

Curriculum

Münster Graduate School of Evolution (MGSE)

1. Introduction

Based on a scientific program that bridges the Faculties of Biology, Medicine, Geosciences, Mathematics, and Philosophy, the MGSE provides doctoral students with the necessary skills for acquiring and applying knowledge in a multidisciplinary world. The curriculum of the MGSE is tightly linked to its research questions, but also based on a strong theoretical and philosophical foundation for all participating students. The three-year teaching program takes the diversity of future careers into account and is tailored towards developing scientists who see interdisciplinary connections in the multifaceted aspects of evolutionary problems.

2. Curriculum overview

The entire doctoral studies are accompanied by the interdisciplinary “**studium integrale**”, which encompasses for example multidisciplinary lectures and courses and that is also open for members of other faculties in the WWU.

The three-year teaching program furthermore includes regular **meetings** in order to facilitate scientific and personal exchange.

The education program is structured into three periods, according to years one to three of the PhD-projects. During the first period doctoral students are trained in a cross-disciplinary manner, participating in courses within and outside their faculties and visiting labs of other disciplines, in order to facilitate the interdisciplinary approach of each student and to promote contacts between the labs. The second period is meant to increase the student’s scientific communication skills and includes for example topic group work and contributions to conferences. Owing to the large diversity of possible careers, the third period is divided into three main tracks (academia, industry, and society) and is shaped according to the students’ individual plans and inclinations. The training program is complemented by **project-oriented training** in the respective research groups, where the doctoral students are fully integrated members.

An overview of the Qualification program of the MGSE is shown in Fig. 1.

3. “Studium integrale”

A key feature of the MGSE is the multidisciplinary “studium integrale” (Integrated studies) for all students of the school, which is also open for students and scientists from other faculties of WWU, further increasing the opportunities for interdisciplinary contacts for the MGSE students.

The “studium integrale” accompanies the entire doctoral studies and consists of

- the seminar series “Evolution across Fields”,
- the lecture series “The Growth of the Evolutionary Thought”,
- and the MGSE symposium,

The weekly **seminar series “Evolution across Fields”** in the summer semester is organized as a discussion seminar by the doctoral students. Students form small groups that are responsible for organizing the contents of and moderation of at least one appointment within the seminar series. The format is flexible; students may invite a PI, postdoc or advanced PhD student to give a short introductory talk. Alternatively, students may prepare and present a talk based e.g. on a paper themselves as an introduction. The introductory talk is followed by a discussion. The aim of this seminar series is scientific exchange and discussion of topics from evolutionary research.

In the winter semester, the weekly **lecture series “The Growth of the Evolutionary Thought”** provides an in-depth introduction to the history and philosophy of evolutionary thinking, the basics of the theory, and philosophy of science in general.

Doctoral students are involved in the preparation of the **MGSE Symposium**, which is a major event bringing together all doctoral students, PIs, and other scientists working in the MGSE research areas. Doctoral students present their projects and results in talks or posters, and invited speakers give public lectures. Furthermore, the general assembly of all members may take place at the symposium.

| | 1 st winter semester | 1 st summer semester | 2 nd winter semester | 2 nd summer semester | 3 rd winter semester | 3 rd summer semester |
|--|---|--|---|--|--|--|
| <i>Studium integrale</i> | MGSE Symposium | | MGSE Symposium | | MGSE Symposium | |
| | lecture series The Growth of the Evolutionary Thought | | lecture series The Growth of the Evolutionary Thought | | lecture series The Growth of the Evolutionary Thought | |
| | | seminar series Evolution across Fields | | seminar series Evolution across Fields | | seminar series Evolution across Fields |
| | monthly student meetings | | | | | |
| <i>Three-phase education program</i> | Cross-disciplinary training lab rotation; courses, journal / book clubs, lectures, and workshops from the Master programmes outside the own department/faculty | | Science-skills training topic group work, contribution to conferences, paper writing, research stay abroad | | Tailored education academia track, industry track, society track soft skill and language courses, application workshops | |
| | Project-oriented training | | | | | |

Figure 1: Qualification program of the MGSE.

4. Regular meetings

In order to facilitate the contacts and scientific exchange between doctoral students, the PhD-students of MGSE meet on a regular basis for discussion and socializing.

During the monthly student **meetings**, all doctoral students from the different disciplines meet to discuss scientific, organizational, and personal matters. For example, one of the students can present an overview and the status quo of his / her PhD-project. Thereby, all students are informed about each other's projects and everyone gets the opportunity to discuss potential problems in an informal manner. Once per semester, the student meeting will be used to discuss upcoming MGSE events, e.g. to discuss topics for workshops, and the organization of the lecture series and the discussion seminar. Furthermore, students are encouraged to organize and meet in an informal setting to facilitate personal exchange.

The student meetings are organized and attended by the MGSE Coordinator, who also assists the students in organisational matters and administrative tasks.

