# **ASML**Faster, smaller, greener

Vadim Banine

La3net 18 November 2014



Slide 2 22 January 2014

# Chips are everywhere



## It's hard to imagine a world without chips













#### **ASML**

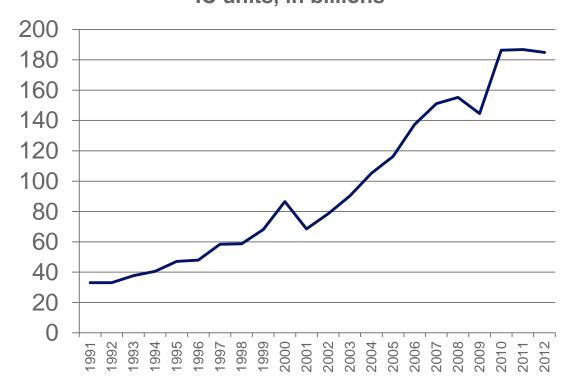
Public

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#### **ASML**

# More than 180 billion chips are made every year IC units, in billions

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In 2012, 185 billion chips were produced — 27 for every man, woman and child on the planet.

Global semiconductor industry sales were about \$300 billion.

Data: WSTS

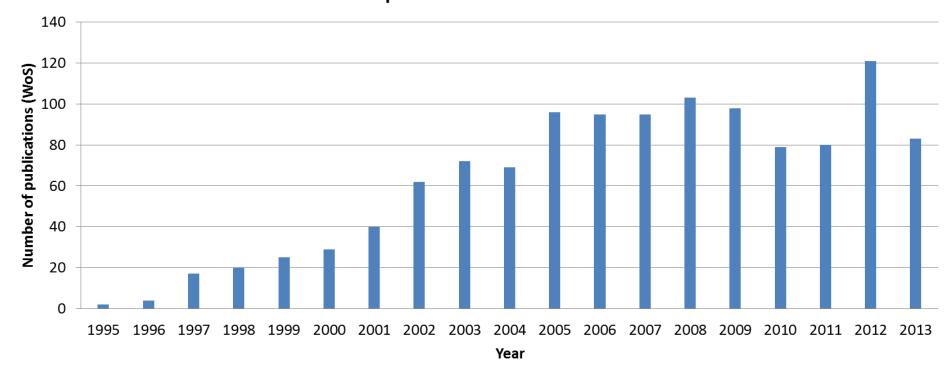


YEAR



Public Slide 5 19 July 2012

#### Number of publications with "Moore's law"



#### The demise of Moore's law?



Public

Slide 6 19 July 2012

explaining it for the first time, Moore made one familiar prediction. "Over the longer



#### Is There Life A

# The End of Moore's Law

By JOHN MARKOFF Published: April 9, 2003

PALO ALTO, Calif., Ar

If there is a religion he long been Moore's Lav number of transistors **Industry Expert Blogs** 

"Moore's Law Dead by 2022" - Then, Before or ....?

MenolithIC 3D Plog - Zvi Or-Bach, MonolithIC 3D Inc. Sep. 04, 2013

"Moore's Law Dead by 2022" announces EE Times headline reporting Bob Colwell's keynote at Hot Chips this week. Actual quote: "Moore's Law -- the

