How to do everything wrong but succeed nevertheless

Katja Höflich[1,2]

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2 CoreLab Correlative Microscopy & Spectroscopy, Helmholtz-Zentrum Berlin

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Who am I?

Katja Höflich date of birth: 17.07.1981, married, two children (2005 & 2011)

since 2021	**Head of Joint Lab for Photonic Quantum Technologies** Ferdinand-Braun-Institut gGmbH Leibniz-Institut für Höchstfrequenztechnik
2014 - 2020	***Postdoctoral Fellow***, responsible for ion beam microscopy Helmholtz-Zentrum Berlin für Materialien und Energie, Berlin, Germany
2012 - 2013	***Postdoctoral Research Associate*** Max Planck Institute for the Science of Light, Erlangen, Germany
2011	***PhD in Physics***, Martin Luther University, Halle-Wittenberg, Germany "Plasmonic Properties of Metal-containing Nanostructures“
2007 - 2011	***Research Associate*** Max Planck Institute of Microstructure Physics, Halle (Saale), Germany & Institute of Photonic Technologies, Jena, Germany
2006 - 2007	***Teaching (‚Lehrauftrag‘)***, physics basic education University of Applied Science, Nordhausen
2005	***Diplom in Physics***, Friedrich Schiller University, Jena, Germany "Quantum Electrodynamics in Strong External Fields“

Leibniz Ferdinand Braun Institut

Ferdinand-Braun-Institut – Facts & Figures

- Member of Leibniz Association
- Shareholders: State of Berlin / Federal Republic of Germany
- Founded in: 1992

- Staff: 315 (incl. 150 scientists & PhD candidates) from 24 nationalities
- Budget / Turnover (2019): 40.4 M€ (incl. 22.9 M€ project revenues)
- Partner of / Joint Labs:
  - Research Fab Microelectronics Germany (FMD)
  - Technische Universität Berlin
  - Humboldt-Universität zu Berlin
  - Goethe-Universität Frankfurt a. M.
  - BTU Cottbus-Senftenberg
  - Universität Duisburg-Essen

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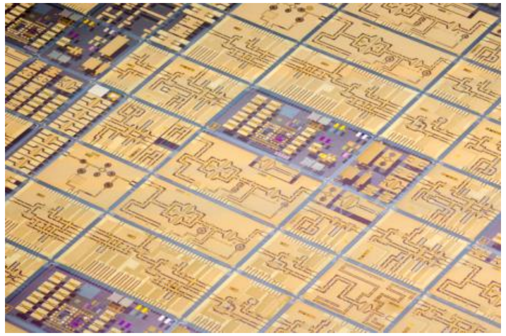
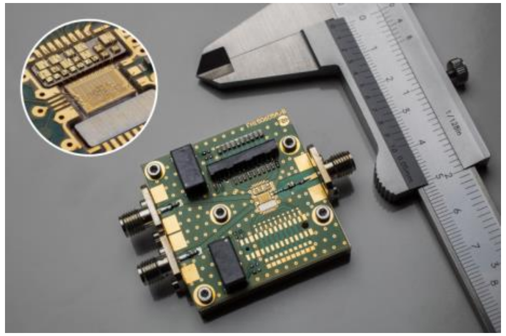
FBH - Basic Research Program





III-V Semiconductor Technology

- Epitaxy & process technology
- Mounting & packaging

III-V Electronics

- Microwave components & systems
- GaN power electronics
- 100+ GHz: THz electronics (InP HBT)
- Fast drivers for laser diodes

Photonics

- GaAs diode lasers (0,63 - 1,2 µm) – from ultra narrowband to kW output powers
- Hybrid diode laser systems (RGB) for versatile applications
- GaN LEDs & GaN diode lasers (UV & true blue)

Integrated Quantum Technology

- Electro-optical components & hybrid micro-integrated modules
- Integrated quantum sensors based on atomic gases
- Nanostructured components for single photon applications

Joint Lab *Photonic Quantum Technologies*

Quantum Communication & Optical Quantum Information Processing

Mission

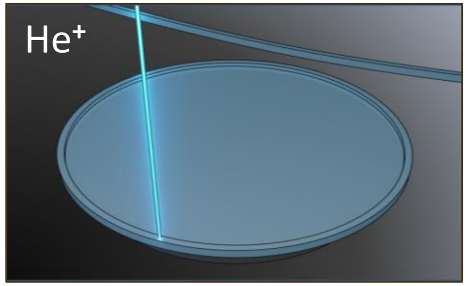
- Realization of real-world quantum optical chips for quantum communication and quantum information processing

