Session 302-F (OPEN)
Panel Discussion of
Intel/Micron 3D XPoint Announcement

Thursday August 13, 2015

9:45-10:50AM

Chuck Sobey

ChannelScience

Established 1996

Signal processing, detection, coding, and test methods, matched to the physics of new storage technologies

Current focus: Spintronics and 3D storage

Please contact me at csobey@ChannelScience.com or 972-814-3441.

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Session 302-F: 3D XPoint

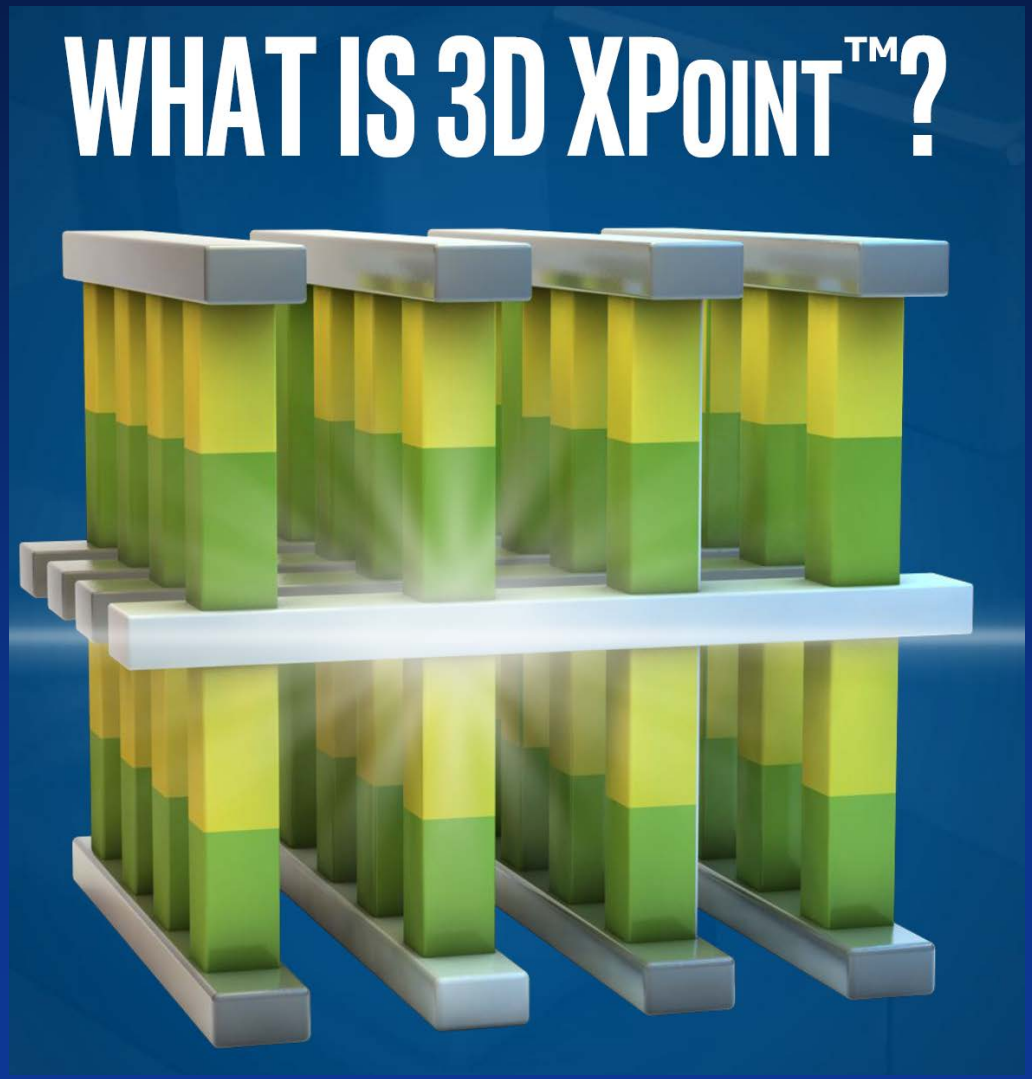
Tom Coughlin, President, Coughlin and Associates

Jim Handy, Director/Chief Analyst, Objective Analysis

Dave Eggleston, Principal, Intuitive Cognition Consulting

Audience Participation

Intel and Micron Announced 3D XPoint NVM on July 28, 2015



Source: Intel / Micron

Audio-Visual Sponsor

"XPoint" – Cross-Point Array (Cross-Bar Array)

The simplest structure

"Word Lines"

"Bit Lines"

