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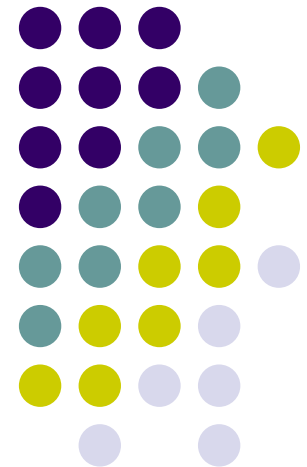
15.351 Managing Innovation and Entrepreneurship
Spring 2008

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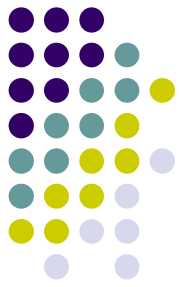
15. 351 Managing Innovation & Entrepreneurship

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MIT Sloan School of Management
Spring 2008

Class Fourteen – D-Wave



D-Wave Additional Financing



- **August 2004 -- \$5.8 million** from existing investors
 - Note that DFJ has invested \$100 million in nanotech startups, which this complements
- **May 2006 -- \$14 million** in second round, led by Harris & Harris (tinytech investors), with existing investors.
 - Adds to \$17.5 million in funding to **(total \$31.5 million to date)**
 - At this time, D-Wave holds rights to 90 patents and applications worldwide, including 38 issued US patents
- **January 2008 - D-Wave closes \$17 Million Series C** financing led by International Investment and Underwriting (IIU) of Dublin, Ireland and strongly supported by existing investors

D-Wave Progress Report



- 16 qubit quantum computer demonstrated in February 2007 at Computer Museum in California
 - Demonstrated three pattern-matching applications: first, a search for a similar compound within a molecule database to a known drug. Second, a seating arrangement at an event based on compatibility requirements between guests, and third, solving a sudoku puzzle. *Note: Not everyone believes the demonstrations relied purely on quantum computation*
- 28 qubit quantum computer demonstrated in Nov. 2007 at Supercomputing Conference 2007, with a chip made at the Jet Propulsion Lab. Herb Martin, D-Wave's CEO:
 - *“Our product roadmap takes us to 512 qubits in the second quarter of 2008 and 1024 qubits by the end of that year. At this point we will see applications performance far superior to that available on classical digital machines.”*

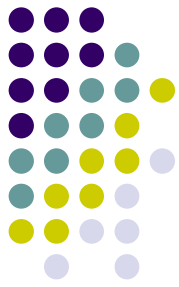
D-Wave Announced Plans



- D-Wave plans to deploy the 28 qubit machine in the last quarter of 2008 using an on-line service model and providing support for applications involving pattern matching, constrained search and optimization.
 - *In June 2009 D-Wave plans to make the on-line quantum computing service available for Monte Carlo simulation targeted at pricing and risk analysis in the Banking and Insurance community. This will be followed by a quantum simulation capability for chemical, material and life science applications.*
- D-Wave is pursuing a partnership strategy with domain software companies to ensure that a rich selection of applications are available on the on-line service. Dr. Bill Macready, D-Wave VP:
 - *“The software is designed such that existing applications may be adapted rapidly through the use of industry standard application programming interfaces. New applications may be written using the universally adopted SQL with the addition of a proprietary extension.”*

Source: D-Wave Press Release, November 12, 2007

Building the D-Wave Team



April 2005

- Hired William Macready, PhD in Physics from U. of Toronto, from NASA Ames Research Center, as head of Product Development. [Optimization software specialist.](#)
- Hired Mark Johnson, PhD in Physics from U. of Rochester, from Northrup Grumman, as Senior Engineer. Expert in [ultra-fast processor design.](#)

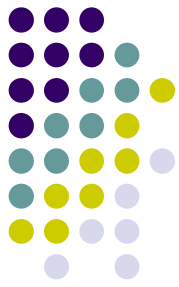
July 2005

- Hired Paul Bunyk, renowned [supercomputer processor architect,](#) from Northrup Grumman Space Technology, 15 years experience.

