



photo: Andreas Willing

From Urgent Need to a Success Story: the Postgraduate Study of Ecotoxicology in Germany

Rolf-Alexander Düring

Institute of Soil Science and Soil Conservation
Research Centre for BioSystems, Land Use and Nutrition (iFZ)
Justus Liebig University Giessen



16TH INTERNATIONAL CONFERENCE ON CHEMISTRY AND THE ENVIRONMENT, 18.06. – 22.06.2017

Ecotoxicology - Definition



René Truhaut, 1969:

...science, which deals with the distribution and the effects of chemical substances on organisms and systems, as they damage nature and human being

Urgent Need: Effects at all Levels

Molecule and Cell

Genes
Enzymes
Proteins
Cell
Transformations

Organism

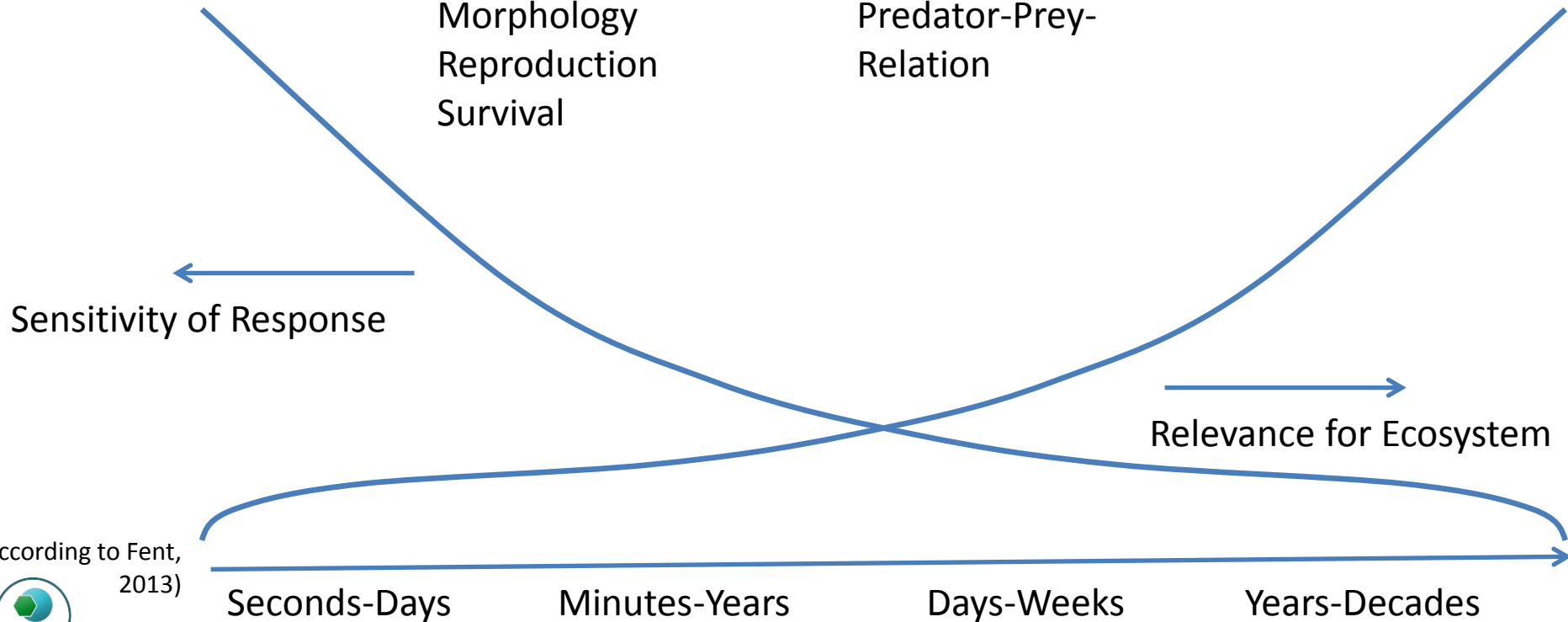
Metabolism
Behaviour
Growth
Development
Structure
Morphology
Reproduction
Survival

