

Helmholtz Imaging - Open Science along the Imaging Pipeline

Deborah Schmidt

Helmholtz Imaging Support & Engineering Unit,
Max Delbrück Center Berlin

Potsdam, March 3rd, 2025



Image: Sven Velten, Lars Bocklage, Ilya Sergeev, DESY &
Ralf Röhlsberger, HI Jena



Imaging is our passion.



MISSION

We catalyze scientific discovery from
sensory measurements to knowledge.



Promote and Advance Imaging Science



Competence hub for Imaging Sciences @Helmholtz

Helmholtz Imaging brings expertise together to promote and develop imaging science and to foster synergies across imaging modalities and applications within the Helmholtz Association.

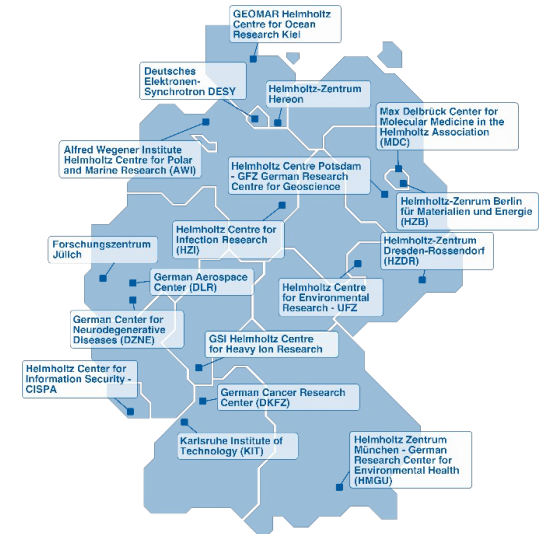
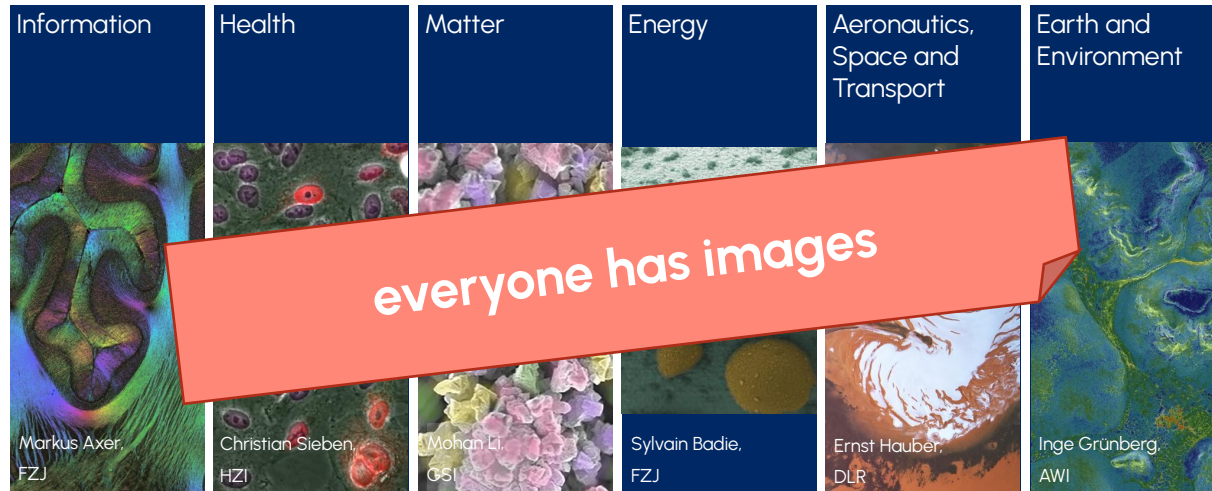
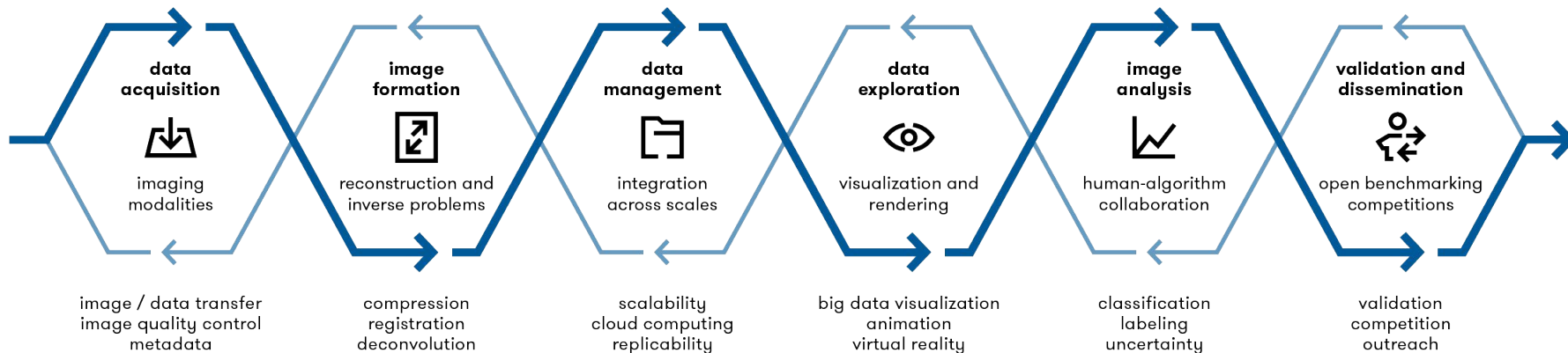


