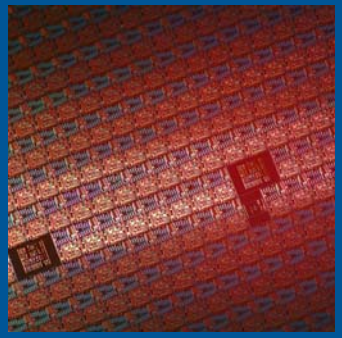
Accelerating the next technology revolution

SEMATECH / LBNL Collaboration



Stefan Wurm
Director of Lithography
SEMATECH

Enabling nanoscale manufacturing technologies: A marathon, not a sprint

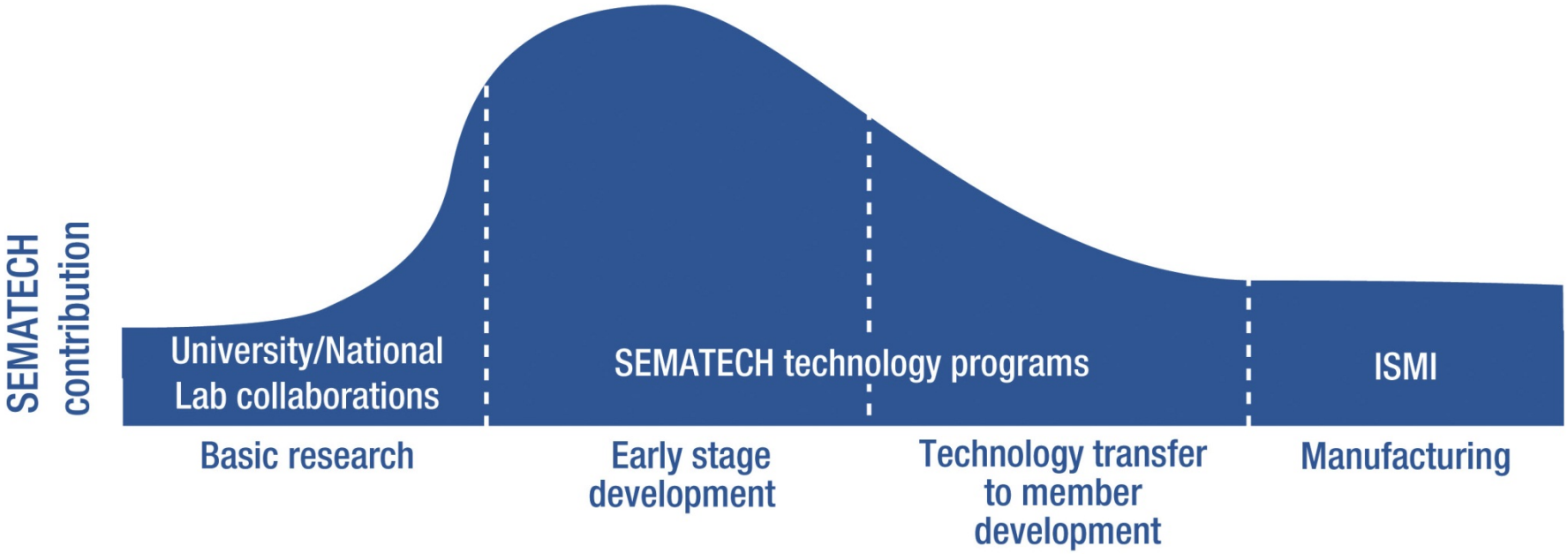
How long does it take:

Decades of development bridging research, development, and manufacturing

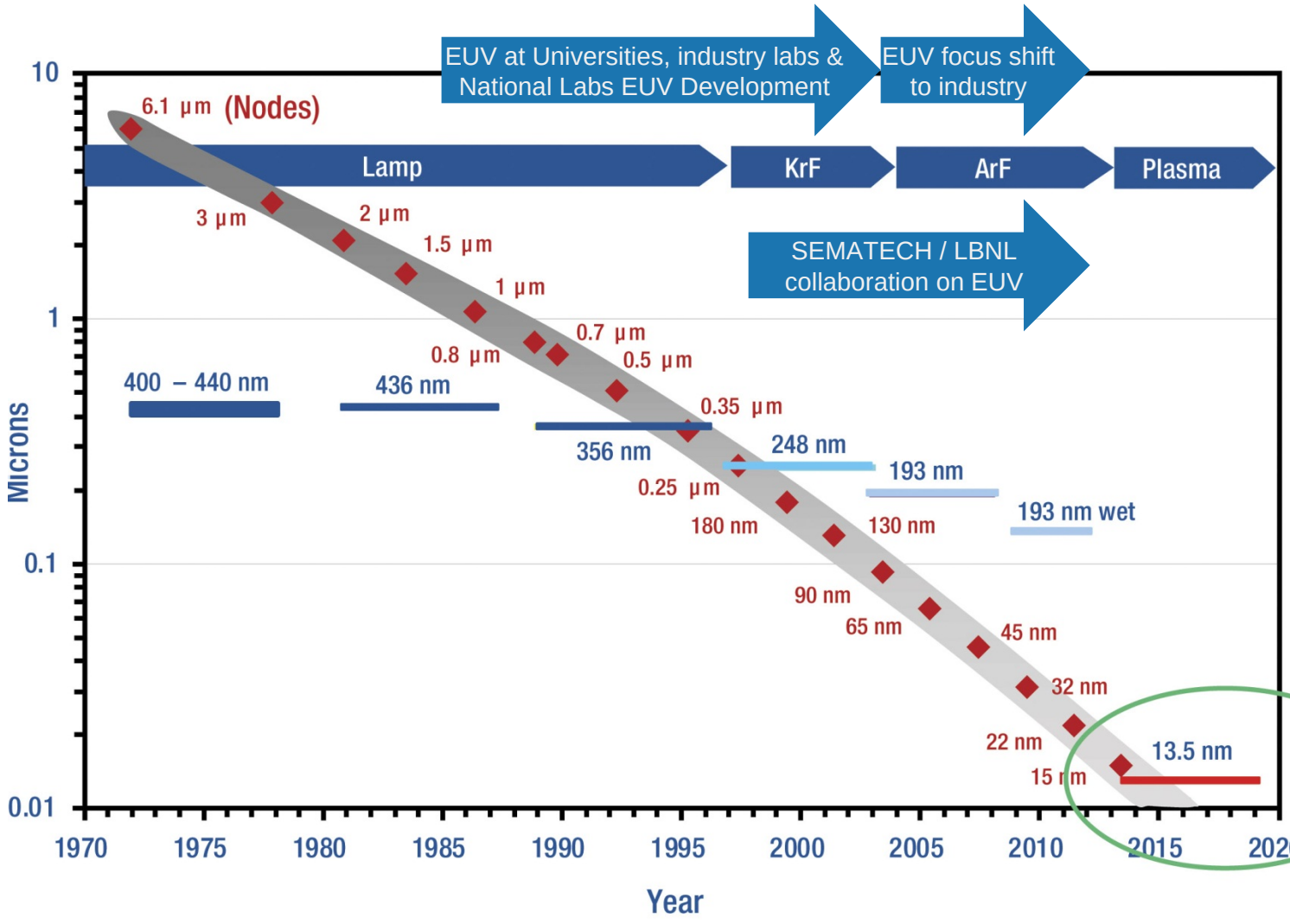
Where is the competitive edge:

