SEMICO
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- Data
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The Semiconductor Production Nanotechnology Dimension

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Topics

- **Why does semiconductor manufacturing need the nanotechnology community?**
- **What does the nanotechnology community need to know about the semiconductor industry?**

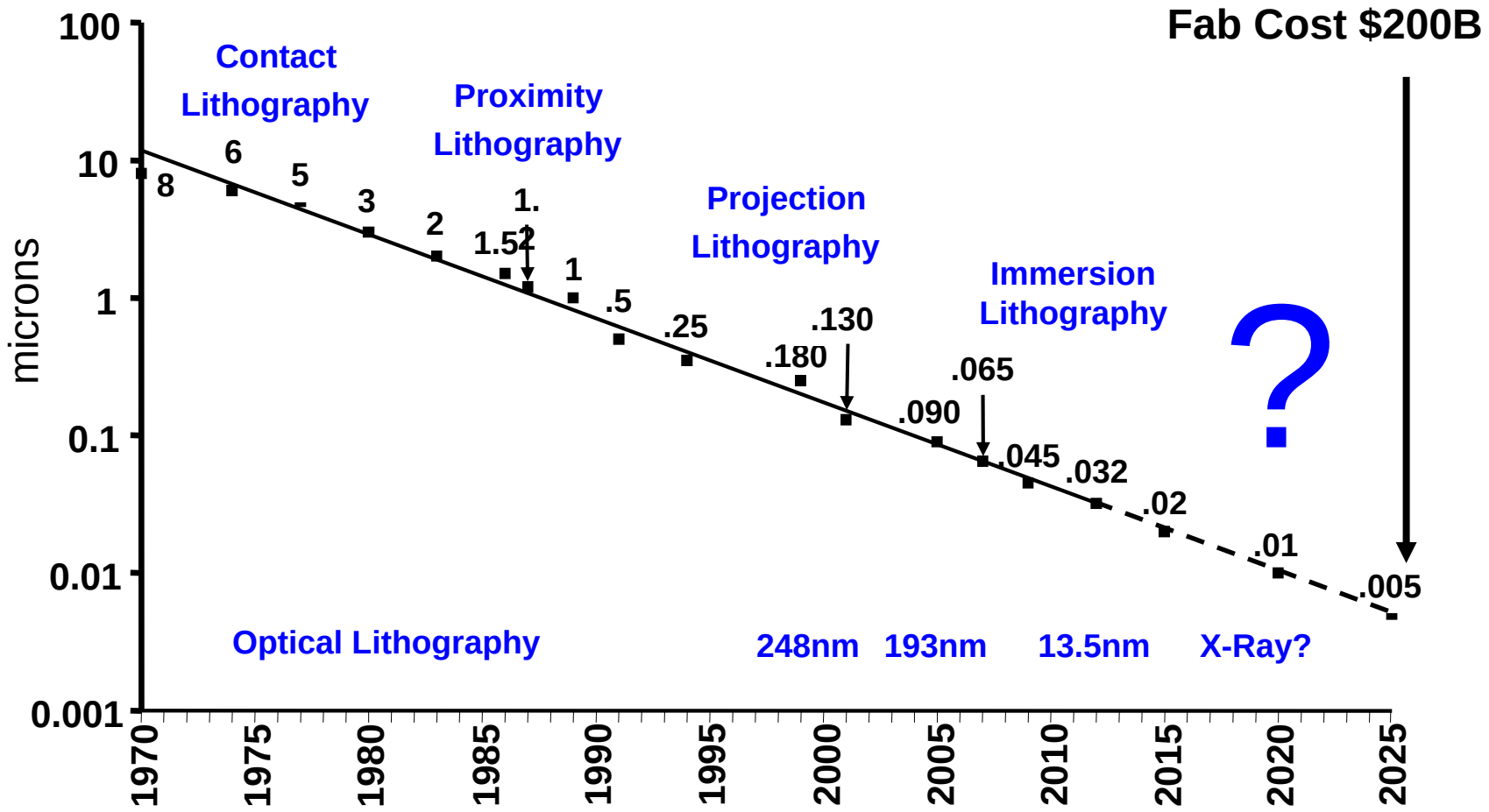
Nanotechnology Definition:

- Feature sizes below one micron

Semico's Semiconductor Nanotechnology Definition

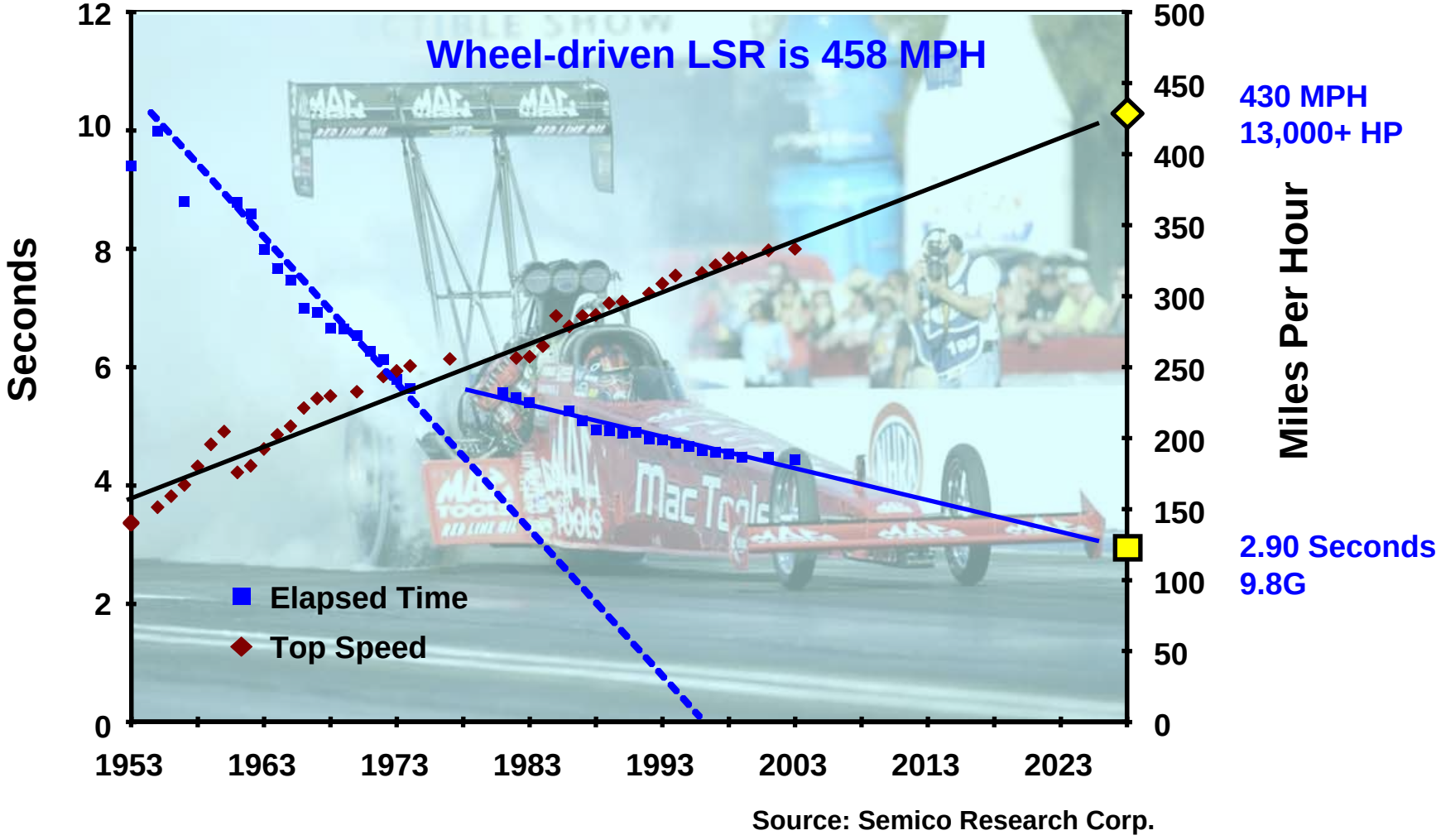
- Scalable beyond 32 nm
- Breaking boundaries with new technologies

Technology Nodes



Drag Racing

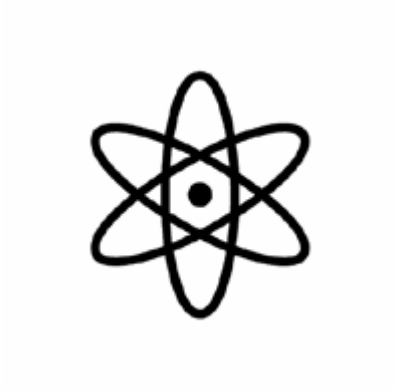
Top Speed and Elapsed Time



Source: Semico Research Corp.