May 2006

- Hired Herbert Martin as [CEO.](#) 30 years of experience in high tech, including 20 as a CEO of computer and semiconductor startups.
- **Founder Geordie Rose moves to CTO.**

Building the Team cont'd



October 2006

- Hired Jonathon Silverman as head of Product Marketing. Will be in Silicon Valley and head the Discrete Optimization product offering. 20+ years of industry experience in planning and optimization software product management, including at startups & IBM

November 2006

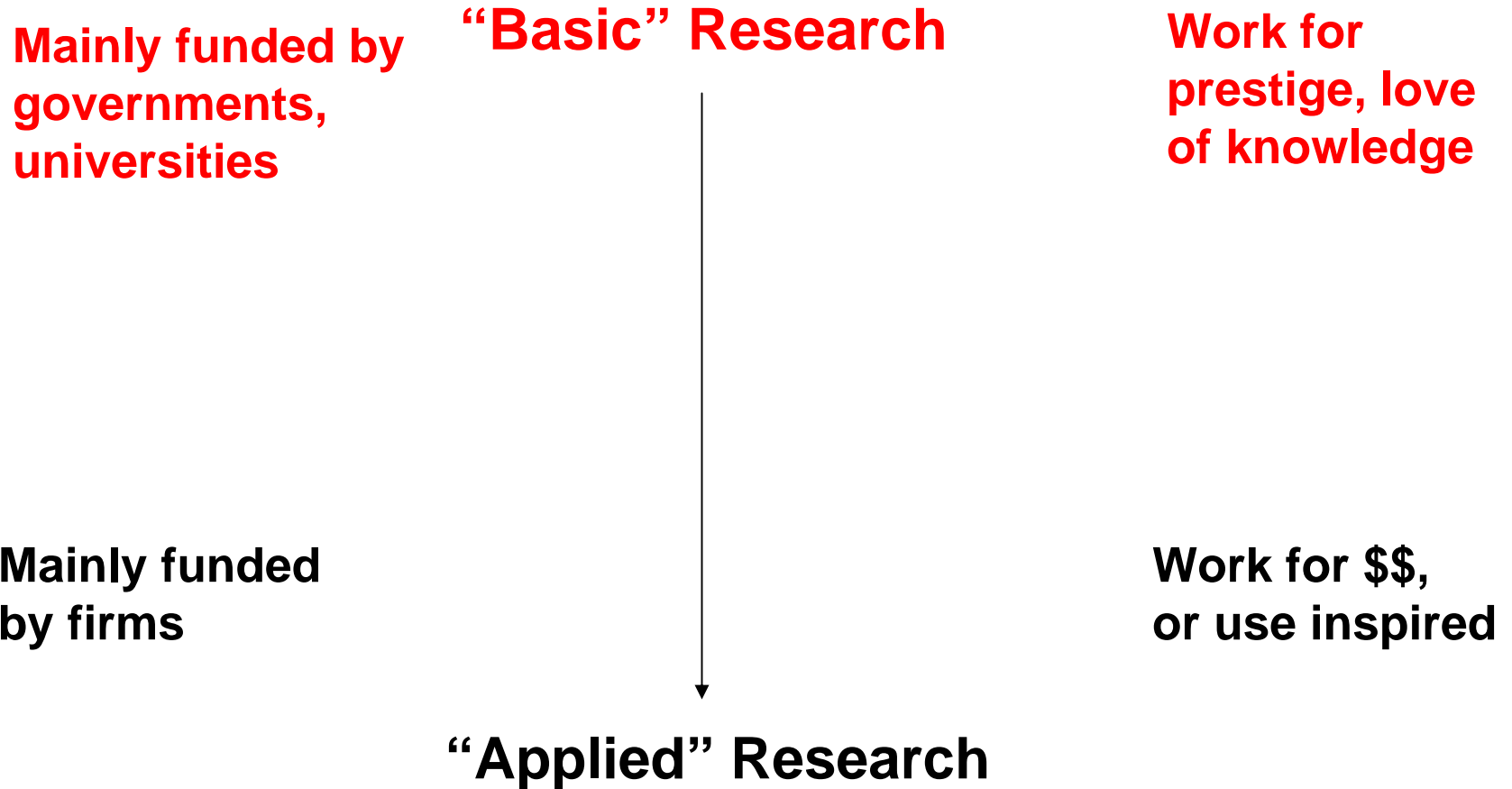
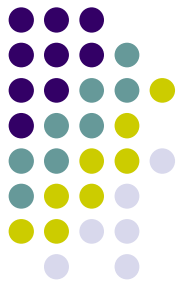
- Hired Mark Scivier as head of R&D. PhD Physics, U of London, 20 years experience in large-scale engineering project management, including Motorola
- Hired Dave Pires as head of Product Engineering. 16 years experience in industry, including Kodak

