

# Stanford

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## Kabir Peay

Associate Professor of Biology and Senior Fellow at the Woods Institute for the Environment

 Curriculum Vitae available Online

### Bio

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#### BIO

I completed a master's degree at the Yale School of Forestry and Environment Science (F&ES) in 2003 and obtained my PhD in 2008 from UC Berkeley's Dept. of Environmental Science, Policy and Management (ESPM) in Matteo Garbelotto's lab. I did my postdoctoral training at UC Berkeley in the Dept. of Plant & Microbial Biology with Tom Bruns, and at Stanford in the Dept. of Biology with Tadashi Fukami. I was an Assistant Professor in the Dept. of Plant Pathology at the University of Minnesota from 2011-2012 before coming to Stanford in 2012 to join the Dept. of Biology in my current position.

#### ACADEMIC APPOINTMENTS

- Associate Professor, Biology
- Senior Fellow, Stanford Woods Institute for the Environment
- Member, Bio-X
- Senior Fellow, Stanford Woods Institute for the Environment

#### PROFESSIONAL EDUCATION

- PhD, UC Berkeley (2008)
- MEd, Yale School of Forestry (2003)

#### LINKS

- Peay lab site: <http://www.stanford.edu/~kpeay/index.html>
- Dimensions of Biodiversity Project Site: [http://www.stanford.edu/~kpeay/DOB\\_Home.html](http://www.stanford.edu/~kpeay/DOB_Home.html)

### Research & Scholarship

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#### CURRENT RESEARCH AND SCHOLARLY INTERESTS

Our lab studies the ecological processes that structure natural communities and the links between community structure and the cycling of nutrients and energy through ecosystems. We focus primarily on fungi, as these organisms are incredibly diverse and are the primary agents of carbon and nutrient cycling in terrestrial ecosystems.

Much of our research focuses on plant-fungal root associations, better known as mycorrhizas, which constitute one of the most pervasive mutualisms in terrestrial ecosystems. We work on questions at three scales of this symbiosis, (1) how does environmental variation and functional variation in mycorrhizal fungi affect the symbiosis at the root tip scale, (2) how does dispersal contribute to the predictability of community assembly patterns at the landscape scale, and (3) how does biogeography affect mycorrhizal community structure and ecosystem function? By integrating these three levels of research we hope to build a 'roots-to-biomes' understanding of plant-microbe symbiosis.

## Teaching

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### COURSES

#### 2019-20

- Introduction to Ecology: BIO 81 (Aut)

#### 2018-19

- The Hidden Kingdom - Evolution, Ecology and Diversity of Fungi: BIO 115, BIO 239 (Win)

#### 2017-18

- Introduction to Ecology: BIO 81 (Aut)
- The Hidden Kingdom - Evolution, Ecology and Diversity of Fungi: BIO 115, BIO 239 (Win)

#### 2016-17

- Ecology: BIO 101 (Aut)

### STANFORD ADVISEES

#### Doctoral Dissertation Reader (AC)

Callie Chappell, Suchana Costa, Lizzie Paulus, Rolando Perez, Sergio Redondo, Priscilla San Juan, Jeffrey Smith

#### Postdoctoral Faculty Sponsor

Brian Steidinger, Michael Van Nuland, Claire Willing

#### Doctoral Dissertation Advisor (AC)

Caroline Daws, Glade Dlott, Suzanne Ou, Gabriel Smith

#### Doctoral Dissertation Co-Advisor (AC)

Rachel Engstrand

#### Doctoral (Program)

Caroline Daws, Glade Dlott, Suzanne Ou, Gabriel Smith

### GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

- Biology (School of Humanities and Sciences) (Phd Program)

## Publications

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### PUBLICATIONS

- **Plant selection initiates alternative successional trajectories in the soil microbial community after disturbance** *ECOLOGICAL MONOGRAPHS*  
Duhamel, M., Wan, J., Bogar, L. M., Segnitz, R., Duncritts, N. C., Peay, K. G.  
2019; 89 (3)
- **Structure and function of the bacterial and fungal gut microbiota of Neotropical butterflies** *ECOLOGICAL MONOGRAPHS*  
Ravenscraft, A., Berry, M., Hammer, T., Peay, K., Boggs, C.  
2019; 89 (2)
- **No evidence that gut microbiota impose a net cost on their butterfly host** *MOLECULAR ECOLOGY*  
Ravenscraft, A., Kish, N., Peay, K., Boggs, C.  
2019; 28 (8): 2100–2117
- **Plant-mediated partner discrimination in ectomycorrhizal mutualisms** *MYCORRHIZA*  
Bogar, L., Peay, K., Kornfeld, A., Huggins, J., Hortal, S., Anderson, I., Kennedy, P.

