# Mission and Goal of the Nuclear Science User Facilities (NSUF)

- Mission: Coordinate a consortium of institutions to provide no-cost access to unique and highly specialized *nuclear research facilities* and *technical expertise*.

- Goal: Produce the *highest quality research results* that increase understanding of advanced nuclear energy technologies important to DOE-NE, industry and create new innovative concepts.

High-quality research results typically require several key elements:
1. **Robust Methodology:** Appropriate and rigorously applied research *methods and techniques*.
2. **Accurate Data Collection:** Reliable and valid data collection processes.
3. **Proper Data Analysis:** Accurate and appropriate analysis of data using suitable statistical or qualitative methods.
4. **Transparency and Reproducibility of Data:** Detailed documentation of the research process to allow others to replicate the study.
5. **Peer Review of Data:** Subjecting the research to peer review to ensure validity and reliability.
6. **Clear Reporting of Data:** Clear and precise reporting of findings in a well-structured format.

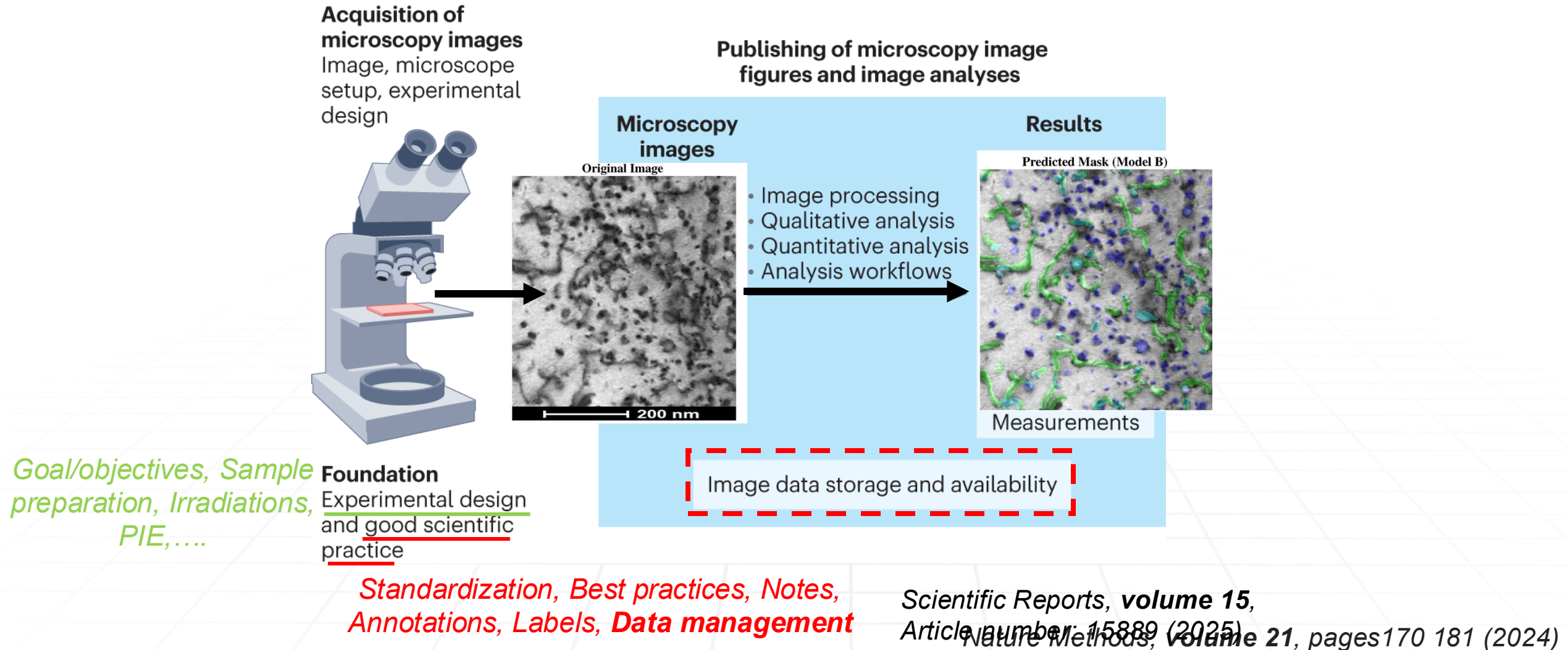# Benefits for high quality and well managed data
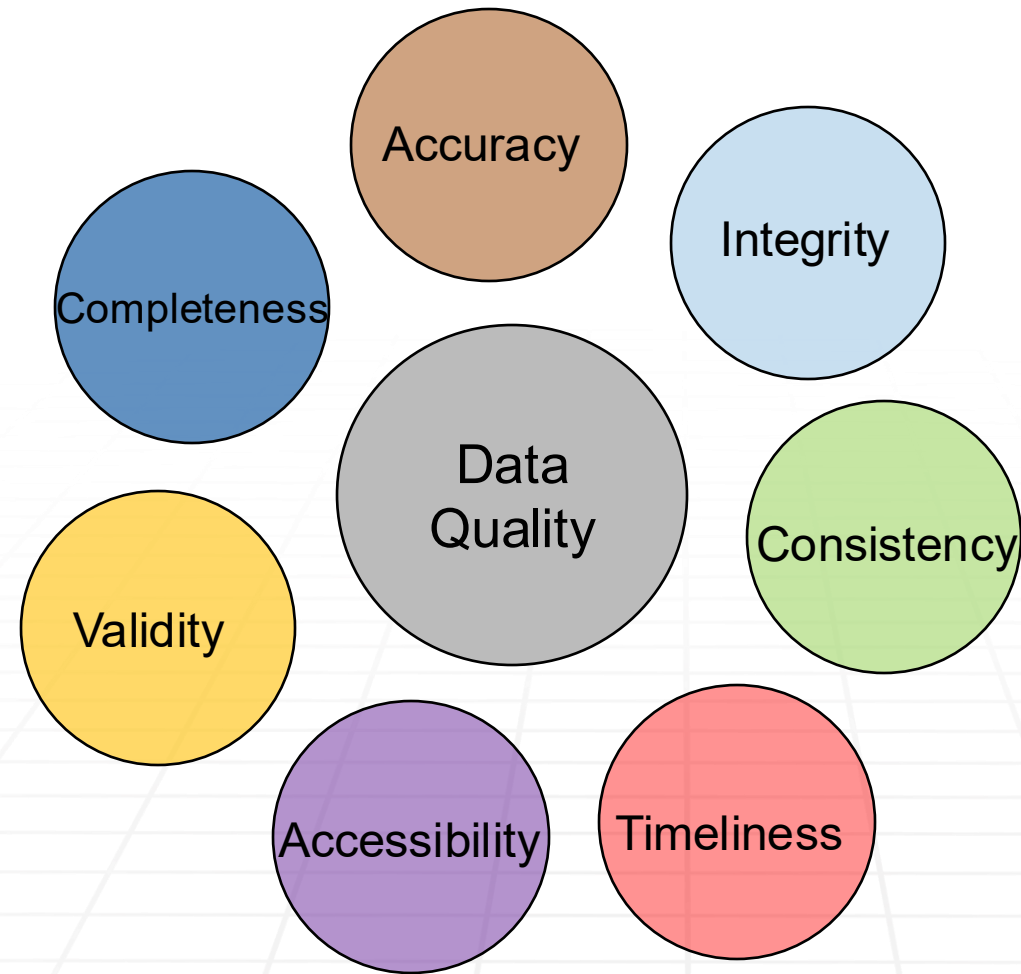
Needs for research data management