**CONCLUSIONS FROM ALL THESE HIRES??
MOVED CONSIDERABLE R&D IN-HOUSE**

**“we don’t do much theoretical physics any more...”
(Geordie Rose blog 2007)**

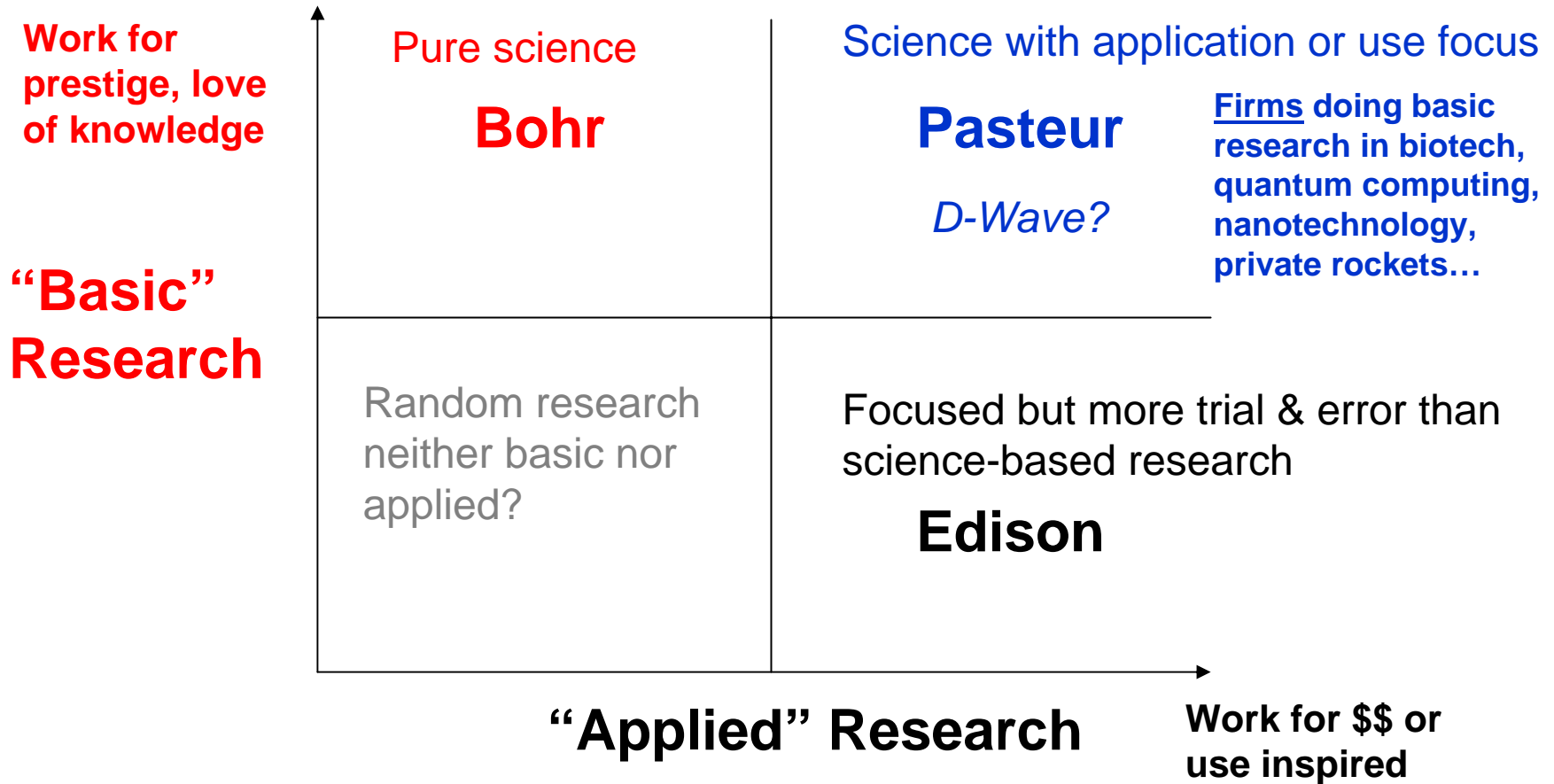
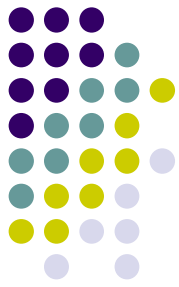
The Traditional View