2019; 29 (2): 97–111

- **No evidence that gut microbiota impose a net cost on their butterfly host.** *Molecular ecology*  
Ravenscraft, A., Kish, N., Peay, K., Boggs, C.  
2019
- **Plant-mediated partner discrimination in ectomycorrhizal mutualisms.** *Mycorrhiza*  
Bogar, L., Peay, K., Kornfeld, A., Huggins, J., Hortal, S., Anderson, I., Kennedy, P.  
2019
- **Trait plasticity is more important than genetic variation in determining species richness of associated communities** *JOURNAL OF ECOLOGY*  
Barbour, M. A., Erlandson, S., Peay, K., Locke, B., Jules, E. S., Crutsinger, G. M.  
2019; 107 (1): 350–60
- **Core microbiomes for sustainable agroecosystems (vol 4, pg 247, 2018)** *NATURE PLANTS*  
Toju, H., Peay, K. G., Yamamichi, M., Narisawa, K., Hiruma, K., Naito, K., Fukuda, S., Ushio, M., Nakaoka, S., Onoda, Y., Yoshida, K., Schlaeppli, K., Bai, et al  
2018; 4 (9): 733
- **Litter chemistry influences decomposition through activity of specific microbial functional guilds** *ECOLOGICAL MONOGRAPHS*  
Bhatnagar, J. M., Peay, K. G., Treseder, K. K.  
2018; 88 (3): 429–44
- **Competition-colonization tradeoffs structure fungal diversity** *ISME JOURNAL*  
Smith, G. R., Steidinger, B. S., Bruns, T. D., Peay, K. G.  
2018; 12 (7): 1758–67
- **Core microbiomes for sustainable agroecosystems** *NATURE PLANTS*  
Toju, H., Peay, K. G., Yamamichi, M., Narisawa, K., Hiruma, K., Naito, K., Fukuda, S., Ushio, M., Nakaoka, S., Onoda, Y., Yoshida, K., Schlaeppli, K., Bai, et al  
2018; 4 (5): 247–57
- **Soil abiotic variables are more important than Salicaceae phylogeny or habitat specialization in determining soil microbial community structure** *MOLECULAR ECOLOGY*  
Erlandson, S., Wei, X., Savage, J., Cavender-Bares, J., Peay, K.  
2018; 27 (8): 2007–24
- **Timing of mutualist arrival has a greater effect on Pinus muricata seedling growth than interspecific competition** *JOURNAL OF ECOLOGY*  
Peay, K. G.  
2018; 106 (2): 514–23
- **Competition-colonization tradeoffs structure fungal diversity.** *The ISME journal*  
Smith, G. R., Steidinger, B. S., Bruns, T. D., Peay, K. G.  
2018
- **Effect of Simulated Climate Warming on the Ectomycorrhizal Fungal Community of Boreal and Temperate Host Species Growing Near Their Shared Ecotonal Range Limits** *MICROBIAL ECOLOGY*  
Mucha, J., Peay, K. G., Smith, D. P., Reich, P. B., Stefanski, A., Hobbie, S. E.  
2018; 75 (2): 348–63
- **Soil Type Has a Stronger Role than Dipterocarp Host Species in Shaping the Ectomycorrhizal Fungal Community in a Bornean Lowland Tropical Rain Forest** *FRONTIERS IN PLANT SCIENCE*  
Essene, A. L., Shek, K. L., Lewis, J. D., Peay, K. G., McGuire, K. L.  
2017; 8: 1828
- **Geographical Variation in Community Divergence: Insights from Tropical Forest Monodominance by Ectomycorrhizal Trees** *AMERICAN NATURALIST*  
Fukami, T., Nakajima, M., Fortunel, C., Fine, P. A., Baraloto, C., Russo, S. E., Peay, K. G.  
2017; 190: S105–S122
- **Convergence and contrast in the community structure of Bacteria, Fungi and Archaea along a tropical elevation-climate gradient.** *FEMS microbiology ecology*  
Peay, K. G., von Sperber, C., Cardarelli, E., Toju, H., Francis, C. A., Chadwick, O. A., Vitousek, P. M.  
2017; 93 (5)

