

# Advanced Research Center for Nanolithography

# Welcome



# Advanced Research Center for Nanolithography

- Our brief history
- Mission
- Research program
- Tour

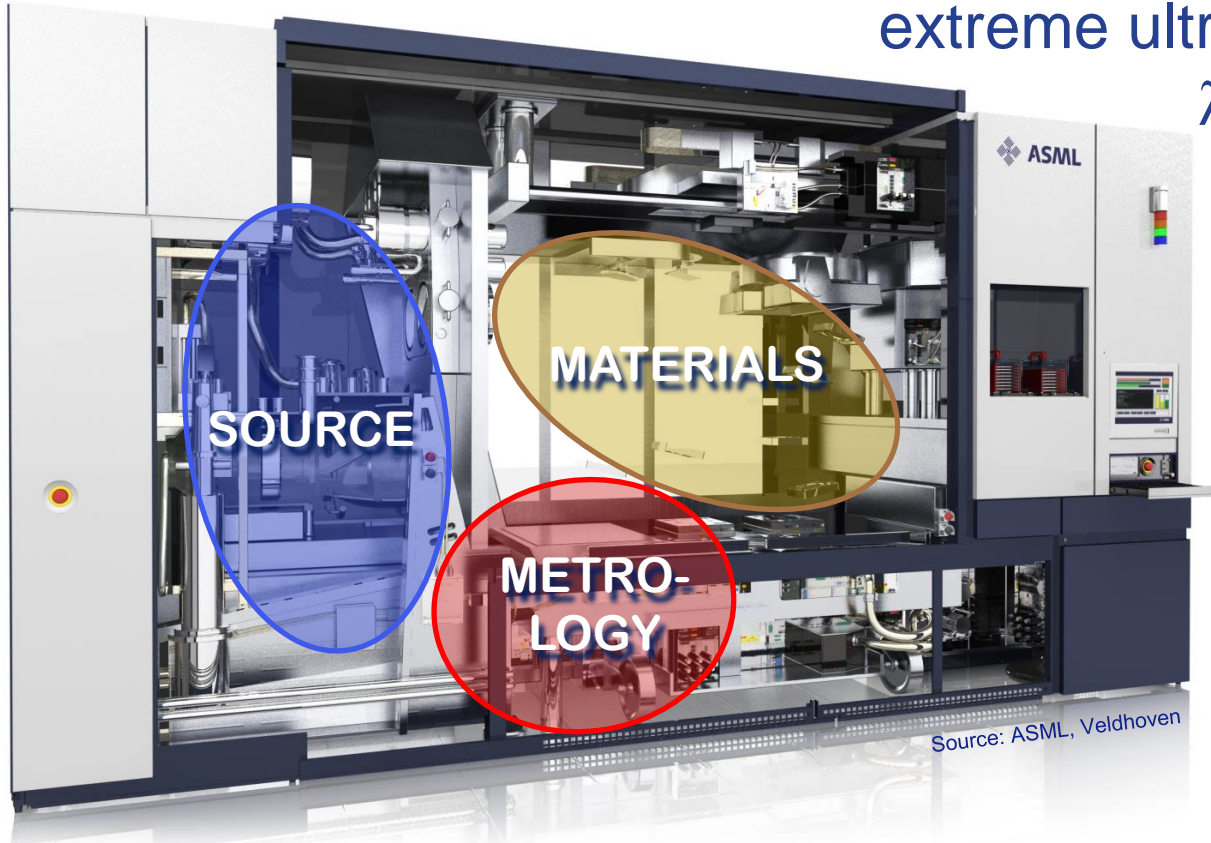
# Mission and brief history of ARCNL

ARCNL focuses on fundamental physics and chemistry in the context of technologies for (nano)-lithography, primarily for the semiconductor industry

- *Start:* Jan. 2014; *concept:* 2013 (ASML)
- *Partners:* NWO (formerly FOM), UvA, VU, ASML
- *Base budget:* 50% ASML, 50% NWO+UvA+VU (rest comes in through grants)
- *Size:* currently ~ 85 people
- *Style:* Organized as NWO-Institute; part of NWO-I

