1. Curriculum vitae and description of the scientific career (photo)

Dr.ssa Lucia Muggia, PhD

PERSONAL DATA

Date, place of birth:	21st February 1980, Trieste, Italy.
Nationality:	Italian
Marital status:	single
Address:	via dei Baseggio 69/1, 34136 Trieste, Italy,
Research position:	Researcher, equivalent to assistant professor, Department of Life Sciences University of Trieste Via Giorgieri 10, 34127 Trieste, Italy; Phone.: +39-040-558-8825
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EDUCATION

1999 Undergraduate education at the Liceo Scientifico "G. Oberdan" in Trieste (60/60).

2004 Master thesis in Biological Science, University of Trieste (110/110 and *lode*). Title of the master thesis: "Genetic and morphologic variability in endolithic lichens of *Caloplaca* sect. *Pyrenodesmia* (Teloschistales, Ascomycota)". Supervisor: Prof. Dr. Mauro Tretiach (Trieste, Italia), co-examiner: Prof. Dr. Martin Grube (Graz, Austria).

2008 Doctoral thesis (PhD) in Natural Science, Institut für Pflanzenwissenschaften, Karl-Franzens Universität Graz, Austria. Title of the doctoral thesis: "Polyketide synthase genes in lichens: evolution and biodiversity". Supervisor: Ao. Prof. Dr. Martin Grube.

2017 Habilitation for Associate Professor in Botany according to the Italian National Scientific Habilitation (Abilitazione Scientifica Nazionale per professore di II fascia SSD 05/A1-BOTANICA, Bando D.D.1532/2016; valid from 06/04/2017 to 06/04/2023 according the Italian Law 240/10, art. 16, comma 1.)

CURRENT POSITION

Since 1st November 2012, Research position equivalent to Assistant Professor in Botany (BIO/01, Botanica Generale), including research activity and teaching duties at the Department of Life Sciences of the University of Trieste, Italy.

PREVIOUS POSITIONS - SCIENTIFIC RESEARCH DEVELOPMENT

2008 Project "Culture experiments of facultative lichen symbionts" financed by the Naturhistorska riksmusset (Stockholm, Sweden), carried out at Karl-Franzens University of Graz, period 7 months (07/2008-01/2009); supervisor: Dr. Mats Wedin.

2009 Project "Bacteria and lichens", Technical University of Graz, period 10 months (02-12/2009); supervisors: Univ. Prof. Dr. Gabriele Berg and Ao. Prof. Dr Martin Grube.

2010 Project "Fungal diversity and photobiont association in *Schizoxylon albescens*" financed by the Naturhistorska riksmusset (Stockholm, Sweden), carried out at Karl-Franzens University of Graz, period 3 months (02-04/2010); supervisor: Dr. Mats Wedin.

2010 Research grant (GZ:39/83-30 ex09/10) assigned by the Karl-Franzens University Graz, project "Convergent evolution of complexity in lichens", period 5 months (01.05-30.09/2010), principal investigator and grant holder.

2010-2013 Herta-Firnberg Stipendium T481-B20, grant holder, project "Species evolution in symbiosis" financed by the Austrian Science Fund FWF (Fonds zur Förderung der wissenschaftlichen Forschung), Karl-Franzens University Graz, period 3 years (01/10/2010-30/09/2013), principal investigator and grant holder.

AWARDS

2005 Award for the best master thesis in lichenology during the academic year 2003-2004 assigned by the Italian Lichen Society (SLI, Società Lichenologica Italiana).

2008 Award for the best scientific research activity assigned by the Karl-Franzens University Graz.

2008 Travel Award to attend the 6th Congress of the International Association of Lichenology (IAL6) in Asilomar, California ($300) assigned by the Mycological Society of America (MSA).

COMMISSIONS OF TRUST

2012 Evaluator of Czech national project (Czech Science Foundation project 14-29819S).

2011 Evaluator of Italian national project PRIN 2010 (prot. 2010YB8HWR).

2014 Evaluator of Netherlands Polar Program project (NWO) (project ALWNNPP/2014-04).

2008 to date, Reviewer of international journals: Biodiversity and Conservation, Bryologist, Ecology and Evolution, Environmental Microbiology, European Journal of Soil Biology, Fungal Biology, Fungal Diversity, International Microbiology, Molecular Ecology, Molecular Phylogenetic and Evolution, Mycologia, Mycological Progress, Mycotaxon, New Phytologist, Plant and Soil, PlosONE, Polar Biology, Symbiosis, The Lichenologist (and others).

SCHOLARSHIP AND RESEARCH VISITS

2011 *Synthesis* European Grant, London, "Species evolution in lichen symbiosis: *Tephromela atra* species-complex as study model".

TRAINING ACTIVITIES

2011-2012 MentoringPLUS Career development program for young female scientists, as mentee at the Karl-Franzens University Graz.

MEMBERSHIP OF SCIENTIFIC SOCIETY

- Società Lichenologica Italiana (SLI) since 2004;
- International Association for Lichenology (IAL) since 2004;
- Bryologisch-lichenologische Arbeitsgemeinschaft für Mitteleuropa (BLAM) since 2008.

ORGANISATION OF SCIENTIFIC MEETINGS

2009 – XXII° National Congress of the Italian Lichen Society (SLI) organizer of the session "Taxonomy, floristic and systematics"

2012 – 7th Congress of the International Association of Lichenology (IAL7), Bangkok-Thailand, organizer of the Session 3I "New approaches to understanding biosynthesis and ecological roles of metabolites in lichens".

2016 – 8th Congress of the International Association of Lichenology (IAL8), Helsinki - Finland, organizer of the Session "The diversity within".

2016 – Organizer of the "*Trebouxia* Workshop", Trieste, 26th-28th September, University of Trieste, Department of Life Sciences, International workshop on the algal genus *Trebouxia* lichen photobiont.

2018 – Co-organizer of the session "Polyextremotolerant fungi in natural and urban extreme environments" at the International Mycological Congress IMC11, Puerto Rico, 16-21 July 2018.

SCIENTIFIC NETWORKING

2016 – Co-editor of the book *Algal and Cyanobacteria Symbioses*, World Scientific Publisher; Grube M, Seckbach J, Muggia L (eds).

2016 – Leading editor of the special Issue of *Herzogia* 29(2) "Festschrift celebrating the 65th birthday of Josef Hafellner"; Muggia L, Obermayer W, Mayrhofer H, Spribille T, Werth S, Resl P, Grube M (eds).