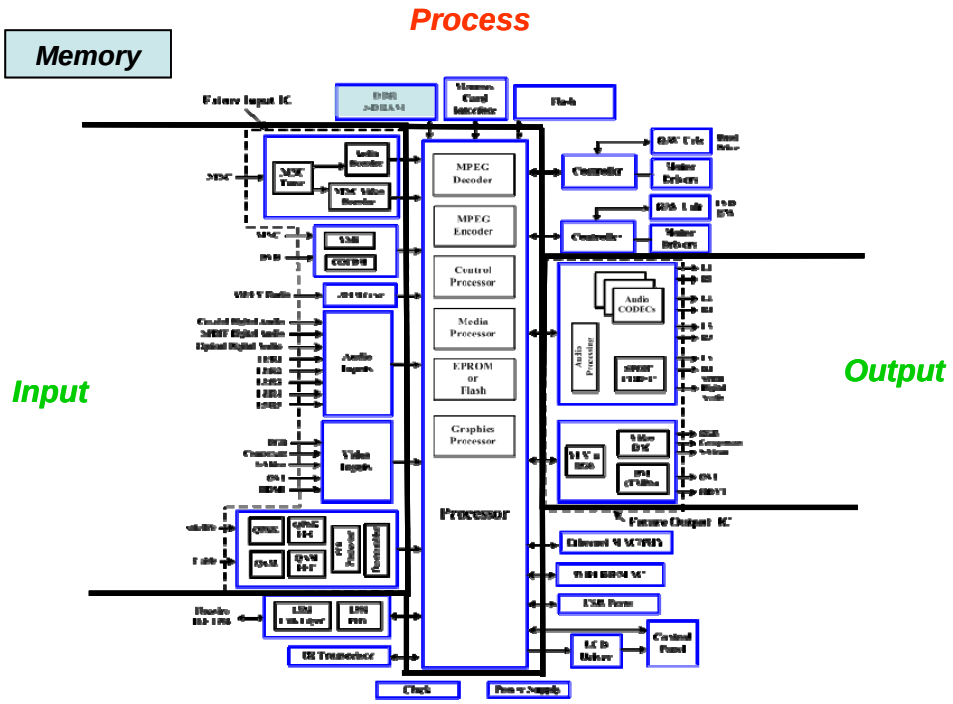
Why Nanotechnology?

To attain the needed feature size!



Why Nanotechnology?

Integrating Memory and Logic

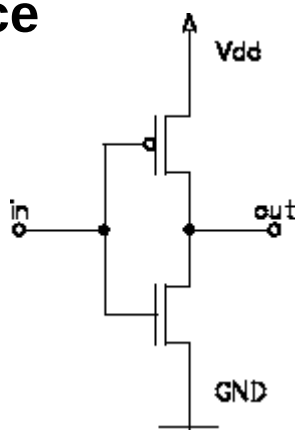


Media Hub Block Diagram

A new process is needed joining memory and logic processes!

Why Nanotechnology
Difficulties of Scaling

Not enough capacitance



Defect density

Soft Error Rates

Leakage current

Heat: Frequency equals temperature

Why Nanotechnology?

- To combat increase in fab costs
- To attain the required feature size
- To embed enough memory on a logic chip
- To overcome difficulties of scalability

The Solution

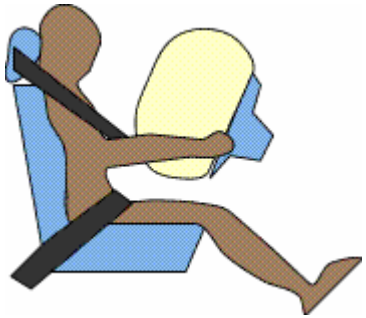
The principles of physics, as far as I can see, do not speak against the possibility of maneuvering things atom by atom. It is not an attempt to violate any laws; it is something, in principle, that can be done; but in practice, it has not been done because we are too big.

Dr. Richard P. Feynman

From a classic talk, “There’s Plenty of Room at the Bottom,” that Dr. Richard Feynman gave on December 29th 1959 at the annual meeting of the American Physical Society at the California Institute of Technology (Caltech). It was first published in the February 1960 issue of Caltech's *Engineering and Science*, which owns the copyright.