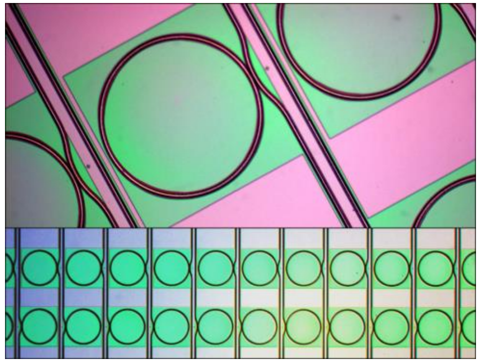
Approach

- Strong coupling of quantum emitters to light guided & confined on chip

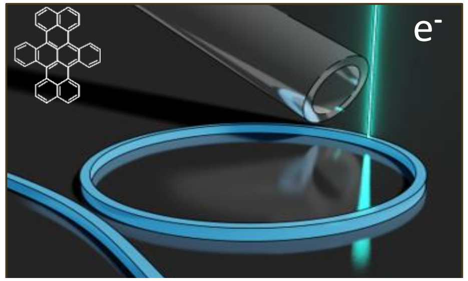
Competences

- Interfacing ultracold atoms, ions, and molecules with nanophotonic components
- Design, fabrication, and characterization of nanophotonic components
- Focused ion and electron beam processing for rapid prototyping, direct writing, and post-processing

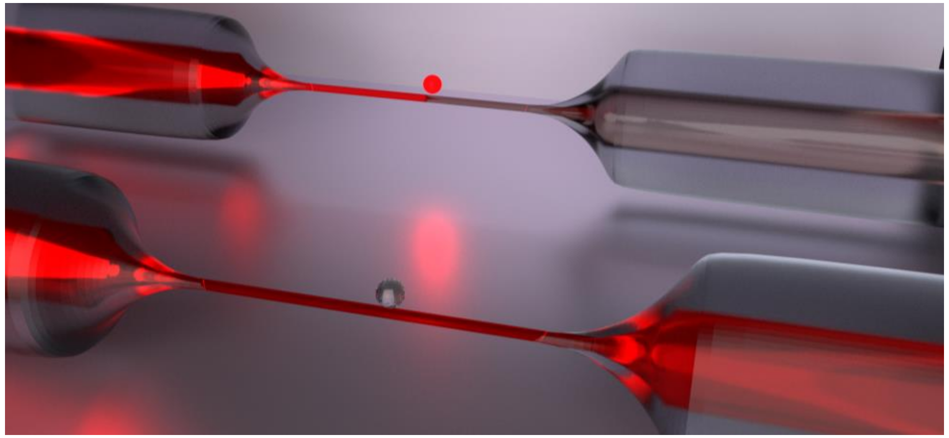




On-chip ring resonators critically coupled to waveguides silica on silicon.

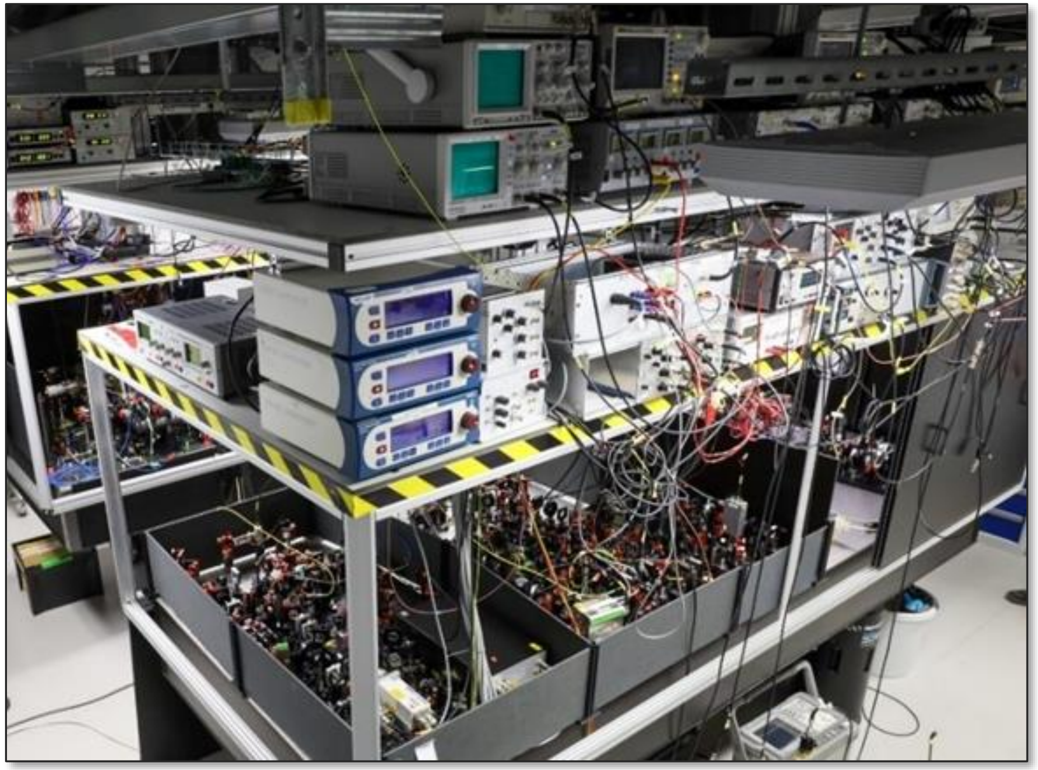


Artistic view of direct emitter writing based on focused beams of charged particles.