# EUV lithography technology

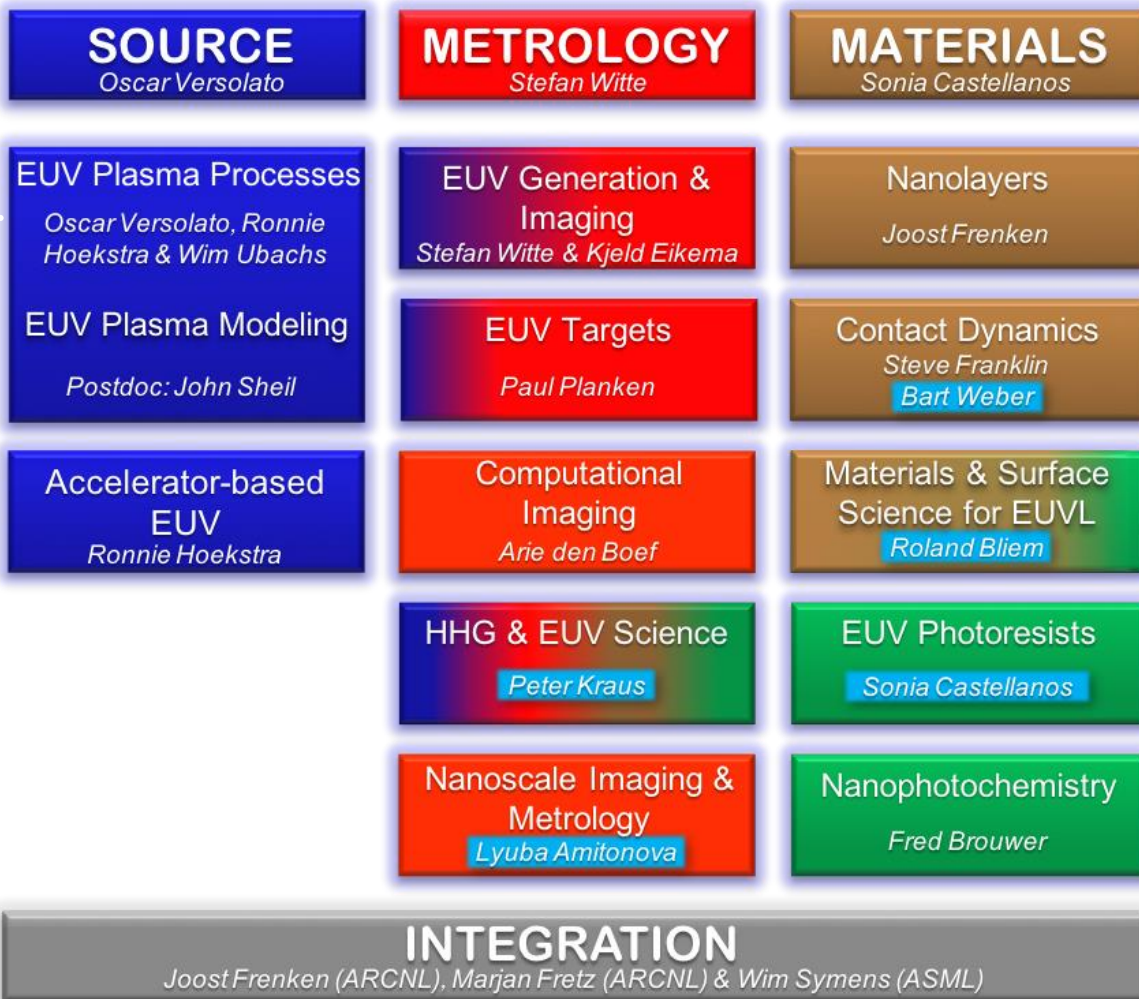
extreme ultraviolet light  
 $\lambda = 13.5 \text{ nm}$



Source: ASML, Veldhoven

# Scientific program

- Three departments
- Twelve research groups
  - Group leader
  - PhD students
  - Postdocs
  - Interns
  - Technicians
- Final growth stage



# Who does the work @ ARCNL?

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- *PhD students:* currently 30
- *Postdocs:* currently 8
- *Research interns:* currently 8
- *Senior scientists:* currently 15
- *Group technicians:* currently 6
- *Support staff:* currently ~ 10 (partly @ AMOLF)