LANGUAGE KNOWLEDGE

English, writing and speaking: good
German, writing and speaking: good, ÖSD C1 certificate
Italian, writing and speaking: good, mother language

SCIENTIFIC AND TECHNICAL KNOWLEDGE

– ***Systematics and diversity*** of plants, fungi (lichenized and lichen-associated fungi), lichen photobionts;
– ***Molecular biology***, including DNA extraction, PCR amplification, purification, cloning, fingerprinting techniques, sequencing, fluorescence *in situ* hybridization (FISH), next generation sequencing (NGS);
– ***Bioinformatic analyses*** of molecular data (DNA, RNA and protein sequence analysis, phylogenetic approaches);
– ***Establishment and maintenance of culture collection*** of lichen-associated microorganisms (including lichen mycobionts, lichen photobionts, stress-tolerant black fungi, lichenicolous fungi, algae, lichen-associated bacteria), and knowledge on isolation techniques, axenic culturing, culture storage;
– ***Microscopy*** (light microscopy, incl. histochemical staining methods, confocal laser scanning microscopy, basic experience with transmission and scanning microscopy TEM and SEM).

RESEARCH ACTIVITY

In the past 12 years I developed my interest in lichenology analyzing different aspects of the lichen symbiosis using diverse experimental approaches which can be summarized in three main tasks:

1) Diversity within lichen symbioses – Lichens are miniaturized ecosystems in which different algal and fungal taxa coexist, interact, and contribute to the mutual growth and survival. I have isolated from the lichen thalli numerous black fungi (Chaetothyriomycetes and Dothideomycetes) still unknown for this environment and demonstrated their close phylogenetic relationships with taxa having different life styles and coming from diverse ecological niches. This has generated further hypotheses on how lichens may represent evolutionary springboards for different life styles. I have also studied lichen photobionts combining molecular and

morphological approaches to describe their diversity in epilithic and epiphytic lichens. I focused on the specificity and selectivity patterns showed by the fungus for the photobionts and analysed the genetic diversity using different molecular markers and at different geographical scales.

2) Axenic cultures of lichen-associated microorganisms – I have isolated and established a rich culture collection which includes lichen mycobionts, photobionts, lichen-associated fungi and bacteria, black rock-inhabiting fungi. This collection is hosted in the laboratory of the Institute of Plant Science at the Karl-Franzens University of Graz. Firstly, the mycobiont cultures were used to investigate the production of secondary metabolites and presence of genes coding the polyketide synthases enzymes that were studied phylogenetically. Secondly, I used the isolated lichen symbionts to establish multiple co-culture experiments to analyze symbiotic interactions *in vitro*. I used this approach to study optional lichenization of the system *Schizoxylon-Coccomyxa* (including scanning microscopy analyses) and *Lichenothelia*. I have also isolated lichenicolous fungi and black rock-inhabiting fungi for ongoing and future research of fungus-fungus and fungus-algae interactions.

3) Systematic – My personal interest in systematics concerns the application of the phylogenetic species concept to study lichen diversity. I usually combine morphological and phylogenetic analyses to resolve critical and cryptic taxa and elucidate their phylogenetic affiliations. The lichen specimens have been almost always personally sampled during numerous field excursions and comprised endolithic, epilithic, fruticose and sterile species characterized by either low morphological diversity, highly morphological and ecological polymorphism, unknown phylogenetic relationships, or were fungi presenting different life styles. I always include a comprehensive taxon sampling and I investigate the genetic diversity analyzing multiple genetic markers (nuclear, mitochondrial and plastidial loci). I have described new species and families.

FIELD RESEARCH ACTIVITIES

2004 – Central- and South Italy (Abruzzo, Marche, Molise, Puglia): wide sampling of endolithic lichens used in the research work of the master thesis.

2005 – Italy, Island of Pianosa: field work in collaboration with the members of the working group "Floristic and Systematic" of the Italian Lichen Society (SLI), compilation of the lichen flora of the island.

2006 – Italy, Parco Nazionale dell'Adamello: joint field excursion of the Italian (Società Lichenologica Italiana) and French (Association Francaise de Lichénologie) lichen societies.

2007 – Albania: in collaboration with Prof. Dr. Josef Hafellner (Graz, Austria) and Prof. Dr. Mauro Tretiach (Trieste, Italia): sampling of lichen material for the completion of the lichen flora of Albania.

2007 – Costa Rica, Botanic excursion organized by the Karl-Franzens University of Graz by Ass. Prof. Dr. Edith Stabentheiner.

2008 – California, U.S.A.: pre-congress excursion of the International Association of Lichenology.

2009 – Tanzania, Mt. Kilimandjaro: collected lichen material was sent on loan to Spanish (Dr. Sergio Perez-Ortega, Instituto de Recursos Naturales, Madrid) and Czech collaborators (Dr. Pavel Skaloud, University of Prague) for molecular and phylogenetic analyses.

2010 – Alaska, student field excursion of the Karl-Franzens University of Graz.

2013 – Greece, Epirus: lichen survey for the project "Conservation through religion: the sacred groves of Epirus".

2013 – Alaska, Katmai National Park: lichen survey for the project "Lichen Inventory for the Southwest Alaska Network".

2013 – New Zealand, North and South Island: lichen sampling for the project "Species evolution in symbiosis" (FWF T481-B20), further collected material was used also for a cooperation project with Dr. Pavel Skaloud, University of Prague and sent to Dr. Bruce McCune Oregon State University (U.S.A.).