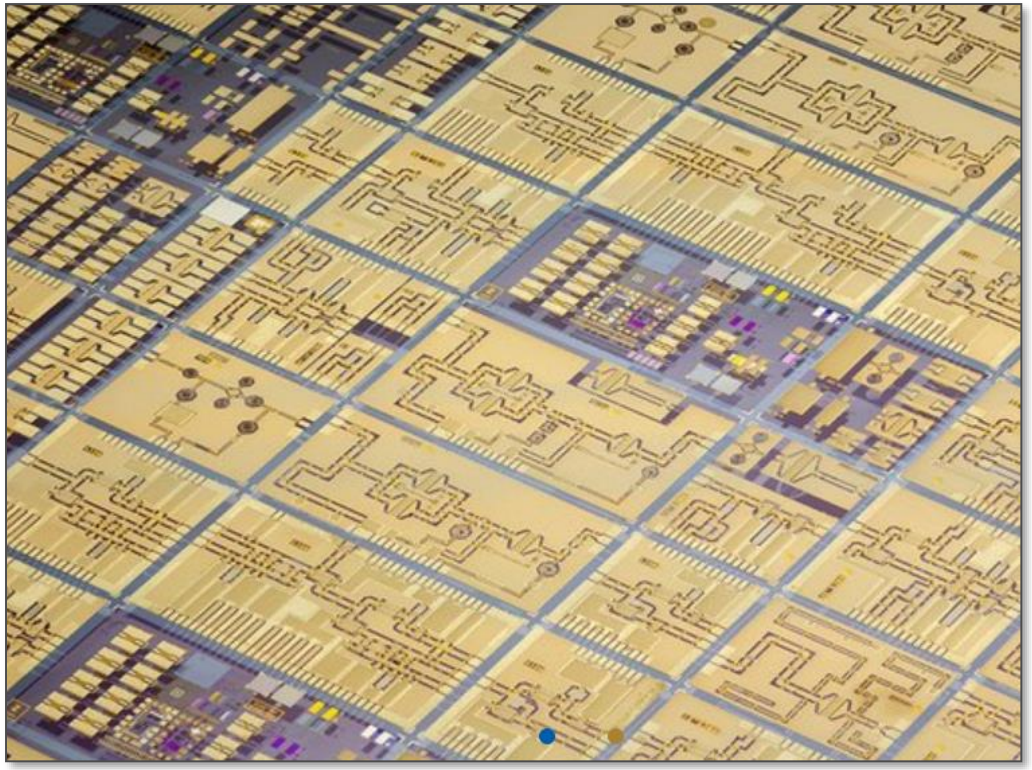


Artistic view of a diode for single photons: only when light travels from left to right, it is absorbed by the atom outside the fiber (top).

Aim: Quantum Nonlinear Optical Devices with Lifetime-limited Emitters



setup for trapping cold atoms in the near-field of a nanofiber (HU)



example of a monolithic integrated circuit (FBH)