5. Three-phase education program

A modern doctoral program and research training should recognize the diversity of future careers. Since career plans differ greatly among the doctoral candidates, the curriculum is tailored to individual students, especially towards the end of the doctoral phase. The curriculum is therefore structured into three periods, according to years one to three of the doctoral studies (see Fig. 1).

5.1 First phase: Cross-disciplinary Training

The first period aims at cross-disciplinary training. Students have the opportunity to participate in a selection of courses within the MGSE research areas. These may be courses specifically designed for the MGSE as well as courses from the established master programs, both within and outside of the own faculty.

For example, the lecture series "The Growth of the Evolutionary Thought" is accompanied by a seminar, thus constituting a course for Master and PhD students from the faculties of biology, medicine, geosciences, and philosophy. While MGSE graduate students are obligated to hear the lecture series at least once, they may voluntarily participate in the seminar (5 credit points for both together). Other examples are the advanced module "Evolutionary Medicine" and weekly journal/book clubs organized, e.g., by the MGSE Junior Group Leader Francesco Catania.

Doctoral candidates are encouraged to spend a minimum of one week in a lab of another discipline, which may or may not be part of the MGSE (lab rotation). The lab should however have strong affiliations with one of the involved groups. The lab rotation strengthens the interdisciplinary approach of the student and facilitates the ability to learn new methods or perspectives on the studied subjects. In addition, the lab rotation exposes the doctoral candidates to new research environments and may facilitate collaborations between labs. The

initiative for conducting a lab rotation lies in the responsibility of the doctoral students. Upon request, the MGSE Coordinator will advise on and assist in the organization of lab rotations.

5.2 Second phase: Science-skills Training

The second period is aimed at scientific communication skills and may, for example, include a contribution to a conference or the publication of a first paper.

All doctoral students are required to attend a training on Good Scientific Practice. These do not necessarily need to be organized by the MGSE but may also be offered by e.g. the Graduate Centre, joint projects like Collaborative Research Centres or in collaboration with other RTGs or graduate schools.

The students may establish interdisciplinary topic groups, e.g. to deal with a specific methodological problem, to facilitate a specific synthesis, or to prepare a scientific event. Topic groups are supported by postdocs, PIs, or ETT fellows, independently chosen by the students and may also be joined by BSc and MSc students. These temporarily existing working groups may be developed autonomously, together with the PIs, or at the suggestion of ETT fellows or MGSE guests. Topic Groups help to achieve one of the main goals of the school, to develop a culture of interdisciplinary discourse between the students, PIs, and ETT fellows. The scientific output of the Topic Groups should bear the potential to be published in scientific journals (e.g. review journals of the 'Trends' or 'Current Opinion' series).

5.3 Third phase: Tailored Education

The third period focuses on qualifications that is tailored to the individual students' career plans and is based on the student's own initiative. There are three main tracks within phase three. For each track a MGSE PI acts as the designated contact person. Interested students may contact these contact persons for general advice, networking, internship opportunities, etc.:

- 1)** Doctoral students aiming at a career in academia (academic track) are supported in their endeavour to facilitate academic networking, contribute to further conferences, and publish papers. Furthermore, they can develop their teaching and leadership skills by mentoring and teaching graduate students, for example in the research groups of their supervisors or by conducting workshops in the WWU Graduate Centre. The students of this track are also trained in proposal writing. Students interested in this track may contact Prof. Erich Bornberg-Bauer (Institute for Evolution and Biodiversity).
- 2)** A second option is provided for students who aim at an industrial or business career (industry track). These students are encouraged to apply for industry internships and participate in business management courses, for example in cooperation with the Career service of the WWU. Moreover, alumni and business representatives may be invited for presentations or a job fair. Students interested in this track may contact Prof. Stephan Ludwig (Institute for Molecular Virology).

- 3) The third option (society track) applies to students who neither aim at academia nor industry. This is the most diverse group, which contains e.g. prospective journalists, publicists, museum and zoo staff, employees in the field of clinical research or education, scientific writers, or administration officers in university and science management. Students are encouraged to contact local non-university partners, e.g. the “LWL-Museum für Naturkunde Münster” (Museum for Natural History), in order to be involved in exhibitions and events on evolution-related topics, which also promotes public outreach. Students aiming at a career in the area of education are enabled to develop their teaching and leadership skills by mentoring and teaching graduate students, as described for the academia track. Students interested in this track may contact Prof. Michael Quante (Department of Philosophy).

For doctoral students of all three tracks the MGSE provides necessary skills for interdisciplinary work in science management and communication in close cooperation with the WWU Graduate Centre, which offers a wide selection of soft skill and language courses. In the last phase of the doctoral studies, the students are supported by the Coordinator, a special consulting unit within the WWU Graduate Centre, and the WWU Career service regarding job applications or proposal writing. Beyond the career guidance and support the PhD-students receive, they are required to take the initiative and organize their third-year training program according to their own wishes and plans, thus increasing their independence.

