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## **1. 2004 Soil Foodweb, Inc. Compost Tea Grant**

SFI is now accepting applications for the 2004 Compost Tea Grant.

The purpose of this Grant is to measure and record the effect of compost tea applications to soil. Participants will take composite soil samples from their specified project area and submit to SFI this spring, prior to any application of compost tea. Three applications of compost tea will be made to the area, by the Participant, during this growing season (in spring, summer and fall). Each compost tea must be sampled and sent into SFI for analysis. Recommendations will be made by SFI to maximize efficacy of compost tea applications based on Participant specific growing conditions and evaluation of compost tea analysis results.

In spring of 2005, another soil sample will be sent in to SFI for analysis. This will complete the Grant and provide Participants and SFI valuable data with which to evaluate the effectiveness of compost tea applications. The data received will help research, develop and establish the most effective practices for achieving the correct beneficial soil

food web for each growing situation. Results will be shared with Grant Participants successfully completing the Grant.

The cost of participation in the Grant is \$250.00, a significant reduction in cost for the detailed lab analysis performed.

This years Grant will include twenty-five Participants selected from individuals who submit a letter of interest describing how the Candidate intends to utilize the Grant. A detailed description of the proposed project in less than 250 words is due by March 31. Please respond to: [teagrants@soilfoodweb.com](mailto:teagrants@soilfoodweb.com)

Thank you for your time.

**Kevin John Richardson**

Kevin John Richardson  
SFI Compost Tea Grant Coordinator

## **2. Field Guide for Actively Aerated Compost Tea now available!**

Soil Foodweb Inc. is offering the "Field Guide for Actively Aerated Compost Tea", a compilation of compost\_tea list serve questions and answers, arranged by topic so the information is easy to access.

The book is being offered at a SPECIAL, INTRODUCTORY price of \$35. This price will increase to \$45 on May 1, 2004, so order your Field Guide now!

**Available through the Soil Foodweb website, [www.soilfoodweb.com](http://www.soilfoodweb.com)**

## **3. Observations on Woodpeckers**

Subj:[compost\_tea] Fungi On Woodpecker Beaks Found Crucial To Forest Processes  
From:[kiphart@ev1.net](mailto:kiphart@ev1.net)

Thought this relevant to our cause.... not to mention fascinating.  
[http://www.enn.com/news/2005-02-04/s\\_12568.asp](http://www.enn.com/news/2005-02-04/s_12568.asp)

Fungus in Woodpeckers' Beaks Crucial to Forest Process

NEW YORK, New York, February 11, 2004 (ENS) - A woodpecker's beak is a virtual petri dish of fungal spores that play a key role in the decay of dead trees, according to new research by the New York-based Wildlife Conservation Society (WCS) and Arkansas State University.

In their study published in the journal "Condor," the authors examined several species of woodpeckers living in ponderosa pine forests in northern California and Oregon. They learned that over 60 percent of the birds nesting in tree cavities had a variety of wood inhabiting fungi

living in their beaks. These fungi serve a critical role in the decomposition of dead trees, commonly known as snags, and influence how they are used by wildlife.

Unless trees decay, woodpeckers are unable to excavate nest cavities, which are used as nesting sites by a variety of wildlife species. While some forestry practices on public and private lands allocate a certain number of snags per acre for wildlife use, the recent Bush administration "Healthy Forests" policies calls for removing snags because of their perceived risk in forest fires.

The authors say that more factors need to be taken into consideration than just density or spatial arrangement of the snags.

"Our study shows that woodpeckers are really the architects and landlords of the forest," said WCS scientist Kerry Farris, the study's lead author. "Their activities play a key role in how snags decay and are used by other species."

Woodpeckers initially puncture dead and dying trees in search of bark beetles and other wood-boring insects, a process that creates holes in wood that serve as infection sites for airborne fungal spores. As the birds return to these holes to feed, or to excavate them further for nesting, they pick up the fungi in their beaks, then help spread the spores by foraging on other dead trees.

"Our research illustrates the numerous agents contributing to the complexity of snag decomposition and eventual cavity generation by woodpeckers," Farris said. "Forest management could benefit from a consideration of these processes when managing snags on public and private lands."

## **4. July 16 – 17, 2005 “Practical, Hands-On” International Compost Tea Council Seminar**

Hold July 16 – 17, 2004 for the “Practical Compost Tea” meeting in Kirkland Washington!

I am kicking around the idea of doing the following “Brew-Off” at the ICTC meeting. SFI will sponsor a prize of one of the new Each-Batch Compost Tea Testing Kits. Anyone want to work with me on designing this contest?

Stay tuned to the ICTC website, and the E-zine for more information on how to enter.

There will be an ICTC, Highlands S&W, and SFI sponsored meeting in Monterey next January, 2005 (last weekend in January, most likely) with likely speakers of Arden Anderson, Elaine Ingham, Mike Amaranthus, and Bob Schaffer as main speakers, and local compost tea makers and users also giving talks.

