Investing in Superconductive Electronics

European Conference on Applied Superconductivity
Geneva, Switzerland
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John Levy
Chairman, Hypres Corp.
TIMING IS EVERYTHING
SOMETIMES, OPPORTUNITIES AND PROBLEMS CATCH UP WITH TECHNOLOGY
Our computer vision technology has been under development since 1992

Technology Development Overview

1998  Development of Prototypes
1997  ePlanet Founded
      Technology Optimized
1996  10 Patents Pending, 200 Claims
      Product Concepts Researched
1995  Initial Products and Graphics Development
1992-1994 Play and Technology Consumer Research
       Vision, Audio and Interaction Research and Development
20 YEARS LATER...
>10 years to maturity
Prior to peak of inflated expectations
>10 years to maturity
Prior to peak of inflated expectations
**Data Centers:** Facebook Data Center

**Luleå, Sweden**

- 2014 completion target
- Cost: ~760 M$ 
- Nearby Lule River generates 9% of Sweden’s electricity (~4.23 GW)
- Average annual temperature: 1.3 °C

**Specifications**

<table>
<thead>
<tr>
<th>Performance*</th>
<th>25-51 PFLOPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Memory*</td>
<td>21-27 PB RAM</td>
</tr>
<tr>
<td>Power</td>
<td>94 MW avg (120 MW max)</td>
</tr>
<tr>
<td>Space</td>
<td>290,000 ft² (27,000 m²)</td>
</tr>
<tr>
<td>Cooling*</td>
<td>~1.07 PUE</td>
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**Data Centers:**
- Cloud computing
- Banking
- Shopping
- Social Networks
- Search Engines....

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**Supercomputers:** K-Computer (Japan)

Lulea data center:

- **120 MW** (max power)

**Top500 No. 5 supercomputer:** K-computer (Japan):

- 10.51 petaflop/s, 12.7 MW

www.top500.org

*rating updated in June 2016*
IT’S WHAT’S INSIDE THAT COUNTS, OR IS IT?
IS YOUR SOLUTION A:

FEATURE, APPLICATION, PLATFORM, OR COMPANY?
WHAT’S THE BIG IDEA?
Great idea
Great founder
Great management team
Capable and value-added venture capitalist
Capable and supportive board
Absence of too many companies/other start-up’s in the same space
Reasonable going-in pricing environment
Ability to attract and retain great technical talent
Who is customer?
What problem are you solving?
How significant and urgent is solving this problem to the customer?
What alternatives does the customer have?
Is the solution unique or proprietary?
How much is it worth to the customer?
How much of that value will the customer be willing to pay?
How many customers are there?
How much of your product do they need?
Do they have sufficient money to buy your product?
Are you the right person to execute this?
Who else do you need to be successful?
Can you recruit?
Can you build and manage a cohesive team?
Is there a market for your solution?
Does your solution scale?
What, if anything, is proprietary?
Is there a major competitor?
What is your business model?
Is it capitally efficient?
Can you raise capital?
How can you verify any of this?
HBS Venture Capital Research
(2016)

Team
  Ability
  Industry experience
  Passion
  Entrepreneurial experience
  Teamwork

Timing
Luck
Technology
Business model
Industry

Source: Harvard Business School, 2016, Prof. Hardymon, Lerner, Leamon et al
VINTAGE FIRST CUSTOMER SHIP
SEPTEMBER 1987

Champagne Hyperion

APPELLATION ELMSFORD DEWAR CONTROLEE

An aggressive presentation of bold sensibility and delicate egos brought together to produce
A Product of Excellence

FROM THE HEART OF NIOBUM VALLEY

WE WILL SHIP NO SYSTEM BEFORE ITS TIME
THE DAWN OF A NEW ERA IN ELECTRONICS...

HYPRES IS MAKING SUPERCONDUCTING TECHNOLOGY A REALITY

Everybody else follows the crowd and goes with conventional technology except this talented and courageous team which has the vision that superconducting electronics is where the action is in performance, opportunity for growth and contributions to the frontier of picosecond domain electronics.

At HYPRES, talented engineers face challenges in picosecond and subpicosecond devices in cryo-processing, development and expertise. Their inventions are destined to advance the state of science and technology.

HYPRES possesses the only self-sufficient microfabrication facility making it proprietary processed integrated circuits for unique ultra-high-performance systems.