recruiting

recruiting

recruiting

~~recruiting~~

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recruiting

<https://arcnl.nl/working-at-arcnl>

<https://arcnl.nl/jobs>

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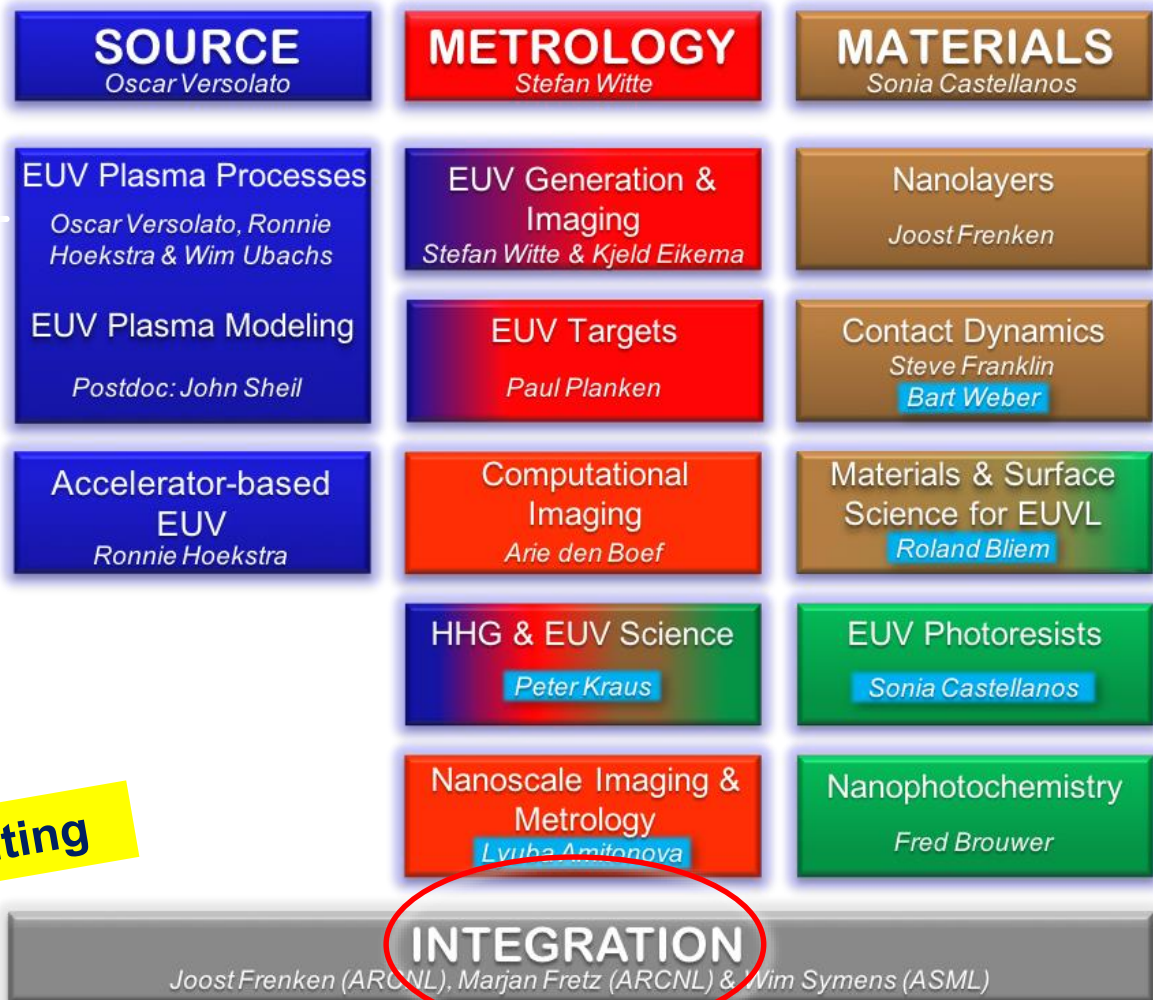
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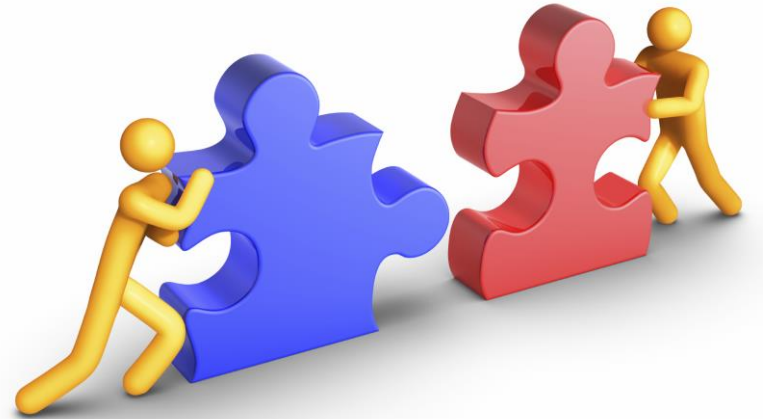


# Integration



Dr. Wim Symens (ASML)  
Dr. Marjan Fretz (ARCNL)  
Prof. Joost Frenken (ARCNL)

- Alignment of research program ARCNL with needs & interests ASML
- Organizational matters



