"But Why Should a Physics Department Be Part of the College of Engineering?"

W.R. Schowalter

One year ago, as I contemplated moving from the position of professor and former chairman of the Department of Chemical Engineering at Princeton University to the position of dean of the College of Engineering at the University of Illinois at Urbana-Champaign, I went through an exercise well known to those contemplating a major career decision. A list of perceived assets and liabilities was composed, weighting functions were assigned, and totals were struck. Finally, also true to the form of most of these attempts at rationality, the list was crumpled up, thrown into the wastebasket, and instincts were followed.

Although the list may not have had the quantitative influence it deserved, the ledger was not a forgotten table, and one entry has repeatedly returned to mind since my arrival on the Urbana campus last February. The entry read, "Physics Department is in the College of Engineering(!)." And, indeed, although such departments as chemistry and mathematics report to the dean of the College of Liberal Arts and Sciences, physics has been a bulwark of this engineering college since the birth of the department in 1889.

This administrative arrangement seemed odd—but fortunate—to me, and the physics "anomaly" definitely went into my ledger on the asset side. I was, however, met by more than a few raised eyebrows upon mentioning this fact in various circles. Shortly after my arrival at Illinois, the head of the Physics Department, A.C. "Andy" Anderson, sent me a photograph of staff members disguised in an outlandish array of Halloween costumes for an annual party. I thanked Andy for the souvenir, explaining that with this evidence I could finally explain to my physics friends at Princeton why the Illinois Physics Department was in the College of Engineering.

The truly pervasive benefit to Illinois has been the cultural attitude toward transdisciplinary research.

Going back many years to my prior presence on this campus as a graduate student, I recall a supper conversation (it would be a mistake to dignify what we ate with the term "dinner") with a physics graduate student (surely unaware that he was a member of the College of Engineering) pontificating on hierarchies. As I recall, his list went "mathematicians, physicists, people, engineers, chemists."

Nevertheless, physics today at UIUC seems as closely bonded to engineering as it did to the university's first professor of engineering, Stillman Robinson. One reads in the department's historical documents* that Robinson "regarded physics as the foundation of engineering." To be sure, since those early days physics has followed a path that has taken it farther from direct applications than existed in the 19th century, and in recent years there has been a tendency for us to think in term of a *discovery* by, for example, a physicist, followed by an *application* by an engineer. (I sense, however, that the two paths are beginning to approach each other again.)

The activities of physicists and engineers are clearly, on average, distinguishably different. A physicist, given the choice, will often choose a problem that has some hope of successful resolution through approaches peers will describe as tasteful, elegant, and deep. An engineer, again on average, will be attracted to a problem because of the hope that a solution will unlock paths to a better product, a more rational design methodology, or a more economical achievement of agreed-upon ends. Industrial research laboratories learned long ago that intelligent blending of these two cultures can produce far more than their sum. For a complex set of reasons, some quite defensible, this blending has not been common in universities. Yet, old-timers still reminisce about the remarkable results achieved from joint efforts on hypersonics, radar, and nuclear energy. It is perhaps symptomatic that it took a worldwide conflagration to induce these accomplishments.

But let me return to Illinois. The fabric of the place as well as specific accomplishments demonstrate, I believe, fruits that have followed from the wisdom of Stillman Robinson. Illinois is where much of the history of solid-state physics was made during the academic careers of Seitz, Bardeen, and others. One associates those names with the Physics Department. However, it is because of that early imprint from physics that today Illinois possesses a powerhouse in microelectronics that includes such contributors as Holonyak, Stillman, Jim Coleman, and others. The microelectronics effort, however, is placed squarely in the Department of Electrical and Computer Engineering. Consider also the new National Science Foundation-sponsored Science and Technology Center for Superconductivity. Its director, Miles Klein, is a member of the Physics Department. However, much of the work important to the Center involves issues surrounding thin films, ceramics, and other topics long ago placed firmly on the research agenda of Illinois faculty members in engineering.

The above are specific examples, but I believe that the truly pervasive benefit to Illinois has been the cultural attitude toward transdisciplinary research that was inculcated long before the word was on the tongue-tips of deans and bureaucrats. Illinois has fostered cohabitation of strong academic departments along with first-class interdisciplinary units for more than a generation. It is a culture that 40 years ago

*Dedication of the Loomis Laboratory of Physics, University of Illinois at Urbana-Champaign, Urbana, Illinois, 1980 (Appendix B).