There is an east-coast ICTC compost tea meeting in the works as well, where we can repeat the Brew-Off experience on the east coast. Stay tuned for more news here!

## **5. Grower Experiences**

## **a. Livestock and compost teas**

We have found that if the livestock stay mainly on our 'biology' pastures, they have fewer flies (lots fewer (<20> - usually if cattle have >200 you figure it is economically viable to spray and reduce that number) - no, I don't actually count them!

We have sprayed CT on these <20 flies group and the flies all but disappear for a good 45-60 days.

We have also sprayed CT on some of our herds >200 flies that don't get to be on our 'biology' pastures very much. This spraying helps for only a few days.

So, got good biology in pastures, got fewer flies to torment our steers. But the message is, its a total package deal: healthy soil=healthy plants=healthy animals = healthy people.

That's my two cents worth.

Betsy  
www.rossfarm.com  
Granger, Texas

## **b. Turf Compost tea programs**

Date: Mon, 12 Jan 2004 14:01:30 -0500

From: Mike Bradley <mailto:safelawn@mindspring.com>

Hey Elaine -

Hope ya'll are having a good New Years. Our Lawn care program was the standard industry fare (7 visits per season) except we do not use synthetic forms of P or K.

We add some dormant beneficials and milorganite as a component...but were still relying on a lot of urea to compete with greenup and cosmetics in the highly competitive residential lawn care market. Here in the "lower transition zone " environment we are primarily working on Tall fescues.

Our major pest problems are annual crabgrasses and Brown Patch (*Rhizoctonia solani*)...both of these pests we were not controlling well with our standard treatments

I had read all about CT and had done mostly organic gardening personally...I have tested many products over my 25 year career. I like to tell customers I have over 60,000 hours of work experience and have stepped on over 60,000 yards...I was frustrated I was not having excellent lawn quality especially during adverse environmental conditions.

Last summer I started doing CT applications on a select group of customers. I was getting as good as control of Brown Patch as the new class of fungicides like Heritage...the control lasted about 4-5 weeks...I also tested adding supplements like

mycorrhizae and the protein Harpin. Adding harpin seemed to speed up the curative affect of the Brown Patch...with every seeding plus aeration we did this fall we sprayed CT and Myco right on top of the seeding/cores...we removed the high rates of urea nitrogen that is traditional in our programs in the lawn care industry this fall and treated with 100 % organic miloganite type product...we plan to do a early spring treatment again without the high levels of quick release N and do our weed controls then...then starting in late spring we plan to do a series of 3-4 CT treatments with a liming also.

If this program is successful and produces quality turf and ornamentals in the upscale residential market we will have a true breakthrough in how a larger horticulture service provider can take care of the yards...I know we are not the first trying this, but the public is bombarded with advertising for products that save time and KILL everything in one fell swoop. But with proof and results that show the way the industry and do-it yourself fertilizer /pest control practices have created many of our problems I believe we can grasp the media and public attention long enough to educate them and get change moving fast ahead like many other industries.

Have a great day.

Mike Bradley, Naturalawn of America. Greensboro NC

### **c. Asian rust and compost tea**

Someone wrote me to ask about rusts, and I asked the list in general if anyone had experience. Scott Alexander, [daylily@bigpond.com](mailto:daylily@bigpond.com) , replied:

If it is a puccinia rust, I found that concentrated AACT applied monthly over the foliage of daylilies suppressed rust and/or helped the plant to build up a resistance to it. Not 100% but very high. All daylily leaves in a clump are very hard to get at!

More answers from Scott in a later e-mail, questions from the list serve (not Elaine):

I thought we came to the conclusion that EM only has a very limited microbial diversity and you are way better off with ACT.

Maybe EM has limited diversity but maybe the "naturally occurring beneficial microorganisms, principally lactic acid bacteria, yeast and phototrophic bacteria in a liquid solution" may not be in ACT. If you combine the two MAYBE you'll end up with a superior tea. I know this list is all about ACT but I can see the day that combinations of herb & plant teas, EM products and ACT will be found to be a superior blend.

How many years have you been using ACT and EM?

25 months of ACT specifically made and applied monthly since daylily rust arrived. 18 months prior to that, different forms of ACT was applied quarterly.

How are your Daylilies responding to the ACT?

Using ACT on daylilies is saving fertiliser costs. I no longer side-dress the plants with organic fertilisers annually.