Public / Private Research Infrastructures

Chip manufacturers / Suppliers



Technology scaling enabled by imaging transfer of ever smaller features

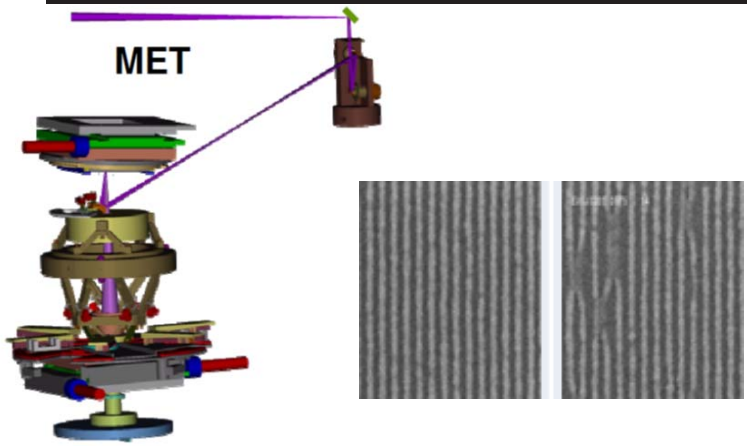


Research for Extreme Ultraviolet Lithography (EUVL) started in the mid 1980's

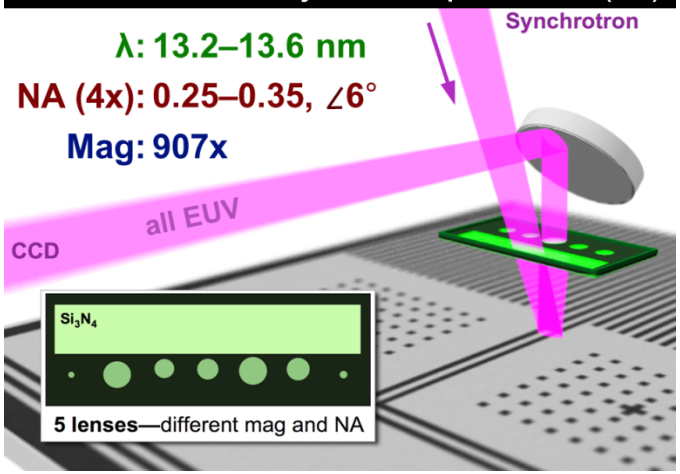
An industry / national lab success story: A decade of SEMATECH / LBNL Collaboration

- Through leading edge imaging and materials research at LBNL the industry can explore fundamental challenges for technologies that need to be ready for manufacturing in ~10 years.
  - The expertise of the LBNL researchers is as important as is the access to a synchrotron facility that can support the research
- SEMATECH / LBNL collaboration is one of the best examples of a successful industry / national lab partnership.
- The complementary expertise and know-how of national labs and semiconductor industry are the key ingredients for the high impact research required to enable nano-scale manufacturing.

SEMATECH Microexposure tool (MET)



The SEMATECH Berkeley Actinic Inspection Tool (AIT)



CXRO THE CENTER FOR X-RAY OPTICS

BERKELEY LAB Lawrence Berkeley National Laboratory

Industry / National Lab Collaboration Opportunities

- Chemistry/Materials Science expertise at National Labs can play a major role in helping address fundamental materials scaling challenges that the semiconductor industry faces with electronic circuit feature sizes approaching sub 10 nm within a decade
- For example:
  - Properties of material platforms used in today's imaging materials (so-called photoresists) may not scale to achieve nanoscale resolution with the precision and the productivity required
  - New materials technologies such as ultra-efficient spintronics for Spin Torque Transfer devices that are compatible with todays CMOS manufacturing technology
  - High carrier mobility materials are required to enable high performance devices at low power

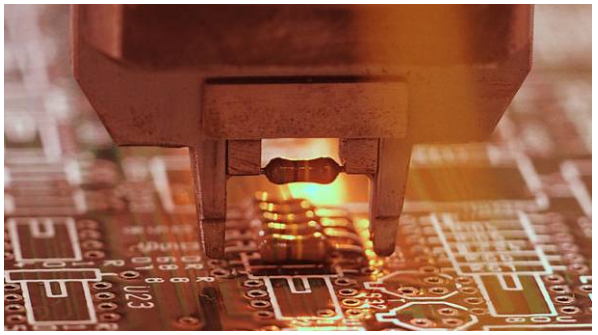
Outlook: Industry / National Lab Collaboration

- **Public / private partnerships** with the industry and National Labs working together increase the vitality of high technology industries and **are a winning model throughout the developed economies worldwide:**
  - They create technology leadership and produce the engineers and scientists companies will need to stay ahead in the competition
  - They attract the best and brightest into fields of research that will be critical for the long-term success of any society who's future depends on its ability to compete in leading edge technologies

Accelerating the next technology revolution

Research

Development



Manufacturing