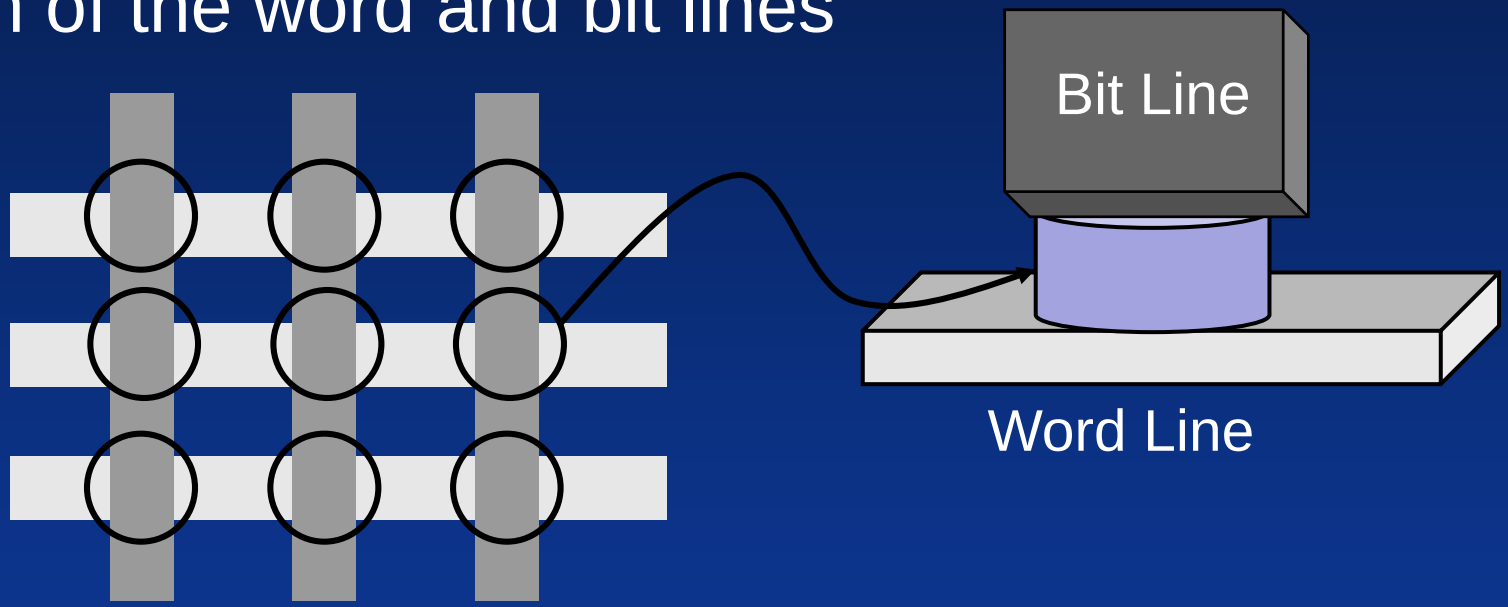
Where are the storage elements?

Source: KnowledgeTek SSD Class

Audio-Visual Sponsor

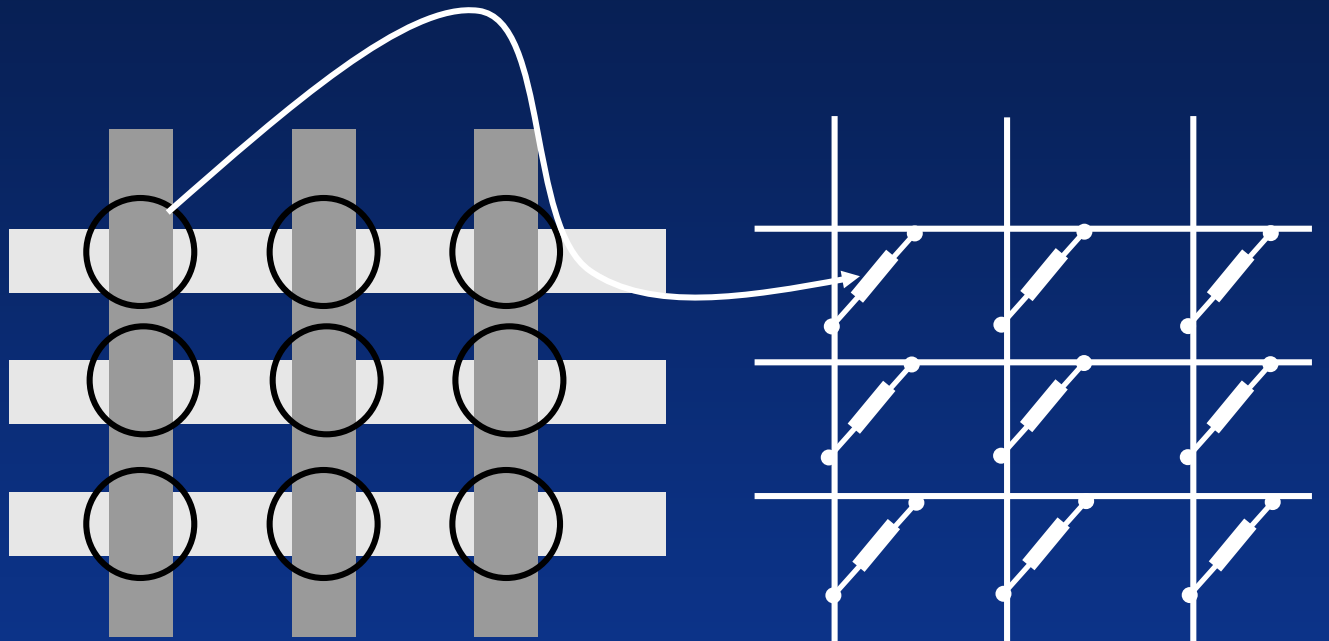
Storage Elements in a Cross-Point Array

The smallest structure: Storage element is at the intersection of the word and bit lines