Data-driven nuclear materials science research data life cycle
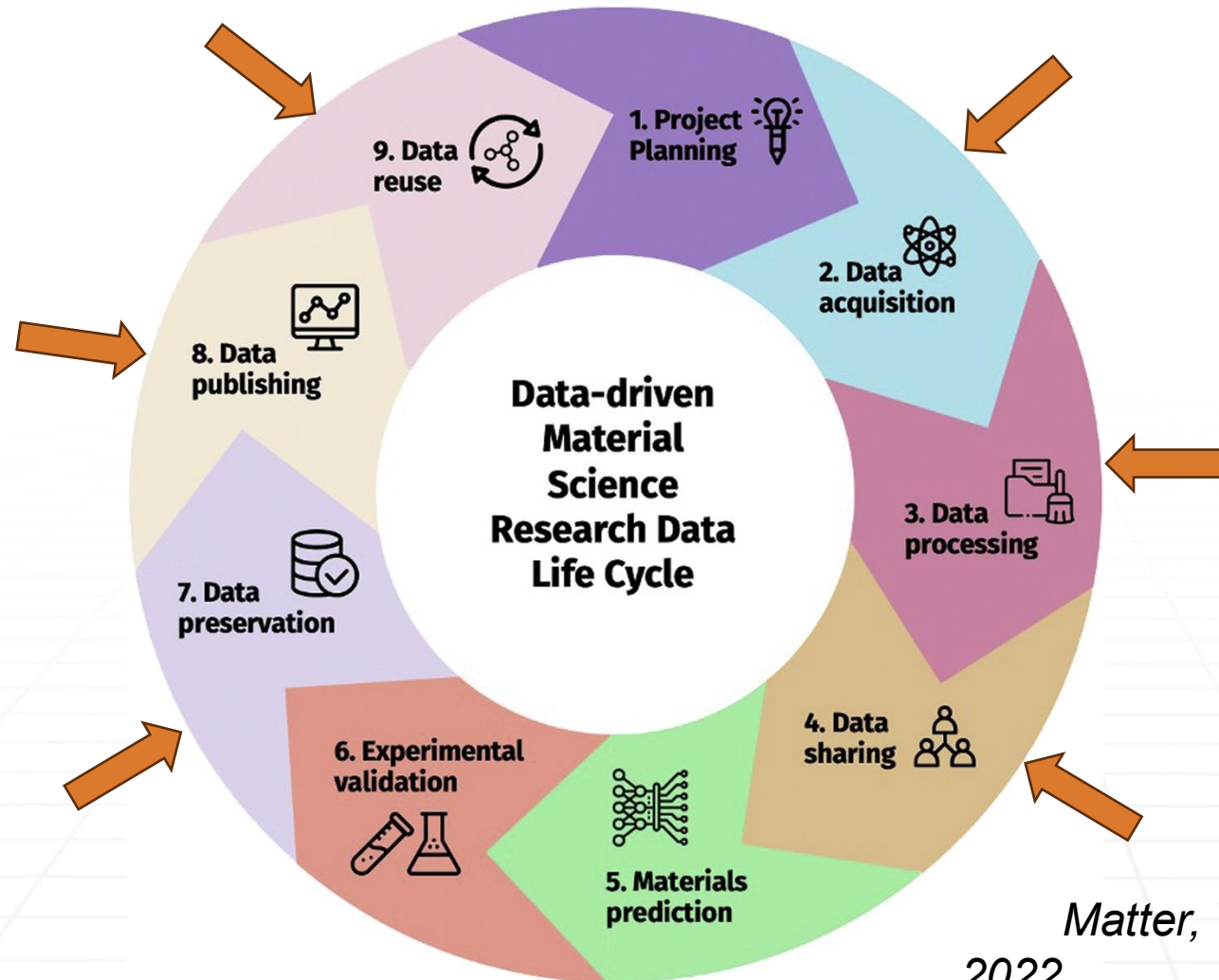
Matter, Volume 5, Issue 2, November 2022

Community-developed checklists for publishing images and image analysis

Acquisition of microscopy images
Image, microscope setup, experimental design

Publishing of microscopy image figures and image analyses

Microscopy images
Original Image

Results
Predicted Mask (Model B)

- Image processing
- Qualitative analysis
- Quantitative analysis
- Analysis workflows

200 nm

Measurements

Image data storage and availability

Goal/objectives, Sample preparation, Irradiations, PIE,….