CONTRIBUTIONS AT INTERNATIONAL CONGRESSES

Oral communication *(17 as speaker; speaker is underlined)*

- 2006, 8 th International Mycological Congress (IMC8), Cairns, Australia. **Muggia L**, Schmitt I, Blaha J, Rankl J, Grube M. Evolution of polyketide synthases in lichens. *8th International Mycological Congress, Cairns, Australia. Congress handbook and abstract book 1*, p. 167.
- 2008, 6 th International Association for Lichenology Congress (IAL6), Asilomar, California, USA. **Muggia L**, Grube M, Polyketide synthase genes in lichens: evolution and diversity; *Lichenological Abstracts* pp. 48. **Muggia L**, Grube M, Zellnig G, Characterization of the trebouxioid photobiont of *Tephromela atra* (Lecanorales, Ascomycota) from the Mediterranean region. *Lichenological Abstracts* pp. 48.
- 2010, 9° International Mycological Congress (IMC9), Edinburgh, Scotland. Special Interest Group "Cryptic speciation in lichen forming fungi". **Muggia L**, The implications of morphological and phylogenetic species concepts in lichens. *Book of abstract* in CD-ROM.
- 2011, 4th Polar and Alpine Microbiology Congress, (PAM4), Ljubljana, Slovenia. **Muggia L**, Perez-Ortega S, Spribille T, Grube M "*Tephromela atra* lichen species-complex: a model for symbiotic evolution studies", *Book of Abstract* p. 59; Printzen C, **Muggia L**, Grube M, "Alphaproteobacterial communities in geographically distant populations of the lichen *Cetraria aculeata"*, *Book of Abstract* p. 46.
- 2011, 4th ISHAM Black Fungi Workshop, Curitiba, Brazil. **Muggia L**, Gueidan C, Knudsen K, Perlmutter G, Kocourkova J, Grube M "Lichens and black fungi: evolutionary relationships and shared habitats'; **Muggia L**, Grube M "Isolation method to study black yeast in lichens" (no book of abstract available).
- 2012, 7th IAL Symposium of the International Association for Lichenology (IAL7), Bangkok, Thailand. **Muggia L**, Perez-Ortega S, Spribille T, Grube M "The *Tephromela atra* species-complex: a case study of symbiotic species evolution", *Book of Abstract* p. 24; Gueidan C, Thues H, **Muggia L**, et al. "Evolution of photobiont associations in the family Verrucariaceae" *Book of Abstract* p. 4.
- 2013 5th Polar and Alpine Microbiology Congress, (PAM5), Big Sky, Montana, U.S.A. **Muggia L**, Fleischhacker A, Kopun T, Hafellner J, Grube M. "Alpine lichen communities as hotbeds of stress toleran fungi." *Program & Abstracts* p. 28.
- 2013, 5th Meeting of the ISHAM working group of Black Years and Chromoblastomycosis, Guangzhou, China. **Muggia L**, Fleischhacker A, Kopun T, Hafellner J, Grube M. "Diversity of black and lichenicolous fungi from lichen communities in the Alps." Electronic Abstract p. 29; de Hoog S, Deng S, Yang L, Moreno L, Stielow B, Blatrix R, **Muggia L**, Grube M. "Phylogeny and ecology of the Chaetothyriales based on LSU rDNA", Electronic Abstract, p. 14: http://www.blackyeast.org/Guangzhou/Download/Abstract.pdf.
- 2014, 10th International Mycological Congress (IMC10), Bangkok, Thailand. "Diversity of lichen-associated fungi in alpine communities by amplicon sequencing", **Muggia L**, Fleischhacker A, Kopun T, Hafellner J, Grube M, *Book of abstracts*.
- 2015, 8th Congress of the International Symbiosis Society, Lisbon, Portugal. "Challenging symbiont association patterns in lichens", **Muggia L**, Skaloud P, Steinova J. (invited talk).
- 2015, 8th Congress of the International Symbiosis Society, Lisbon, Portugal. "Diversity of mycobiont-photobiont associations correlate with reproductive strategies in *Cladoni*a lichen species", Steinova J, **Muggia L**, Skaloud P.
- 2015, 2° Workshop of Inter-kingdom Interactions and Biocontrol, Graz, Austria. "The multiplicity of algal interactions: a panoramic path from rock to bark of evolutionary relationships and symbiotic patterns", **Muggia L** (invited talk).
- 2016, XV OPTIMA Meeting, Montpellier, France. "Lichens as a niche for black fungi" **Muggia L**, Fernandez-Mendoza F, Grube M (invited talk), *Book of Abstract* p. 45; "A phylogenetic insight into the diversification of saxicolous black fruited Caloplacas in Eurasia (Pyrenodesmia, Teloschistaceae)"

Fernandez-Mendoza F, Frolov I, Vondrak J, Rabensteiner J, Kopun T, **Muggia L**, Mayrhofer H, Grube M. (invited talk) *Book of Abstract* p. 46.

- 2016, 8th IAL Symposium of the International Association for Lichenology (IAL8), Helsinki, Finland. "A panoramic path along multiple symbiotic patterns: together or not together?" **Muggia L**, Ametrano CG, Grube M, Fernandez-Brime S, Wedin M. (invited talk) *Book of Abstract* p. 53; "Phylogenetic relationships among extremotolerant rock-inhabiting fungi and their association with algae" Ametrano CG, Knudsen K, Grube M, Selbmann L, Muggia L. *Book of Abstract* p. 75; "Intrathalline diversity of lichen-inhabiting fungi assessed by metabarcoding of ITS2 region" Banchi E, Stankovic D, Fernandez-Mendoza F, Pallavicini A, **Muggia L**. *Book of Abstract* p. 87; "Exploring the microbiome of the optionally lichenized fungus Schizoxylon albescence" Fernandez-Brime S, **Muggia L**, Maier S, Grube M, Wedin M. *Book of Abstract* p. 88; "Transcriptomic analysis of the lichen photobiont *Trebouxia gelatinosa* subjected to dehydration and rehydration processes" Montagner A, Candotto Carniel F, Gerdol M, Banchi E, Manfrin C, **Muggia L**, Pallavicini A, Tretiach M. *Book of Abstract* p. 99.
- 2016, 6th Meeting of the ISHAM working group of Black Years and Chromoblastomycosis, Viterbo, Italy. "The phylogenetic relationships connecting extremotolerant rock-inhabiting fungi from the Alps to the desert" Ametrano CG, Knudsen K, Kocourkova J, Grube M, Selbmann L, **Muggia L**.
- 2018, 5th Meeting of the ISHAM working group of Black Years and Chromoblastomycosis, Amsterdam, The Netherland. **Muggia L**, Grew F, Lumbsch TH, Grube M, Leavitt SD, Ametrano CG, "Phylogenetic and phylogenomic analyses of the two rock inhabiting fungi *Lichenothelia* and *Saxomyces* (Dothideomycetes, Ascomycota)" Book of Abstract without page number.
- 2018, 10th International Mycological Congress (IMC11), San Juan, Puerto Rico, USA. Grube M, Fernandez-Mendoza F, Banchi E, **Muggia L**, "Lichen symbioses as a niche for extremotolerant fungi", *Book of Abstracts* p. 107.

Poster *(n=22)*

- 2004, 5 th International Association for Lichenology Congress (IAL5), Tartu, Estonia. **Muggia L**, Tretiach M, Grube M, Genetic and morphological variability in endolithic taxa of *Caloplaca* sect. Pyrenodesmia. *In:* Randlane T, Saag, A (eds.), *Book of Abstracts of the 5th IAL Symposium. Lichens in Focus*. Tartu University Press, p. 19.
- 2005, XVII° International Botanical Congress (IBC), Vienna, Austria. **Muggia L**, Rankl J, Blaha J, Grube M, Paralogy and homology in polyketide genes of lichen fungi. *XVII International Botanical Congress, Vienna, Book of abstract*, p. 554.
- 2007, European Consortium of the Barcoding Of Life (ECBOL), DNA-barcoding Congress, Leiden, The Netherlands. **Muggia L**, Bjelland T, Cardinale M, Wornik S, Grube M, DNA-barcoding and fungal symbiosis. *DNA Barcoding in Europe, 3-5 October 2007, Leiden, The Netherlands, Conference Book*, p. 44.
- 2008, 6 th International Association for Lichenology Congress (IAL), Asilomar, California, USA. **Muggia L**, Gueidan C, Grube M, Phylogenetic affiliation of granulose genera formely attributed to Verrucariaceae. *Lichenological Abstracts*, pp. 48; **Muggia L**, Nadyeina O, Grube M, Diversity of fungal associates in lichens assessed by single strand conformation polymorphism. *Lichenological Abstracts*, pp. 49.
- 2010, 9th International Mycological Congress, Edinburgh, Scotland. **Muggia L**, Baloch E, Stabentheiner E, Grube M, Wedin M, Photobiont association and genetic diversity of the optionally lichenized fungus *Schizoxylon albescens*. *Book of abstract* in CD-ROM.
- 2011, 4th Polar and Alpine Microbiology Congress, (PAM4), Ljubljana, Slovenia. **Muggia L**, Klug B, Berg G, Grube M, Fluorescence *in situ* hybridization and confocal laser scanning microscopy approach to analyse alpine soil crust lichens. *Book of Abstract* p. 118.

