Silicon Economics'2011

a view from Silicon Valley - last 10 years and beyond

"to build intelligent machines" *Jeff Hawkins, PalmPilot / Treo / Numenta*

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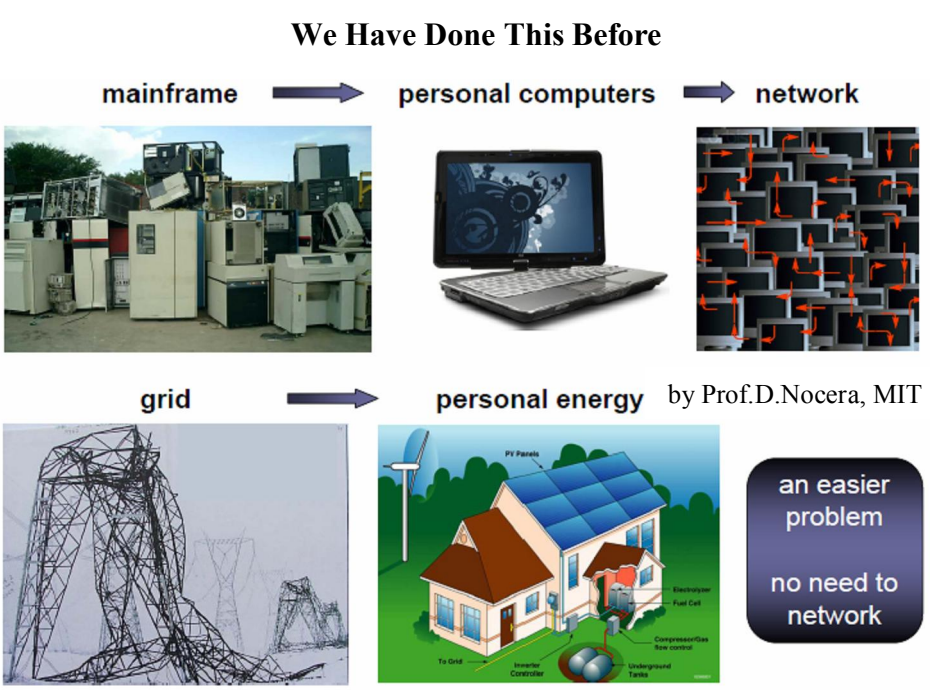
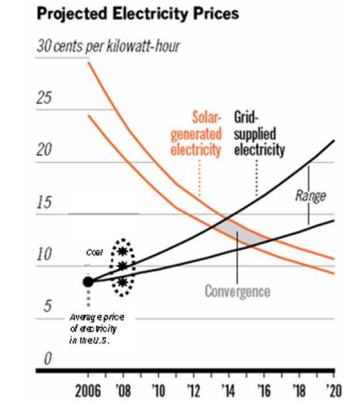
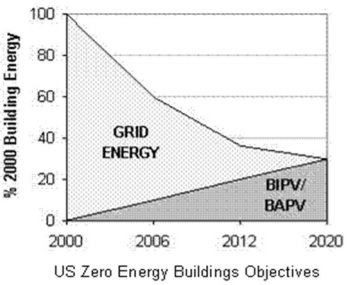
This work focuses on historical and modern geography-related study of semiconductor industry (especially microlithography) and its role in information technology, energy, and bio-applications. We've explored microlithography dynamics with the patterns of economy's macro-behavior and scrutinize consequences of silicon technology becoming a commodity in "post-semiconductors" age. Our comprehensive analysis of promising technology, economic and social trends over the years has identified early the need and the tremendous potential for clean•green-tech and medicine applications. Those are clearly connected now to the very large existing markets of energy, civil-industrial infrastructure, and healthcare.

Silicon Valley and venture capital veterans, we grew up with life sciences and semiconductor industries, have been involved and defined new energy initiatives early on. We have directly experienced the challenges of rapid technological innovation and business growth, have been part of the emergence of new business models, and have seen what works and what doesn't. The "post-semiconductors" environment has the same characteristics – the basic strategies and winning approaches are the same.