- **Continental-level population differentiation and environmental adaptation in the mushroom *Suillus brevipes*** *MOLECULAR ECOLOGY*  
Branco, S., Bi, K., Liao, H., Gladieux, P., Badouin, H., Ellison, C. E., Nguyen, N. H., Vilgalys, R., Peay, K. G., Taylor, J. W., Bruns, T. D.  
2017; 26 (7): 2063-2076
- **Controls of nitrogen cycling evaluated along a well-characterized climate gradient.** *Ecology*  
von Sperber, C., Chadwick, O. A., Casciotti, K. L., Peay, K. G., Francis, C. A., Kim, A. E., Vitousek, P. M.  
2017
- **Survey of corticioid fungi in North American pinaceous forests reveals hyperdiversity, underpopulated sequence databases, and species that are potentially ectomycorrhizal** *MYCOLOGIA*  
Rosenthal, L. M., Larsson, K., Branco, S., Chung, J. A., Glassman, S. I., Liao, H., Peay, K. G., Smith, D. P., Talbot, J. M., Taylor, J. W., Vellinga, E. C., Vilgalys, R., Bruns, et al  
2017; 109 (1): 115-127
- **Continental-level population differentiation and environmental adaptation in the mushroom *Suillus brevipes*.** *Molecular ecology*  
Branco, S., Bi, K., Liao, H., Gladieux, P., Badouin, H., Ellison, C. E., Nguyen, N. H., Vilgalys, R., Peay, K. G., Taylor, J. W., Bruns, T. D.  
2016
- **Dimensions of biodiversity in the Earth mycobiome** *NATURE REVIEWS MICROBIOLOGY*  
Peay, K. G., Kennedy, P. G., Talbot, J. M.  
2016; 14 (7): 434-447
- **Common foliar fungi of *Populus trichocarpa* modify *Melampsora* rust disease severity** *NEW PHYTOLOGIST*  
Busby, P. E., Peay, K. G., Newcombe, G.  
2016; 209 (4): 1681-1692
- **Soil moisture and chemistry influence diversity of ectomycorrhizal fungal communities associating with willow along an hydrologic gradient.** *FEMS microbiology ecology*  
Erlandson, S. R., Savage, J. A., Cavender-Bares, J. M., Peay, K. G.  
2016; 92 (1)
- **Common foliar fungi of *Populus trichocarpa* modify *Melampsora* rust disease severity.** *The New phytologist*  
Busby, P. E., Peay, K. G., Newcombe, G.  
2016; 209 (4): 1681-92
- **The Mutualistic Niche: Mycorrhizal Symbiosis and Community Dynamics** *ANNUAL REVIEW OF ECOLOGY, EVOLUTION, AND SYSTEMATICS, VOL 47*  
Peay, K. G.  
2016; 47: 143-164
- **Competition-function tradeoffs in ectomycorrhizal fungi.** *PeerJ*  
Moeller, H. V., Peay, K. G.  
2016; 4
- **Functional guild classification predicts the enzymatic role of fungi in litter and soil biogeochemistry** *SOIL BIOLOGY & BIOCHEMISTRY*  
Talbot, J. M., Martin, F., Kohler, A., Henrissat, B., Peay, K. G.  
2015; 88: 441-456
- **Lack of host specificity leads to independent assortment of dipterocarps and ectomycorrhizal fungi across a soil fertility gradient** *ECOLOGY LETTERS*  
Peay, K. G., Russo, S. E., McGuire, K. L., Lim, Z., Chan, J. P., Tan, S., Davies, S. J.  
2015; 18 (8): 807-816
- **Genetic isolation between two recently diverged populations of a symbiotic fungus** *MOLECULAR ECOLOGY*  
Branco, S., Gladieux, P., Ellison, C. E., Kuo, A., LaButti, K., Lipzen, A., Grigoriev, I. V., Liao, H., Vilgalys, R., Peay, K. G., Taylor, J. W., Bruns, T. D.  
2015; 24 (11): 2747-2758
- **A continental view of pine-associated ectomycorrhizal fungal spore banks: a quiescent functional guild with a strong biogeographic pattern** *NEW PHYTOLOGIST*  
Glassman, S. I., Peay, K. G., Talbot, J. M., Smith, D. P., Chung, J. A., Taylor, J. W., Vilgalys, R., Bruns, T. D.  
2015; 205 (4): 1619-1631