Clear Separation and Flow of Basic to Applied Research

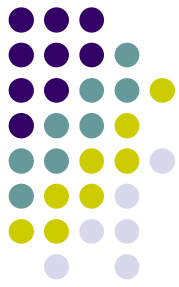


Pasteur's Quadrant

Separation No Longer So Clear for Science-driven Fields



Logic Behind D-Wave?



1. Such a ***short gap between discovery & practice that it's worth doing the basic research?***
2. Or you ***can't do applied without a fundamental understanding of the basic***, and that can only be gained by actually doing it?
3. Or ***potential payoff is REALLY BIG*** and can lock in intellectual property even at this early stage?

=> KEY IS TIMING- need to carefully decide when to move R&D in-house & when to move from Pasteur's Quadrant into Edison's Quadrant...

Network Opportunities & Challenges



		D-Wave	IBM-Linux	InnoCentive
IP	Can you control it – what do you need to control?	OK - IP from universities	None – need complementary assets	YES
People quality	How good are the people – do they want to be internal or external?	Middle-tier – higher tier won't do the IP deal you want	Can't control but there are community controls	Can't control – simply broadcast
Sharing	Can you take advantage of multiple minds on a single problem – sharing ideas...?	Sort of – academia does share but you can amplify	Yes - lots!	None (but see netflix)
Integration & focus	How do you integrate external knowledge with your strategy & platform?	Problematic – need a focused product architecture	Via product architecture so easy to integrate (but not yours)	Yes – you define the question
Q-communities	Does your participation change them?	Not really	High possibility – need to be careful	No



Possible Network Typology?

- **Integrating Network e.g. Mechanical Turk, P&G with InnoCentive, Myelin Repair Foundation**
 - Firm as integrator in center of network
 - Integrates “pieces of knowledge” into existing product architecture OR via workshops etc.
 - Works when problems are well-defined & can be “chunked” into pieces
- **Sensing Network e.g. IBM-Linux, DuPont-MIT Alliance**
 - Firm tapping into pre-existing network/community to sense what is going on
 - Firm also contributes (& amplifies) – software, tools, science, code
 - Firm may have some opportunity to “shape” – via funding, participation, influence
 - Firm also hopes to benefit by learning, employee satisfaction
 - May benefit via complementary assets (services, products etc.) or via later IP