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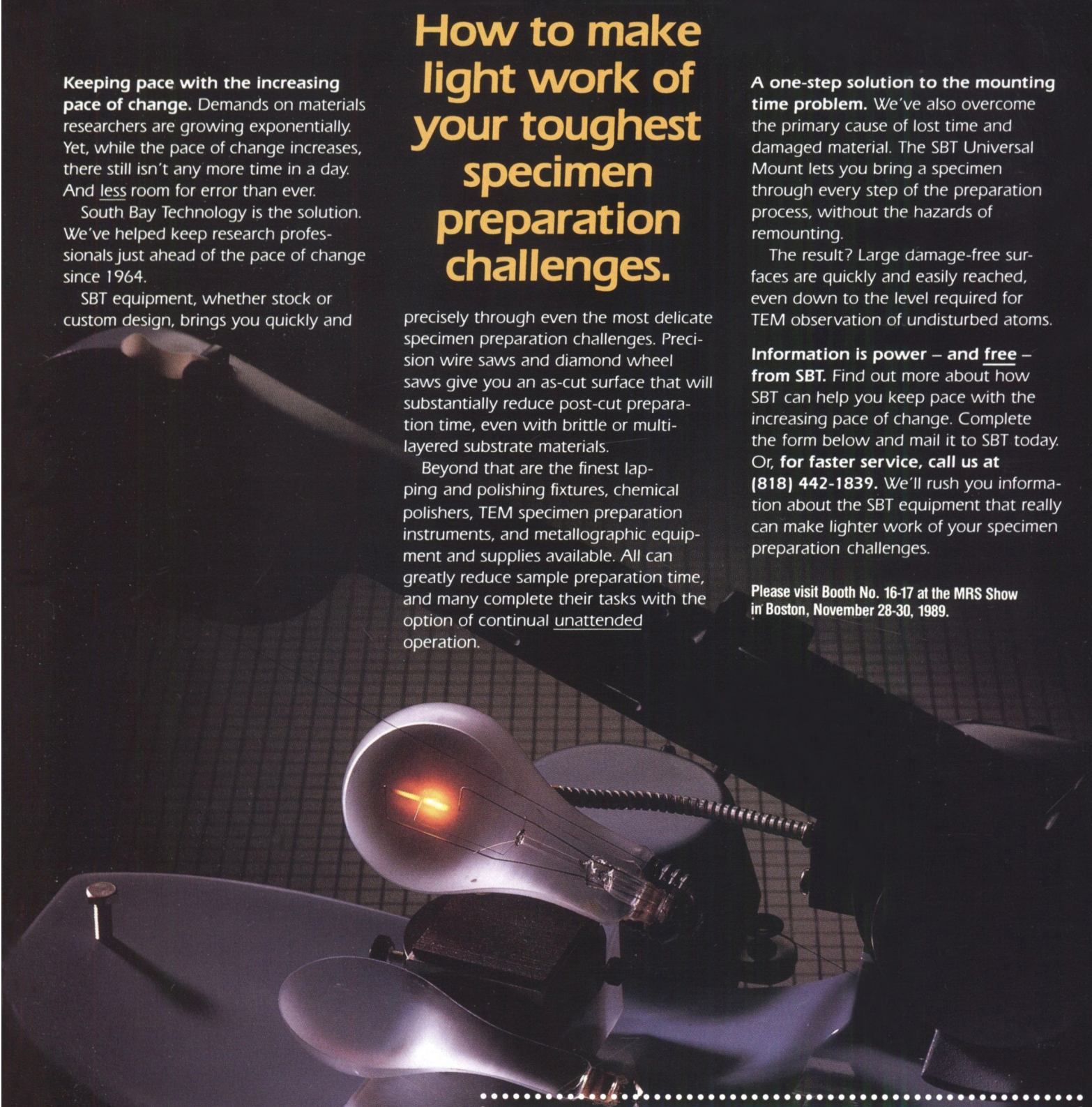

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prompted landmark work in high-speed computation, that later spawned the Coordinated Science Laboratory, and that today fosters development of the Beckman Institute, a $40 million facility devoted to the fundamental understanding of memory, learning, and intelligence. I believe that a climate hospitable to these endeavors would have been far less likely had physics and engineering grown up under distinct administrative compartments.

Is there a lesson here for other institutions? Perhaps there is only the lesson that cultures do not change by administrative edict. They *emerge,* often only slowly. Perhaps the lesson is no different than the instruction intended by the legendary gardener of one of Cambridge's colleges when asked by the equally legendary American tourist what in the world one did to get the lush carpet of lawn that seems so natural in the magnificent settings near the Cam. His answer was that cultures require nourishment, commitment, and, above all, patience.**

Perhaps cultures emerge only slowly, but they do emerge. I can vouch for the success of this particular one and encourage those who may contemplate similar bridge-building between engineering and physics to proceed forthwith... □

**The gardener of course did not really say that. He said, "Sir, you mows it and you rolls it for 400 years."

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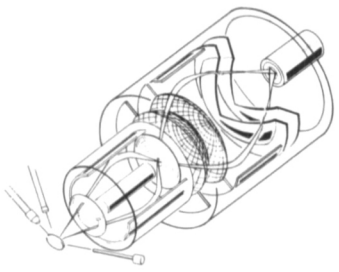

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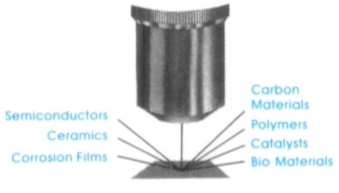