I am finding that many varieties, particularly diploids, have built up tremendous resistance to daylily rust because of "something" in the ACT. My interest in adding herb and weed teas to ACT has been further increased after reading "comfrey and cow-parsnip extracts is associated with their action on the pathogenic fungus and with the activation of natural defense reactions of the host plant"

Scott Alexander

#### **d. Mycorrhizal fungi do the job**

I understand that ever since Dr. Bonnie Appleton, a professor at one of the Virginia schools did an experiment where she couldn't get VAM established on the trees she inoculated with VAM, she has been negative about mycorrhizal colonization, and has been a major force in turning people away from use of mycorrhizal fungi on trees.

Lack of colonization means the whole concept is bunk? Should we take that attitude when someone can't get pregnant the first time? Or one shot of Novocain doesn't numb your mouth? Maybe the proper answer was not that mycorrhizal fungi don't work, and don't help trees, but that something else was operating to prevent establishment.

I have heard over and over that there are no data that mycorrhizal fungi improve plant growth. Nothing could be further from the truth. Here are a couple examples from Dr. Mike that inoculation DOES improve plant growth. - ERI

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“The January issue of Arborage magazine features (cover photo and article) the results of mycorrhizal inoculation of planted ponderosa pine in a severely burned area in the Biscuit Fire. Melody Culp of the USDA Forest Service organized and facilitated the plantings and inoculation. The mycorrhizal inoculations resulted in a 42% increase in pine survival, improved root growth and seedling phosphorous and calcium nutrition.

You can go straight to the article at

<http://www.greenmediaonline.com/aa/2004/0401/0401tm.asp>

There is also an article in Erosion Control magazine that used our mycorrhiza on a rigorous site and got huge improvement in grass survival and nutrition. Go to

[http://www.forester.net/ecm\\_0309\\_symbiotic.html](http://www.forester.net/ecm_0309_symbiotic.html)

Take care

Mike”

## 6. Major Development on GE Front

The scientist involved in this field research is one of Europe's most prominent and runs a large, government-backed lab working on the impacts of GE foods. This story will have major repercussions worldwide.

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Filipino farmers show GM pollen reaction-scientist

February 23, 2004

Reuters

KUALA LUMPUR- Norwegian scientist Terje Traavik was cited as saying on Monday that Filipino farm workers living by a field of gene-modified maize showed signs of exposure to the plant's anti-pest toxin three months after the pollen season.

Traavik said that blood samples from 39 people in a farm community on the southern Philippine island of Mindanao carried increased levels of three different target antibodies, evidence of an immune reaction to the Bt toxin built in to combat pests, adding, "We are absolutely sure it's a reaction to being exposed to the Bt maize."

The story says that if more tests were to confirm his findings, they would fuel anti-GM campaigner arguments that extra caution is needed before wide-scale cultivation of modified crops such as maize, canola and cotton goes any further.

Traavik said the maize variety involved, sold as Dekalb 818 YG, came from U.S. crop company Monsanto.

The professor of gene ecology at Norway's University of Tromso is a critic of mainstream biotech research who says too few scientists are free from industry connections.

No one from Monsanto, whose representatives were present at the talks, was immediately available for comment.

Willy De Greef, a biotech law consultant formerly employed by Swiss agrochemicals company Syngenta, expressed surprise at Traavik's findings, saying research showed Bt maize pollen did not carry the toxin so no reaction should occur.

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## **7. USDA REQUESTS NOMINATIONS TO FILL UPCOMING VACANCIES ON NATIONAL ORGANIC STANDARDS BOARD**

WASHINGTON, March 8, 2004 - The U.S. Department of Agriculture is seeking nominations to fill five upcoming vacancies on the National Organic Standards Board (NOSB). Secretary of Agriculture Ann M. Veneman will appoint persons to serve a 5-year term of office to commence January 24, 2005, and run until January 24, 2010.

The NOSB is a 15-member board responsible for developing and recommending to the Secretary a proposed National List of Approved and Prohibited Substances. The NOSB also advises the Secretary on all other aspects of the National Organic Program.

USDA is asking for nominations to fill the following five upcoming NOSB vacancies: organic producer (two positions), organic handler, retailer, and environmentalist. To serve on the NOSB, an individual must be either an owner or operator of an organic production operation, an owner or operator of an organic handling operation, an individual who owns or operates a retail establishment with significant trade in organic products, or an individual with expertise in areas of environmental protection and resource conservation. USDA will follow equal opportunity practices in all appointments to the NOSB.

Written nominations, accompanied by resumes, must be postmarked on or before June 14, 2004, and sent to Ms. Katherine E. Benham, Advisory Board Specialist, National Organic Program, USDA-AMS-TMP-NOP, 1400 Independence Avenue, SW, Room 4008-S, Ag Stop 0268, Washington, D.C. 20250. For more information, contact Ms. Katherine Benham at (202) 205-7806; e-mail: [Katherine.benham@usda.gov](mailto:Katherine.benham@usda.gov); or fax: (202) 205-7808.

