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**FILE: ■ Mushrooms
■ Fungi
■ Paul Stamets**

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RE: Paul Stamets' Remarkable Contribution to Our Knowledge of Fungi

Horrigan BJ. Can mushrooms help save the world? *Explore*. March 2006;2(2):152-161.

Paul Stamets, credited with discovering four new mushroom species; author of six books on mushrooms; founder and director of Fungi Perfecti, LLC., and Fungi Perfecti Research Laboratories (Seattle, WA); "holds a vision of a deeply interconnected... environment and... believes that... fungi can solve many... pollution problems as well as... health problems." Horrigan talked with the recipient of the 1998 Collective Heritage Institute's Bioneers Award, and 1999 Founder of a New Northwest Award from the Pacific Rim Association of Resource Conservation and Development Councils, on an array of topics.

Human medicinal and shamanistic use of mushrooms dates back over 10,000 years. Fungi were used as food even earlier. A species found with the "Ice Man", a well-preserved prehistoric human discovered in Europe in 1991, wood conk or *amadou* (*Fomes foemntarius*), was hollowed and used to carry and re-ignite fire. "[T]hese mushrooms were... instrumental to human survival... and... allowed for the migration of humans into Europe from Africa." Fungi are "molecular decomposers in nature and... recyclers of the dead." Ubiquitous mycelial mats create soil from dead plants and animals, channel nutrients to form mushrooms, and infuse plants through their fungal associates. "[Y]ou can no longer define a plant without its fungal allies. Plants do not exist in absence of fungi." Stamets calls fungi "immune systems" of environments and mycelium the earth's natural Internet, "the nutritional and information sharing platform, and... the basis and... construct of the food web."

Of an estimated one to 30 million species of fungi, about 14,000 have been identified. "[O]ur ignorance of species diversity exceeds our knowledge by at least one order of magnitude." Millions of years ago, men and mushrooms had a common ancestor. We share about 30% of our genes with fungi, more than with bacteria, as well as "the same microbial enemies." The fungi's antibiotic defenses are "exquisitely useful to us in fighting... infections," but most antifungal medicines are toxic. Calvacin from puff ball (*Calvatia gigantea*); armillaric acid from honey mushroom (*Amillaria mellea*); sparassol from cauliflower mushroom (*Sparassis crispa*); and campestrin from meadow mushroom (*Agaricus campestris*) discovered in the 1950s and 60s, joined penicillin, from the mold *Penicillium chrysogenum*, as fungus-derived medicines. Stamets is researching *agarikon* (*Fomitopsis officinale*), described by Dioscorides in 65 C.E. and once a well-known medicinal mushroom, now found only in old growth forests of the Pacific Northwest. Two *agarikon* extracts made with Stamets'

proprietary methods were found active against ortho poxes by the U.S. Department of Defense. Stamets declares, "[T]he fact that we have an old growth forest, and [*al Qaeda* terrorist leader] Osama Bin Laden does not, means that the old growth forests are essential to our national defense... [I]f this mushroom can prevent or cure pox infections, from a monetary point of view, it exceeds the value of timber."

Stamets extracts mushroom compounds without boiling, the traditional method in Chinese medicine. Water extracts of *agarikon* are inactive against pox viruses. Research on Stamets' ethanol extracts continues at the National Center for Natural Products Research (University of Mississippi). He is also working with Dr. Donald Abrams on a study at San Francisco General Hospital, funded by the National Institutes of Health, using oyster mushroom (*Pleurotus* spp.) extracts as an adjunct therapy for HIV patients, who often get fungal infections consequent to liver damage from protease inhibitors which keep the virus in check. Oyster mushrooms contain a compound which helps remodulate liver function. Stamets also mentions conifer coral (*Hericium abietis*), with a compound stimulating brain neuron re-growth; *Agaricus brasiliensis*, a Japanese anti-cancer treatment; and *reishi* (*Ganoderma lucidum*), with anti-inflammatory and antimicrobial properties.

Mycofiltration and mycoremediation are explored in Stamets' new book, *Mycelium Running: How Mushrooms Can Help Save the World*. Mushrooms break down toxic wastes, including petroleum, and can be used to clean up pollution. Mushrooms also concentrate heavy metals, "good news" for decontamination, but "bad news" in that mushrooms from contaminated areas, or grown with pesticides, contain toxins. Stamets' route to developing a pesticide for carpenter ants from "a group of fungi called *Metarbizum*" is noteworthy for his manipulation of the mold to a form acceptable – and deadly – to the ants, previously "repulsed" by *Metarbizum* spores. He hopes that environmental principles which shaped his patents on this process will help "create a paradigm shift" with the help of fungal allies, in which toxic chemicals are no longer economically advantageous.

Stamets named one species, *Psilocybe weilii*, for friend and mentor Andrew Weil, saying, "I accuse him of culturing me, like I culture fungi." He relates a "vast fruiting" of the hallucinogenic species near the Georgia office of former Republican Speaker of the U.S. House of Representatives Newt Gingrich, adding, "[T]hese mushrooms have a poetic sense of humor." He uses no pesticides in his spore-free organic growing facility, but "partners" with tree frogs for insect control and as contaminant detectors. Most of his mushrooms are saprophytes (decomposers), grown on sawdust which is later further digested by earthworms. The resulting certified organic soil is traded to nearby organic farms for vegetables.

— Mariann Garner-Wizard

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