

What trends am I most excited about and what can we expect to see convert to products in the near future?

- **I have a bit of emotional attachment to PCM – Phase Change Memory; my first grad school thesis research, my first semiconductor job. Nice to see it come to market in Intel’s 3D XPoint. Will it be a success?**
- **Another NVM - in 2010 I evaluated an EverSpin STT-MRAM proposal, and recommended that NSF fund it. I’ve been gratified to see that EverSpin did bring product to market (1 Gb devices). Once predicted by some (over sold?) to beat DRAM speeds and densities.**
- **3D packaging for IC’s (lots of flavors). Increases effective device density as node shrinks become prohibitively expensive and hit physical limits. 3D chips - active silicon layers upon layers, & more active material layers – are a long way from product.**

Origin Stories

Exploring Entrepreneurship



SAN FRANCISCO BAY AREA
NANOTECHNOLOGY COUNCIL

Nanotechnology Origin Stories 2018

Panel Discussion



Dick Elkus
Ampex

David Lam
Multibeam

Pavel Lazarev
Capacitor Science

Vivian Qu
ViaX

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Any Technical Start Up

- **Many start up founders are so involved with their inventions & ideas that it can be hard for them to objectively determine the market potential for their proposed products or solutions.**
- **How did YOU go about addressing this issue?**
- **How important is creating a business plan?**
- **How early should some form of business plan be created?**

Any Technical Startup

- **Objectively determine the market potential for the proposed products or solutions**
- **Create a business plan**
- **Protect ideas; know the relevant IP landscape**
- **These are valuable basics when looking for investors & partners**
 - **private funds**
 - **government grants (e.g. SBIR / STTR)**

New Devices & Chips Startups

- **Taking a new device from laboratory feasibility demonstration / proof of concept to manufacturing & production takes different skills and can be very expensive**
- **Today's new CPU or GPU built with cutting edge silicon technology has > \$100 M in EDA work before “tapeout” and “first silicon” is achieved**

New Devices & Chips Startups

- **Where will early development work take place?**
 - partner with a university?
 - acceptance at a place like Molecular Foundry?
 - foundry like TSI Semiconductor?
 - partnership with an existing company?
- **Trial Production**
 - Shuttle runs in foundries
 - avoids “tooling” costs (masks)

New Devices & Chips Startups

- **Cutting Edge Foundries cost \$5 to \$20 Billion to build. It's an expensive business!**
 - **is the most advanced technology needed?**
- **Foundries make money on volume production**
 - **they may not accept a Startup's shuttle business**
 - **customers are often chosen for their potential**
 - **technological innovations are evaluated**
 - **market opportunities are evaluated**
 - **business plans are evaluated**

New Devices & Chips Startups

- **A good foundry relationship is valuable**
- **A Startup can leverage the foundry's production skills and manufacturing experience**
- **Foundries can serve their own interests by helping a Startup achieve volume production success**



Origin Story – the Big Bang







Create the Future

Change the World

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