- 2012, 7th IAL Symposium of International Association for Lichenology (IAL7), Bangkok, Thailand, **Muggia L**, Vancourova L, Skaloud P, Peksa O, Grube M, Are long living thalli an arena for photobiont variation? *Book of Abstract* p. 94; **Muggia L**, Spribille T, A tale of two mycobionts. Exploring convergent evolution and photobiont switching in the lichen genus Polychidium. *Book of Abstract* p. 95; **Muggia L**, Klug B, Berg G, Grube M, Fluorescence *in situ* hybridization and confocal laser scanning microscopy approach to analyse alpine soil crust lichens. *Book of Abstract* p. 78.
- 2013, 5th Polar and Alpine Microbiology Congress, (PAM4), Big Sky, Montana, U.S.A. **Muggia L**, Perez-Ortega S, Spribille T, Grube M. "A lichen species complex to study evolution of organisms in symbiosis" *Program & Abstracts* p. 47.
- 2014, 10th International Mycological Congress (IMC10), Bangkok, Thailand, "Disentangling the complex of Lichenothelia species from rock communities in the desert", **Muggia L**, Kocoukova J, Knudsen K, *Book of abstracts*.
-2015, II° International Workshop on Ascomycete Systematics, Amsterdam, The Netherland, "Black magics on the rocks: anamorph-teleomorph relationship among rock inhabiting fungi?" **Muggia L**, Selbmann L, Knudsen K, Grube M. Program and Abstract p. 25.
- 2015 8th Congress of the International Symbiosis Society, Lisbon, Portugal, "Insights in the lichen-forming species complex *Tephromela atra*: mycobiont-photobiont specific association defines a new taxon". Cestaro L, Grube M, Bjork C, Tønsberg T, **Muggia L**.
- 2016, 8th IAL Symposium of the International Association for Lichenology (IAL8), Helsinki, Finland. "Potential horizontal gene transfer (HGT) of Desiccation Related proteins in the lichen phototbiont *Trebouxia gelatinosa*" Banchi E, Candotto Carniel F, Gerdol M, Montagner A, **Muggia L**, Pallavicini A, Tretiach M, *Book of Abstract* p. 112; "A phylogenomic examination of the diversification of black fruited Caloplacas in Eurasia (Pyrenodesmia, Teloschistaceae)" Fernandez-Mendoza F, Frolov I, Vondrak J, Rabensteiner J, Kopun T, **Muggia L**, Mayrhofer H, Grube M, *Book of Abstract* p. 113; "Molecular analyses uncover the phylogenetic position of the lichenized hyphomycetous genus *Cheiromycina*" **Muggia L**, Mancinelli R, Tønsberg T, Palice Z, *Book of Abstract* p. 170.
- 2016, 6th Meeting of the ISHAM working group of Black Years and Chromoblastomycosis, Viterbo, Italy. "Black fungi as model for mixed culture experiments: analyses of co-growth rate and photobiont associations" Ametrano CG, **Muggia L**.
- 2018, 10th International Mycological Congress (IMC11), San Juan, Puerto Rico, USA. Ametrano CG, Grewe F, Knudsen K, Lumbsch HT, **Muggia L**, Leavitt SD, "First insights into the genomes of *Lichenothelia* and *Saxomyces* (Dothideomycetes)", *Book of Abstracts* p. 345; **Muggia L**, Zalar P, Azua-Bustos A, Gunde-Cimermann N, "The thread connection *Hotaea weneckii* and *Dunaliella atacamensis*: triggering symbiosis from spiderwebs to in vitro culture", *Book of Abstracts* p. 383; **Muggia L**, Banchi E, Ametrano CG, Stankovic D, Pallavicini A, Fungal diversity of airborne samples is uncovered by DNA metabarcoding." *Book of Abstracts* p. 233; Hill R, Fernández-Brime S, **Muggia L**, Hawksworth D, Navarro-Rosinés P, Gaya E, "Exploring the evolution of lichenicolous fungi in a phylogenetic context", *Book of Abstracts* p. 348.

CONTRIBUTIONS AT NATIONAL ITALIAN CONGRESSES

Oral communication *(13 as speaker; speaker is underlined)*

- 2005, XVIII° Congress of the Società Lichenologica Italiana, Trieste. **Muggia L**, Grube M, Munzi S, Tretiach M. Analisi filogenetica di mico- e fotobionte in popolazioni simpatriche di tre varietà del lichene *Tephromela atra* (Huds.) Hafellner. *Notiziario della Società Lichenologica Italiana* 19 (2006): 15.

