

Curriculum

Research Training Group 2220 “Evolutionary Processes in Adaptation and Disease” (RTG EvoPAD)

EvoPAD doctoral students will participate in a multidisciplinary qualification programme, which is tightly linked to the EvoPAD-specific research questions, based on a strong theoretical and philosophical foundation. It comprises the following key elements: (1) a three-phase EvoPAD education programme, providing the students with the necessary tools for a successful career in a multidisciplinary, fast-changing scientific world, (2) EvoPAD meetings in order to facilitate scientific and personal exchange within the RTG, (3) a *Studium Integrale* (integrated studies), that is offered by the Münster Graduate School of Evolution (MGSE) and which is devoted to the reflection of scientific principles and theories as well as to exchange across disciplines, and (4) project-oriented training in the different research groups.

In order to ensure a high common standard of education and, at the same time, create opportunities for flexible adaptation to individual requirements, the qualification programme is divided into **compulsory**, **elective**, and **facultative** elements (see Table 1). A clear and transparent credit point system is used, thus doctoral students can easily oversee the activities required to graduate within EvoPAD. Doctoral students are required to earn a **minimum number of 20 CP** (1 CP ~ 25 – 30 h workload). At least 15 CP have to be gained within the compulsory area, which contains teaching elements that have to be passed by all doctoral students. Additional 5 CP have to be gained within the elective area, in which doctoral students can freely choose between different elements. Finally, the graduate programme is completed by facultative elements which are not required for graduating within EvoPAD but offer the possibility for acquiring additional skills and knowledge.

1. Three-phase EvoPAD education programme

1.1. Phase 1: Cross-disciplinary training

1.1.1. *EvoPAD summer schools*

The core of the cross-disciplinary training are three EvoPAD-wide mandatory summer schools, which will be offered on an annually rotating basis by the PIs and guest lecturers. The four- to five-day summer schools will include lectures, methodology courses, and thematic debates on the state-of-the-art in the field. They will deepen the understanding of the research fields covered by EvoPAD and train the doctoral students in core skills and techniques needed for their individual research projects. At the same time, the active discourse between the EvoPAD PIs and the doctoral students will be fostered.

1.1.2. *EvoPAD method courses*

In the introductory methods courses, doctoral students will learn fundamental techniques applied in current research. The doctoral students will suggest topics that are most urgently needed for

their scientific projects and that reflect the expertise of the PIs and their groups. Courses will be between two and five days long and held in small groups.

1.1.3. *Seminar in Philosophy*

The seminar series will be organised in cooperation with the *Centrum für Bioethik* (CfB) and the *Zentrum für Wissenschaftstheorie* (ZfW). It will accompany the entire doctoral studies. After an introduction to bioethical questions and positions in general – including also research ethics – and to medical ethical issues in particular, students will take an active role in defining the specific format and content of the seminar. They will identify ethical aspects and problems relevant for their work for thorough discussion with experts from the CfB and ZfW.

1.1.4. *Lab rotation*

Doctoral students will be given the opportunity to spend two to six weeks in a lab of another discipline, which is chosen by the student in concordance with the PhD committee. The lab rotation will strengthen the students' interdisciplinary approach, promote their ability to learn new methods or perspectives, and facilitate collaborations between labs. Also philosophy students will take part in the lab rotations to gain a deeper understanding of the discussed biological processes and methodologies.

1.2. **Phase 2: Science-skills training**

1.2.1. *Good Scientific Practice*

All doctoral students have to participate in a seminar on good scientific practice (according to the DFG guidelines and the curriculum provided at <http://www.ombudsman-fuer-die-wissenschaft.de/>).

1.2.2. *From idea to publishing*

This seminar series will take the doctoral students through planning a qualitative project and preparing a manuscript. The course will provide an introduction to experimental design, the use and application of the correct statistical measures, data collection and management, and professional scientific writing skills. Moreover, the principles of standardization within experiments will be critically discussed and innovative approaches to improve reproducibility of findings will be presented. In addition to lectures and hands-on sessions, doctoral students will have the opportunity to address individual issues related to the experimental design of their own research projects.

1.2.3. *EvoPAD Forum*

An EvoPAD Forum is an interdisciplinary discussion group consisting of doctoral students, postdocs, and PIs who deal with a specific methodological problem or seek for common definitions and concepts in the field of evolution and medicine. Also visiting researchers and Mercator fellows may contribute to the EvoPad Forums to provide their expertise and ideas. The scientific output will bear the potential to be published in scientific journals. EvoPAD Forums should be launched on the initiative of the doctoral students and organised according to their needs and interest.