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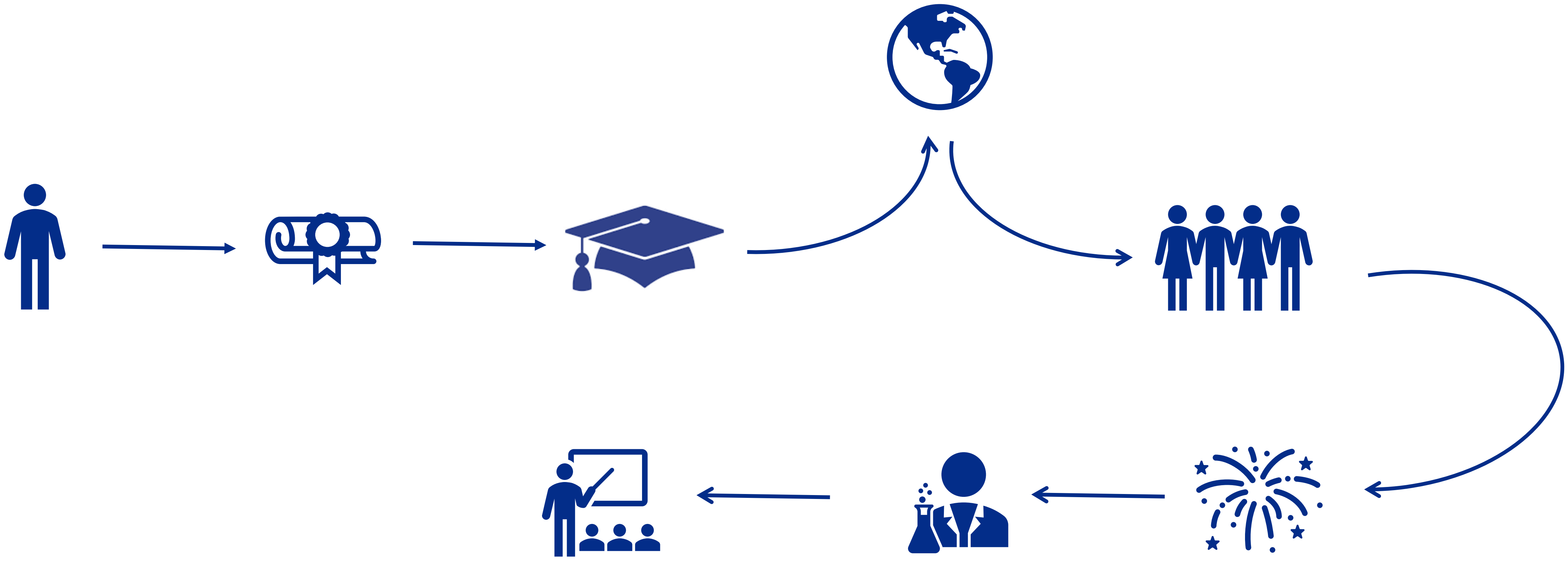
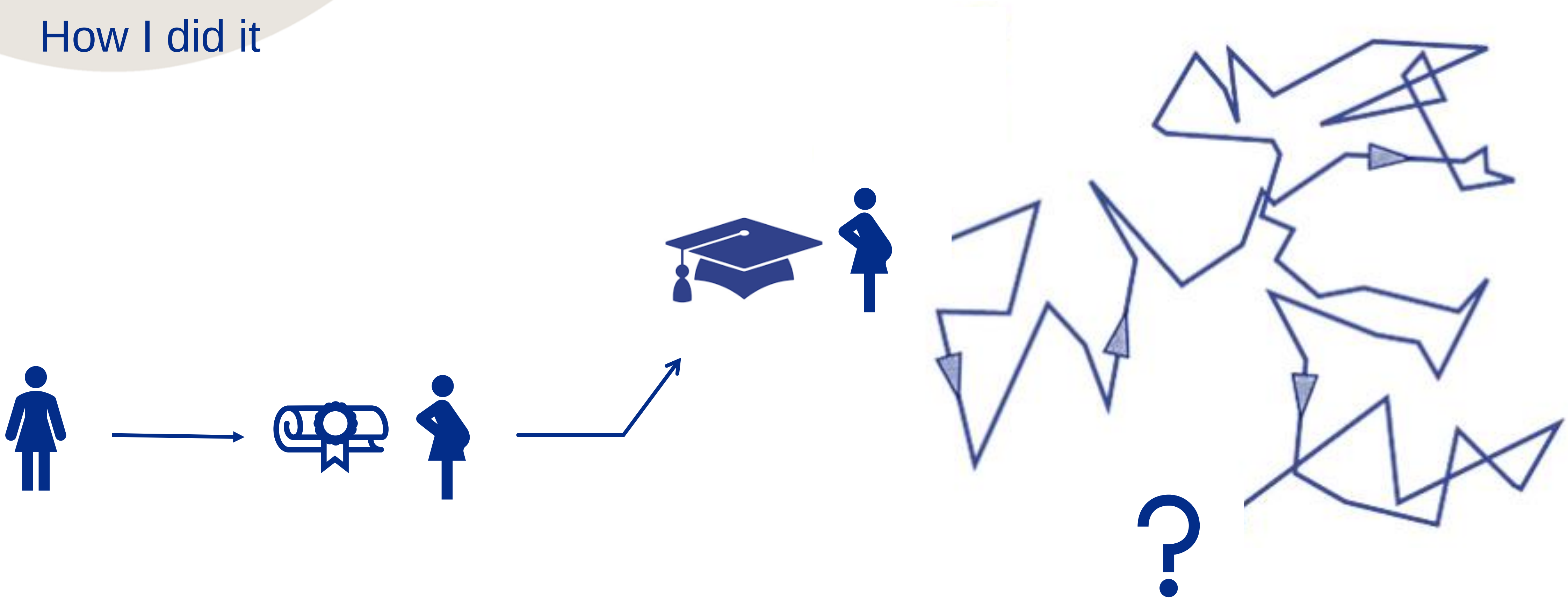
My career path up to this point