Source: KnowledgeTek SSD Class

Schematic of Cross-Point Array



Let

Low resistance = 1

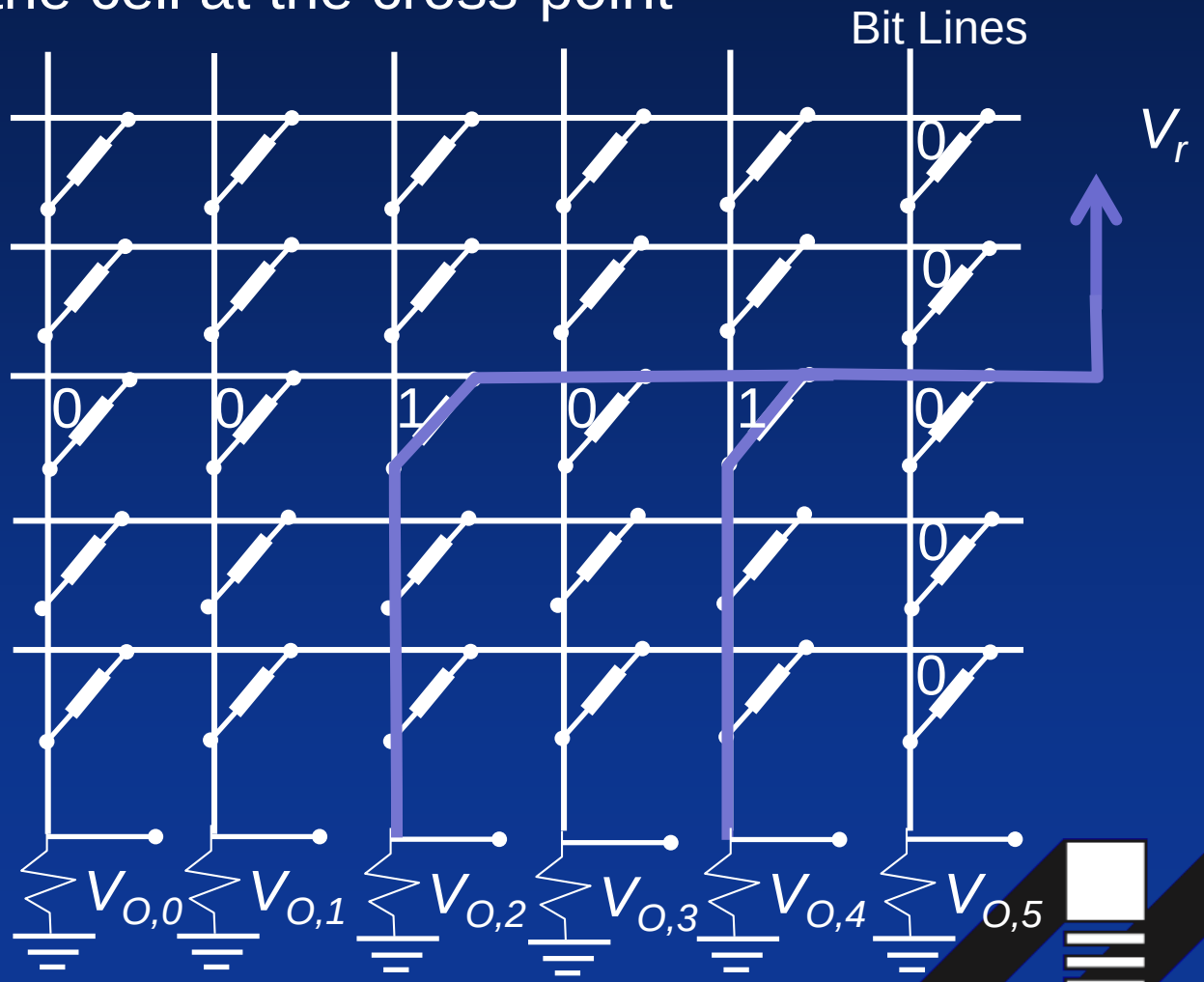
High resistance = 0

Source: KnowledgeTek SSD Class

Audio-Visual Sponsor

Reading Cells

Current flow depends on the resistance value of the cell at the cross-point



Low resistance = 1

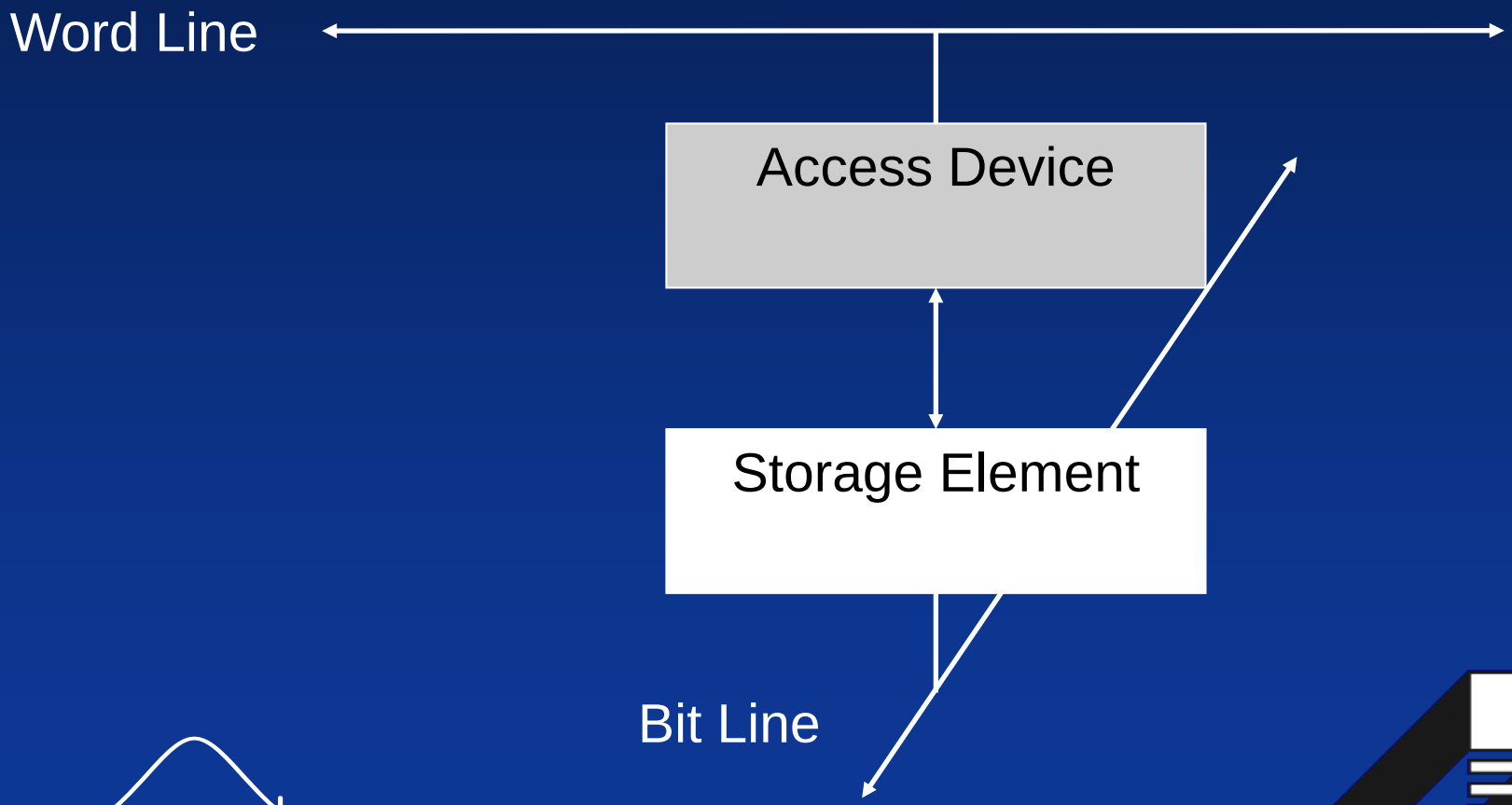