Fig. The Helmholtz Associations' Research Fields.

The Imaging Pipeline



Supporting imaging from data acquisition to images to knowledge



Helmholtz Imaging's holistic scope facilitates the incorporation of feedback loops.

Heads of Units

Support & Services

- Support along the full imaging pipeline
- First contact for technical and scientific support
- Guidance towards a suitable Solution
- Organise support and expertise within the Imaging network (on demand)

Get in touch:
support@helmholtz-imaging.de



Deborah Schmidt
Solutions



Dr. Fabian Isensee
Support Hub
& Applied Computer
Vision Lab



Dr. Philipp Heuser
CONNECT
& Image Analysis



Heads of Units



Research



Martin Burger
DESY

- Inverse problems
- Development of new modalities by applying new physical forward models



Dagmar Kainmüller
MDC

- Image data preparation, management & processing
- Visualization of solutions across modalities & scales in space & time



Annika Reinke
DKFZ
(interim)

- Image analysis validation



Klaus Maier-Hein
DKFZ

- Image analysis



Lena Maier-Hein
DKFZ

- Validation & bench-marking

Helmholtz Foundation Model Initiative

Paul F. Jäger*, Stefan Bauer*, Stefan Kesselheim*, Fabian Isensee*, Rainer Kiko, Uwe Ohler, Oliver Stegle, Guido Grosse, Michael Bussmann, Frederik Tilmann, Peter Steinbach, Markus Götz, Guido Juckeland, Philipp Heuser, Ralf Mikut, Sören Lorenz, Mario Fritz, Jilles Vreeken, Klaus Maier-Hein, Lena Maier-Hein, Fabian Theis, Dagmar Kainmueller*

*coordination team

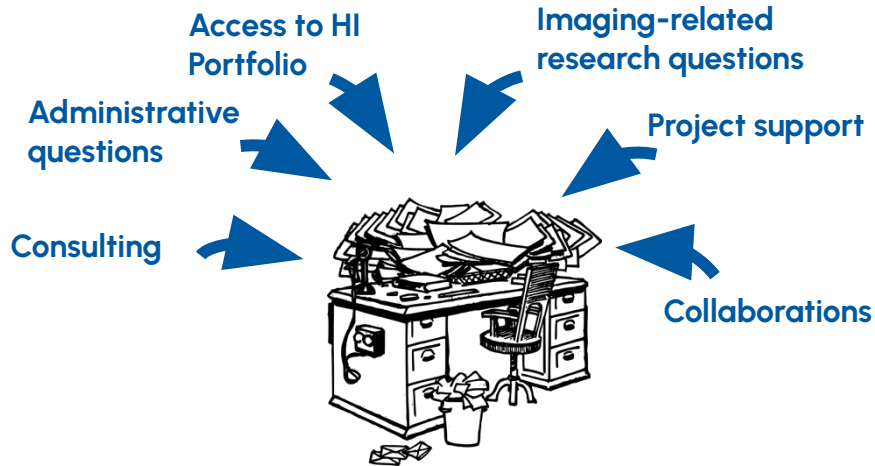


Helmholtz Imaging for you: How to benefit!