We Have Done This Before



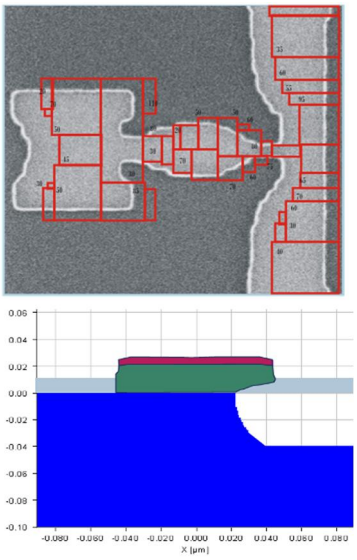




Modern energy economics is becoming similar to silicon-computer systems one – energy is transitioning from being "analog" to becoming "digital". Already well-defined adjacent separate markets of new energy, clean•green-tech and nano-medicine applications confidently point toward **nanoenabled energy future**. Adaptive alive systems is a way to get there. The eventual convergence of new energy and bio-applications will lead into the most-efficient bio-energy solutions. We see solar energy, being completely renewable, emission-free, and distributed (photovoltaics) as a leading segment in the energy solution. At scale solar power will achieve unsubsidized market competitiveness and will conform into three key requirements – cost, availability and reliability. Further advantages of solar power include its complementarities with **water desalination**, which would reduce the costs of

both technologies. The capture and storage of solar energy at the individual level – **personalized solar** – being realized as photosynthesis, will address the triumvirate of secure, carbon neutral and plentiful energy solution compatible with society.

Trends in technology markets 'force' us to think in depth about brands dynamics. From that perspective we'll illustrate our experience and conclusions with the series of technology-business cases on our start-ups and partners. For example, our work led to the identification of the opportunity, conceptualization and the eventual implementation of Silicon Valley Technology Center (www.svtc.com) - new generation of semiconductor foundry which takes novel ideas from the lab to the fab. We focus to unlock SVTC value – jointly developing and implementing strategy for the sustainable, attractive, and scalable business. Similarly, we'll point into Photronics (www.photronics.com) incubation platform and the corresponding R&D business model. Founded in 1969, the company has one of the most recognizable industry brands coupled with the top management unparalleled technical vision & capabilities for innovative solutions. Photronics is perfectly positioned to leverage its incubation capacity in the rapidly developing markets of alternative energy, solid state lighting, and modern bio-applications. Likewise, together with Cypress Semiconductor (www.cypress.com) we have been building long-term relationships with main industrial groups, universities, and R&D centers in emergent markets. Cypress has been called "a quintessential entrepreneurial company" by The Wall Street Journal. Business Week has listed Cypress among the industry's biggest growth engines together with Google, AT&T, and Apple. In 25+ years the company became a powerful brand driven by its founder and current CEO, Dr.T.J.Rodgers (TJ) – one of Silicon Valley super-stars. TJ was a major force in the remarkable success of SunPower – the best investment by Cypress in which we've been closely involved. Last but not least: we build our start-ups with the brand and market focus – new brain-learning architecture and micro-grid-energy quality companies will be noted.