Populations and Communities

Diversity
Abundance
Distribution
Succession
Predator-Prey-
Relation

Ecosystems

Productivity
Food Chain
Nutrient Cycle
Energy Flows



(according to Fent,
2013)



Urgent Need: Regulation of Chemicals

implementation

Set-up of
agency

Regulation (EC) No 1907/2006
REACH entering in force in 2007

June 2007

June 2008



(picture alliance / dpa - Fredrik Von Erichsen)

registration of substances, depending on production volume;
evaluation, authorization

November 2010

June 2013

June 2018

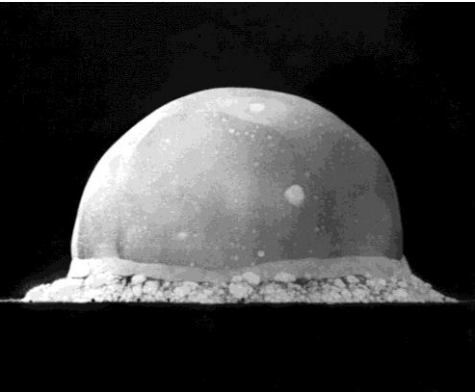
Addressing potential impacts of chemical substances on both the environment and human health:

Due to the vast amount of chemicals used in Europe it will not be fully implemented until the end of the decade.

Urgent Need:

We are in a New Age, the „Anthropocene“

- Soil erosion
- Deposition of micro plastic and radioactive irradiation
- altered carbon, nitrogen and phosphorus cycles
- Global warming and elevation of sea level
- Spread of invasive species



First nuclear explosion
July 16th 1945



International Geological Congress am 29.8.2016, Cape Town:

“Humanity’s impact on the Earth is now so profound that a new geological epoch – the Anthropocene – needs to be declared” (according to an official expert group who presented the recommendation to the International Geological Congress).

Further Needs and Opportunities?

Increasing number of students in Germany, but no range of studies in ecotoxicology

„Berlin Manifesto on Ecotoxicology“ (2002): to improve education in ecotoxicology