Gateway to the world of Helmholtz Imaging:
support in all imaging related questions by
HI Team



support@helmholtz-imaging.de

Funding Line:

Annual Helmholtz Imaging Project Call

Goals

- **promote imaging science** through innovative approaches & **foster interaction and method transfer** between applications and research fields

Terms

- **collaborative:** \geq two centers, different expertise
- **eligible:** all researchers in the Helmholtz Association
- **budget:** €500k (€250k from INF, €250k matched)
- **duration:** 2-3 years

Next call will open in spring 2025.

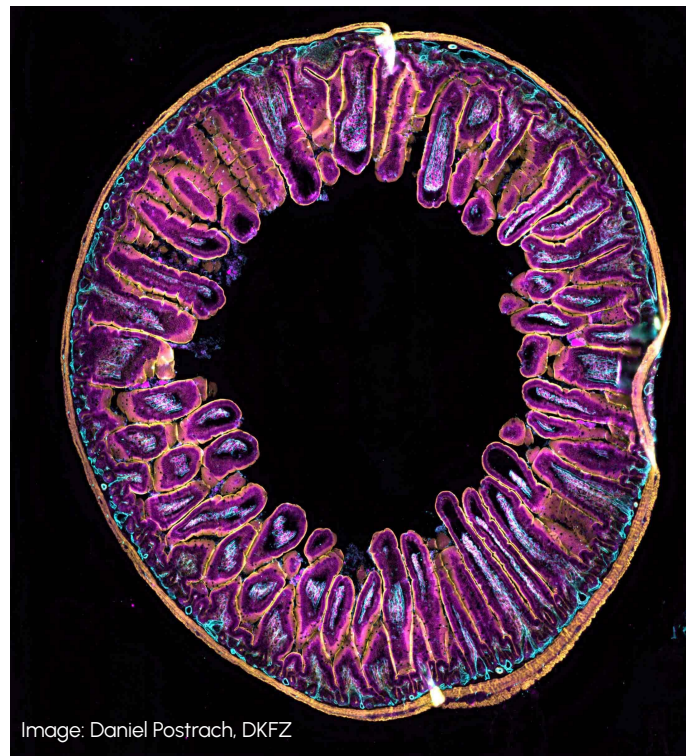
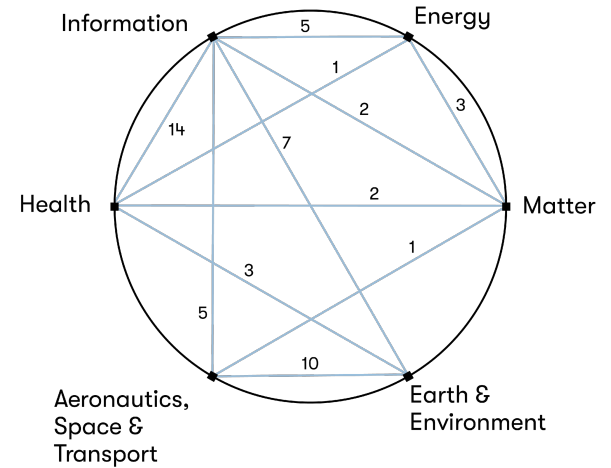
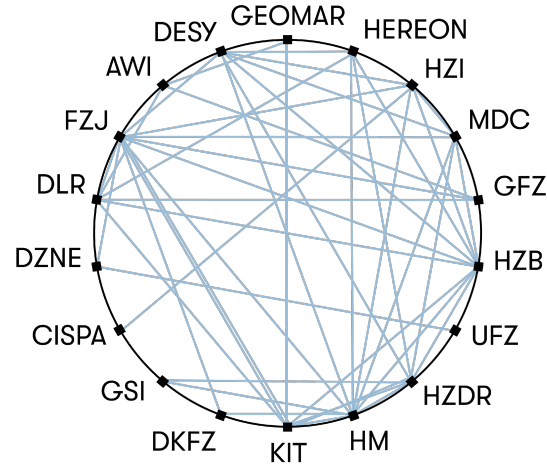
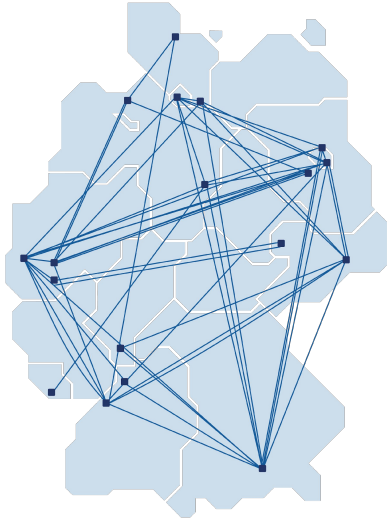