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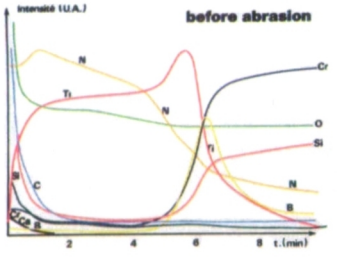

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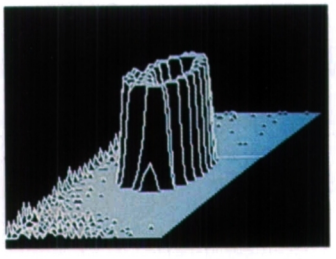

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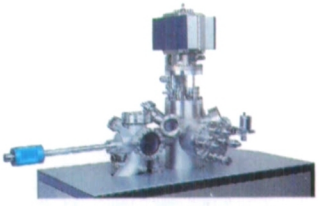

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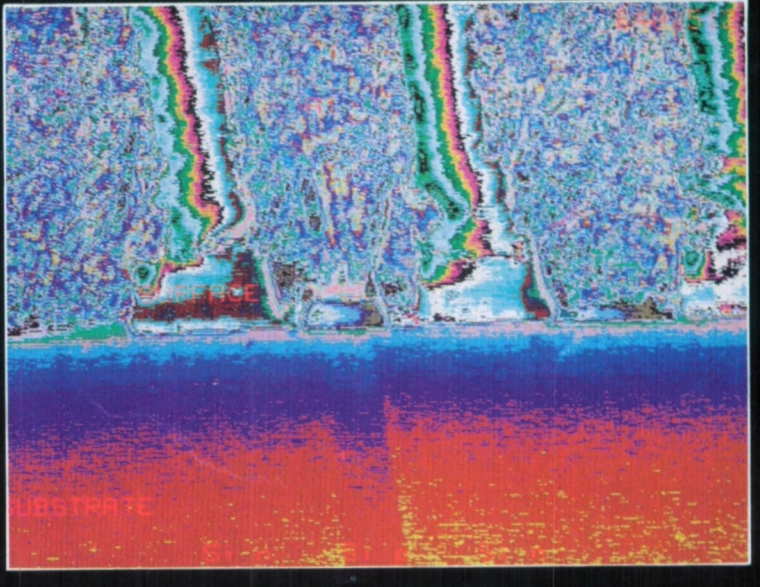

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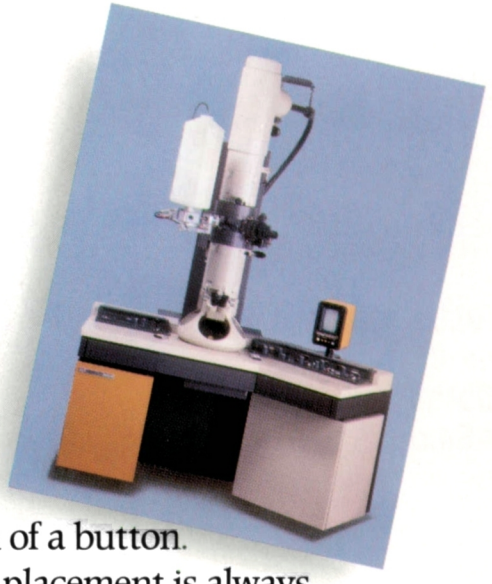

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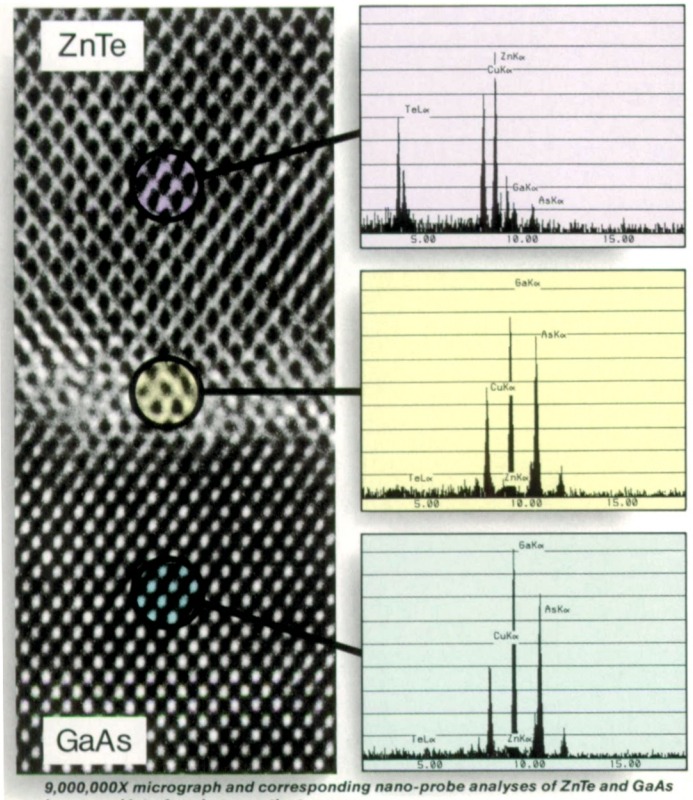

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