

Innovation at the Interface: Technological Fusion at MIT

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Two Views of Technological Innovation

1. Significant innovation comes from breaking through the boundaries of a given technology.
2. Significant innovation comes from combining existing technologies into hybrids.

Both views are obviously correct. But we focus on #2! “The greatest progress occurs at the intersection of disciplines ... among a wide variety of fields. (Jackson, 2003)

Early Technological Innovation from Convergence/Fusion/Merger

**U.S. machine tool industry (mid-1800s) resulted
from technological convergence.
(Rosenberg, 1963)**

**Later in the 19th century similar patterns
occurred in firearms, sewing machines,
bicycles. (Kodama, 1992)**

Later Technological Innovation from Convergence/Fusion/Merger (Kodama, 1995)

“Mechatronics”, the fusion of mechanical, electronics and materials technologies, generated numerically controlled (NC) machine tools (Fanuc) and industrial robots.

“Optoelectronics” came from the fusion of glass with cable and electronic device technologies, and has had widespread and continuing impact.

Some Recent Technological Innovation from Convergence/Fusion/Merger

Sharp's liquid crystal displays (LCD) for pocket calculators came from fusion of electronic, crystal and optic technologies. (Kodama, 1992)

Minimally invasive therapies involve fusion of a wide range of existing technologies. (Gelijns & Rosenberg, 1995)

Handheld computers illustrate industry convergence. (Stieglitz, 2003)

More Current and Local Examples

In one view, the MIT Media Lab embodied “a fusion of audio and video hardware and software with the entertainment industry’s creativity and artistry”. Others would cite the convergence of computers and communications technologies as critical here.

And, in other parts of MIT, what about the emergence and evolution of bio-chemistry and bio-physics and bio-informatics??

At the Fusion of Computer Sciences and Life Sciences

IBM has announced its entry to servicing biotech and pharma with large scale computing. (Gwynne, 2003)

Tiny MEMs-like devices are moving through human circulatory systems to help diagnose and treat.

Early-stage firms such as Reify are combining machine learning and signal processing technologies with biology for use in cell assays throughout drug discovery.

But Technological Innovation and Entrepreneurship Go Hand in Hand

If significant innovations are occurring, innovators including some who are entrepreneurs are involved.

Entrepreneurs see many different opportunities from the same discoveries and developments. (Shane, 2003)

And in this community angel investors and venture capitalists will be nearby, interested and in contact.

Tonight's Agenda: Innovation (and Entrepreneurship) at the Interface

- 1. Rodney Brooks: Fusion in Computer sciences, AI, robotics**
- 2. Robert Langer: Fusion in Biomaterials**
- 3. Langer and Brooks: Fusion at the interface between computer sciences and life sciences**