How you should do it



How I did it



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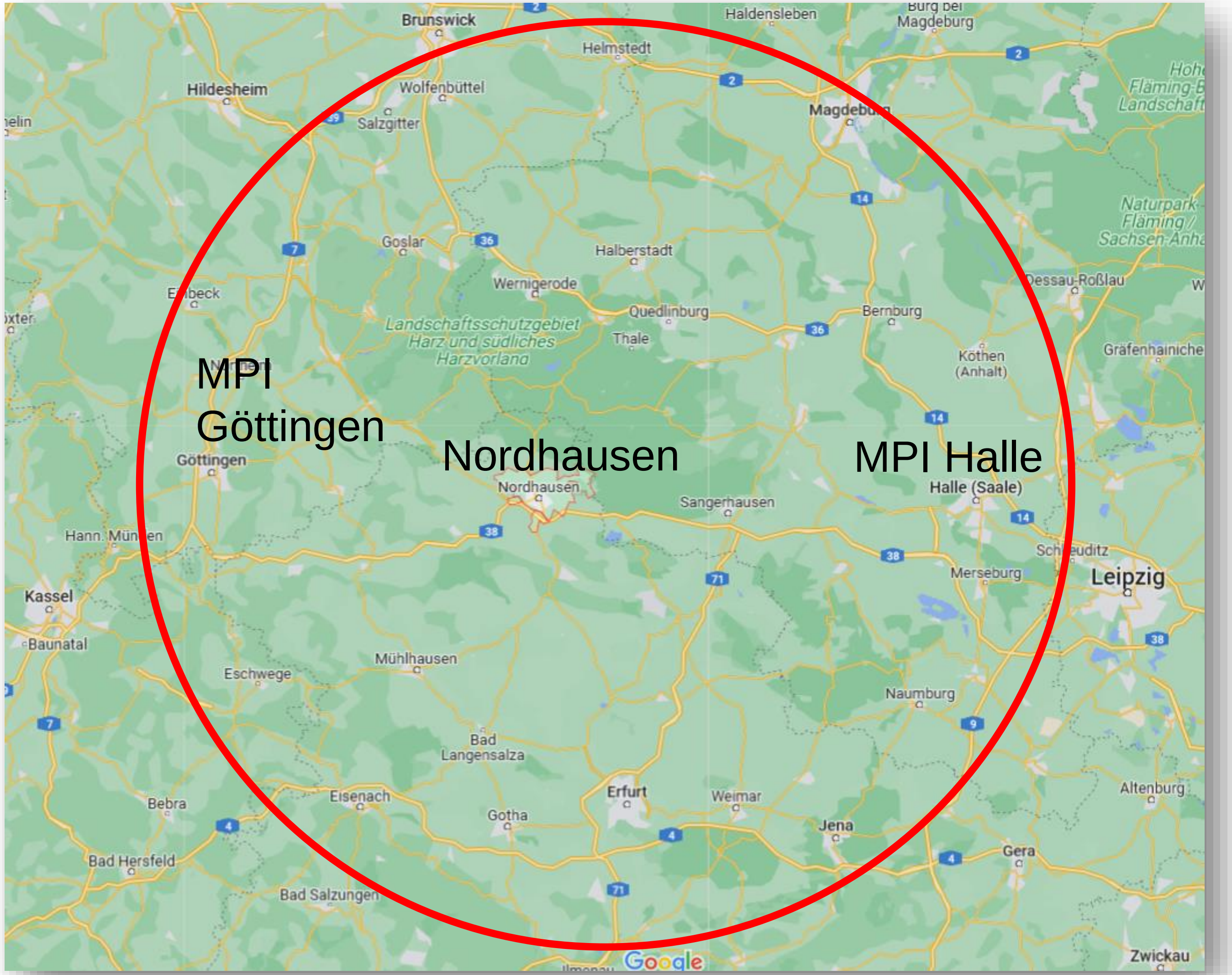
Mistake 1: Not choosing carefully where to work



Nordhausen = in the middle of nowhere

r = 100 km

=

daily travel distance, that I may survive as a mom of a little baby

Mistake 2: Not taking the time to discuss with people

My typical time schedule during PhD

5:30 am	get up
5:55 am	leave house
6:20 – 7:50 am	train ride to Halle
7:50 – 8: 25 am	bike ride to MPI
	work, work, work
4:30 pm	leave MPI
5:00 – 6:30 pm	train ride to Nordhausen
roughly 7 pm	arriving home, care about family
roughly 9 -11 pm	continue working from home

Talking to people makes your daily work easier and more enjoyable!
And they notice that you are indeed working!