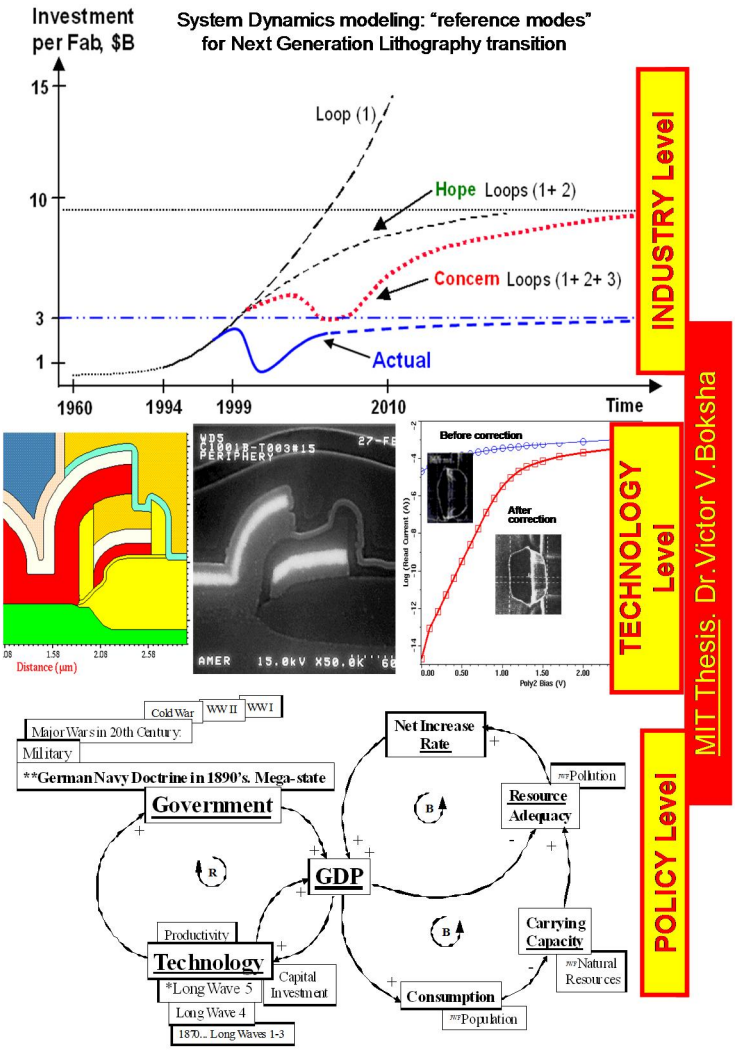


Modern semiconductor masks complexity: 5 nm design, dramatic implications on data size and cost.

Several of us are of different generations of USSR, Russia, and Belarus high-tech. We understand it in-depth, love it, and believe in unique and powerful market brands to be deployed out of our homelands. In that regard we'll present our IV Annual Professor E.I.Tochitsky Award'2011 to Moscow University and Moscow Institute of Electronics & Mathematics (BG_Partners-Cypress E.I.Tochitsky Award'2011). We will finish with two world-class cases: Novosibirsk Academgorodok cluster & brand

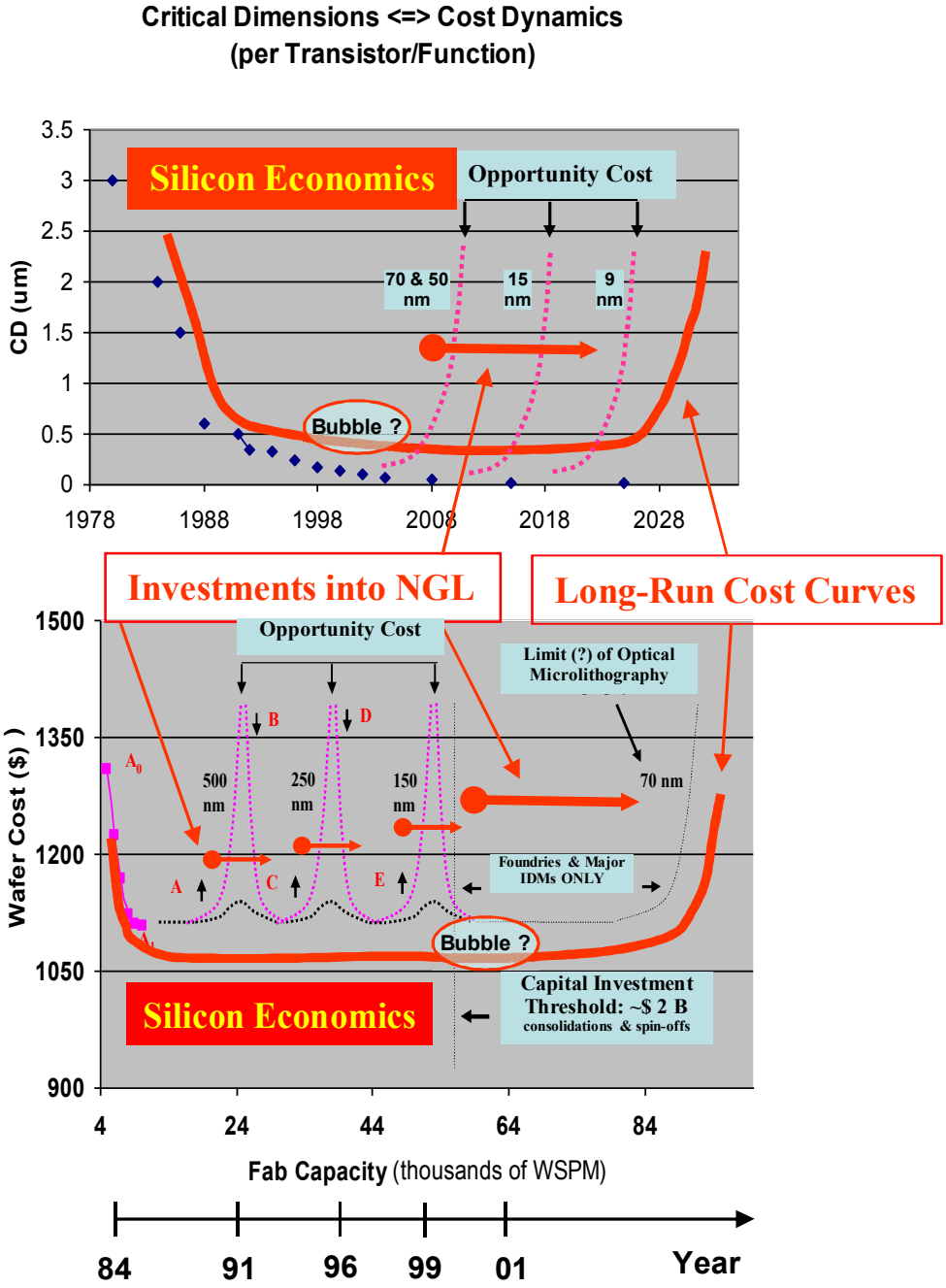
- Wikipedia: Masdar City is latest of a few highly planned, specialized, research & technology-intensive cities incorporating a living environment, as in **Novosibirsk, Russia** or Tsukuba, Japan.