Foundation
Experimental design and good scientific practice

*Standardization, Best practices, Notes, Annotations, Labels, **Data management***

*Scientific Reports, **volume 15**, Article number: 15889 (2025)*
*Nature Methods, **volume 21**, pages170 181 (2024)*

Recommendations to standardize reporting, execution and interpretation of TEM measurements
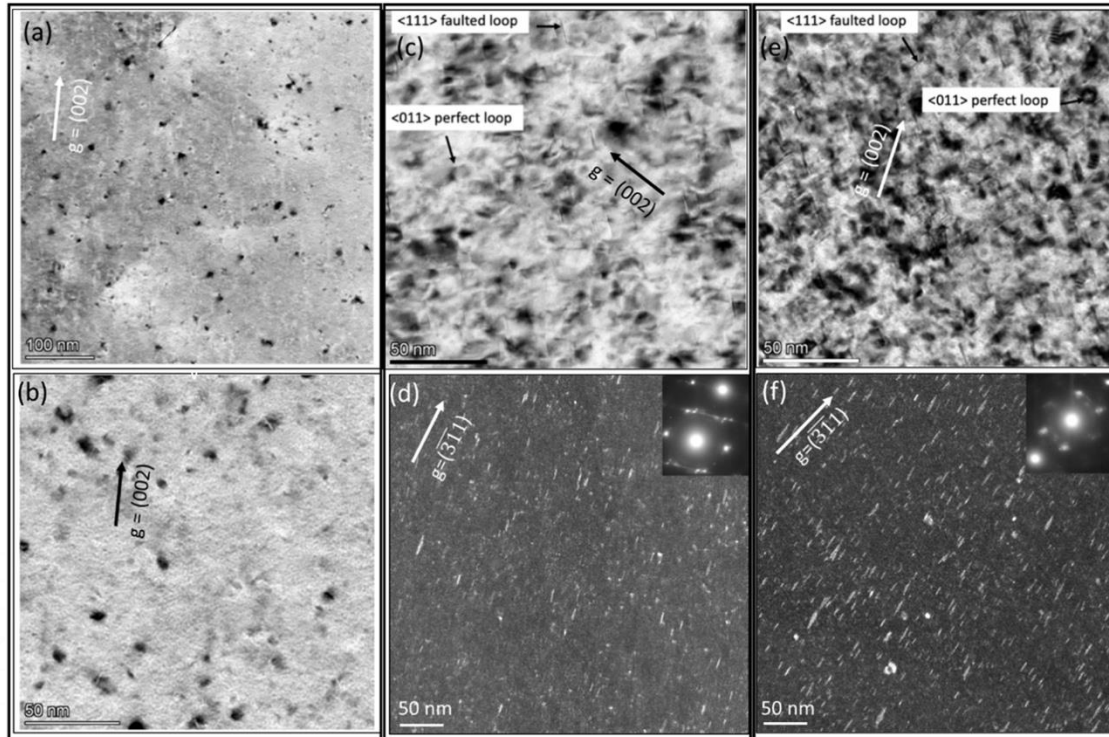
- Morphology, size distribution, shape, composition heterogeneity
- Robust statistical measurements Measurement method description?
- Microscope details during acquisition
- Sample preparation
- Region of interest

Discussion points in the workshop

- Data needs for Nuclear Science Research Data (NRDS)

- Discuss best practices to store/share data

- Discuss best practices for data acquisition, data analysis, and data reporting

- What can be done for TEM data management practices as well as generate/report high quality results?

09:20   Modama: Modular Data Management at the Ernst Ruska-Centre.............................*Dieter Weber*

Scientist, Forschungszentrum Jülich GmbH, Germany

09:50   Nuclear Research Data System (NRDS) for Data Management ....*Bradlee Jensen / Matthew Anderson*

High Performance Computer (HPC), INL

10:30   Break

10:40   In-Situ TEM Data Challenges and Opportunities....................................*Meimei Li / Wei-Ying Chen*

Argonne National Laboratory

11:10   Roundtable Topic 1: TEM Data Generation / Utilization .... *Tiankai Yao*

Senior Scientist, INL

11:35   Roundtable Topic 2: Best TEM Practices for Radiation Damage Studies ......*Boopathy Kombaiah*

Senior Scientist, INL

12:00   Adjourn ....*Mukesh Bachhav*

MaCS Lab Lead, INL