MITSUBISHI ELECTRIC RESEARCH LABORATORIES Cambridge, Massachusetts

Industrial Research Labs: Neither for the Feint of Heart Nor the Short of Sight But Vital

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Outline

- What is Mitsubishi Electric and MERL
- The Future of Corporate Research
- Basic Research in a Corporate Setting
- Technology Transfer
- University Industry Interaction
- IP (Bone of Contention)
- What Government Should Do
- What's it All About Really



Mitsubishi Electric (Melco)

- \$30B in sales
 - 70% in Japan, 10% in US, 10% in EU, 10% in East Asia
- 100,000 people in 35 countries
- Diverse business units
 - Elevators, communications equipment, auto parts, factory automation, semiconductors, TVs, DVD players, satellites, power plant equipment, large systems for government and industry, ...
- Primarily a business to business company
- Seeks competitive advantage via technology
 - (as opposed to e.g., price)
 - Every recent president of Melco has been an engineer
 - The current president is the former head of corporate R&D



Mitsubishi Electric Research Labs (MERL)

- The US arm of Melco's Corporate R&D
 - Computer science and electrical engineering research from algorithms and devices to systems
- MERL's Mission
 - To generate important intellectual property in areas of value to Melco
 - To locate appropriate Melco organizations and, through partnership with them, significantly impact business
- 65 researchers in Cambridge MA
- Established in 1991



Placing MERL in the Research Lab Spectrum

- Funding
 - 1/3 customer requests, 2/3 central funding
- Research vs advanced development
 - MERL has two sub-labs, one for applied research & one for AD
- Creator versus observer/acquirer
 - MERL seeks to create new technology
- Participation in the research community
 - MERL is open, publishing all its results
- Collaboration with universities
 - MERL does a lot: Student interns, relations with professors, ...



The Future of Industrial research

- Recent years have not been glory days
 - Mighty labs have fallen
 - Research is shorter range in most places
 - Some labs have been closed
- Is industrial research on the way out?
- Can basic research continue in industry?



Is Industrial Research on the Way Out?

- I don't think so
 - Companies need to innovate or die
 - If a company has the PE ratio of Cicso Systems in the late 90s, it can buy up all it needs from innovative startups
 - But for lower fliers, this costs too much
 - Also, companies need research closely tuned to their needs
 - That is not necessarily available from anywhere outside
 - There are many ways to organize research and pendulums swing back and forth, but companies must devote effort to innovation



Can Basic Research Continue at Companies?

- I believe it can
 - But there is almost certainly going to be less of it for a while
- Basic research takes time and money
 - The more basic it is the more time and money it takes
 - The most basic research requires (near) monopoly profits
 - The old AT&T could do it
 - Probably, Microsoft can do it
 - The government can and should do a lot of it
 - Most companies cannot
 - But, patient companies like Melco can benefit from basic research
 - The key is focusing on relevance to the company and
 - Following through all the way to business impact



Basic Research in a Corporate Setting

- First a caveat:
 - In general, basic research in computer science
 - is nowhere near as basic as in physics of biology
 - However, even if only modestly basic,
 - long term research is tricky to achieve in a corporate environment



The Rule of Thirds

- What a lab does needs three key parts:
 - 1/3 had better be benefiting the company now
 - Or else, people will wonder if money is well spent
 - 1/3 laying the groundwork for next year's immediate benefit
 - Or else, the lab will be in trouble next year
 - 1/3 developing seeds for the future
 - Or else little of real interest is going to happen
 - This is where basic research is possible
 - And in my opinion essential



The Approach to Basic Research Used by MERL

- Basic research requires
 - Exceptional people
 - Stable funding
 - Avoidance of micromanagement from above
- For it to benefit the company
 - The people must do relevant things
 - The people must follow through all the way to impact
- It's a delicate balancing act,
 - but potentially very productive
- Freedom within moderate constraints
 - Can be very good for research and company impact



Freedom & Focus in Basic Industrial Research



Researchers

Understand where they can advance science Understand company needs (far from easy) Select research directions in the overlap (Only a few can really do this, others follow)

Create major innovations

Follow through to impact the company



Technology Transfer

- At the center of technological development
 - But far from easy



Technology "Transfer" I - Idea flow



- Not very effective model
 - "Great ideas" move from one step to another
 - Doesn't work well for universities or corporate labs (unless ideas are very simply described as in pharmaceuticals)
 - Communication is difficult
 - Not-invented-here antibodies are virulent!
- Implicitly lurks behind many university-industry models
 - Including (it would seem) the "one-stop IP-shop" model