Mistake 3: To forget about your own agenda

What I did after my PhD:

- Lab planning (but not my labs)
- Reviewing (on top of my reviews)
- Administrational tasks (for which I was not in charge)
- Writing proposals (where my name didn‘t show up)

All of this may be helpful, you can learn a lot in the process. But it will most likely not help you get a job in academia.

Being uncomplicated, hardworking and invisible is often a female problem!

Mistake 4: To realize only late what you really want

Katja in 2015:

- aged 34, lots of experience in science managment
- but no publication for 3 years (= clinically dead in science)

Met wonderful people that supported me.

Thanks to Steffi Reich, Ivo Utke, and many others!

- resumed my own research
- frantically wrote my own research proposals
  (in my ‚free' time, while being busy in user service during the days)

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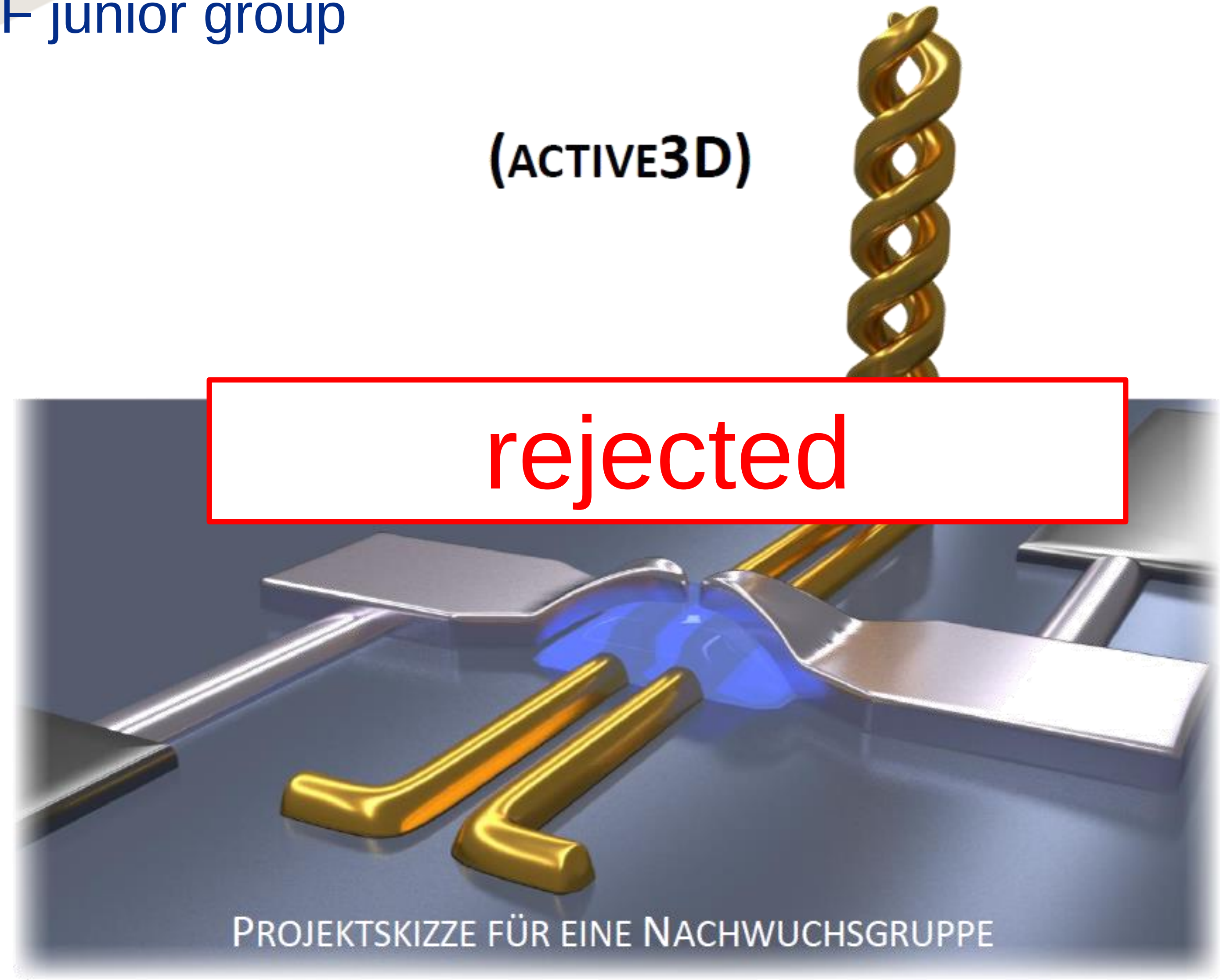
2016 BMBF junior group



rejected

"BMBF-Nachwuchswettbewerb - NanoMatFutur"