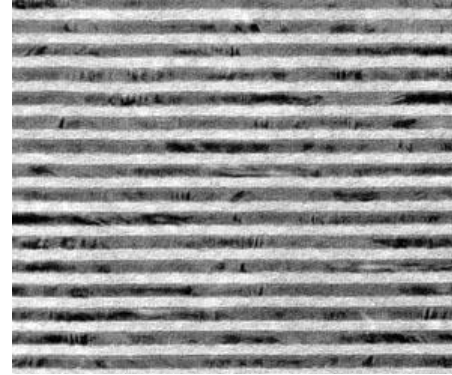
# My own example of ARCNL-research



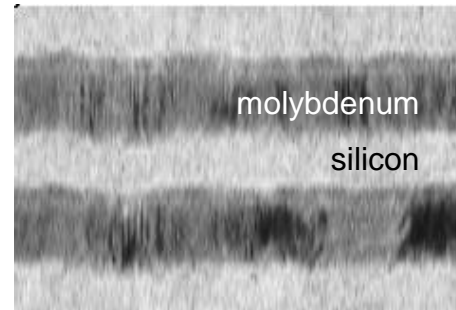
**ZEISS** CARL ZEISS SMT

Collector lens:  
*polished with atomic precision!!!*

Mirror for **13.5 nm** light



source: research group Prof. Fred Bijkerk  
Twente University



molybdenum  
silicon

**6.25 nm**

# Scanning tunneling microscope



Marcel Rost and  
Vincent Fokkema  
Leiden University

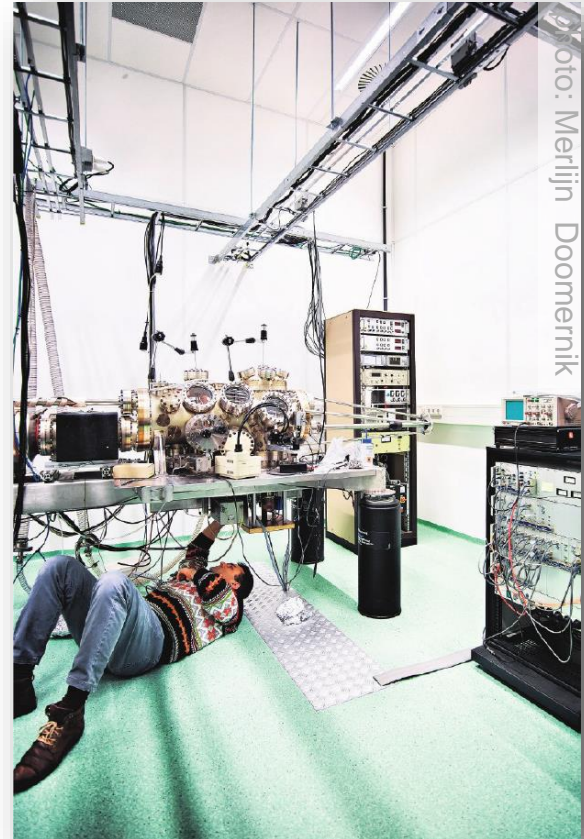
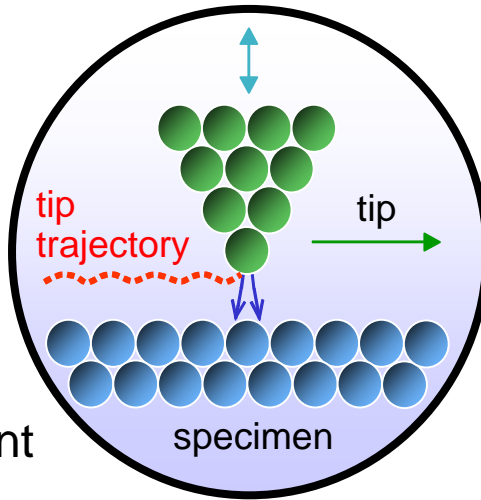
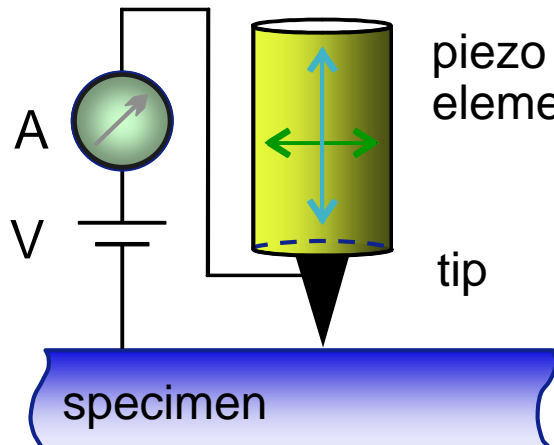