- **Parsing ecological signal from noise in next generation amplicon sequencing** *NEW PHYTOLOGIST*  
Nguyen, N. H., Smith, D., Peay, K., Kennedy, P.  
2015; 205 (4): 1389-1393
- **Local-scale biogeography and spatiotemporal variability in communities of mycorrhizal fungi** *NEW PHYTOLOGIST*  
Bahram, M., Peay, K. G., Tedersoo, L.  
2015; 205 (4): 1454-1463
- **Does Microbial Diversity Confound General Predictions?** *Trends in plant science*  
Duhamel, M., Peay, K. G.  
2015; 20 (11): 695-97
- **Metatranscriptomic analysis of ectomycorrhizal roots reveals genes associated with Piloderma-Pinus symbiosis: improved methodologies for assessing gene expression in situ** *ENVIRONMENTAL MICROBIOLOGY*  
Liao, H., Chen, Y., Bruns, T. D., Peay, K. G., Taylor, J. W., Branco, S., Talbot, J. M., Vilgalys, R.  
2014; 16 (12): 3730-3742
- **Spore dispersal of basidiomycete fungi at the landscape scale is driven by stochastic and deterministic processes and generates variability in plant-fungal interactions.** *New phytologist*  
Peay, K. G., Bruns, T. D.  
2014; 204 (1): 180-191
- **Endemism and functional convergence across the North American soil mycobiome** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*  
Talbot, J. M., Bruns, T. D., Taylor, J. W., Smith, D. P., Branco, S., Glassman, S. I., Erlandson, S., Vilgalys, R., Liao, H., Smith, M. E., Peay, K. G.  
2014; 111 (17): 6341-6346
- **Ectomycorrhizal fungal traits reflect environmental conditions along a coastal California edaphic gradient.** *FEMS microbiology ecology*  
Moeller, H. V., Peay, K. G., Fukami, T.  
2014; 87 (3): 797-806
- **Genetic variation within a dominant shrub structures green and brown community assemblages** *ECOLOGY*  
Crutsinger, G. M., Rodriguez-Cabal, M. A., Roddy, A. B., Peay, K. G., Bastow, J. L., Kidder, A. G., Dawson, T. E., Fine, P. V., Rudgers, J. A.  
2014; 95 (2): 387-398
- **Sequence depth, not PCR replication, improves ecological inference from next generation DNA sequencing.** *PLoS one*  
Smith, D. P., Peay, K. G.  
2014; 9 (2)
- **Missing checkerboards? An absence of competitive signal in Alnus-associated ectomycorrhizal fungal communities.** *PeerJ*  
Kennedy, P., Nguyen, N., Cohen, H., Peay, K.  
2014; 2
- **Towards a unified paradigm for sequence-based identification of fungi** *MOLECULAR ECOLOGY*  
Koljalg, U., Nilsson, R. H., Abarenkov, K., Tedersoo, L., Taylor, A. F., Bahram, M., Bates, S. T., Bruns, T. D., Bengtsson-Palme, J., Callaghan, T. M., Douglas, B., Drenkhan, T., Eberhardt, et al  
2013; 22 (21): 5271-5277
- **Strong coupling of plant and fungal community structure across western Amazonian rainforests** *ISME JOURNAL*  
Peay, K. G., Baraloto, C., Fine, P. V.  
2013; 7 (9): 1852-1861
- **Host plant genus-level diversity is the best predictor of ectomycorrhizal fungal diversity in a Chinese subtropical forest** *MOLECULAR ECOLOGY*  
Gao, C., Shi, N., Liu, Y., Peay, K. G., Zheng, Y., Ding, Q., Mi, X., Ma, K., Wubet, T., Buscot, F., Guo, L.  
2013; 22 (12): 3403-3414
- **Independent roles of ectomycorrhizal and saprotrophic communities in soil organic matter decomposition** *SOIL BIOLOGY & BIOCHEMISTRY*  
Talbot, J. M., Bruns, T. D., Smith, D. P., Branco, S., Glassman, S. I., Erlandson, S., Vilgalys, R., Peay, K. G.  
2013; 57: 282-291

