



AGILE European Doctoral Network

Quantitative Microscopy Imaging for Plant Cell Biology

Shaping the Next Generation of Quantitative Plant Scientists

- Synopsis of the Training Programme -

AGILE is an international doctoral training network designed to train a new generation of plant scientists with cutting-edge expertise in **quantitative microscopy imaging** — combining advanced experimental imaging with computational image analysis.

While quantitative imaging is widely used in animal systems, it remains underdeveloped in plant sciences. AGILE addresses this gap by offering a unique, interdisciplinary doctoral training programme tailored specifically to plant cell and tissue imaging challenges.

What Is AGILE About?

Quantitative microscopy allows scientists to:

- Visualize plant cells and tissues in 3D and over time (4D)
- Measure size, shape, spatial distribution and dynamics of cellular structures
- Generate reproducible, quantitative data
- Combine experimental microscopy with computational workflows and machine learning

AGILE trains doctoral candidates (DCs) to master **both sides** of this equation:

- **Advanced microscopy imaging**
- **Quantitative image analysis & machine learning**

What You Will Learn

1. Hard Skills (Technical & Scientific Expertise)

You will develop strong interdisciplinary competence in:

- Fluorescence microscopy of plant cells and tissues
- Confocal and super-resolution microscopy
- Time-lapse imaging of live samples
- Image data management following FAIR principles
- Quantitative image analysis (Fiji, Imaris, OMERO)
- Machine learning for bioimage analysis
- Workflow development for reproducible research
- Programming and computational methods (for selected projects)

Training is tailored to plant-specific challenges such as:

- Optical complexity of plant tissues
- Sample mounting constraints
- Low signal-to-noise ratios
- Heterogeneous fluorescence signals

2. Soft Skills (Professional & Transferable Competencies)

- Scientific communication (oral & written)
- Critical thinking & peer-review training
- Project planning and time management
- Teamwork in international environments
- Diversity & inclusion awareness
- Sustainability in research (3R principles)
- Entrepreneurship & industry exposure
- Mock interviews and career coaching

Programme Structure

AGILE training is delivered at two levels:

1. Individual Level

- Research-based training within your Individual Research Project (IRP)
- Supervision by leading experts
- Intersectoral secondments (industry placements for most DCs)
- Exposure to industrial partners in imaging, optics, and bioimage analysis

2. Network-Wide Level

All 15 doctoral candidates participate in **12 structured training events** over 3 years, for a total of **~10 ECTS**

Fundamentals of Microscopy (M9)

- Designing imaging experiments
- Avoiding common pitfalls
- Hands-on confocal and super-resolution systems

Advanced Microscopy of Plant Cells (M24)

- Super-resolution imaging (SIM, PALM, STED, Airyscan)
- Time-lapse imaging (spinning disk, multiphoton, resonance confocal)
- Imaging fixed and live plant tissues

Image Data Management & FAIR Practices

- Reproducible workflows
- Open science principles
- Data sharing standards
- OMERO-based image data management

Career Development & Industry Exposure

Two dedicated Career Days:

- Career Day 1 – Academia
- Career Day 2 – Industry

Includes:

- Talks from academic and industry professionals
- Career path poster sessions
- HR-led interview preparation
- Mock interviews with industry partners
- Industry pitch training for entrepreneurship

Most doctoral candidates complete industry secondments in companies specialized in:

- Microscopy imaging systems
- Fluorescent dyes
- Image analysis software
- Automated phenotyping

Machine Learning for plant Image analysis

- Introduction to ML concepts
- Segmentation and tracking
- Super-resolution image analysis
- Tools such as Ilastik, DeepImageJ, PlantSeg, ZeroCostDL4Mic, Biom3D
- Application to 3D and 4D plant datasets

Advanced Image Analysis Workflows

You will learn to:

- Design complete, publication-ready workflows
- Handle 3D & 4D data
- Perform segmentation, tracking & feature extraction
- Evaluate algorithm performance
- Document workflows according to FAIR principles

Sustainability & Responsible Research

AGILE integrates:

- 3R (Reduce–Reuse–Recycle) lab practices
- Sustainable research strategies
- Green Charter monitoring
- Ethical and inclusive workplace culture
- Responsible data sharing

Network Conferences (3 Major Events)

Held in:

- Gatersleben, Germany (M9)
- Brno, Czech Republic (M24)
- Heidelberg, Germany (M38)

Each 3-day conference includes:

- Keynote lectures in quantitative plant imaging
- Scientific seminars from supervisors
- Doctoral candidate presentations
- Career development activities
- Sustainability & inclusion workshops
- Outreach project development

What Makes AGILE Unique?

- ✓ First structured doctoral curriculum fully dedicated to **quantitative microscopy imaging for plant cell biology**
 - ✓ Balanced training in **experimental and computational skills**
 - ✓ Strong industry integration
 - ✓ Tailored to plant-specific imaging challenges
 - ✓ International, interdisciplinary cohort of 15 DCs
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Your Profile After AGILE

By the end of the programme, you will be:

- An expert in quantitative plant imaging
- Skilled in advanced microscopy and computational analysis
- Fluent in FAIR and reproducible research practices
- Experienced in interdisciplinary collaboration
- Prepared for careers in academia, biotech, imaging industries, and data science