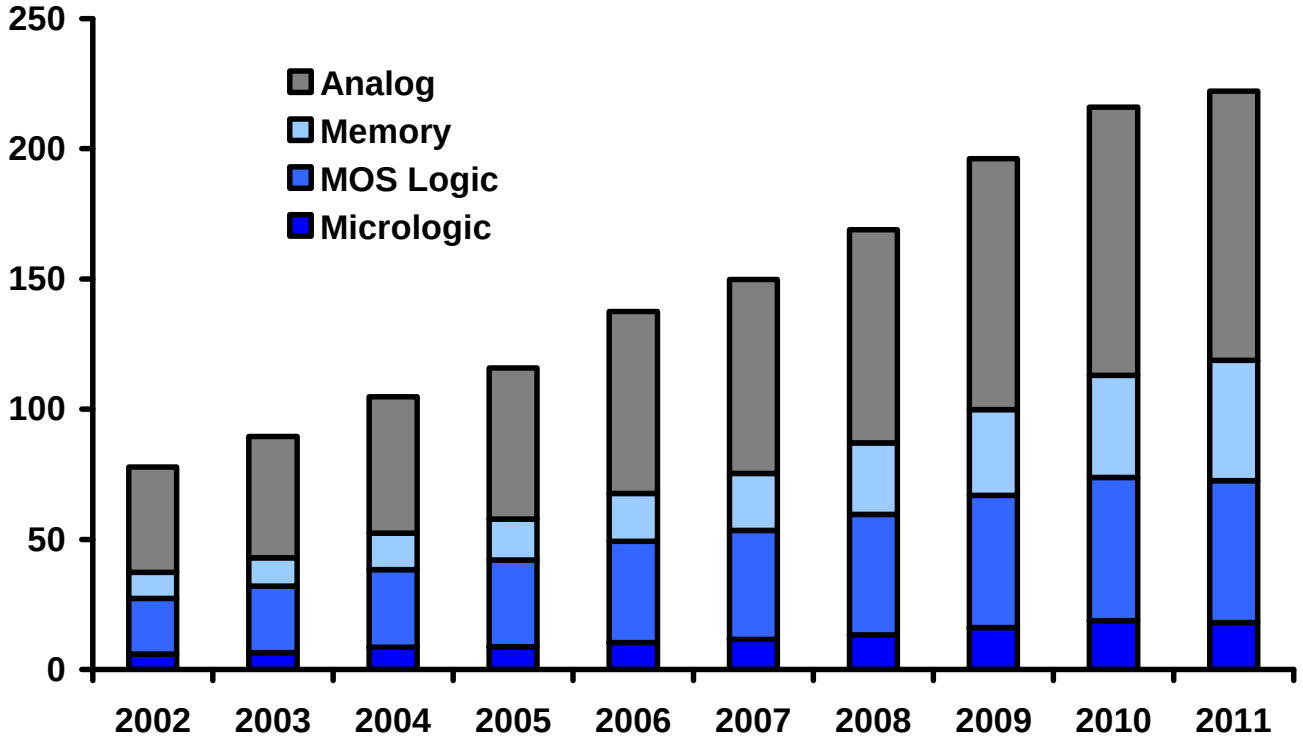
A Limitation?

Volume Applications (All MEMS)