2017 DFG Emmy Noether group

DFG form 53.05 – 05/16 page 1 of 20

active3D - Switchable 3D Nanodevices based on Integrated Focused Electron and Ion Beam Processing

rejected

Katja Höflich, Hel ... n

Part B - Project Description

1 State of the art and preliminary work

Progress in miniaturisation constitutes an enormous impetus for technical innovations in information technology, permeating all economic sectors. Future IT systems will rely on photons

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2018 DFG standard proposal

ChiralFEBID
Direct writing of chiral and nonlinear plasmonic devices

Katja Höflich, He … lin

revision required

Project Description

1 State of the art and preliminary work

Progress in miniaturisation constitutes an enormous impetus for technical innovations in information technology, permeating all economic sectors. Future IT systems will rely on photons instead of electrons what triggers the need for nanoscale optical devices. Plasmonic nanostructures constitute a promising approach since their minimum geometric features are

2018 EU COST action

EUROPEAN COOPERATION
IN SCIENCE & TECHNOLOGY

rejected

Open Call Collection OC-2018-2

Proposal Reference OC-2018-2-23453

Title: Focused Ion Technology for Nanomaterials

Acronym: FIT4NANO

2019 DFG standard proposal

DFG form 53.05 – 05/16 page 1 of 20

ChiralFEBID
Direct writing of chiral and nonlinear plasmonic devices

Katja Höflich, Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik

funded

1 State of the art and preliminary work

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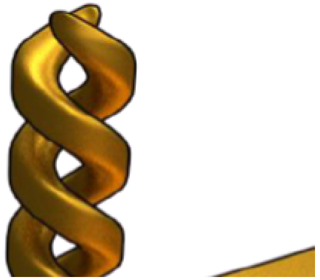


2019 DFG priority programme

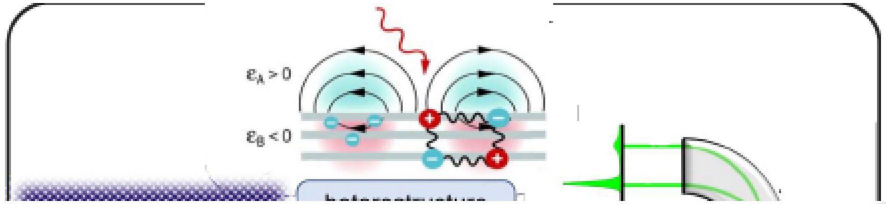
Project Description

1. State of the a

rejected

Overall aim: we focus *interactions in 2D vdW materials'*. By combining cutting-edge nanopatterning with nanoscale analysis we will ultimately realize ***hybrid polaritonic modes with nanoscale confinement and low losses*** for possible applications in light-based future information technology. In addition, we offer our advanced nanopatterning techniques and our unique analysis instrumentation to the whole SPP network.

In two-dimensional (2D) materials light-matter interaction can be significantly enhanced by polaritons [1, 4–6]. A polariton is a quasiparticle that results from coupling between an electro-



2019 Leibniz competition

Defect-engineering for tailored growth of van der Waals heterostructures

Martin Heilmann[1]*, Katja Höflich*[2] *and J. Marcelo J. Lopes*[1]

[1]*Paul-Drude-Institut für Festkörperelektronik (PDI)*

[2]*Hemlholtz* rejected *gie (HZB)*

Ever since the discovery of graphene, other materials have been found to be stable as single, two-dimensional (2D) layers. Their combination into vertical van der Waals heterostructures allows novel designs for atomically thin electronic devices, such as capacitors or transistors. However, currently such heterostructures are mostly fabricated via mechanical stacking of exfoliated flakes, a process which is inherently non-scalable. Therefore, van der Waals epitaxy

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And then 2020 came

2019 EU COST action

EUROPEAN COOPERATION IN SCIENCE & TECHNOLOGY

Open C

funded

Proposal Reference OC-2019-1-24152

Title: Focused Ion Technology for Nanomaterials

Acronym: FIT4NANO

Leibniz Ferdinand Braun Institut

2020 DFG standard proposal

Tuning and mapping hybrid polaritons at the nanoscale

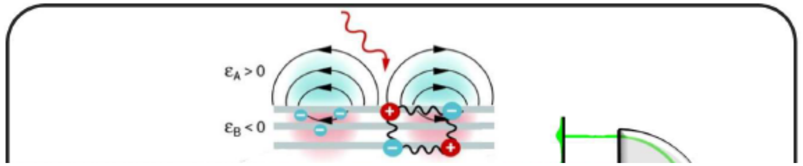
Katja Höflich, Helmholtz-Zentrum Berlin für Materialien und Energie
Hannah C. Nerl, Fritz Haber Institute of the Max Planck Society

1. State o

funded

Overall aim: we focus on studying optical properties emerging from interlayer interactions in 2D van der Waals materials. By combining cutting-edge nanopatterning with nanoscale analysis we will ultimately realize ***hybrid polaritonic modes with nanoscale confinement and low losses*** for possible applications in light-based future information technology.