AFTER THIS, THE STATE OF SCIENCE AND TECHNOLOGY WILL NEVER BE THE SAME.

Talented engineers and engineering managers: Participate in a major historic event. Be with the first to introduce the revolutionary technology to market, explore opportunities in the following areas:

- Design of High-Speed Circuits (Sasha, Bipolar, CMOS, C-MOS)
- Microwave, Millimeter Wave, or Hybrid Integrated Circuits
- Cryogenics, Cryocooler Cryo-Processors, and Vacuum Systems
- Thin Film and Lithographic Processes, Vacuum Deposition
- 8 Bit Slice or Micro-Code
- Signal Processing System Development
- Applications Engineering, Test & Measurement Instrumentation
- Solid State Physics, Material Science
- Software Development (8 Bit, Assembler, Pascal, C)

HYPRES is located in the beautiful suburbs of Westchester County. It offers attractive compensation packages for those who aspire to the highest standards of excellence and want this nation to continue to lead.

Contact our Recruiting Officer, Mary K. Barry, 500 Executive Park, White Plains, New York 10603
(914) 992-1187

Making Superconducting Electronics a Reality
SEEQC

SUPERCONDUCTIVE ENERGY EFFICIENT QUANTUM COMPUTING
OPPORTUNITY

SCALABLE
QUANTUM
PROCESSORS
PROCESSES &
SYSTEMS
Our Quantum Computing System

**Quantum Core:** Quantum Circuits (quantum gates made of qubits, resonators, quantum memory, etc.)

- **SFQ Readout**
  - SFQ Error Correction
  - Quantum noise limited amplifiers

- **20 mK**
- **20-600 mK**

**Features:**
1. Low cost per qubit (<$100 at volume – multiple controller per chip and MCM)
2. Scalable to practical QC levels (1M qubits and beyond)
3. Very small ECF latency (delay between readout and control signal) – enables fault-tolerant computing

Enables fault-tolerant QC systems scalable to practical complexity levels
HYPRES Single Flux Quantum Qubit Readout (Quantum Readout chip)

Provides high-fidelity readout of qubits and data conversion to SFQ digital form

The SFQ generator will be coupled to the quantum chip in a flip-chip arrangement using bump bonds.
Qubit Error Correction & Control

Technology to Enable Scalable Build-Out of Quantum Computers

Project Date: 2017-2021

Market: Qubit Designers and QC Systems

Qubit Designers and QC Systems
Project: Quantum Key Distribution

Ultra-Secure Communications

Date: 2018-2021

Market: Government & Large Enterprise
DATA CENTER ACCELERATOR

SUPERCONDUCTOR BLADE BOOSTS TODAY’S CLOUD PROCESSORS

DATE  2017-2020  MARKET  HYPER DATACENTERS
PROJECT

SCALABLE QUANTUM COMPUTER

BEYOND EXASCALE QUANTUM SYSTEM

DATE 2020-2025

MARKET HIGH END COMPUTING

same scale comparison

2' x 2'
Source: Intel 2017
SOURCES OF INVESTMENT

Dilutive to ownership
  - Institutional venture capital (financial & corporate)
  - Angel investment
  - Private equity

Non-dilutive to ownership
  - National and pan-national initiatives
  - Research topics
  - Grants
  - Contracts to purchase goods/services
VENTURE CAPITAL CIRCA 2017

2016 = 2\textsuperscript{nd} highest year of investing (2015) in past 11 years; $69B

$112b committed to venture funds over past 3 years

Best fundraising year of the past decade = $42B across 253 funds

Continued trend of higher concentration

7 funds accounted for 23\% of all investment

Source: National Venture Capital Association Yearbook, 2016,
Venture Capital Circa 2017

Areas of tech focus:
- AI and machine learning
- Robotics
- Drones
- IoT

82% of VC-backed exits were corporate acquisitions
13% were PE buyouts; rest were IPO’s

Median exit size = $84.5m,
59% of exit dollars were for companies >$500m (Jet, Dollar Shave Club)

Source: National Venture Capital Association Yearbook, 2016,
Team most significant variable
Secondary: product/technology, business model, market, industry
Investment sourcing
Only 10% come inbound
90% from personal/professional networks, other investors and existing portfolio companies

Source: Harvard Business School, 2016, Prof. Prof. Hardymon, Lerner, Leamon et al
Thank you

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