Image: Daniel Postrach, DKFZ

Engage centers, leverage synergies



Helmholtz Imaging has impact on all research fields and centers.



Impact of funded projects on networking between centers and research areas:

Left & center: Cross-center collaboration in Helmholtz Imaging Projects.

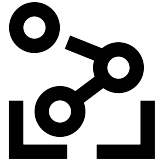
Right: Number of cross-field projects broken down by the six Helmholtz research fields.



Open Science at the core of Helmholtz Imaging



CONNECT



All the **imaging expertise** of the association on one page:

Find the:

- modalities
- instruments
- labs
- experts
- solutions

HELMHOLTZ IMAGING

CONNECT Home Galleries Blog About Login

Helmholtz Imaging CONNECT

Helmholtz Imaging CONNECT shows the rich portfolio of scientific imaging in the Helmholtz Association. Here you find the **instruments**, the **modalities**, the **solutions**, which are used by the dedicated **experts** to conduct the research for grand challenges. The content of CONNECT is provided by the experts from the association, and when you are affiliated to one of the Helmholtz Centers, you are invited to **login** with your institutional credentials and contribute to complete the picture of imaging in the Helmholtz Association.

Search

- Applications**
An application is the object of study in a scientific or research field, i. e., the use of scientific knowledge for a specific purpose, e.g. for further research, developing a product, treatment, or technology.
- Modalities**
A modality is any imaging technique that utilizes a certain physical mechanism to measure a quantity. This comprises different imaging methods (e.g. ultrasound, light, X-rays, etc.) but also different imaging particularities (e.g. X-ray includes X-ray microtomography, X-ray spectroscopy, etc.).
- Instruments**
Instruments are devices used for making measurements, alone or in conjunction with one or more supplementary devices. A set of instruments belonging to the same platform can be grouped in a facility.
- Solutions**
A solution can be any kind of answer to an imaging challenge. This can be software (scripts/ algorithms/pipelines ...), or a dataset of images, but also a whitepaper describing a solution to a recurring imaging challenge.
- Centers**
The eighteen Centers of the Helmholtz Association.
- Facilities**
A facility is a scientific or administrative unit within one or multiple centers that operates or manages several instruments.
- Labs**
A lab is a group of scientists working in a team. A lab can also be a virtual consortium of people collaborating.
- Experts**
Any members of a Helmholtz Center working with images, or on the development of methods for image processing or analysis, or just interested in scientific imaging are considered Helmholtz Imaging Experts.