- 2006, XIX° Congress of the Società Lichenologica Italiana, Trento. **Muggia L**, Schmitt I, Blaha J, Rankl J, Grube M. Evoluzione, selezione ed espressione dei geni delle poliketide sintasi nei licheni. *Notiziario della Società Lichenologica Italiana* 19 (2006): 82.
- 2008, XXI° Congress of the Società Lichenologica Italiana, Cogne. **Muggia L**, Nadyeina O, Grube M. Stima della diversità di associazioni fungine in talli lichenici attraverso SSCP analisi. *Notiziario della Società Lichenologica Italiana* 21 (2008): 19.
- 2009, XXII° Congress of the Società Lichenologica Italiana, Brescia. **Muggia L**, Gueidan C, Grube M. Phylogenetic relationships of some morphologically unusual members of Verrucariales. *Notiziario della Società Lichenologica Italiana* 22 (2009): 27.
- 2010, XXIII° Congress of the Società Lichenologica Italiana, Pesche. **Muggia L**, Baloch E, Stabentheiner E, Grube M, Wedin M, Photobiont association and genetic diversity of the optionally lichenized fungus *Schizoxylon albescens*. *Notiziario della Società Lichenologica Italiana* 23 (2010): 24.
- 2011, XXIV° Congress of the Società Lichenologica Italiana, Terni, **Muggia L**, Spribille T, A tale of two mycobionts. Exploring convergent evolution and photobiont switching in the lichen genus *Polychidium*. *Notiziario della Società Lichenologica Italiana* 24 (2011): 44.
- 2012, XXV° Congress of the Società Lichenologica Italiana, Roma, **Muggia L**, Grube M, Lichens and black fungi: evolutionary relationships and shared habitats. *Notiziario della Società Lichenologica Italiana* 25 (2012): 17.
- 2013, XXVI° Congress of the Società Lichenologica Italiana, Piacenza. **Muggia L**, Perez-Ortega S, Spribille T, Grube M. "A lichen species complex to study evolution of organisms in symbiosis" *Notiziario della Società Lichenologica Italiana* 26, p. 31.
- 2014, XXVII° Congress of the Società Lichenologica Italiana, Montecatini Terme, "Diversity of lichen-associated fungi in alpine communities by amplicon sequencing", **Muggia L**, Fleischhacker A, Kopun T, Hafellner J, Grube M, *Notiziario della Società Lichenologica Italiana* 27, p. 30.
- 2015, XXVIII° Congress of the Società Lichenologica Italiana, Lanciano, "Rock-inhabiting fungi and their association with algae: where does symbiosis start?", **Muggia L**, Selbmann L, Knudsen K, Grube M, *Notiziario della Società Lichenologica Italiana* 28, p. 24.
- 2016, XXVIV° Congress of the Società Lichenologica Italiana, Trieste, Itay. "Phylogenetic relationships among extremotolerant rock-inhabiting fungi and their association with algae" Ametrano CG, Knudsen K, Kocourkova J, Grube M, Selbmann L, **Muggia L**, *Notiziario della Società Lichenologica Italiana* 29, p. 22; "Intrathalline diversity of lichen inhabiting fungi assessed by metabarcoding of ITS region" Banchi E, Stankovic D, Fernandez-Mendoza F, Pallavicini A, **Muggia L**, *Notiziario della Società Lichenologica Italiana* 29, p. 25; "Molecular analyses uncover the phylogenetic position of the lichenized hyphomycetous genus *Cheiromycina*" Mancinelli R, Tonsber T, Palice Z, **Muggia L**, *Notiziario della Società Lichenologica Italiana* 29, p. 27.
- 2017, XXX° Congress of the Società Lichenologica Italiana, Torin, Itay. "Species or not species: the dark boundaries between Lichenothelia and Saxomyces" Ametrano CG, Knudsen K, Leavitt S, Kocourkova J, Selbmann L, Grube M, Muggia L. *Notiziario della Società Lichenologica Italiana* 30, p. 18.
- 2018 XXXI° Congress of the Società Lichenologica Italiana, Pistoia, Italy. **Muggia L**, Grube M, "Lichen-associated fungi: diversity and culture approaches". *Notiziario della Società Lichenologica Italiana* 31 p. 22.
- 2019 XXXII° Congress of the Società Lichenologica Italiana, Bologna, Italy. **Muggia L**, Perez-Ortega S, Ertz D, "*Muellerella*, a lichenicolous fungal genus recovered as polyphyletic within Chaetothyriomycetidae (Eurotiomycetes, Ascomycota)". *Notiziario della Società Lichenologica Italiana* 32 p. 19.

Poster (n=14)

- 2006, 101° National congress of the Società Botanica Italiana, Caserta. Baruffo L, **Muggia L**, Tretiach M. Posizione sistematica e distribuzione di due problematici taxa del genere *Lepraria* (Lecanorales, Ascomycota). Riassunti Relazioni – Comunicazioni – Poster, p. 239.
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- 2008, XXI° Congress of the Società Lichenologica Italiana, Cogne. **Muggia L**, Grube M, Evoluzione e diversità dei geni delle polichetidi sintasi nei licheni. *Notiziario della Società Lichenologica Italiana* 21 (2008): 52; **Muggia L**, Grube M, Zellnig G. Caratterizzazione di un fotobionte di *Tephromela atra* (Lecanorales, Ascomycota) dall'area Mediterranea. *Notiziario della Società Lichenologica Italiana* 21 (2008): 53.
- 2011 XXIV° Convegno of the Società Lichenologica Italiana, Terni, **Muggia L**, Perez-Ortega S, Spribille T, Grube M, The *Tephromela atra* species-complex: a case study of symbiotic species evolution. *Notiziario della Società Lichenologica Italiana* 24 (2011): 64.
- 2012 XXV° Congress of the Società Lichenologica Italiana, Roma, Fleischhacker A, Hafellner J, Grube M, **Muggia L**, Assessing fungal diversity among alpine lichen communities. *Notiziario della Società Lichenologica Italiana* 25 (2012): 48; **Muggia L**, Perez-Ortega S, Spribille T, Grube M, The Tephromela atra species complex: a case study of symbiotic species evolution. *Notiziario della Società Lichenologica Italiana* 25 (2012): 57.
- 2013 XXVI° Congress of the Società Lichenologica Italiana, Piacenza. Fleischhacker A, Kopun T, Grube M, **Muggia L**, "Diversity of lichenicolous and endolichenic fungi from alpine lichen communities" *Notiziario della Società Lichenologica Italiana* 26, p. 38.
- 2014 XXVII° Congress of the Società Lichenologica Italiana, Montecatini Terme, "Species richness and diversity of lichen communities by conservation through religion" Rohrer A, Mayrhofer H, Kati V, **Muggia L**, *Notiziario della Società Lichenologica Italiana* 27, p. 69..
- 2014 XXVII° Congress of the Società Lichenologica Italiana, Montecatini Terme, "Pyrosequencing analysis reveals high diversity of lichen-associated fungi in alpine habitats" Fleischhacker A, Kopun T, Grube M, **Muggia L**, *Notiziario della Società Lichenologica Italiana* 27, p. 46.
- 2015 XXVIII° Congress of the Società Lichenologica Italiana, Montecatini Terme, "Insights in the lichen-forming species complex *Tephromela atra*: mycobiont-photobiont specific association defines a new taxon". Cestaro L, Grube M, Bjork C, Tønsberg T, **Muggia L**. *Notiziario della Società Lichenologica Italiana* 28, p. 41.
- 2015 XXVIII° Congress of the Società Lichenologica Italiana, Montecatini Terme, "The dessication-related proteins in *Trebouxia*: a family to discover". Banchi E, Gerdol M, Montagner A, Candotto Carniel F, **Muggia L**, Pallavicini A, Tretiach M. *Notiziario della Società Lichenologica Italiana* 28, p. 34.
- 2018 XXXI° Congress of the Società Lichenologica Italiana, Pistoia, Italy. Ametrano CG, Grewe F, Knudsen K, Lumbsch HT, **Muggia L**, Leavitt SD, "First insights into the genomes of *Lichenothelia* and *Saxomyces* (Dothideomycetes)", *Notiziario della Società Lichenologica Italiana* p. 31.
- 2019 XXXII° Congress of the Società Lichenologica Italiana, Bologna, Italy. Moya P, Molins A, **Muggia L**, Barreno E, "Illumina assay reveals habitat as the main factor shaping microalgal diversity in *Ramalina farinacea*". *Notiziario della Società Lichenologica Italiana* 321 p. 64.

Personalia

I like nature, in particular hiking, climbing and mountaineering in the Alps and Andes. I play a lot of sport as amateur, such as swimming, climbing, alpine ski and jogging. In my spare time I like cooking, reading, knitting, relaxing or spend it with colleagues and friends.

