

## Symbiosis Directory

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Vesicular-arbuscular mycorrhizae

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associations

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Nitrogen fixation, symbiosis in legume  
nodules

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Cyanobacteria-plant symbioses

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Microbial symbiosis in termites, macrobic  
bacteria, invertebrate macrofauna in soil

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Marine behavioral symbioses,  
fish-anemone, crab-anemone,  
shrimp-anemone; behavioral ecology,  
coevolution

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Physiology and ecology of  
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Mycorrhiza

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Ecology and systematics of  
ectomycorrhizal fungi, biodiversity  
assessment methodology for  
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Crab-invertebrate symbioses

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*Bradyrhizobium*, nitrate reduction and  
nitrogen fixation, legume mutants for  
nodulation and nitrogen fixation

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Ectomycorrhizae of temperate forests,  
nitrogen fixation and tuberculate  
mycorrhizae, soil organisms, soil physical  
and chemical properties and forest  
productivity

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Plant *Rhizobium* biochemistry

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Forest soil microbiology

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Carbon and nitrogen metabolism of  
symbiotic anthozoa, carbon and energy  
budgets

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Symbiotic interaction between  
*Azorhizobium caulinodans* ORS571 and  
*Sesbania rostrata*, and *Rhizobium*  
*meliloti* and alfalfa; stem-nodulation;  
nitrogen fixation; nodulin gene  
regulation; environm. control of gene  
expression in *Rhizobium*

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Nitrogen fixation

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Ecology of *Rhizobium* and *Frankia* in  
soil, inoculant technology

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Ciliates, chloroplast "symbiosis",  
mixotrophy, planktonic symbiosis

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Symbioses between infusoria and their  
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Organic acid metabolism in the  
*Bradyrhizobium japonicum* soybean  
symbiosis

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Endomycorrhizas, ectomycorrhizas

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Mycorrhiza

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Actinorhizal and cyanobacterial  
symbiosis

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Anaerobic protozoan consortia

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Physiology and ecology of hydrothermal  
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chemoautotrophic symbioses,  
methanotrophic symbiosis

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Endocytobionts of Protista, especially  
bacterial and endocytobionts of  
ciliophora

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Applied microbiology, symbiosis,  
interaction among microorganisms,  
plant-microorganisms associations,  
application of N-15 trace techniques

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Biology of lichen symbiosis

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Lichens: gas exchange, Antarctic, stress  
water relations, growth

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Plant-fungus interactions, endophytic  
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Studies on vesicular-arbuscular  
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Biological nitrogen fixation and nitrate  
metabolism, primarily soybean

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VAM, rhizobia

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Environm. introduction of recombinant  
strains, bacterial systematics, soil  
microbiology, microbial and plant  
molecular genetics, *Pseudomonas*,  
*Agrobacterium*, rhizobia

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Free-living nitrogen fixers in plant root  
zones, plant-fungus-insect interactions

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Lichens, symbiont development and  
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VA mycorrhizal symbiosis

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Arbuscular mycorrhiza, *Frankia*,  
production of monoclonal antibodies for  
surface antigens of arbuscular  
mycorrhizal fungi and *Frankia*

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Legume-*Rhizobium* interactions,  
leghemoglobin; plant growth promoting  
rhizobacteria in agriculture and forestry;  
PGPR-*Rhizobium* interactions

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Ecology and ecophysiology of arbuscular  
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Molecular signals in legume-*Rhizobium*  
interaction, nodulation genes, cellular  
events in early events

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Physiological aspects of nitrogen fixation,  
native rhizobial populations, virus  
inspection

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Effects of tropical mycorrhizae on the  
composition and structure of natural and  
agro-ecosystems

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*Gunnera-Nostoc*, cyanobacterial  
symbiosis, infection process

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Arbuscular mycorrhiza

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Forest soil microbiology

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Termites and their gut microbes;  
microbial molecular systematics and  
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Legume-*Rhizobium* symbiosis

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Ectomycorrhizas, ecological physiology

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*Rhizobium*-inoculants, ecology of  
*Rhizobium*

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*Azolla-Anabaena* symbiosis: molecular  
and biochemical aspects

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Alga-ciliate symbiosis, alga-invertebrate  
symbiosis

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Molecular ecology of *Rhizobium*  
*galegae* and rhizobia infecting tropical  
leguminous trees

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Metabolism of symbiotic algae



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Role of vesicular-arbuscular  
mycorrhizae on intra-specific  
competition, evolution of mycorrhizae  
and symbioses in general

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Legume symbioses, rhizobia,  
mycorrhiza, DRB-interaction

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Ediacaran biota, Garden of Ediacara  
hypothesis, early animals, early life on  
land, Hypersea

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Symbiosis bacteria-molluscs,  
chemosynthesis

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Forest microbiology, *Frankia-Casuarina*  
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agroforestry systems in the tropics

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Development and cytology of nitrogen  
fixing root nodules

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*Rhizobium meliloti* symbiosis; surface  
carbohydrates in plant microbe  
interaction; symbiotic/parasitic  
interactions in alfalfa

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Symbioses involving insects, especially  
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*Gunnere-Nostoc*, symbiosis spec. genes

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*Rhizobium* infection of legumes

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Symbiosis in Protozoa, particularly  
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 Bacterial light organ symbiosis, bacterial  
 symbiotic development specificity of  
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Molecular biology of *Bradyrhizobium japonicum*-soybean symbiosis; molecular genetics; plant molecular biology

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Cultivation of lichens and lichen bionts,  
Cladoniaceae, lichens and cyanobacteria,  
N-metabolism of lichens,  
photosymbiodemes; plant symbioses.

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Forest soil microbiology

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*Frankia*, actinorhizal plants, nitrogen  
fixation

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Mycorrhizae, hypogeous fungi, evolution

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Symbiosis; algal-invertebrate  
associations, dinoflagellate  
phylogenetics, recognition,  
macromolecular signals

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*Rhizobium*-legume symbioses

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Evolutionary relationships among  
cyanobacteria and plastids

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*Azolla-Anabaena* symbiosis:  
morphological and physiological aspects,  
agricultural potentials and utilization

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Rhizosphere ecology, microbial  
engineering, plant engineering, bacterial  
genetics

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*Rhizobium, Frankia*, nitrogen fixation of woody species, genetics of nitrogen fixing bacteria

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Foraminifera: Ecology, biology, symbiosis: today and in the geologic past

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Mycorrhizal ecology, resource partitioning in mycorrhizas continuum of symbiotic relations from parasitism to mutualism, application of knowledge about symbiotic microbial associations to sustainable ecosystem management

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Behavioral interactions between sea anemones and invertebrates

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*Rickettsia*-like symbionts that induce unisexual reproduction in parasitic wasps, biological control

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 Germany  
 Biochemistry and isotope discrimination in lichens

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