role models among staff without tenure versus those with tenure.

When asked why they were willing to take these professional risks, graduate students frequently mentioned societal benefits. One student said "I have become very aware of the horrible inefficiency of the scientific enterprise in turning knowledge into useful products … so I came to branch out from what I was doing, to do something bigger and better, more intellectually interesting, and more practically important." Another commented: "I am sorta' on the fringe of science—but I am dealing with the core problems of society."

Our study supports the claim that "[b]right young scientists will gravitate toward the rich scientific opportunities at disciplinary boundaries" (*13*). It also suggests, however, that many still feel the tension between the scientific promise of the interdisciplinary path and the academic prospect of the tenure track.

References and Notes

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7. D. Stokols *et al.*, *Nicotine Tob. Res.* **5**, 21 (2003).
8. J. Cummings, S. Kiesler, *Soc. Stud. Sci.* (in press).
9. The five programs included a Human Dimensions of Global Change Center, two Integrative Graduate Education and Research Training programs, a National Synthesis Center, and a Science and Technology Center. See supplemental material for further information.
10. The affiliates across the five programs were distributed as 18% graduate students, 28% non–tenure-track faculty, 9% postdoctoral, 8% assistant professors, 9% associate professors, and 27% full professors (see the table); when the separate program percentages are averaged across the five programs, thus treating each program equally, the distributions are 32, 16, 6, 7, 9, and 28%, respectively. Both calculations point to light involvement of early career tenure-track faculty.
11. "Interdisciplinary" refers to relations that cross boundaries (e.g., engineering, physical science, life science, and social science).
12. D. Rhoten, A. Parker, unpublished data.
13. N. Sung *et al.*, *Science* **301**, 1485 (2003).

14. Supported by NSF grant BCS-0129573.

Supporting Online Material

www.sciencemag.org/cgi/content/full/306/5704/2046/DC1

10.1126/science.1103628

VIEWS ON CAREER EFFECTS OF INTERDISCIPLINARY RESEARCH

	Distribution by rank*							
	G	NTT	PD	AsP	AP	P	PIs	Total
Number surveyed	160	245	84	73	82	232	12	888
Total responses	99	155	59	47	53	147	11	571
Positive	67	104	42	34	43	109	11	413
Neutral	16	43	11	12	8	23	0	114
Negative	16	8	6	1	2	15	0	44

*G, graduate student; NTT, nontenure track; PD, postdoctoral fellow; AsP, assistant professor; AP, associate professor; P, professor; PI, principal investigator. [Source (*9*)]

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