2. List of publications

Peer review publication with IF

1. **Muggia L**, Nelsen MP, Kirika PM, Barreno E, Beck A, Trebouxia working group, Lindgren H, Lumbsch HT, Leavitt SD. 2020. Formally described species woefully underrepresent phylogenetic diversity in the common lichen photobiont genus *Trebouxia* (Trebouxiophyceae, Chlorophyta): An impetus for developing an integrated taxonomy. *Molecular Phylogenetics and Evolution* (in press).
2. Bradshaw M, Grew F, Thomas A, Harrison CH, Lindgren H, **Muggia L**, St Clair LL, Lumbsch HT, Leavitt SD. 2020. Characterizing the ribosomal tandem repeat and its utility as a DNA barcode in lichen-forming fungi. *BMC Evolutionary Biology* **20**: 2. https://doi.org/10.1186/s12862-019-1571-4.
3. Banchi E., Ametrano CG, Greco S, Stanković D, **Muggia L**, Pallavicicini A. 2020. PLANiTS: a curated sequence reference dataset for plant ITS DNA metabarcoding. *DATABASE 2020*, baz155.
4. **Muggia L**, Pérez-Ortega S, Ertz D. 2019. *Muellerella*, a lichenicolous fungal genus recovered as polyphyletic within Chaetothyriomycetidae (Eurotiomycetes, Ascomycota). *Plant and Fungal Systematic* **64 (2)**: 367–381.
5. Ametrano CG, Grewe F, Crous PW, Goodwin SB, Liang C, Selbmann L, Lumbsch HT, Leavitt SD, **Muggia L**. 2019. Genome-scale data resolve ancestral rock-inhabiting lifestyle in Dothideomycetes (Ascomycota). *IMA Fungus* **10**: 19.
6. Ametrano C, Knudsen K, Kocourkova J, Grube M, Selbmann L, **Muggia L**. 2019. Phylogenetic relationships of rock-inhabiting black fungi belonging to the widespread genera *Lichenothelia* and *Saxomyces*. *Mycologia* **111**: 127–160.
7. Fernandez-Brime S, **Muggia L**, Maier S, Grube M, Wedin M. 2019. Bacterial communities in an optional lichen symbiosis are determined by substrate, not algal photobionts. *FEMS Microbiology Ecology* fiz012(accepted, https://doi.org/10.1093/femsec/fiz012).
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11. Vančurová L, **Muggia L**, Peksa O, Řídká T, Škaloud P. 2018. The complexity of symbiotic interactions influences the ecological amplitude of the host: a case study in *Stereocaulon* (lichenized Ascomycota). *Molecular Ecology* **27**: 3016–3033.

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13. **Muggia L**, Vasiliki K, Rohrer A, Halley J, Mayrhofer H. 2018. Species diversity of lichens in the sacred groves of Epirus (Greece). *Herzogia* **31**: 231-244.
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20. Grube M, Avery SV, Bendiksby M, Eivindsen T, Fernstad SJ, Gaya E, Kauserud H, Kõljalg U, **Muggia L**, Smith AM. 2017. The next generation fungal biologist. *Fungal Biology Review* **31(3)**: 124–130. IF: 4,357
21. Ametrano CG, Selbmann L, **Muggia L**. 2017. A standardized approach for co-culturing Dothidealean rock-inhabiting fungi and lichen photobionts *in vitro*. *Symbiosis* 73: 35–44. IF 1,25
22. Santi E, Bacaro G, Rocchini D, Chiarucci A, Bonini I, Brunialti G, **Muggia L**, Maccherini S, (2016) 2017. Methodological issues in exploring cross-taxon congruence across vascular plants, bryophytes and lichens. *Folia Geobotanica* **51(4)**: 297–304. IF:1,46
23. Moya P, Molins AA, Ânez-Alberola FM, **Muggia L**, Barreno E. 2017. Unexpected associated microalgal diversity in the lichen *Ramalina farinacea* is uncovered by pyrosequencing analyses. *PLoS ONE* **12(4)**: e0175091.
24. Cestaro L, Tønsberg T, **Muggia L**. 2016. Phylogenetic data and chemical traits characterize a new species in the lichen genus *Tephromela*. *Herzogia* **29(2)**: 383-402. IF 0,82
25. **Muggia L**, Fernadez-Brime S, Grube M, Wedin M, 2016. *Schizoxylon* as an experimental model for studying interkingdom symbiosis. *FEMS Microbiology Ecology* **92**: fiw165. IF 3,530
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29. **Muggia L**, Fleischhacker A, Kopun T, Grube M, 2016. Extremotolerant fungi from alpine rock lichens and their phylogenetic relationships. *Fungal Diversity* **76**: 119-142. IF 6,221

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35. Spribille T, Tønsberg T, Stabenteiner E, **Muggia L**, 2014. Reassessing evolutionary relationships in Siplonema (Peltigerales, Lecanoromycetes). *Lichenologist* **46**: 373–388. IF 1,135
36. **Muggia L**, Perez-Ortega S, Fryday A, Spribille T, Grube M, 2014. Global assessment of genetic variation and phenotypic plasticity in the lichen-forming species *Tephromela atra*. *Fungal Diversity* **64**: 233–251. IF 6,221
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38. **Muggia L**, Klug B, Berg G, Grube M, 2013. Localization of bacteria in lichens from Alpine soil crusts by fluorescence in situ hybridization. *Applied Soil Ecology* **68**: 20–25. IF 2,106
39. Spribille T, **Muggia L**. 2013. Expanded taxon sampling disentangles evolutionary relationships and reveals a new family in Peltigerales (Lecanoromycetidae, Ascomycota). *Fungal Diversity* **58**: 171–184. IF 6,221
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42. Gostincar C, **Muggia L**, Grube M, 2012. Polyextremotolerant black fungi: oligotrophism, adaptive potential, and a link to lichen symbioses. *Frontiers in Microbiology* **3**: 390. IF: 4,53
43. Printzen C, Fernandez-Mendoza F, **Muggia L**, Berg G, Grube G, 2012. Alphaproteobacterial communities in geographically distant populations of the lichen *Cetraria aculeata*. *FEMS Microbiology Ecology* 82: 316-325. IF 3,563
44. **Muggia L**, Nelson P, Wheeler T, Yakovchenko LS, Tonsberg T, Spribille T, 2011. Convergent evolution in a symbiotic duet: the case of the lichen genus *Polychidium* (Peltigerales, Ascomycota). *American Journal of Botany* **98:** 1647-1656. IF 2,586
45. Thüs H, **Muggia L**, Pérez-Ortega S, Favero-Longo SE, Joneson S, O'Brien H, Nelsen MP, Duque-Thüs R, Grube M, Friedl T, Brodie J, Andrew CJ, Lücking R, Lutzoni F, Gueidan C, 2011. Revisiting photobiont diversity in the lichen family Verrucariaceae (Ascomycota). *European Journal of Phycology* **46**(4): 399-415. IF 1,912
46. Spribille T, Goffinet B, Klug B, **Muggia** L, Obermayer W, Mayrhofer H, 2011. Molecular support for the recognition of the *Mycoblastus fucatus* group as the new genus *Violella* (*Tephromelataceae, Lecanorales*). *The Lichenologist* **43** (5): 445-466. IF 1,135