IC Shipments Forecast

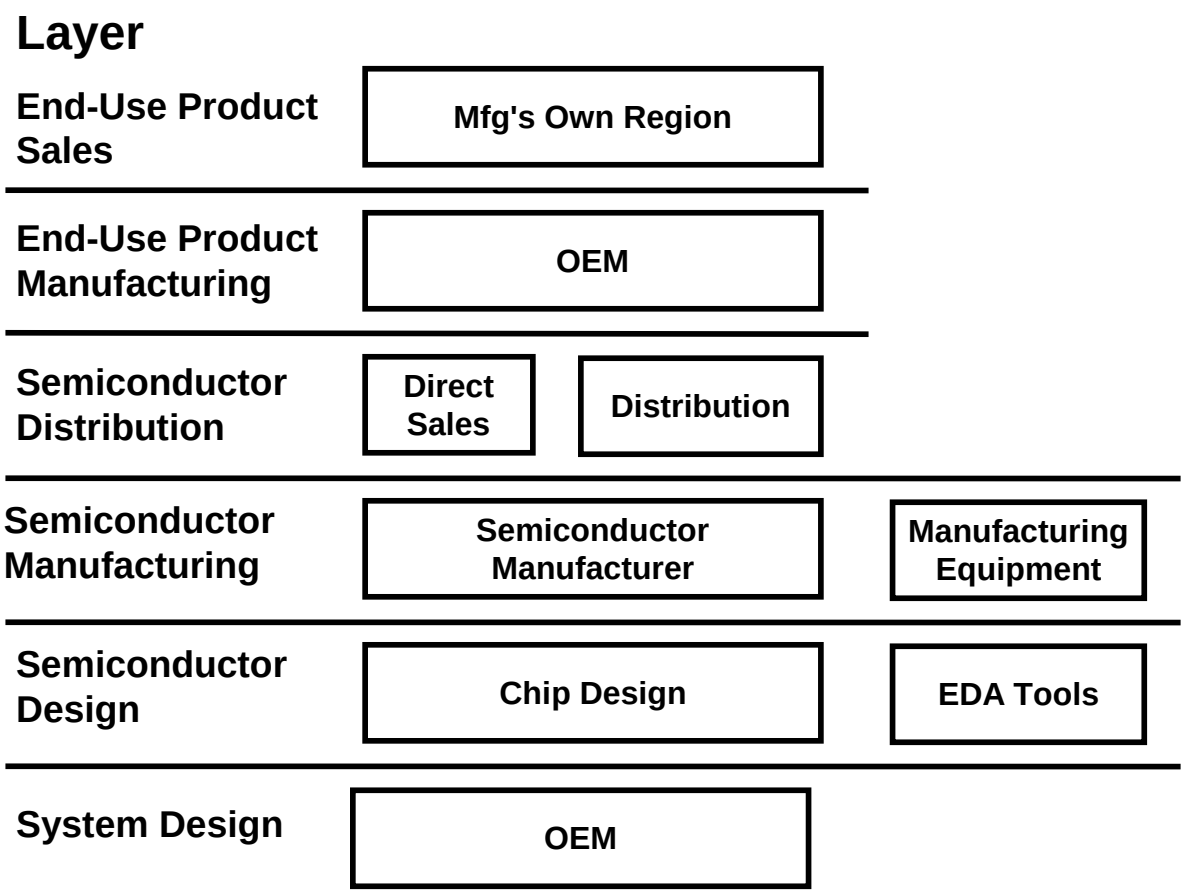
Billions



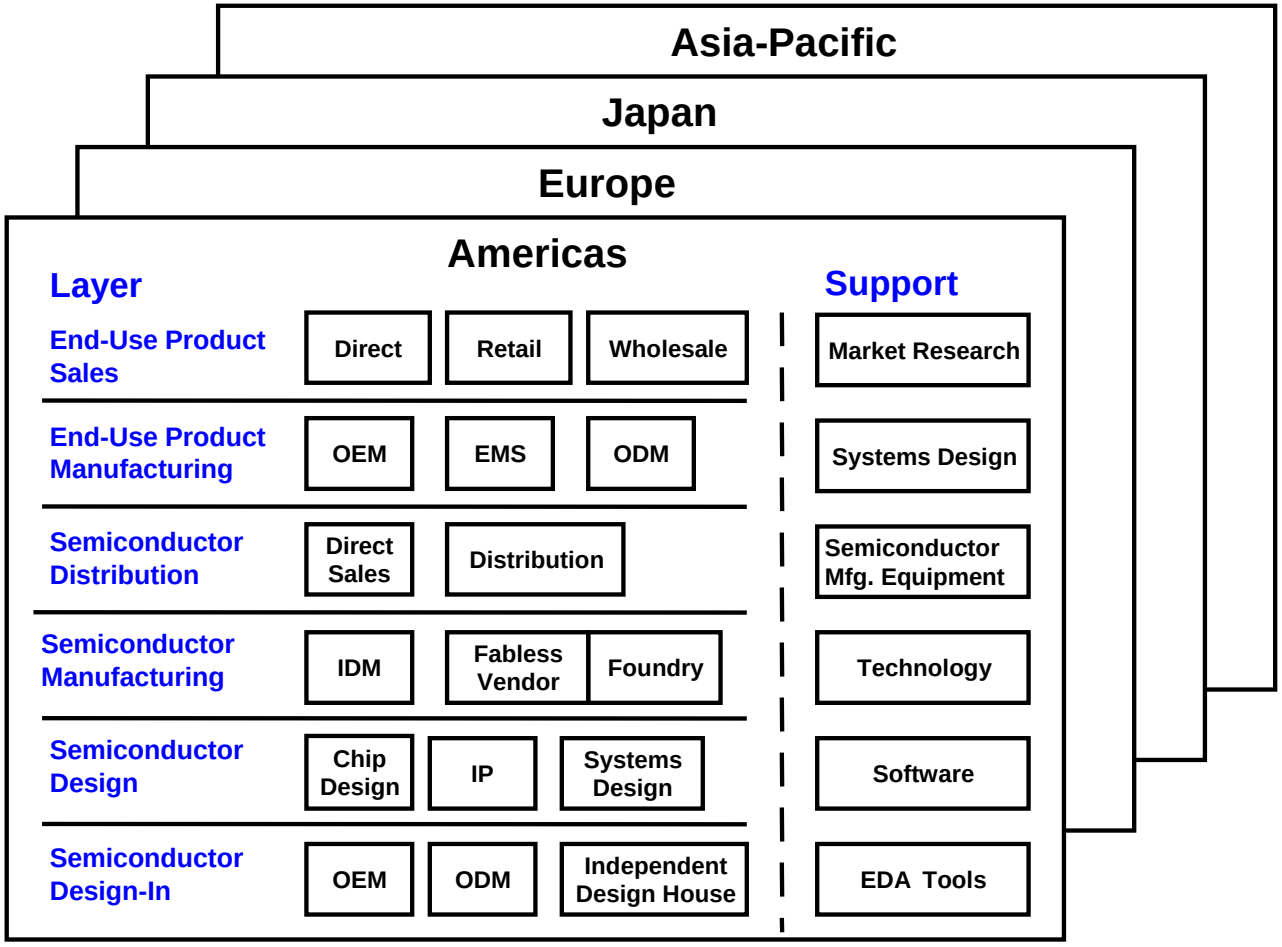