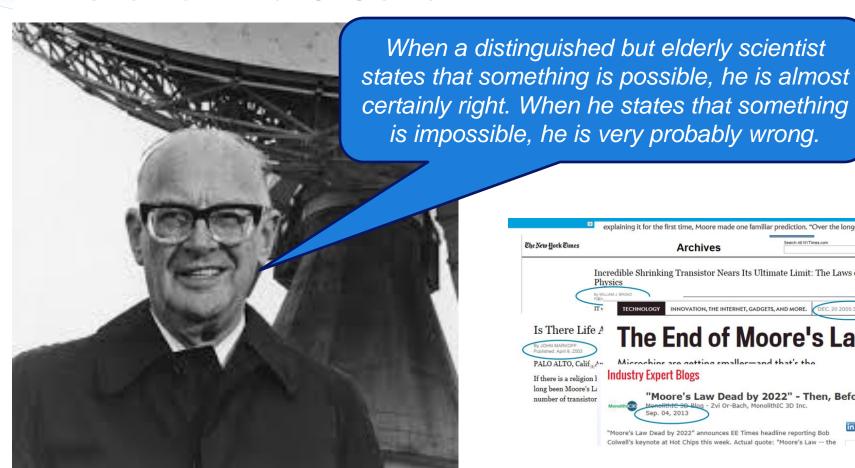


#### **ASML**

#### First law of Arthur C. Clarke

Public Slide 7

19 July 2012



explaining it for the first time, Moore made one familiar prediction. "Over the longer The New Hork Times **Archives** Incredible Shrinking Transistor Nears Its Ultimate Limit: The Laws of Physics INNOVATION, THE INTERNET, GADGETS, AND MORE. DEC. 20 2005 3:15 PM The End of Moore's Law Is There Life A Microchine are getting smaller-and that's the PALO ALTO, Calif An Industry Expert Blogs If there is a religion h long been Moore's La "Moore's Law Dead by 2022" - Then, Before or .... ? number of transistor in Share 7 "Moore's Law Dead by 2022" announces EE Times headline reporting Bob Colwell's keynote at Hot Chips this week. Actual quote: "Moore's Law -- the



## From connecting cities to connecting smart things

"One day there will be a telephone in every major city in the USA"

A.G. Bell







~ 50 Billion things (2020)

 $^\sim$  6 Billion People

~1 Billion households



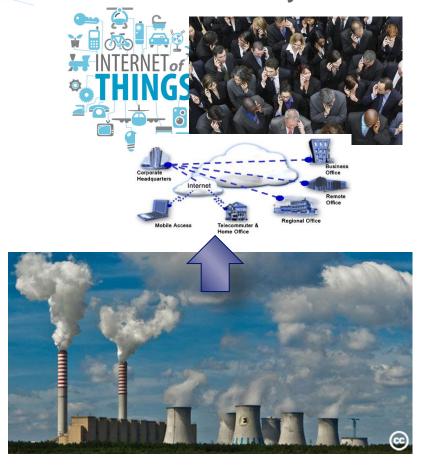


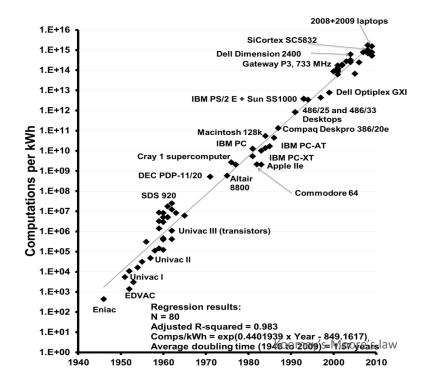


## Power efficiency: additional driver to Moore's law



**Public** 







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# Introducing lithography

## ASML makes the machines for making those chips



Public Slide 11 22 January 2014

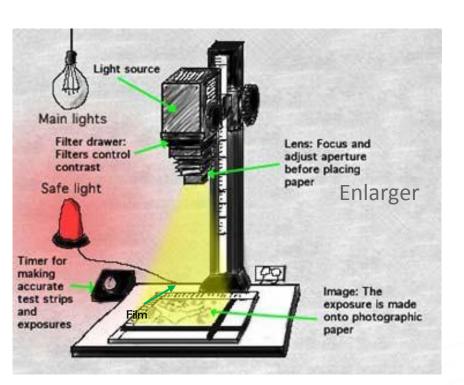


- Lithography is the critical tool for producing chips
- All of the world's top chip makers are our customers
- 2013 sales: €5.2 bln
- Payroll: about 10,400 FTEs