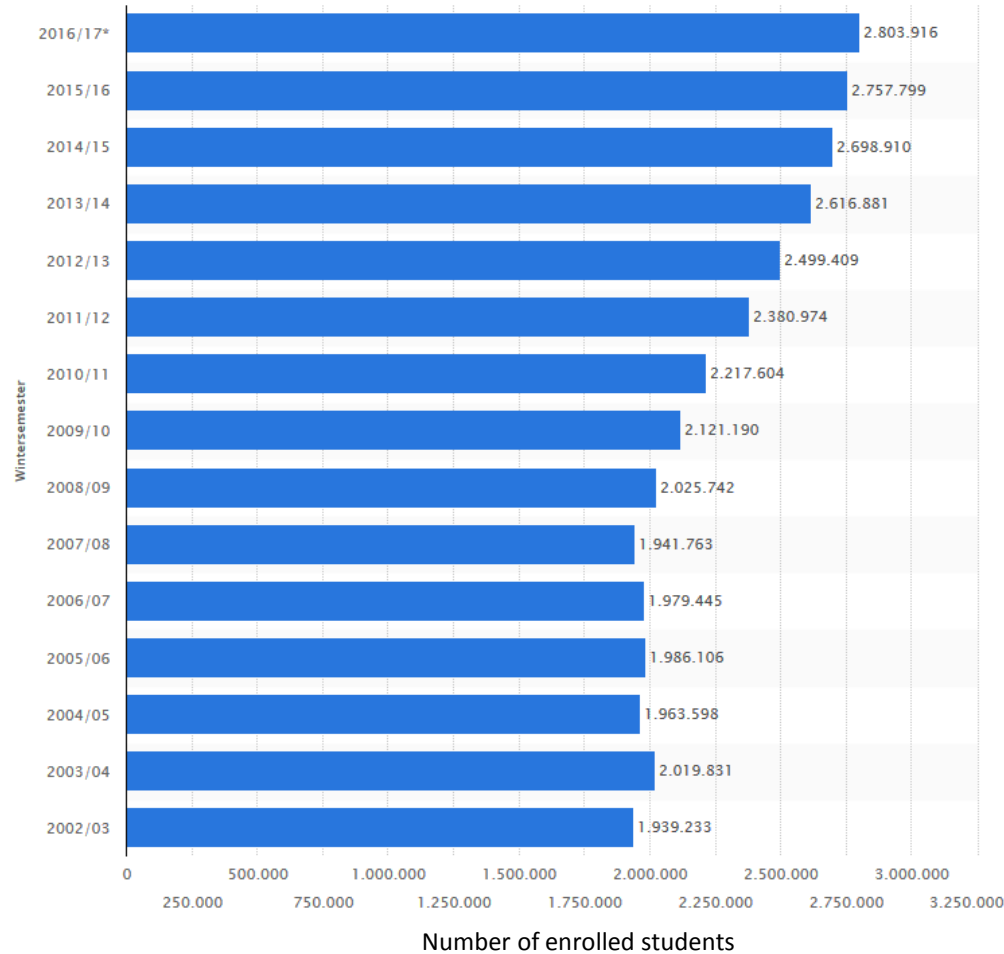


in 2005,

and

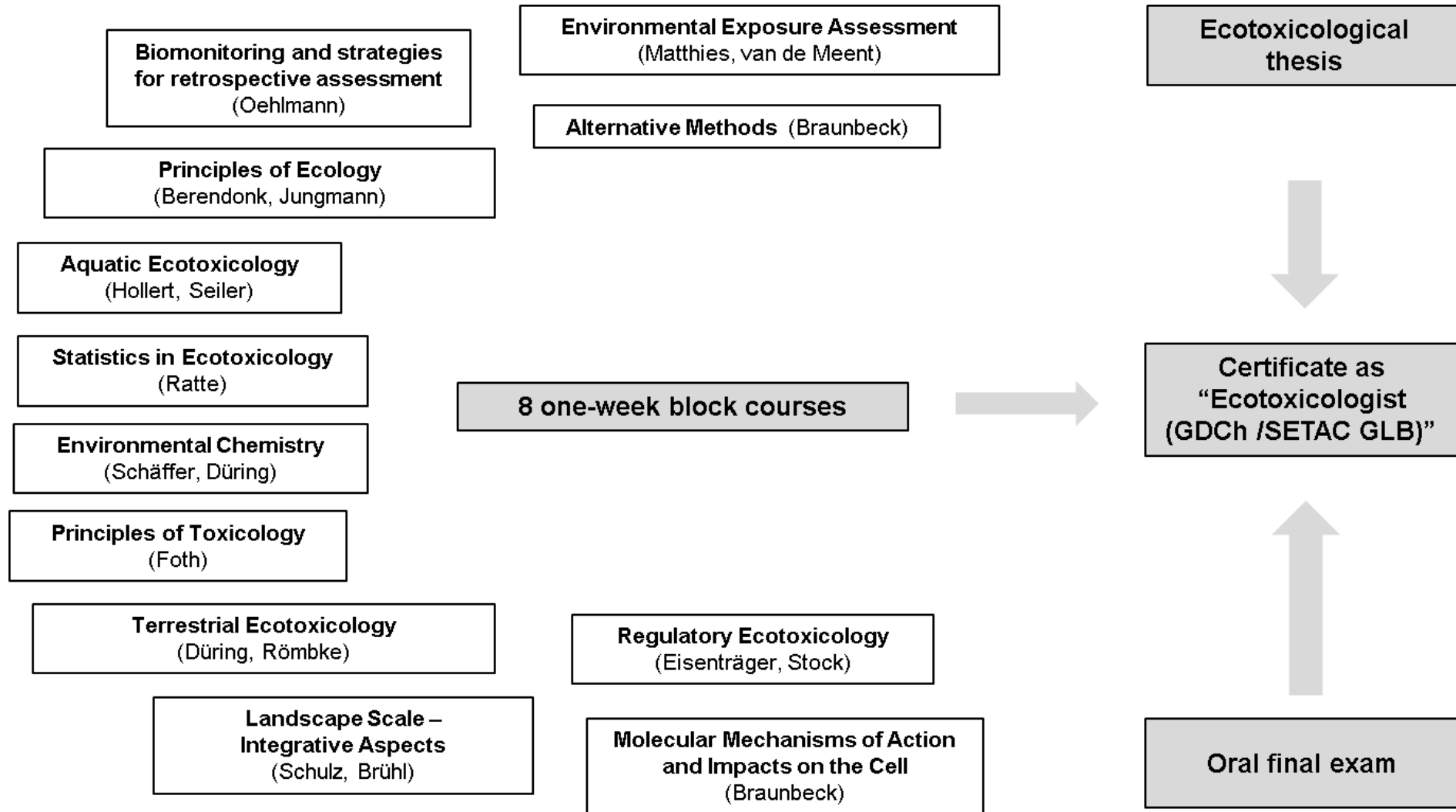


signed a contract on the establishment of the postgraduate degree program



How to Deal With This Complexity?

Composition of the Postgraduate Program



Nationwide concept



Education and training
at eleven sites,
distributed all over
Germany

Organisation: PGS Panel at Present

Chairperson	Prof. Dr.-Ing. Adolf Eisenträger	Federal Environmental Agency Dessau-Rosslau	Authority
Deputy Chairperson	Prof. Dr. Henner Hollert	Environmental Biology and Chemodynamics, Aachen University	Academia
Member	Prof. Dr. Thomas Braunbeck	Institute of Zoology, Heidelberg University	
Member	Prof. Dr. Jörg Oehlmann	Department of Aquatic Ecotoxicology, Frankfurt University	
Member	Prof. Dr. Andreas Schäffer	Environmental Biology and Chemodynamics, Aachen University	
Member	Dr. Andreas Willing	BASF Personal Care & Nutrition GmbH, Düsseldorf	Industry
Coordination	SETAC GLB – administrative office –	Mesocosm GmbH at FNU Research Centre Neu-Ulrichstein, Homberg (Ohm)	
Managing Director	Prof. Dr. Klaus Peter Ebke	Institute for Water Protection MESOCOSM GmbH, Homberg (Ohm)	



Further Opportunity: Ecotoxicology at German Universities Since 2010

University	Master study	Places to study
RWTH Aachen University	Ecotoxicology	approx. 30
Koblenz-Landau University	Ecotoxicology	approx. 30
Duisburg-Essen University	Environmental toxicology	approx. 30
Several universities with a focus on ecotoxicology within studies of biology, environmental sciences and related		