Source: WSTS, Semico Research Corp.

“In The Old Days”

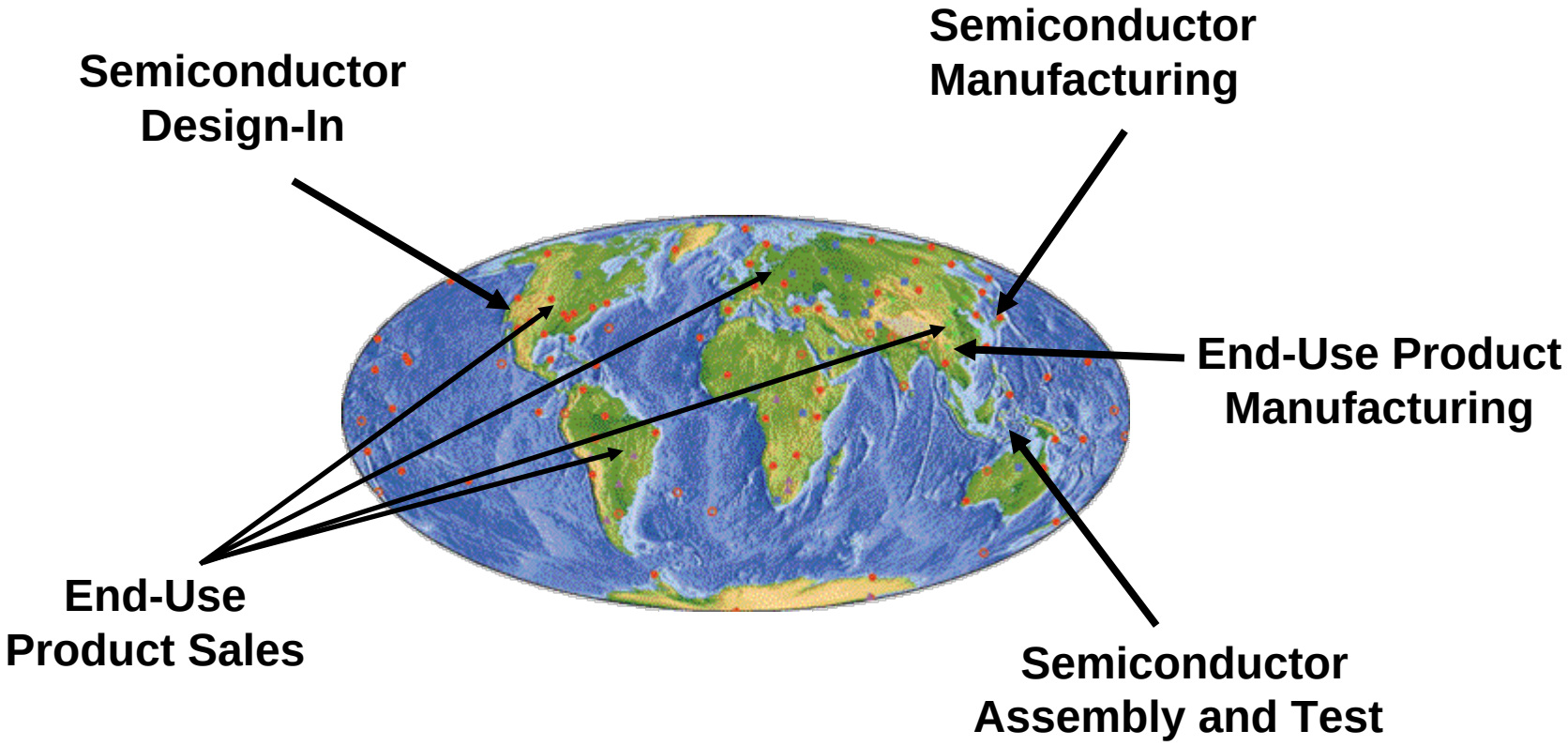
The Semiconductor Manufacturer Did It All