#### **ASML**

Public Slide 12

#### Lithography machine



# Reflective 4x reduction 19 July 2012 6 mirror 6" reticle projection lens ASML 19 Vacuum

13.5 nm light source

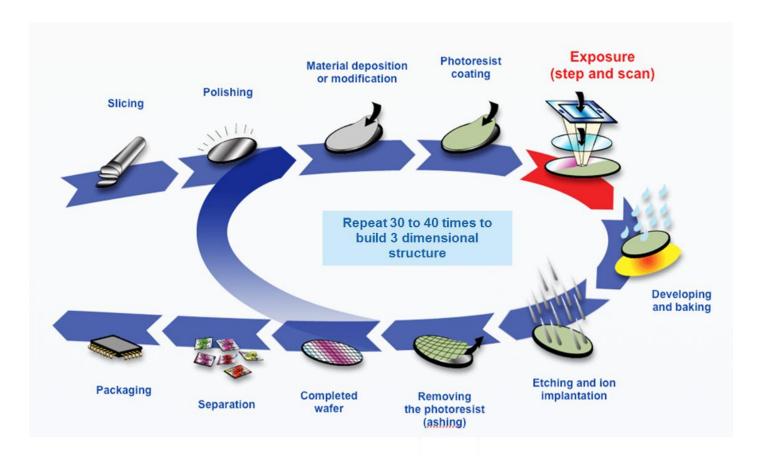
environment

## The place of lithography in semiconductor process



Public

Slide 13 19 July 2012

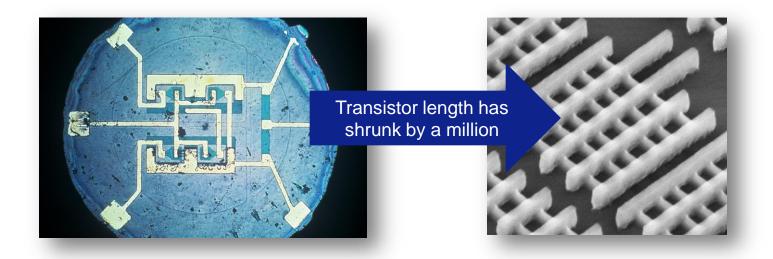


### Key to Moore's Law: Making smaller transistors



**Public** 

22 January 2014



The first integrated circuit on silicon, on a wafer the size of a fingernail

(Fairchild Semiconductor, 1959)

Today: More than a billion transistors on the same area (Intel, 2012)



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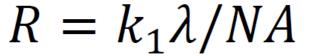
How do we do it?

## Defining equation of the optical lithography



Public

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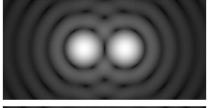


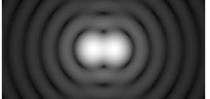
436 nm (ака g-шne)

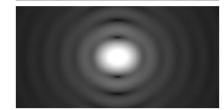
365 nm(aka i-line)

193 nm (aka ArF)



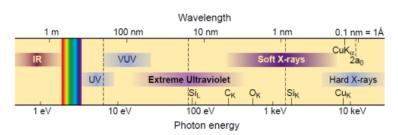








Rayleigh



#### 13.5 nm (aka EUV)





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1980s:

PAS 2000/5000



1990s: PAS 5500

R&D: 50 mln € R&D: 400 mln €



**TWINSCAN** 

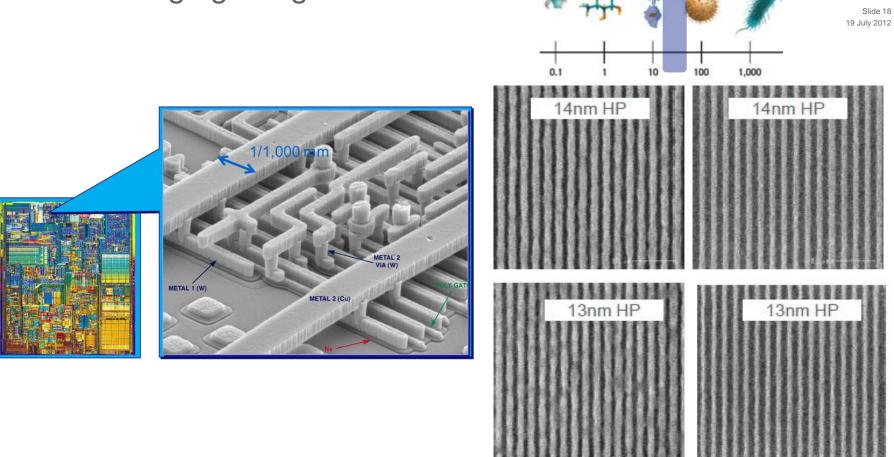
R&D: 1500 mln €



**NXE EUV** 

R&D: 2000 mln €

## EUVL Imaging: magic inside

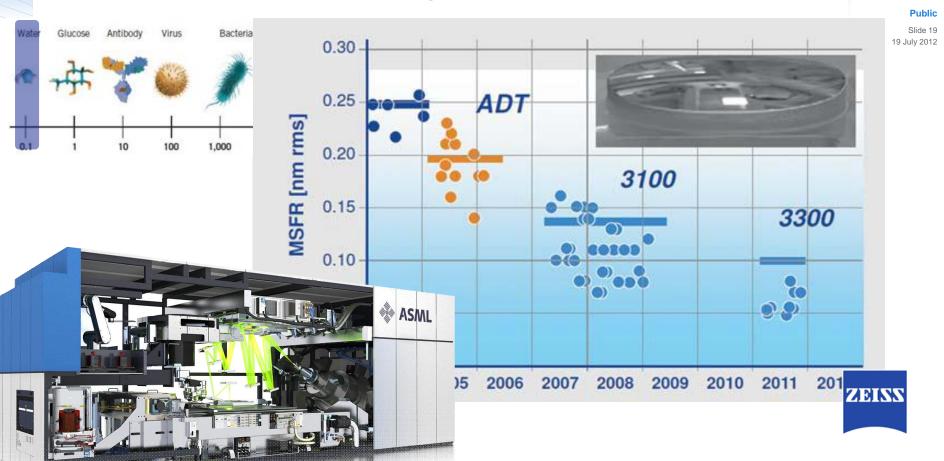


**ASML** 

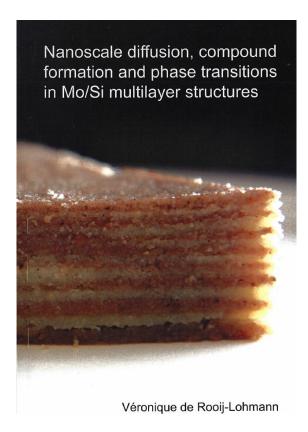
Public

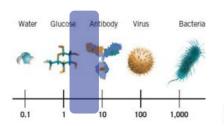
## Optical elements: pushing atoms

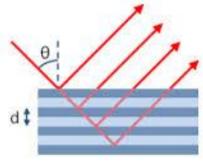




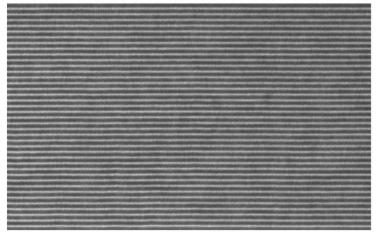
## Multi-layer magic











Courtesy of Saša Bajt (LLNL)



Public

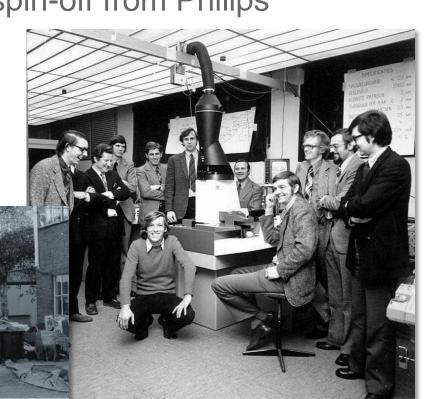
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# Introducing ASML

## Founded in 1984 as a spin-off from Philips



#### **ASML**

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Slide 23 16 April 2014



Over 70 sales and service offices located worldwide

Source: ASML Q2 2014



Slide 24 22 January 2014



San Diego(CA)

Wilton (CT)

A global presence

Korea



Chandler (AZ)

Veldhoven

**Taiwan** 

#### A market of 12 large ASML customers



Public

Slide 25 22 Januar!2014



Technology
Collaboration Award



Preferred Quality Supplier Award



'Good Partner' Award



For the 10<sup>th</sup> consecutive year, top five of VLSI's "Best Wafer Processing" suppliers

	Company	2013 semi capex (estimate, \$M)
Em Service Constitution of the	Intel	10,500
	TSMC Group	9,750
	Samsung	9,500
	GlobalFoundries	4,000
	SK Hynix	2,730
	Toshiba (incl. SanDisk)	2,580
	Micron Technology	1,800
	United Microelectronics Group	1,500
	SMIC	805
	Infineon	640
1.	Sony	617
	STMicroelectronics	500

Source: Gartner, Q4 2013



## Vision, Mission, Strategy



Public

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#### Vision:

ASML makes possible affordable microelectronics that improve the quality of life.