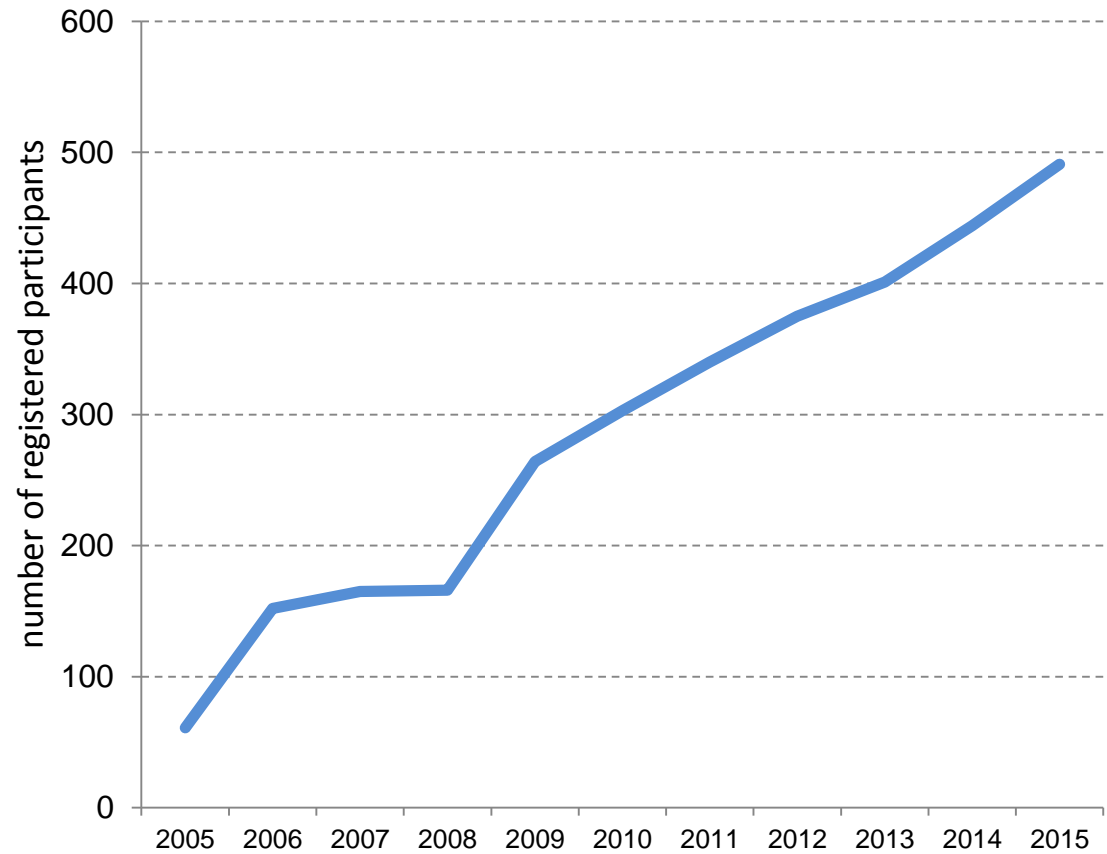
Principles of Sound Ecotoxicology

Catherine A. Harris,^{*,†} Alexander P. Scott,[‡] Andrew C. Johnson,[§] Grace H. Panter,^{||} Dave Sheahan,[⊥]
Mike Roberts,[#] and John P. Sumpter[†]

1. Adequate planning and good design
2. Define the baseline
3. Include appropriate controls
4. Use appropriate exposure routes and concentrations
5. Define the exposure
6. Understand your tools
7. Think about statistical analysis of the results when designing an experiment
8. Consider the dose–response
9. Repeat the experiment
10. Consider confounding factors
11. Consider the weight of evidence
12. Report findings in an unbiased manner

Still Increasing Number of Participants

Despite evolving offer for university studies, most of the courses of the postgraduate degree program are fully booked!