- **Rat invasion of islands alters fungal community structure, but not wood decomposition rates** *OIKOS*  
Peay, K. G., Dickie, I. A., Wardle, D. A., Bellingham, P. J., Fukami, T.  
2013; 122 (2): 258-264
- **Towards global patterns in the diversity and community structure of ectomycorrhizal fungi** *MOLECULAR ECOLOGY*  
Tedersoo, L., Bahram, M., Toots, M., Diedhiou, A. G., Henkel, T. W., Kjoller, R., Morris, M. H., Nara, K., Nouhra, E., Peay, K. G., Polme, S., Ryberg, M., Smith, et al  
2012; 21 (17): 4160-4170
- **Measuring ectomycorrhizal fungal dispersal: macroecological patterns driven by microscopic propagules** *MOLECULAR ECOLOGY*  
Peay, K. G., Schubert, M. G., Nguyen, N. H., Bruns, T. D.  
2012; 21 (16): 4122-4136
- **Flowers as Islands: Spatial Distribution of Nectar-Inhabiting Microfungi among Plants of *Mimulus aurantiacus*, a Hummingbird-Pollinated Shrub** *MICROBIAL ECOLOGY*  
Belisle, M., Peay, K. G., Fukami, T.  
2012; 63 (4): 711-718
- **Phylogenetic relatedness predicts priority effects in nectar yeast communities** *PROCEEDINGS OF THE ROYAL SOCIETY B-BIOLOGICAL SCIENCES*  
Peay, K. G., Belisle, M., Fukami, T.  
2012; 279 (1729): 749-758
- **Spongiforma squarepantsii, a new species of gasteroid bolete from Borneo** *MYCOLOGIA*  
Desjardin, D. E., Peay, K. G., Bruns, T. D.  
2011; 103 (5): 1119-1123
- **Rethinking ectomycorrhizal succession: are root density and hyphal exploration types drivers of spatial and temporal zonation?** *FUNGAL ECOLOGY*  
Peay, K. G., Kennedy, P. G., Bruns, T. D.  
2011; 4 (3): 233-240
- **Evidence of dispersal limitation in soil microorganisms: Isolation reduces species richness on mycorrhizal tree islands** *ECOLOGY*  
Peay, K. G., Garbelotto, M., Bruns, T. D.  
2010; 91 (12): 3631-3640
- **Testing the ecological stability of ectomycorrhizal symbiosis: effects of heat, ash and mycorrhizal colonization on *Pinus muricata* seedling performance** *PLANT AND SOIL*  
Peay, K. G., Bruns, T. D., Garbelotto, M.  
2010; 330 (1-2): 291-302
- **Potential link between plant and fungal distributions in a dipterocarp rainforest: community and phylogenetic structure of tropical ectomycorrhizal fungi across a plant and soil ecotone** *NEW PHYTOLOGIST*  
Peay, K. G., Kennedy, P. G., Davies, S. J., Tan, S., Bruns, T. D.  
2010; 185 (2): 529-542
- **Root tip competition among ectomycorrhizal fungi: Are priority effects a rule or an exception?** *ECOLOGY*  
Kennedy, P. G., Peay, K. G., Bruns, T. D.  
2009; 90 (8): 2098-2107
- **Spore heat resistance plays an important role in disturbance-mediated assemblage shift of ectomycorrhizal fungi colonizing *Pinus muricata* seedlings** *JOURNAL OF ECOLOGY*  
Peay, K. G., Garbelotto, M., Bruns, T. D.  
2009; 97 (3): 537-547
- **Fungal Community Ecology: A Hybrid Beast with a Molecular Master** *BIOSCIENCE*  
Peay, K. G., Kennedy, P. G., Bruns, T. D.  
2008; 58 (9): 799-810
- **A strong species-area relationship for eukaryotic soil microbes: island size matters for ectomycorrhizal fungi** *ECOLOGY LETTERS*  
Peay, K. G., Bruns, T. D., Kennedy, P. G., Bergemann, S. E., Garbelotto, M.  
2007; 10 (6): 470-480