and the unique high-tech family business from post-USSR: $300 million exit to Yahoo! in 2007 and Guinness World Records Holder in 2011.



APPENDIX 1.

Long-run Cost Curves in Semiconductors



Semiconductor industry continues to mature (with corresponding diminishing returns). **Long-run Cost Curves**. Bottom: combined representation of operational business issues (total & opportunity costs) and technology issues (from 500 to 70 nm nodes). Top: dynamic of cost-per-transistor (& critical dimensions, Moore 1st Law) behavior.

APPENDIX 2

Platforms as Outcome of Recombination

When concentration of population is big enough then highly dynamic and cumulative (or auto-catalytic) nature of technology development is enhanced by **recombination processes** (Aghion, P., Howitt P. 1998. Endogenous Growth Theory, MIT Press: Cambridge).

Effective platforms. micro-Case Study. ***From first printing technology to Treo-iPhone.*** An effective platform is illustrated through two examples related to writing: printing of first Bible by Gutenberg in A.D. 1455 vs. Newton (by Dr.Pachikov group & Apple Computers) & PalmPilot/Treo/ iPhone story. Why did printing spread explosively in medieval Europe after Gutenberg printed his Bible in A.D. 1455, but not after the unknown master printed the Phaistos disk in 1700 B.C. (6.5 inches in diameter, covered with 245 signs or letters, and found on the island of Crete, left picture)?

The explanation is partly that medieval European printers were able to combine six technological advances (**recombination process**, most of that new technology was unavailable to the maker of the Phaistos disk): paper, movable type, metallurgy, presses, inks, and scripts.

While Apple's Newton and GO Corporation of Mr.Kaplan were too early (by ~10 years) for existing technology, PalmPilot's (& Treo afterwards) triumph is indisputable.

The simplicity of Palm design and its ability to easily synchronize with a PC account for at least 50% of the success; another half was contributed by "pure" technology **recombination factors**. Among them are: memory & LCD pricing; advances in operational systems and architecture; IC chip size and performance in the middle of 90's. Now (as of August 2011) it is in the full circle: HP is out of Treo/Pre, and Apple is in with its iPhone/iPad revolution.

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