High resistance = 0

Source: KnowledgeTek SSD Class

Block Sneak Currents: Access Device (AD)

Make current only flow one way: Diodes

Make certain low-resistance cells are OFF: Transistors or other devices (for programing and erasing)



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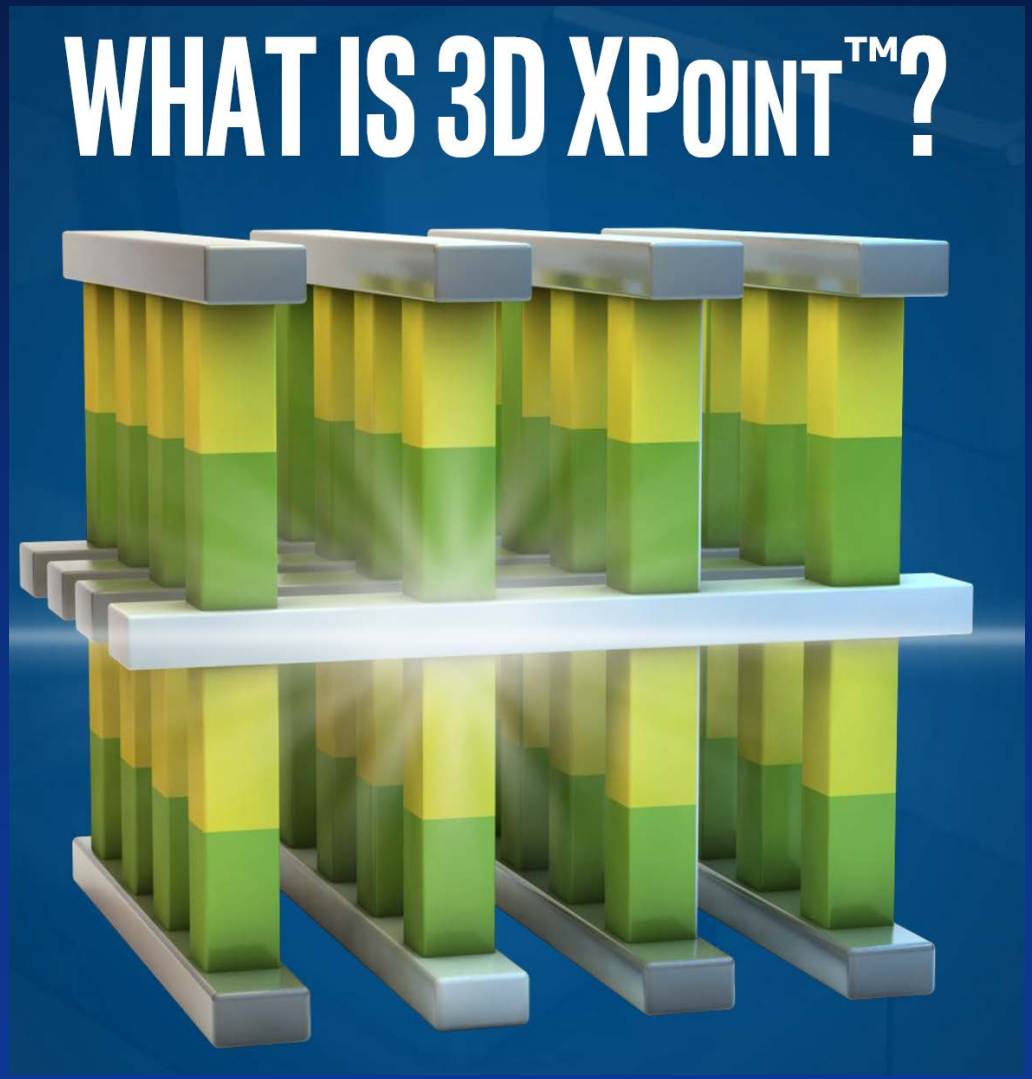