Today's Semiconductor Industry
Divided by Geographic Area



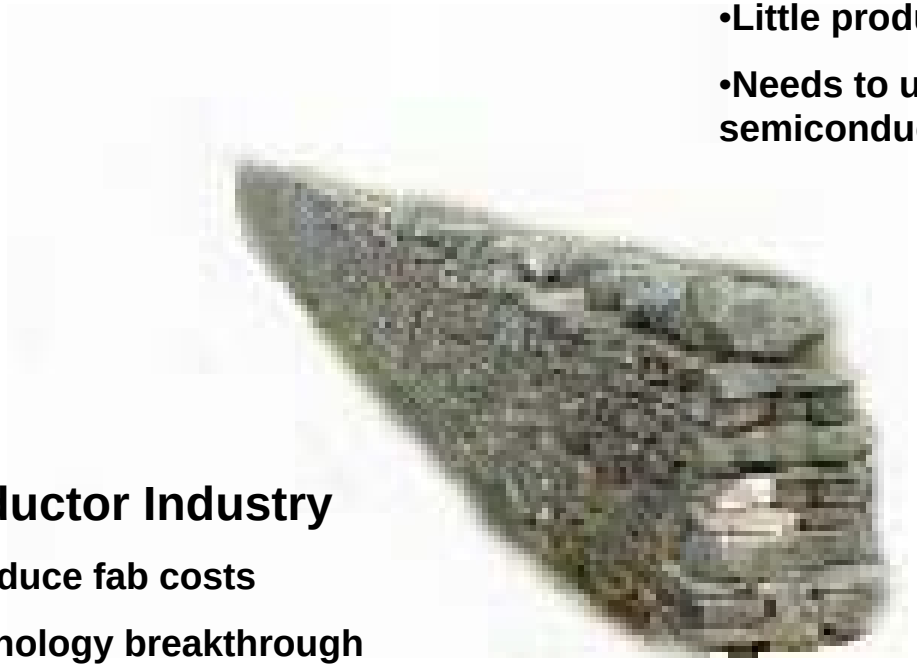
The Global Supply Chain



The Wall

Nanotechnology Community

- **Nanotechnology knowledge**
- **Little production experience**
- **Needs to understand semiconductor ecosystem**



Semiconductor Industry

- **Needs to reduce fab costs**
- **Needs technology breakthrough**
- **Has lithography expertise**
- **Very little nanotechnology expertise**

Conclusion

The semiconductor industry desperately needs nanotechnology solutions. This is an opportunity for practical, volume nanotechnology applications.

The nanotechnology community can take advantage of this opportunity by learning to deal with the semiconductor industry in terms of semiconductor realities: industry disaggregation and the need for scalability, volume production and lower cost fabs.