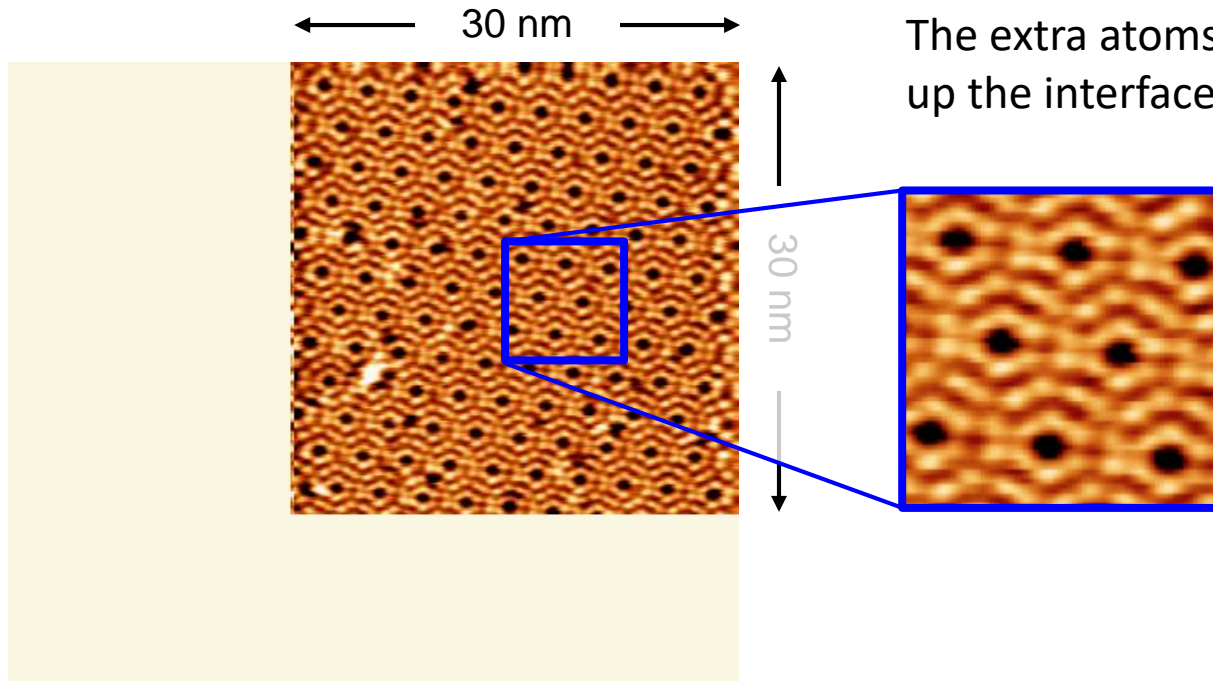
Photo: Merlijn Doornik

# Deposition on the atomic scale

Molybdenum atoms on silicon

'Fatal attraction'

1.7 seconds  
per image



# ARCNL's new building



# ARCNL Lab tour

don't miss it!

- Four parallel tours
- Four research groups @ ARCNL

SOURCE <i>Oscar Versolato</i>	METROLOGY <i>Stefan Witte</i>	MATERIALS <i>Sonia Castellanos</i>
EUV Plasma Processes <i>Oscar Versolato, Ronnie Hoekstra &amp; Wim Ubachs</i>	EUV Generation & Imaging <i>Stefan Witte &amp; Kjeld Eikema</i>	Nanolayers <i>Joost Frenken</i>
EUV Plasma Modeling <i>Postdoc: John Sheil</i>	EUV Targets <i>Paul Planken</i>	Contact Dynamics <i>Steve Franklin</i> <i>Bart Weber</i>
Accelerator-based EUV <i>Ronnie Hoekstra</i>	Computational Imaging <i>Arie den Boef</i>	Materials & Surface Science for EUVL <i>Roland Bliem</i>
	HHG & EUV Science <i>Peter Kraus</i>	EUV Photoresists <i>Sonia Castellanos</i>
	Nanoscale Imaging & Metrology <i>Lyuba Amitonova</i>	Nanophotochemistry <i>Fred Brouwer</i>
<b>INTEGRATION</b> <i>Joost Frenken (ARCNL), Marjan Fretz (ARCNL) &amp; Wim Symens (ASML)</i>		

# Nanolithography *Science with a Mission*



ARCNL