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Audio-Visual Sponsor

Do We Need A New Memory Layer?

Jim Handy

OBJECTIVE ANALYSIS

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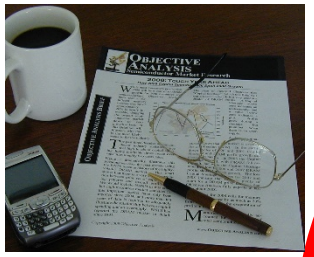
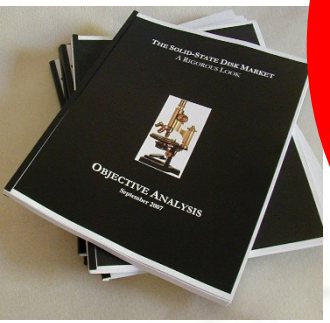
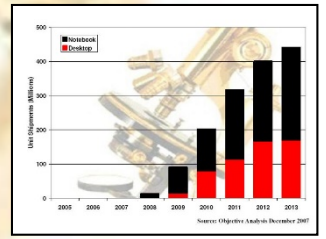
Profound Analysts

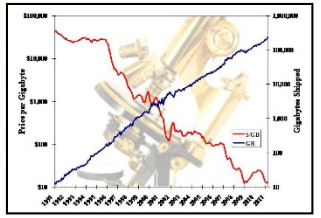


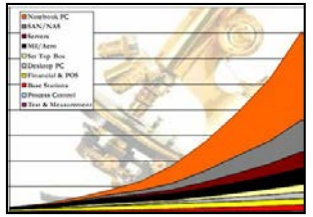
Reports & Services