1.2.4. *Conference contribution*

All doctoral students are encouraged to present their work on at least one international conference.

1.2.5. *Scientific articles*

Doctoral students will be supported in preparing their first peer-reviewed publication as first author and in preparing joint publications across labs. In accordance with the doctoral regulations of the Faculty of Biology, doctoral students in Biology will have to publish at least three separate but with regard to content coherent scientific articles of which at least one with first or shared first authorship has already been published or been accepted for publication by a recognized international scientific journal with peer review-system. In exceptional cases, doctoral students may submit their thesis in form of a monograph. Doctoral students in Philosophy will publish their work as a peer-reviewed monograph and/or as a peer-reviewed paper in an international journal, as decided by the PhD committee depending on the project.

1.2.6. *Research stay abroad*

EvoPAD will promote research stays abroad at distinguished partner institutions/labs working in the field of evolutionary medicine. During these external exchanges doctoral students will acquire new techniques essential for their individual research projects, exchange knowledge and ideas with international colleagues, and improve their academic networking skills.

1.2.7. *Training on animal experiments*

If not already done so, doctoral students whose research involves animal experiments have to participate in a training event on animal experiments in compliance with the European Communities Council Directive 2010/63/EU, the Animal Protection Act (*Tierschutzgesetz*).

1.2.8. *Other science-skills training workshops/courses*

EvoPAD students may participate in further courses, workshops on science-skills offered within the WWU, e.g., by the Graduate Centre or SAFIR, or at other universities or by third-party providers.

1.3. **Phase 3: Tailored Education**

1.3.1. *EvoPAD Career Talks*

EvoPAD will regularly invite representatives from academia, industry, or the social/cultural sector to talk about the nature and scope of their work and the path they took to their career. Students will gain first-hand information on job perspectives and learn what conditions and factors contribute to successfully realising a certain career goal. Moreover, students may take the opportunity to connect with potential employers. For the second doctoral cohort, alumni of the first doctoral cohort will be invited as speakers as well.

1.3.2. *Supervision of undergraduate courses*

Doctoral students aiming at a career in academia will be supported in developing their teaching and leadership skills by teaching undergraduate students in courses of the BSc and MSc programmes. *Please note:* For receiving a PhD in biology, the Faculty of Biology requests 5 SWS (hours per week during one semester) of teaching in regular BSc or MSc courses (no supervision of students in research modules or other projects).

1.3.3. *Mentoring/Supervision of undergraduate students*

In addition to participation in the supervision of undergraduate courses, doctoral students may supervise undergraduate students in their BSc or MSc theses.

1.3.4. *Other soft-skills training workshops/courses*

EvoPAD students may participate in further courses or workshops on soft-skills to qualify for the national and international job market. They may for example participate in language courses, software training, self-marketing, communication or application workshops offered within the WWU, e.g., by the Career Service, the Graduate Centre, and the Language Centre. The doctoral students will be free to choose from these programmes according to their specific needs and interests.

1.3.5. *Internship*

Doctoral students who aim for an industrial or business career will be supported in their application for industry internships (e.g., in companies cooperating with EvoPAD PIs, e.g., *Ardeypharm GmbH, Ridom GmbH, Cilian AG*).

2. **EvoPAD Meetings**

2.1. **EvoPAD student meetings**

In order to facilitate scientific exchange and personal contacts, the EvoPAD doctoral students will meet every four weeks to discuss scientific, organizational, and personal matters. During the EvoPAD meetings, doctoral students will, e.g., talk about relevant scientific topics, invite EvoPAD researchers, or present and discuss their individual projects. The meetings will also be an important instrument to actively participate in the development of EvoPAD, as the students will regularly discuss whether the EvoPAD programme suits their needs and identify where improvements or further teaching elements are needed. The students will further decide on which visiting researchers and Mercator fellows will be invited and if an EvoPAD Forum should be launched on a subject of their choice. As an occasion for socializing, the meetings may be combined with a BBQ or other activities.