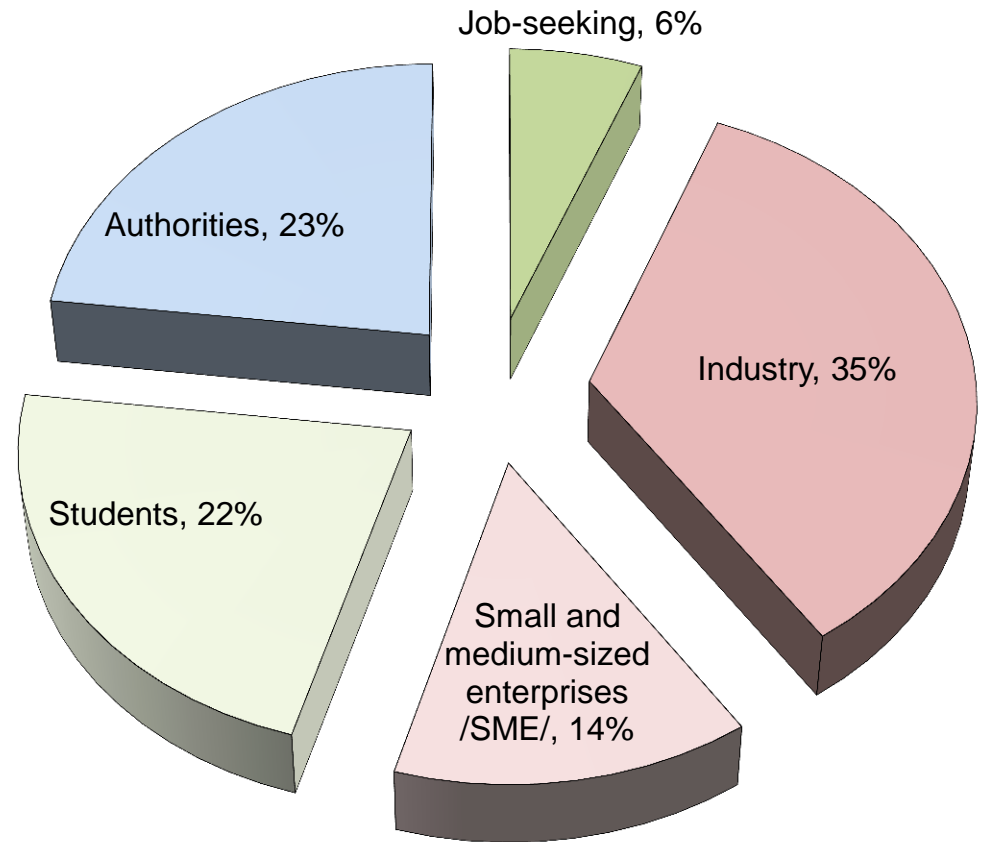


Who are the Participants?

Harris et al. (2014):

“... many ecotoxicologists have little or no contact with the people (regulators) who have to act on the results that they publish ...”

Coming from many different professions, PGS-participants are all networkers!



At the end: Certified Ecotoxicologist (GDCh/SETAC GLB)

- In total 12 distinct courses (obligatory 8)
- Ecotoxicological thesis/alternative thesis
- Oral final exam

- 500 persons registered
- about 250 participants attended more than 4 courses
- >25 alumni
- timing: around 4 years

- The need for training in ecotoxicology is sustaining!

For more information, please see: <http://www.fachokotoxikologie.de/>

Ebke *et al.* *Environ Sci Eur* (2016) 28:19



Gesellschaft Deutscher Chemiker e.V.
German Chemical Society

&
SETAC-EUROPE (German Language Branch) e.V.
Society of Environmental Toxicology and Chemistry



Mr Dr. rer. Mustermann

born June 25, 1999 in Munich, Germany
completed

the German Postgraduate Degree Program in Ecotoxicology
(SETAC GLB and GDCh)

attending the following courses:

Regulatory Ecotoxicology
Aquatic Ecotoxicology
Principles of Toxicology
Principles of Ecology
Statistics in Ecotoxicology
Environmental Exposure Assessment
Environmental Chemistry
Terrestrial Ecotoxicology

submitting a scientific thesis
as well as passing an oral final exam.

Hereby, on behalf of the societies
German Chemical Society, Division of Environmental Chemistry and Ecotoxicology
and
SETAC-EUROPE (German Language Branch) e.V.,

he is appointed as

Certified Ecotoxicologist (GDCh/SETAC GLB)
– Fachökotoxikologe (GDCh/SETAC GLB) –

Dessau-Roßlau, _____

Prof. Dr.-Ing. A. Eisenbürger
on behalf of the board of the
postgraduate degree program

Prof. Dr. K. P. Ebke
managing director SETAC GLB, on behalf of
the administration of the postgraduate degree
program



Acknowledgement

Course instructors and speakers working on a voluntary basis since beginning
(excluding the author):



J. Ahlers/Federal Environmental Agency, Dessau,
T. U. Berendonk/Universität Dresden,
T. Braunbeck/Universität Heidelberg,
C. Brühl/Universität Koblenz-Landau,
R. Debus/Hochschule RheinMain,
K. P. Ebke/Institute for Water Protection MESOCOSM GmbH, Homberg(Ohm),
A. Eisenträger/Federal Environmental Agency, Dessau,
H. Foth/Universität Halle,
H. Hollert/RWTH Aachen,
D. Jungmann/Universität Dresden,
M. Matthies/Universität Osnabrueck,
R. Nagel/formerly Universität Dresden,
J. Oehlmann/Universität Frankfurt,
T. Ratte/ToxRat Solutions GmbH , Alsdorf,
J. Römbke/ECT GmbH, Flörsheim,
R. B. Schäfer/Universität Koblenz-Landau,
A. Schäffer/RWTH Aachen,
G. Schüürmann/UFZ-Umweltforschungszentrum Leipzig-Halle,
R. Schulz/Universität Koblenz-Landau,
T. B. Seiler/RWTH Aachen,
A. Seitz †/formerly Universität Mainz,
F. Stock/UBA Dessau.

Financial support by the “Verband der Chemischen Industrie” (German Chemical Industry Association) is gratefully acknowledged.