HELMHOLTZ IMAGING Capturing the world of science. **HELMHOLTZ**

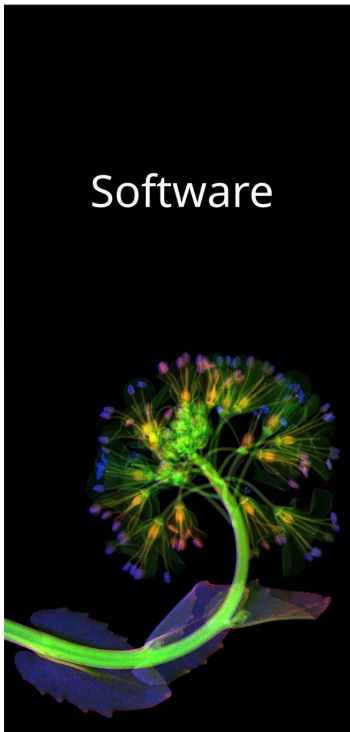
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Join CONNECT: connect.helmholtz-imaging.de



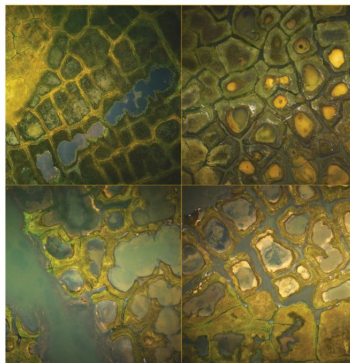
Catalog of open-source
imaging solutions
developed and used
within our community

Software



Kathryn Spiers, Dennis Brückner, DESY

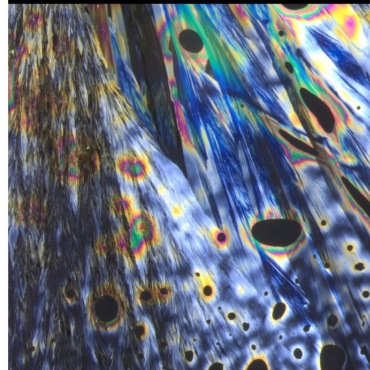
Tilman Bucher, DLR & Guido Grosse, AWI



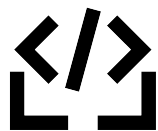
Datasets



Protocols
White Papers



Sreevidya Thekku Veedu, Patrick YA Reinke, DESY

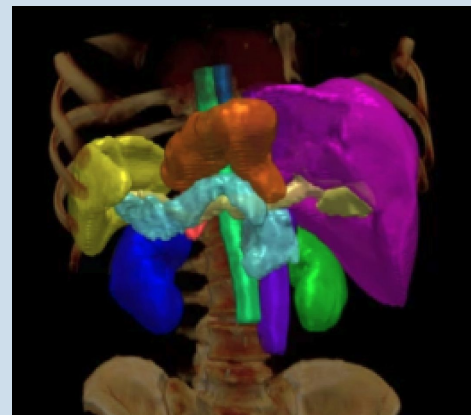


Development of our own open source software solutions addressing the most challenging research questions in imaging science

Example: nnU-Net

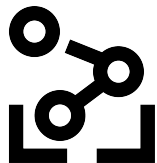
Helmholtz Imaging has enabled out-of-the-box high quality image segmentation by **developing the self-configuring segmentation tool "nnUNet"**, currently solving imaging problems across Helmholtz in numerous collaborations with Helmholtz Munich, HZDR, FZJ, DKFZ, HEREON, Helmholtz AI, MDC, HiF, and DLR.

The community using nnU-Net as a software basis for their own further developments in over 1200 cases further showcases how the tool catalyzes research in semantic segmentation.



*Thirteen abdominal organs
in a CT image segmented by nnU-Net*

CONNECT



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- labs
- experts
- solutions

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Be Helmholtz Imaging! Join us today!

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work in
progress

Where to upload image data?

Image Datasets Across Domains

[InfiniteSpace / dCache](#)
[Kaggle Datasets](#)
[Open Science Framework \(OSF\)](#)
[Open Images Dataset](#)
[Figshare](#)
[Zenodo](#)

Image Datasets in Health

[The Cancer Imaging Archive \(TCIA\)](#)
[BioImage Archive](#)
[ICPSR](#)
[BioStudies](#)

Image Datasets in Earth & Environment

[PANGAEA](#)
[Earthdata](#)
[GBIF](#)

Image Datasets in Energy

[OpenEI](#)
[International Energy Agency \(IEA\) Data](#)

Image Datasets in Aeronautics, Space, and Transport

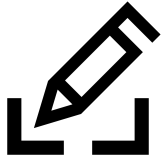
[NASA's Planetary Data System \(PDS\)](#)
[OpenSky Network](#)

Image Datasets in Matter

[Materials Data Facility \(MDF\)](#)
[NanoHub](#)

Input, ideas, suggestions?