Custom Consulting







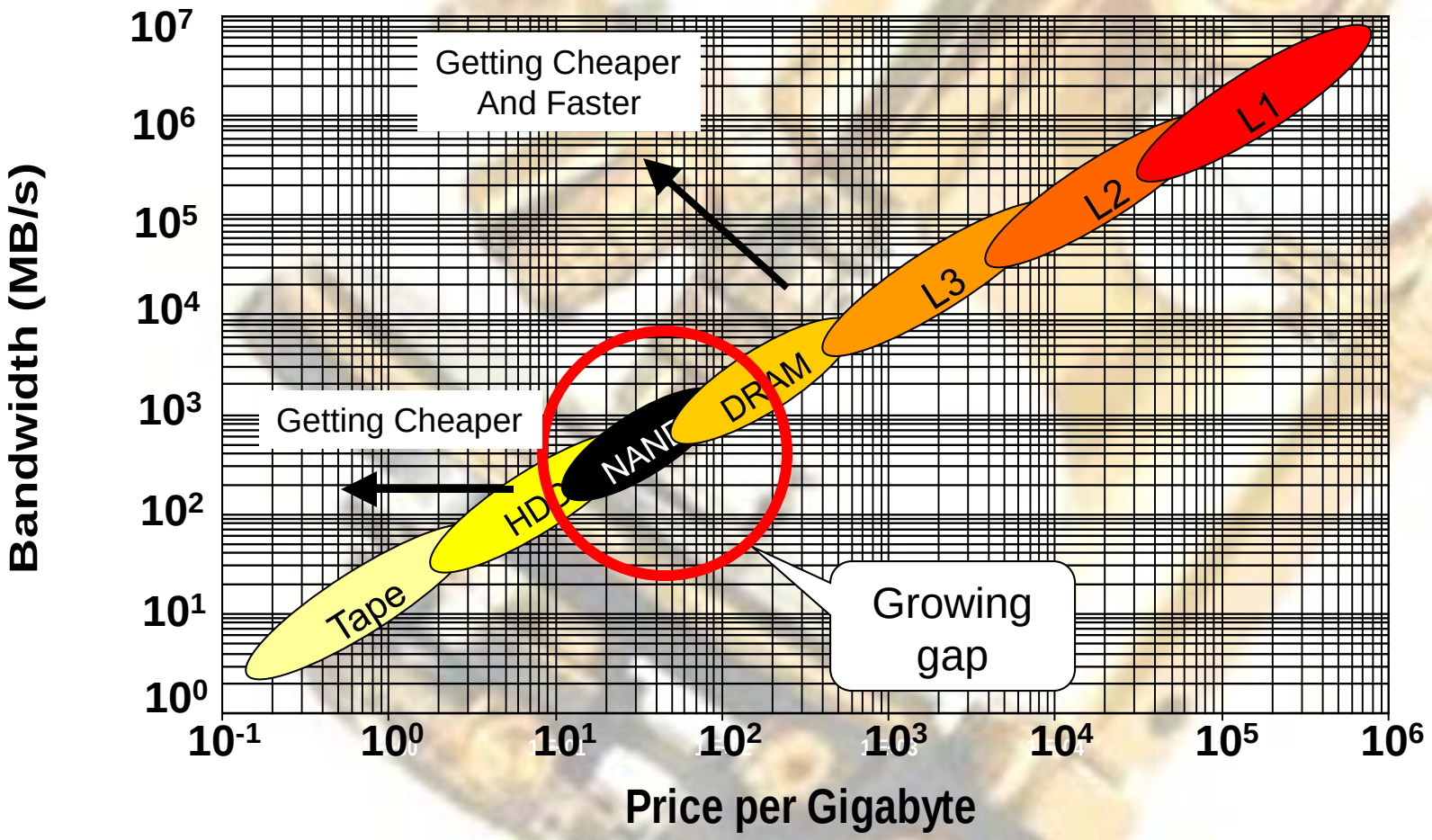


Objective Analysis
Semiconductor Forecast Accuracy

Year	Forecast	Actual
2008	Zero growth at best.	-3%
2009	Growth in the mid teens	-9%
2010	Should approach 30%	32%
2011	Muted revenue growth: 5%	0%
2012	Revenues drop as much as -5%	-2.7%
2013	Revenues increase nearly 10%	4.9%
2014	Revenues up 20%+	9.9%
2015	Revenues up ~10%	TBD

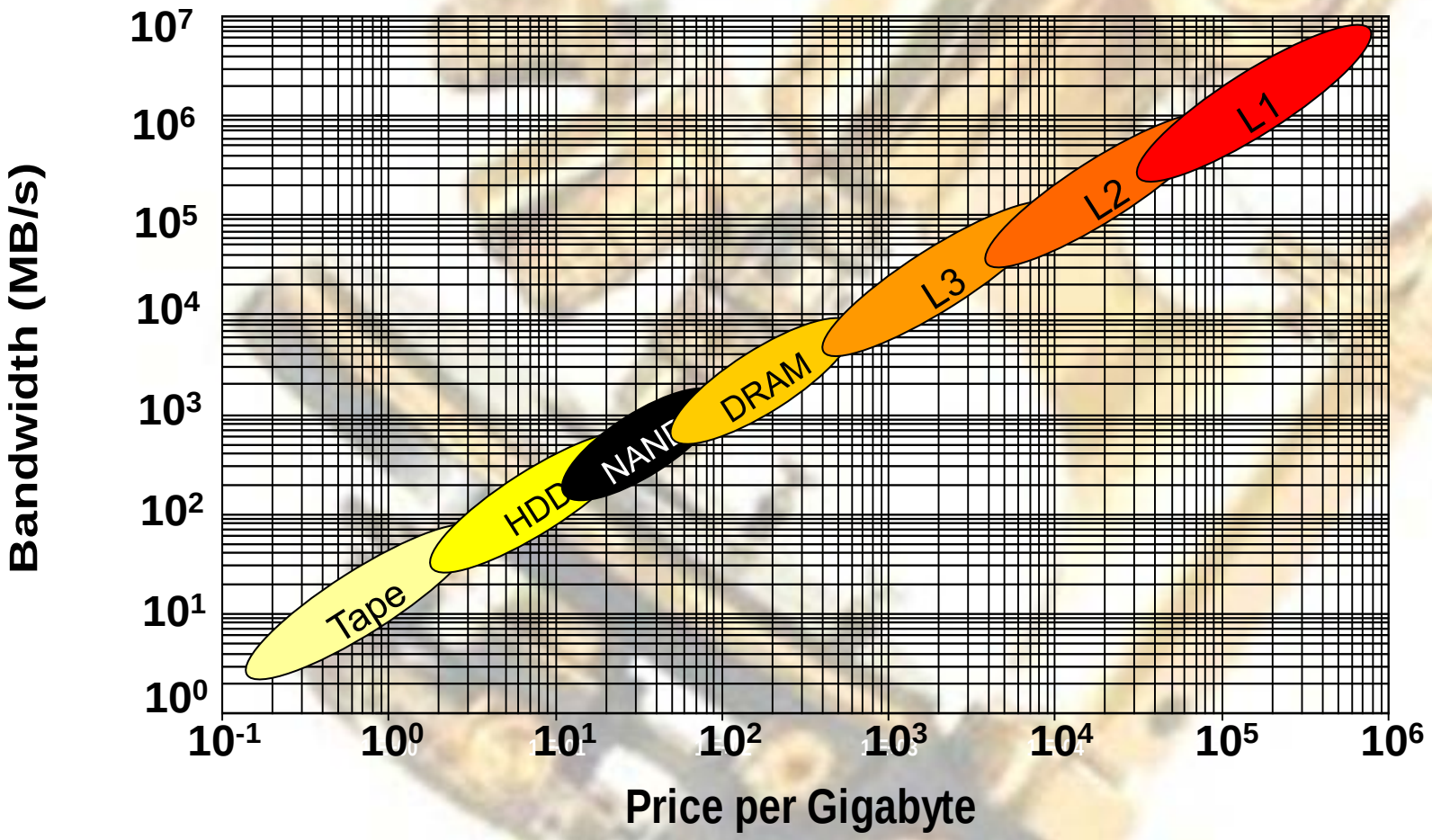
Why Add A Layer?