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49. **Muggia L**, Gueidan C, Grube M, 2010. Phylogenetic placement of some morphologically unusual member of Verrucariaceae. *Mycologia* **102**: 835-846. IF 2,11
50. **Muggia L**, Grube M, 2010. Type III polyketide synthases in lichen mycobionts. *Fungal Biology* **114**: 379-385. IF 2,082
51. **Muggia L**, Grube M, 2010. Fungal composition of lichen thalli assessed by single strand conformation polymorphism. *Lichenologist* **42**: 1-13. IF 1,135
52. Nelsen Mp, Lücking R, Grube M, Mbatchou GS, **Muggia L**, Rivas Plata E, Lumbsch HT, 2009. Unravelling the phylogenetic relationships of lichenized fungi in Dothideomyceta. *Study in Mycology* **64**: 135-144. IF 6,231
53. Schoch CL, Crous PW, Groenewald JZ, Boehm EWA, Burgess TI, De Gruyter J, de Hoog GS, Dixon LJ, Grube M, Gueidan C, Harada Y, Hatakeyama S, Hirayama K, Hosoya T, Hyde KD, Jones EBG, Kohlmeyer J, Kruys A, Lücking R, Lumbsch TH, Lutzoni F, Marvanová L, McVay AH, Mbatchou JS, Miller AN, Mugambi GK, **Muggia L**, Nelsen MP, Nelson P, Owensby CA, Li YM, Phillips AJL, Phongpaichit S, Pointing SB, Pujade-Renaud V, Raja HA, Rivas Plata E, Robbertse B, Ruibal C, Sakayaroj J, Sano T, Selbmann L, Shearer CA, Shirouzu T, Slippers B, Suetrong S, Tanaka K, Volkmann-Kohlmeyer B, Wingfield MJ, Wood AR, Woudenberg JHC, Yonezawa H, Zhang Y, Spatafora JW, 2009. A class-wide phylogenetic assessment of Dothideomycetes. *Study in Mycology* **64**: 1-15. IF 6,231
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55. **Muggia L**, Gueidan C, Perlmutter GB, Eriksson OE, Grube M, 2009. Molecular data confirm the position of *Flakea papillata* in the Verrucariaceae. *Bryologist* **15**: 538-543. IF 0,977
56. Brunauer G, **Muggia L**, Stocker-Wörgötter E, Grube M, 2009. A transcribed polyketide synthase gene from *Xanthoria elegans*. *Mycological Research* **113**: 82-92. IF 2,082
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60. **Muggia L**, Hafellner J, Wirtz N, Hawksworth DL, Grube M, 2008. The sterile microfilamentous lichenized fungi *Cystocoleus ebeneus* and *Racodium rupestre* are relatives of plant pathogens and clinically important dothidealean fungi. *Mycological Research* **112**: 50-56. IF 2,921
61. **Muggia L**, Schmitt I, Grube M, 2008. Purifying selection is a prevailing motif in the evolution of ketoacyl synthase domains of polyketide synthases from lichenized fungi. *Mycological Research* **112**: 277-288. IF 2,082

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63. Harutyunyan S, **Muggia L**, Grube M, 2008. Black fungi in lichens from seasonally arid habitats. *Study in Mycology* **61**: 83-90. IF 6,231
64. Tretiach M, **Muggia L**, 2006. *Caloplaca badioreagens*, a new calcicolous, endolithic lichen from Italy. *Lichenologist* **38**: 223-229. IF 1,135

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1. Grube M, **Muggia L**, 2013. Success by flexible management of algal partners. Lichen Symbiosis. *The Biochemist* **35**: 10-13.
2. Hafellner J, **Muggia L**, Obermayer W, 2012. *Rinodina candidogrisea*, a new sorediate species from high altitudes in the Alps. *Bibliotheca Lichenologica* **108**: 75-100.
3. **Muggia L**, Schmitt I, Grube M, 2009. Lichens as treasure chests of natural products. *Society of Industrial Microbiology News*, pp. 85-97.
4. Hafellner J, **Muggia L**, 2006. Über Vorkommen von *Caloplaca erodens* in der Steiermark (Österreich). *Mitteilungen des Naturwissenschaftlichen Vereines für Steiermark* **135**: 33-49.

Book chapters

1. Ametrano CG, **Muggia L**, Grube M. 2019. Extremotolerant black fungi from rocks and lichens. In: Tiquia-Arashiro SM, Grube M (eds.), Fungi in Extreme Environments: Ecological Role and Biotechnological Significance. Springer Nature Switzerland, pp. 119-143.
2. **Muggia L**, Candotto Carniel F, Grube M. 2017. The lichen photobiont *Trebouxia*: towards and appreciation of species diversity and molecular studies. In: Grube M, Seckbach J, **Muggia L** (eds) *Algal and Cyanobacteria Symbioses*. World Scientific Publisher, pp 111-146.
3. Grube M, **Muggia L**, Baloch E, Hametner C, Stocker-Wörgötter E, 2017. Symbioses of lichen-forming fungi with Trentepohlialean algae. In: Grube M, Seckbach J, **Muggia L** (eds) *Algal and Cyanobacteria Symbioses*. World Scientific Publisher, pp 85-110.
4. Maier S, **Muggia L**, Kuske CR, Grube M. 2016. Bacteria and non-lichenized fungi within biological soil crust. In: Weber B, Budel B, Belnap J (eds) Biological soil crusts: an organizing principle in drylands. Springer, pp. 81-100.
5. Grube M, **Muggia L**, Gostinčar C, 2013. Niches and adaptation of polyextremotolerant black fungi. In: Seckbach J, Oren A, Stan-Lotter E (eds), Polyextremophiles. Life under multiple forms of stress. Springer, pp 551-566.
6. Grube M, **Muggia L**, 2010. Identifying algal symbionts in lichen symbiosis. In: Nimis PL, VLRe (ed) Tools for Identifying Biodiversity: Progress and problems, pp. 295-299.
7. Grube M, Rabensteiner J, Grube U, **Muggia L**, 2010. Architectures of biocomplexity: lichen-dominated soil crusts and mats. In: Seckbach J, Oren A (eds), Microbial Mats. Modern and ancient microorganisms in stratified systems. Springer, pp. 341-357.