#### Mission:

- 1. ASML invents and develops complex technology for high-tech lithography machines for the semiconductor industry.
- 2. ASML's guiding principle is continuing Moore's Law towards ever smaller, cheaper, more powerful and energy-efficient semiconductors that drive our customers' competitiveness.

#### Strategy:

- Our success is based on three pillars: technology leadership, combined with Customer and Supplier intimacy, high efficient processes and Entrepreneurial people.
- 2. We operate in a safe environment where we care for people, planet and our local communities.
- 3. Our company is an inspiring place where employees work, meet, learn and share.

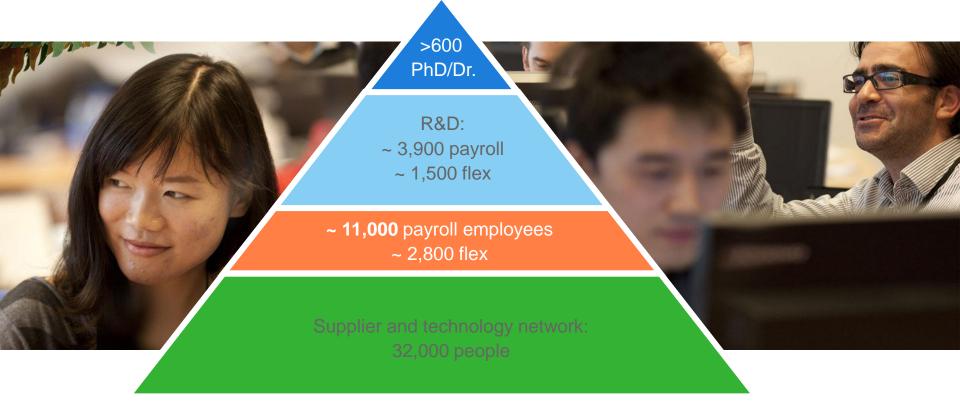


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## ASML and employees

## Great people in an integrated supply chain

Public Slide 28 October 2014





## Our people are the key to our success

















## Their workspace















#### ASML nominated as Best Employer in NL

Public Slide 31



**BESTEWERKGEVERS2013** 

Intermediair Effectory

ASML's first entry in Top 100 employers resulted in Top 25\* position

Good result and a lot to gain!

Kwaliteit van leven Het beste ides wint bij ASML. Of je er nu pas een maand of all tien jaar workt, een engineer met non goed idee kan overal enlopes mot zijn plan', vertelt Hank Desterbaan, Global Manager Labor Market munications. 'Is het sen goed idee, dan riis ie de fondoor en magalijkheden om wereldspoler, maar ook een 'mensenedriit', zoals Vincent Songers het noemt. III is Sentor Manager Poople Developmen in Europa. 'Hier werken munsen weroldwijd samen varmit verschillende landen, met ver-schillende culturen. Die millen allemaal het maximale eruit haten, dat inspireert anorm Ik ben dan ook org Levredon dat wij op bnrokkenheld on beylogenheid hoog scoren i et Beste Werkgeversonderzpek. Bij ASML regent de wet van Moore. Die stelt dat het anntal transistoren op ean chip deer de technologische voorslitgeng elke twee jaar verdubbelt. Oosterbaan: "We werken dus tegen de grenzen van de weten-schap zen. Wij doen dingen die je rier jaar valeden voor namugelijk hield. Dat dangt git." En als wij ons werk niet goed deen mork je dat metoce op je loptep, tabler of swartphone', wilt Sangers nnn. 'Daarom zijn mensen dit hier werken ook zo trots: ze zinn in het degelijks leven resultaten, e worken direct van de kunliteit van ho ASMI blijft de woreld afrenken naar terh nisch talest. 'Het duurt een tet iwee jaar your le once unicke machines velledig bagrilpt', zegi Oostorbaan. Enn forse investe ring in mensen dus, maar ASML'ers zijn wel vanad de eerste dag volledig actief, aldus ASML HOLDING Sangors, 'Ze leren al werkende. Wij hobber

\* based on high me@asml scores



## Strong team with active social agenda















#### Extra information

- **ASML** 
  - Public

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- Job application: <a href="https://www.asml.com/careers">www.asml.com/careers</a>
- This also concerns Internships & Traineeships
- ASML offers PhD positions via Universities
- Master class
- Vadim.banine@asml.com

# ASML