2.2. **Peer group meetings**

In addition to the academic mentoring through the PhD Supervision Committee, a system of peer mentoring will provide interdisciplinary discourse and facilitate the exchange of knowledge, ideas, and experience: Groups of three to four EvoPAD doctoral students from at least two different disciplines should form cross-faculty Peer Groups who will meet once a month and discuss methods, results, and questions related to their project. They should choose one of the EvoPAD PIs or associated PIs as an advisor who will help to develop efficient practices of work.

2.3. **EvoPAD colloquium**

All EvoPAD members meet on a monthly basis in the EvoPAD colloquium. It consists of progress reports by the PhD students and talks by invited guests from Münster or visiting researchers.

3. **Studium Integrale of the Münster Graduate School of Evolution**

EvoPAD doctoral students will be given the opportunity to participate in the multidisciplinary *Studium Integrale* of the Münster Graduate School of Evolution (MGSE) that is offered collaboratively by MGSE members of different faculties. It will not only provide the students with a broad knowledge in evolutionary biology, but also facilitate contacts with peers and senior scientists both from the students own and from other disciplines.

3.1. Lecture series “The Growth of the Evolutionary Thought”

In the winter semester, the 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 the philosophy of science. Doctoral students may attend this lecture once during their graduate studies, preferably in their first or second year.

3.2. Lecture series “Evolution across fields”

In the summer semester, the lecture series “Evolution across fields” spans all topics and fields of the MGSE. It is based on the research of the groups but aims at the broad spectrum of MGSE students from diverse disciplines.

3.3. MGSE Symposium

Every year, the EvoPAD students will be given the opportunity to present their research to a broader audience and to gain experience in giving academic presentations at the annual MGSE Symposium, where talks and poster presentations of doctoral students are embedded in contributions from PIs and internationally renowned guest scientists. Doctoral students participating the symposium will also be expected to participate in the organization of the event.

4. Project-oriented training

Throughout their work all EvoPAD students will be fully integrated members of their respective research groups and take part in all scientific and social group activities.

Table 1 Overview of achievable credit points during the 3-years qualification programme. The programme consists of compulsory (C), elective (E), and facultative (F) elements. Doctoral students are required to earn a minimum number of 20 CP (1 CP ~ 25 – 30 h workload), including at least 15 CP which have to be earned within the compulsory area and 5 CP which have to be earned within the elective area. The maximum number of credit points to be earned is limited to 40 CP to leave enough room for the project-oriented training. Activities not listed below but with thematic relevance for EvoPAD can be taken into account on an individual basis after consultation with the EvoPAD Coordinator. * = topic has to be related to EvoPAD.

Compulsory elements		min.	max.
EvoPAD summer schools	2 CP per summer school	4 CP	6 CP
Seminar in Philosophy	1 CP per semester	3 CP	6 CP
Good Scientific Practice	1 CP per training event	1 CP	1 CP
From idea to publishing	1 CP per seminar series	1 CP	1 CP
EvoPAD student meetings	1 CP per year	2 CP	3 CP
Peer group meetings	1 CP per year	2 CP	3 CP
EvoPAD colloquium	1 CP per year	2 CP	3 CP
		15 CP	23 CP
Elective elements		min.	max.
EvoPAD method courses	1 CP for one-week course	5 CP	6 CP
EvoPAD Forum	1 CP per EvoPAD Forum		3 CP
Conference contribution (poster/talk)	1 CP per event		6 CP
EvoPAD Career Talks	0.5 CP per semester		2 CP
Supervision of undergraduate courses	1 CP for one week		4 CP
Mentoring/Supervision of undergraduate students	BSc thesis: 1 CP MSc thesis: 2CP		6 CP
Other soft-skills training workshops/courses	0.5 – 1 CP per training event		3 CP
Other science-skills training workshops/courses*	0.5 – 1 CP per training event		3 CP
		5 CP	10 CP
Facultative elements		min.	max.
Lab rotation	1 CP for one week	--	6 CP
Research stay abroad	1 CP for one week	--	6 CP
Internship	1 CP for one week	--	4 CP
Training on animal experiments	1 CP per training event	--	1 CP
Lecture series <i>The Growth of the Evolutionary Thought</i>	1 CP per semester	--	1 CP
Lecture series <i>Evolution across fields</i>	1 CP per semester	--	3 CP
Participation in (and organization of) the annual MGSE symposium	2 CP per symposium	--	6 CP
Organization of a workshop*	2 CP per workshop	--	6 CP
Book/journal club*	1 CP per semester	--	6 CP
		--	7 CP
Sum of the achievable credit points		20 CP	40 CP