6. Project-oriented Training

During the entire doctoral studies, the students are fully integrated members of the research groups of their supervisors and take part in all scientific and social group activities. The doctoral students profit from the excellent research environment and the international network provided by the participating PIs and their groups. While being fully integrated into the network of the research labs and MGSE structure, doctoral students are able to exert autonomy and develop their leadership and administration abilities.

7. Credit point system

We use a clear and transparent credit point (CP) system to ensure that the doctoral students can easily oversee the activities that are required to graduate within the MGSE.

Through their participation in the core courses, the students should earn at least 6 CP. They are required to participate in each of the elements at least once.

| Core courses | | min. | max. |
|---|-------------------|------|------|
| – Seminar series ‘Evolution across Fields’ | 1 CP per semester | 1 CP | 3 CP |
| – Lecture series ‘The Growth of the Evolutionary Thought’ (at least 8 appointments; equals 80% of one lecture series) | 1 CP per semester | 1 CP | 1 CP |
| – Participation in (and organization of) MGSE symposium | 2 CP per event | 2 CP | 6 CP |
| – Student Meetings | 1 CP per year | 2 CP | 3 CP |

At least 9 CP should be earned within the three-phase education program by accomplishing freely chosen activities from the respective education program.

| Three-phase education programme | | min. | max. |
|--|------------------------|------|------|
| (1) Cross-disciplinary training | | | |
| – Courses from Master programs (4 weeks advanced modules) | 5 CP each | 3 CP | 5 CP |
| – Lab rotation | 1.5 CP per week | | 9 CP |
| – Journal & book clubs (1 SWS) | 1 CP each | | 3 CP |
| – Workshops (2 days; in a field of relevance to the MGSE) | 1 CP each | | 3 CP |
| (2) Science-skills training | | | |
| – Topic group work (1 SWS) | 1 CP each | 3 CP | 3 CP |
| – Good Scientific Practice training | 1 CP | | 1 CP |
| – Contribution to conference | 1 CP each | | 3 CP |
| – Paper publishing | 2 CP each | | 6 CP |
| – Research stay abroad (4 weeks) | 5 CP each | | 5 CP |
| (3) Tailored education | | | |
| – Internship (4 weeks) | 5 CP each | 3 CP | 5 CP |
| – Soft skill and language courses | 0.5 – 2 CP each | | 6 CP |
| – Mentoring bachelor/master students (research module, bachelor thesis, master thesis) | 0.5 – 2 CP each | | 6 CP |
| – Contribution to the Eyebrow | 0.5 – 2 CP each | | 6 CP |

In some of the faculties involved in the MGSE, teaching is required for graduation, e.g., in the Faculty of Biology 5 hours per week during one semester (=approximately 70 hours in total) of teaching in BSc- or MSc-courses (no research modules) have to be accomplished. To complete the MGSE doctoral program, doctoral students should earn at least 3 CP for the engagement in teaching activities at some point during their doctoral studies. The amount of CP assigned should be designated and certified by the person supervising the teaching activity (e.g., course provider). For the MGSE (not necessarily for the Faculty of Biology) the following Teaching activities qualify for example:

| Teaching activities | | min. | max. |
|--|---------------|------|------|
| – Participation in the supervision of a 4-weeks-course, supervision of a weekly seminar during one semester or comparable involvement in basic or undergraduate teaching | 1 - 5 CP each | 3 CP | 5 CP |
| – Holding a lecture in a course | 0.5 CP each | | 3 CP |
| – Organizing a 2-day workshop for students | 2 CP each | | 6 CP |

To graduate within the MGSE, doctoral students are requested to earn at least 18 CP:

- at least 6 CP within the core courses,
- at least 9 CP within three-phase education program,
- at least 3 CP for teaching activities.

It is possible to balance the CP across the three years and to shift activities from one phase to another, to allow a flexible PhD project structure. In case of doubt the MGSE Speaker and the MGSE Coordinator decide which activities qualify for the acquisition of CP and how many CP will be assigned. Calculations are based on the total workload required to successfully complete a course with 1 CP corresponding to 30 h workload.

The MGSE Coordinator lists the acquired CP of each graduate student in a database, which is also be accessible for the respective student. By supervising the students' achievements, the MGSE Coordinator makes sure that each candidate fulfils all necessary requirements to graduate within the MGSE. If necessary, the MGSE Coordinator offers advice and help in finding adequate opportunities to achieve the CP, as well as in organisational and administrative matters related to the doctoral thesis.

The intensive supervision provided by the dissertation committee and the MGSE Coordinator is outbalanced by the explicit encouragement of independence. Doctoral students are enabled to work on their research projects self-dependently and to shape the teaching program according to their own affinities and intentions, especially during the third year of the thesis.