The DRAM/HDD Speed Gap



From: ***Solid State Drives in the Enterprise***

The DRAM/HDD Speed Gap



From: ***Solid State Drives in the Enterprise***

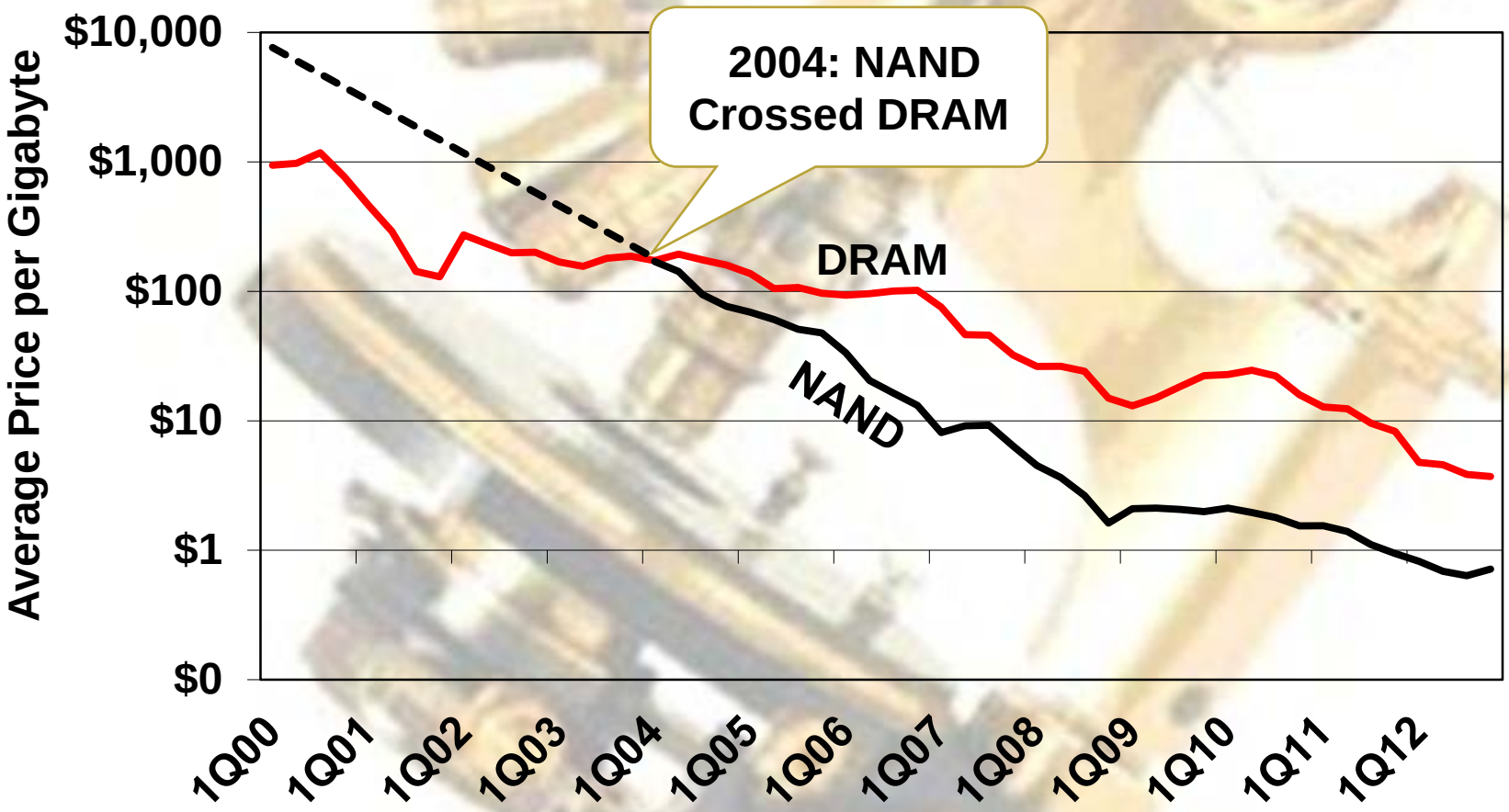
Will This Be Difficult?