3. Description of teaching

TEACHING EXPERIENCE (language of teaching)

2004, Coordinator together with Prof. Mauro Tretiach and Prof. Dr. Martin Grube of the course "Techniques of DNA analysis in lichenology" organized by the Italian Lichen Society, 13-18 September, University of Trieste, Italy (Italian)

2011, "Special chapter about evolution and systematic of plants and fungi by applying CLS- microscopy methods", Seminar for Doctoral Study in Plant Science, academic year 2010/2011 (651.606; 30 hours course, 2 semester hours), Karl-Franzens University of Graz (Austria). (English)

2012, "Morphology and systematic of medical plants" for Diploma study in Pharmacy, academic year 2011/2012 (651.967; 30 hours course, 2 semester hours), Karl-Franzens University of Graz (Austria). (German)

2012, Seminar for Doctoral Study in Plant Science, "Special chapter about evolution and systematic of plants and fungi by applying CLS- microscopy methods", academic year 2012/2013 (651.606; 30 hours course, 2 semester hours), University of Graz (Austria). (English)

2013, "Morphology and systematic of medical plants" for Diploma study in Pharmacy, academic year 2012/2013 (651.967; 30 hours course, 2 semester hours), Karl-Franzens University of Graz (Austria). (German)

2013, Module "Lebensraum Alpen", Bachelor study in Biology, student field excursion at Planner Alm (Styria, Austria), academic year 2012/2013 (635.087; 45 hours course, 3 semester hours), Karl-Franzens University of Graz (Austria). (German)

2013, Molecular Systematics (668SM, SM56-Environmental Biology, BIO/01; 48 hour course, 6 CFU credits), Master study in Environmental Biology, academic year 2013/2014, University of Trieste (Italy). (German)

2014, Molecular Systematics (668SM, SM56-Environmental Biology, BIO/01; 48 hour course, 6 CFU credits), Master study in Environmental Biology, academic year 2014/2015, University of Trieste (Italy). (English)

2015, Module "Lebensraum Alpen", Bachelor study in Biology, student field excursion at Planner Alm (Styria, Austria), academic year 2013/2014 (635.087; 45 hours course, 3 semester hours), Karl-Franzens University of Graz (Austria). (German)

2015, Genetics and molecular biology for environmental analysis (633 SM), Master study in Ecology of Climate Changes (SM57); 48 hour course, 6 CFU credits), academic year 2015/2016, University of Trieste, Italy. (English)

2016, Module "Lebensraum Alpen", Bachelor study in Biology, student field excursion at Planner Alm (Styria, Austria), academic year 2013/2014 (635.087; 45 hours course, 3 semester hours), Karl-Franzens University of Graz (Austria). (German)

2016, Genetics and molecular biology for environmental analysis (633 SM), Master study in Ecology of Climate Changes (SM57); 48 hour course, 6 CFU credits, academic year 2016/2017, University of Trieste (Italy). (English)

2016, Laboratory of Plant Histology (SM621), Bachelor study of Science and Technology for Environment and Nature; 36 hour course, 3 CFU credits, academic year 2016/2017, University of Trieste (Italy). (Italian)

2017, Genetics and molecular biology for environmental analysis (633 SM), Master study in Ecology of Climate Changes (SM57); 48 hour course, 6 CFU credits, academic year 2017/2018, University of Trieste (Italy). (English)

2017, General Botany (SM621), Bachelor study of Science and Technology for Environment and Nature (SM40); 48 hour course, 9 CFU credits, academic year 2017/2018, University of Trieste (Italy). (Italian)

2018, General Botany (SM621), Bachelor study of Science and Technology for Environment and Nature (SM40); 48 hour course, 9 CFU credits, academic year 2017/2018, University of Trieste (Italy). (Italian)

2019, General Botany (SM621), Bachelor study of Science and Technology for Environment and Nature (SM40); 48 hour course, 9 CFU credits, academic year 2017/2018, University of Trieste (Italy). (Italian)

2019, Cladistics and phylogeography (633 SM), Master study in Ecology of Climate Changes (SM57); 48 hour course, 6 CFU credits, academic year 2019/2020, University of Trieste (Italy). (English)

SUPERVISION OF STUDENTS

2009 Co-supervisor of one master thesis, Study in Biodiversity and Biomonitoring of Terrestrial Ecosystems, University of Trieste (Italy).

2012-2015 Co-supervisor of one PhD student and 1 laboratory project (Karl-Franzens University of Graz, Austria).

2013 Advisor of PhD student from Czech Republic during 2-month visit in Graz for the *Aktion* Austria-Czech Republic (project research).

2014-2015 Supervisor of one master thesis for the master degree of Environmental Biology, University of Trieste (Italy).

2016 Supervisor of one master thesis for the master degree of Ecology of Climate Changes University of Trieste (Italy).

2014-2017 Co-supervisor (ongoing) of one PhD thesis within the Doctoral Program "Environmental Life Sciences", University of Trieste (Italy).

2015-2018 Supervisor of one PhD thesis within the Doctoral Program "Environmental Life Sciences", University of Trieste (Italy).

2019-2022 Supervisor of one PhD thesis within the Doctoral Program "Environmental Life Sciences", University of Trieste (Italy), ongoing.

4. List of projects and cooperations

INTERNATIONAL PROJECTS AND COOPERATIONS

2010-2011 Project OEAD "Symbiotic selection arenas in lichens" in collaboration with the University of Prague; partner: Dr. Pavel Skaloud, Department of Botany, Charles University, Prague.

2012-2015 Project leader of the research project FWF P24114-B16 "Alpine lichen as hot-beds for fungal diversification" financed by the Austrian Science Fund FWF (Fonds zur Förderung der Wissenschaftlichen Forschung), Karl-Franzens University Graz, period 3 years (01/03/2012-28/02/2015).

2013-2015 Collaborator in the project "Lichen Inventory for the Southwest Alaska Network" (financed by NSF, project coordinator Dr. Bruce McCune, Oregon State University, Corvallis, Oregon, U.S.A.; study n. KATM-00108).

2013-2015 Collaborator in the project "Religion working for conservation: the sacred groves of Epirus"(project coordinator Dr. John Healy, University of Joannina, Greece); co-financed by the European Union (European Social Fund – ESF) and the Greek national funds through the Operational Program "Education and Lifelong Learning" of the National Strategic Reference Framework (NSRF) - Research Funding Program: THALIS. Investing in knowledge society through the European Social Fund.

2013-2016 Collaborator in the project "Fungal phylogeny and evolution", project coordinator Prof. Mats Wedin, financed by the Swedish Research Council (project n. VR621-2012-3990), Sweden.

2017-2019 Collaborator in the project "Novel interdisciplinary perspective on the complexity of lichen symbiosis: a genomic and functional study of microalgae and bacteria. SYMBIOLICHEN", project

coordinator Prof. Eva Barreno Rodríguez, financed by the Ministerio Economía y Competitividad (project n. CGL2016-79158-P), Spain.

ITALIAN NATIONAL PROJECTS

2014-2016 Project leader of the project FRA-2014 (individual project) "Analyses of symbiotic associations in vitro by studying the *Schizoxylon-Coccomyxa* system" financed by the University of Trieste.

2016-2018 Project leader of the project FRA-2016 (intra-department project) "Development of NGS meta-barcoding for the characterization of aerobiological samples" financed by the University of Trieste.

2020-2023 Project leader of the Italian national project PRIN17 (linea giovani) "Stability and variation of lichen mycobiomes -LiMycS".

2020-2022 Project leader of the Italian national project PNRA18 (National projects for Research in Antarctics) "The Antartic lichen as evolutionary niches for microbial diversification - THALLI" (project n. PNRA18-00056)