→ support@helmholtz-imaging.de



Develop your skills in the realm of imaging science

We offer on a regular basis:

- Helmholtz Summer School: Lectures and tutorial
- Hackathons and datathons
- Trainings in cooperation with partners from Helmholtz Centers or other organisations
- Tutorials
- Workshops

Visit our events' page for an overview of current trainings:





Develop your skills in the realm of imaging science

Helmholtz Imaging Conference

June 25-27, 2025, Potsdam

<https://helmholtz-imaging.de/news/helmholtz-imaging-conference-2025/>

4. Helmholtz Reproducibility Workshop

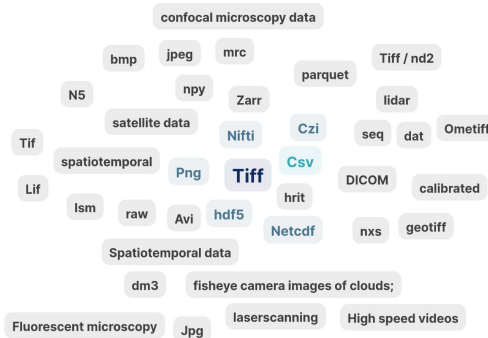
March 25th, 2025, Berlin, MDC

<https://events.hifis.net/event/1750/>



Which dataset formats do you work with?

Wordcloud Poll 117 responses 70 participants



work in
progress

Prevalidation

What should we know about image datasets before we work with them?

Dataset Visualization

Interactive Exploration

Statistical Summaries

Quality Control Checks / Report

Interested?

→ support@helmholtz-imaging.de

→ Helmholtz Reproducibility Workshop @MDC, March 25th



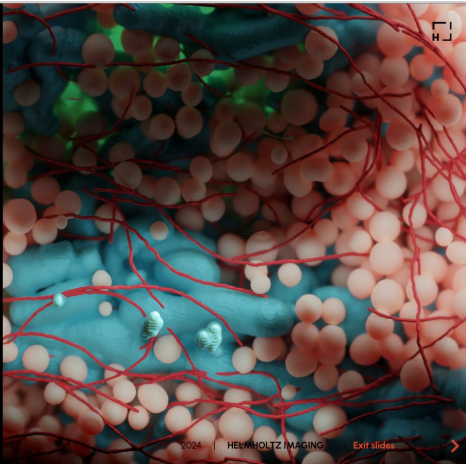
Ella Bahry



Where to host teaching resources (i.e. videos)?

3D Data Visualization Workshop

Deborah Schmidt
Head of Helmholtz Imaging Support Unit, MDC Berlin
Sep 25, 2024

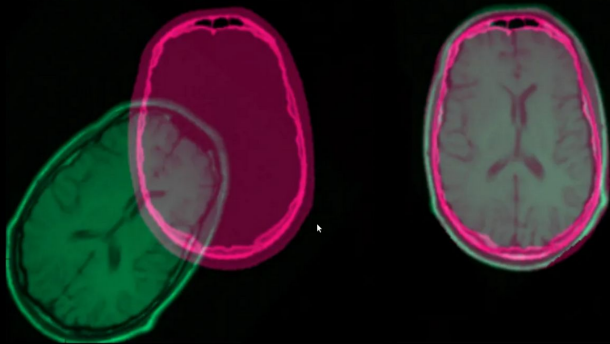


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2024 | HELMHOLTZ IMAGING | Exit slides

Image Registration Workshop

Ella Bahry
Sep 24, 2024



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Exit slides

<https://ida-mdc.github.io/workshop-visualization/3d-data/>

<https://ida-mdc.github.io/registration-workshop/>

Opinions? → support@helmholtz-imaging.de

- Write a project proposal
- Register at CONNECT
- Need help?
Contact our Support Hub!

www.helmholtz-imaging.de

Image: Sreevidya Thekku Veedu, Patrick YA Reinke, DESY

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