A New Memory Layer Needs A Lot Of Support

- Will require a new bus
  - DDR doesn't support variable access times
- Will require new O/S support
  - Cache management?
  - Memory management?
- Persistence will require application support
  - SNIA and others working on this
  - Some instruction support now in Intel specs

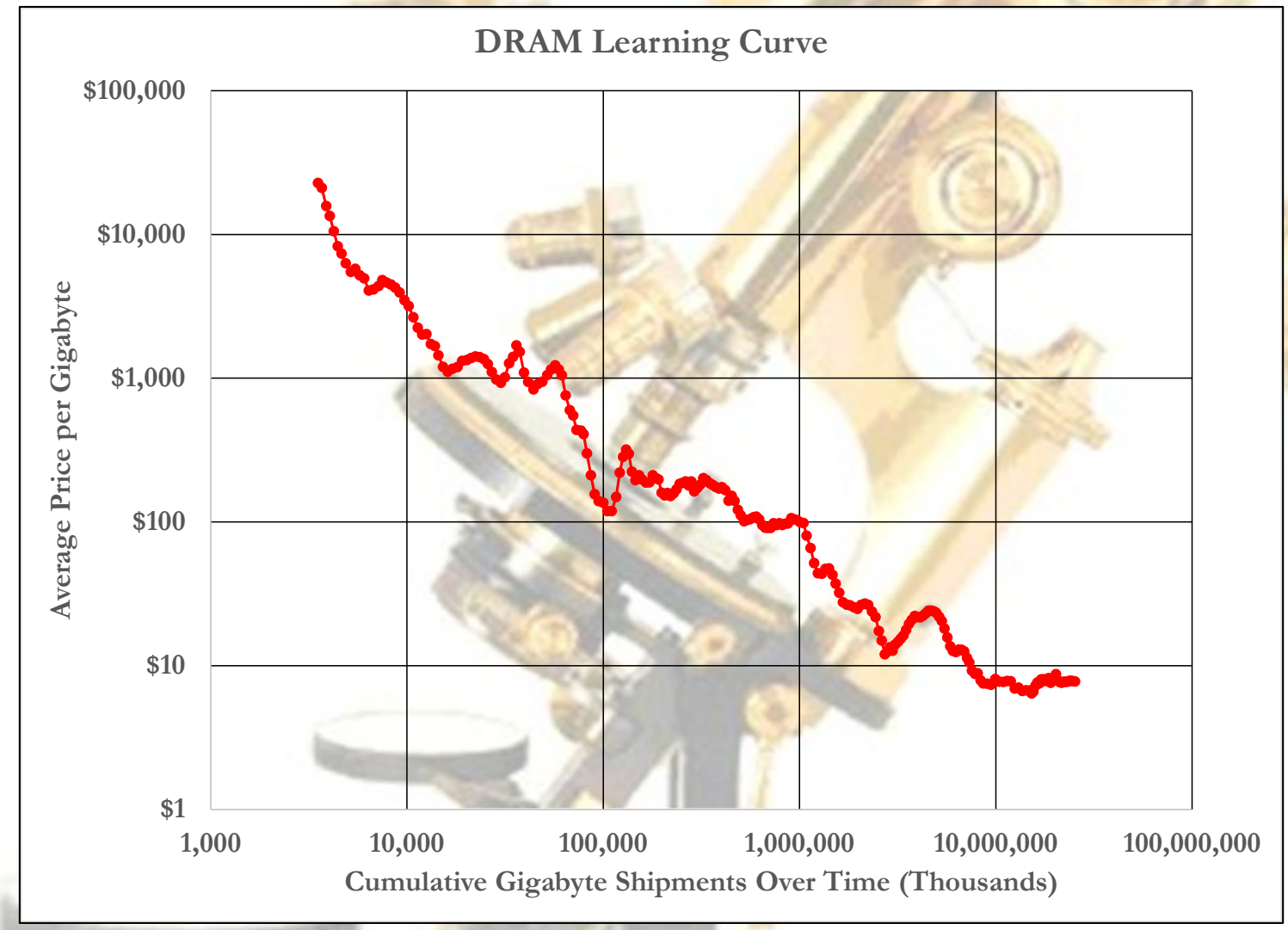
The Cost Issue

Cost Brought Flash Into Computing



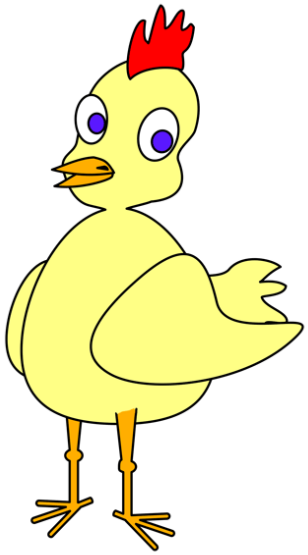
From: ***Hybrid Drives: How, Why, & When?***

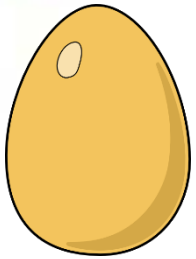
Volume Brings Costs Down



A Chicken & Egg Problem

- 3D XPoint will be sell in volume once it's priced lower than DRAM
- 3D XPoint prices will fall below DRAM once the volume is high enough





Summary

- New layer necessary… eventually!
  - 3D XPoint shows promise
- Lots of support will be required
  - Hardware, software, standards
- Getting pricing below DRAM will be tough
  - Smaller die size isn't the only factor
- Don't expect big changes soon

Thank You!

Jim Handy

OBJECTIVE ANALYSIS