In two-dimensional (2D) materials light-matter interaction can be significantly enhanced by polaritons [1, 4–6]. A polariton is a quasiparticle



2020 Leibniz competition

Proposal

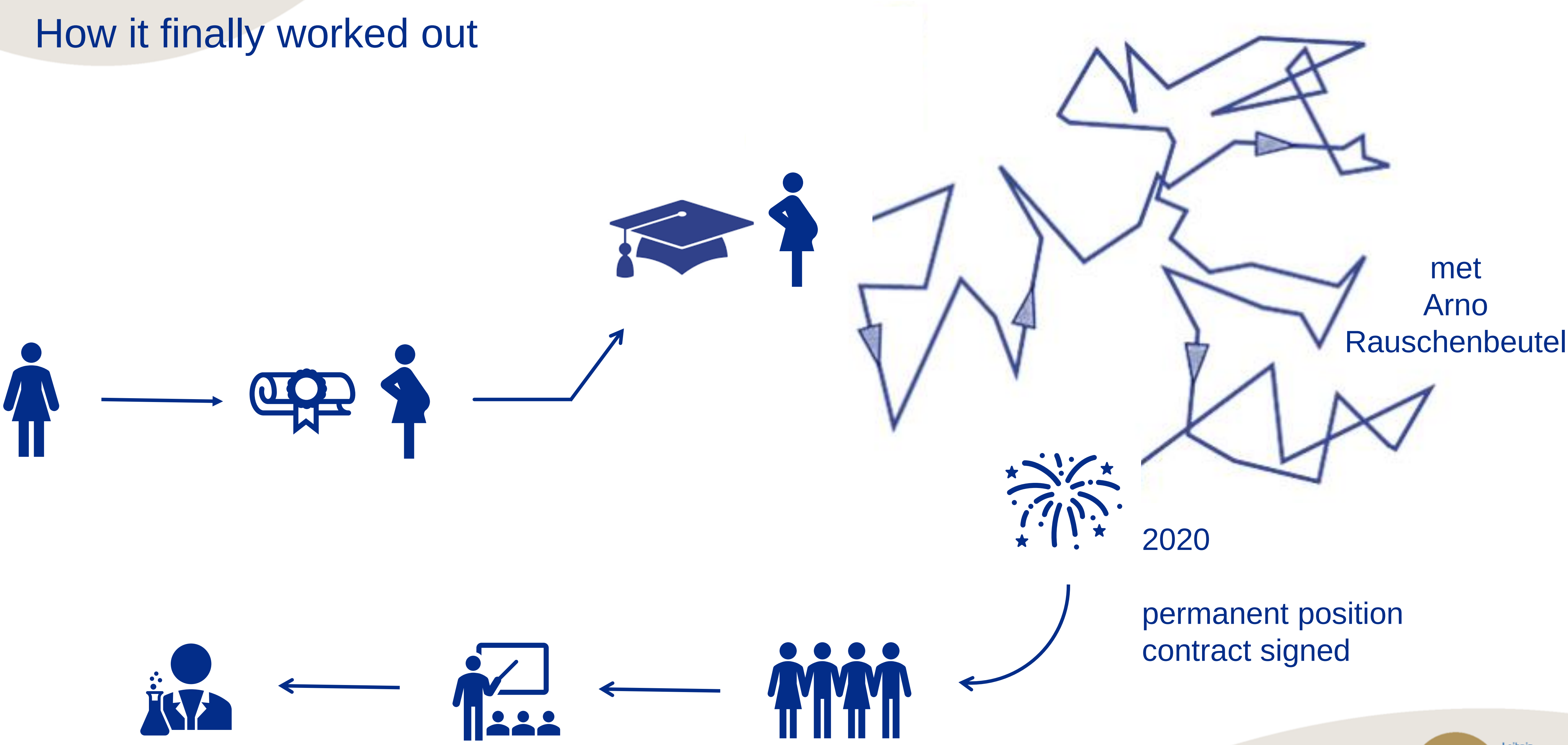
Leibniz Collaborative Excellence

funded

Defect-engi … beam for tailored van der Waals epitaxy of h-BN

ENGRAVE

How it finally worked out



Conclusions

Making mistakes is perfectly fine! You will make a lot of them.

You need luck, this is true! But the more you try, the more chances you have to get lucky!

Digesting rejections stays painful, but gets better and better!

The princess approach: Fall down, get up, fix crown, move on

It is never too late. Find out, what you really want and then do it!

At the age of 40 I finally bought myself a dirndl.