Technology "Transfer" II - People flow



- Pretty effective model
 - People move with "Great ideas" from one step to another
 - Works fine for universities and within companies because
 - Communication is good
 - Transplantation limits not-invented-here antibodies
 - The outflow of students is a university's greatest strength
 - But, requires a lot of turnover at the recipients
 - new people with each set of ideas



Technology "Transfer" III - Collaboration of Peers



- Very effective model
 - People with similar abilities collaborate as peers
 - Creating and communicating ideas
 - Works great for universities and within companies because
 - Communication is good
 - True collaboration means everyone feels "it is invented here"
 - People moving useful but not essential



Peer Collaboration Good With Universities Too





University Industry Interaction

- Universities and industry can work together many ways
 - Some are a lot better than others for one side or the other



Great Kinds of Industry University Collaboration

- Peer collaboration (With or without corporate gifts)
 - Good for all concerned
 - Inexpensive; but company shares IP
 - MERL does this a lot
- Student interns
 - Great for company and students (as long as company is open)
 - Medium expense; Company owns IP
 - MERL does this a great deal (50-60 interns/yr for 65 tech staff)
- Professors consulting to industry
 - Great for company and professors
 - Considerable expense; Company owns IP
 - MERL does this a moderate amount



Not so Great Kinds of Collaboration

- Fully funded research
 - Great for university
 - Extremely expensive; Company owns IP
 - Too expensive for MERL
- Partly funded research
 - OK for both sides
 - Still quite expensive; Company shares IP
 - MERL does this a small amount
- Research Consortia
 - Fine for University, variable value for companies
 - Expensive; complex IP situations
 - MERL hasn't yet seen a consortia worth the cost



Industrial Affiliate Programs

- Here I can only speak from MERL's particular perspective
 - IAPs have many goals, but one often cited is "access"
 - This seems to me to be a weak justification at best
 - If a company has competent researchers in a field
 - It has much better access to all universities at once
 - If it does not have such researchers
 - It is difficult for it to take advantage of the access an IAP provides
- In its early days, MERL was a member of several IAPs
 - In part, this was an attempt to make connections
 - Which wasn't particularly effective
 - In part, it was philanthropy
 - Which in better economic times we would be pleased to continue



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IP (Bone of Contention)

- Universities and industry are natural collaborators
 - With few areas of contention
 - Except IP!



Not all IP is the Same

- Some IP is
 - straightforward to transfer, hard to get around, and has high value
 - Pharmaceuticals, plant verities, ...
 - Nobody can argue against universities obtaining maximum value
 - Hundreds of millions are at stake
- A lot of other IP is
 - hard to transfer, easy to get around, and of much less value
 Computer algorithms, system things, ...
 - It doesn't make much sense to be fighting over this kind of IP
- University licensing departments
 - Were created because of the former
 - But naturally tend to treat everything the same
 - They can greatly complicate collaboration



A Horror Story

- A few years back
 - MERL was considering joining a university/industry consortium
 - MERL would have paid a considerable sum to the university
 - MERL was asked to sign an IP agreement that
 - Gave the University shared rights to IP developed by MERL by its own people on its own money in its own facility in the area of the consortium
 - MERL never succeeded in negotiating an agreement that
 - Was even equal to no agreement at all
 - No surprise, MERL never joined the consortium
- One cannot help but feel nostalgic for 10 years ago
 - When universities didn't care much about IP



The Typical Case Isn't Very Good Either

- US universities are asking way too much for IP (Often claiming Bayh Dole made them)
 - Many a proposed IP agreement is of the form
 - Pay now for the right to decide later what it will cost later
 - One doesn't need to have any agreement
 - To be able to decide later what it will cost later
 - The only kind of agreement MERL will sign is of the form
 - Pay now so you don't have to pay later
 - But we haven't had this opportunity with a US university in a while
- All this is a major impediment to collaboration
 - In general, we sign no agreement and
 - Collaborate only in situations where MERL will co-invent
 - At least then, US patent law specifies we don't have to pay later



What Government Should Do

- Support basic research
 - This is something that really raises all boats
- Grow scientific talent
 - By supporting education
- Promote immigration of the talented and hard working
 - The current difficulties in getting visas of all kinds is a big problem
 - The influx of the talented and hard working
 - Has been the foundation of America
 - Let it continue to be so!



Above all, Let's Focus on the Fundamental Goal We Share

- Stepping back from the details of IP and the like
 - All in research are involved in the same great enterprise
 - Let's not let anything petty stop us!
 - (There are enough ways around everything)
- Let's just collaborate no matter what
 - And through collaboration
 - Make a bigger difference