Chrys Ostrander  
Chrysalis Farm at Tolstoy  
Grower of Organic Produce & Botanicals  
33495 Mill Canyon Rd. Davenport, WA 99122  
(509) 725-0610  
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## **8. Eco-Farm Bans Compost Tea Information**

Those of you who don't like to hear about arguments in the world of sustainable or biological farming should just skip this article.

We have some egos in the world of sustainable ag. We need to work TOGETHER, but when someone acts to fragment that togetherness, or refuses to work with others, or goes off in a huff because of what someone said that someone else said and never checks out

the validity of the rumor, or when someone tries to be territorial about sustainable approaches, then that situation needs to get aired.

I've tried to get resolution on this situation with Eco-Farm, but when you try to get people to tell you what's going on, and you get no answer, or you get told "Too bad you listened to hearsay" when you have heard the same information from quite a few people, when Eco-Farm is doing nothing to rectify the harm that is being done to people's reputations, then I am left with no way to deal with this situation than to put it out to the general public to try to get resolution.

So, here's the situation -

I asked several friends to speak to their friends on the Board of Eco-Farm this year about doing a compost tea talk at Eco-Farm. One friend spoke to Bob Cantisano and related back to me that Bob Cantisano is telling people that the Board of Eco-Farm voted to never allow me to come to Eco-Farm again. Since I knew NOTHING about this, I wrote this letter to the Eco-Farm Board.

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To the Governing Board of Eco-Farm

A friend of mine attended Eco-Farm last week, and told me that they spoke to Bob Cantisano. They said that Bob told them that I (Elaine) "have the distinction of being the only person not allowed to come to Eco-Farm meetings."

I have never been told this before. I would like to know why Mr. Cantisano would say such a thing.

The person talking to Bob related that Bob said that I had argued with Vicki Bess about something in a seminar. That has never happened. I have never argued with any speaker in any forum at Eco-Farm.

Then the person said that Bob had said that someone else had argued with Vicki Bess at Eco-Farm about something I said. I cannot be held accountable for something that someone else did or did not do. I wasn't even at Eco-Farm last year to do anything about someone arguing with anyone.

To ban me from the meeting because someone else mentioned me is downright inappropriate.

I have explained to people why things Vicki Bess has said are not true. But supporting the truth should not result in me being not allowed to come to Eco-Farm meetings!

If it is true that the Board has decided that I am not to be allowed to come to Eco-Farm, or give talks there, I think the very least you should do is tell me about the decision. Or if what Mr. Cantisano has said is not true of Eco-Farm policy, then Mr. Cantisano should be told to not say such things.

Please let me know the truth in this matter ASAP.

Elaine Ingham  
President, Soil Foodweb Inc.  
Affiliate Faculty, Graduate Research, Southern Cross University  
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To: Elaine Ingham  
From: Kristin Rosenow, Executive Director, Ecological Farming Association  
Re: Your "Query and Concern" dated January 29, 2004  
Date: February 2, 2004

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Dear Elaine,

I'm sorry if hearsay from the 2004 Ecological Farming Conference has caused concern on your part regarding participation in our annual event. As a member of the Ecological Farming Conference Planning Committee and the staff representative on the EFA Board of Directors, I can assure that there is no policy banning you from the Ecological Farming Conference.

At our 2003 conference there was a distasteful incident in our "Compost Tea Update" workshop, where a speaker was heckled by a member of the audience during a presentation. Said heckler also passed out literature during and after the workshop that specifically attacked the companies represented by the speakers. While Eco-Farm does not in general shy away from controversial topics, we will not allow such negative tactics to infiltrate and damage the atmosphere of collegial respect and honest debate for which Eco-Farm is known. As a result of the 2003 incident, the Eco-Farm Conference Planning Committee decided not to have a compost tea workshop in 2004 and not to invite any Soil Foodweb representatives as speakers. We will be monitoring the compost tea debate throughout 2004 in order to determine if we want to bring the topic back in 2005, and if so, which speakers we would like to invite.

I'd be happy to answer any further questions about our policies and procedures.

Regards,

Kristin Rosenow  
Executive Director  
Ecological Farming Association  
Watsonville, California  
831-763-2111  
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First of all, to tell me that I listened to hearsay, when several people around the world have related the same story to me about Bob Cantisano's behavior with regard to the Eco-Farm decision and I is just rude. Belittling other people's concerns is not wise.

Second, Kristin tells me in that letter that I have indeed been banned, although maybe she doesn't care to put it in that bald a terminology. She said in that letter, "and not to invite any Soil Foodweb representatives as speakers."

Hum, maybe Bob isn't going about spreading un-true information.

Since Kristin Rosenow did not address several of my points to the Board, I e-mailed back to her to ask her to tell me if any effort would be made by Eco-Farm to ascertain if Bob Cantisano, a member of their board, has indeed been going about saying that I have the unique distinction of being the only person banned by Eco-Farm.

I have had no response.

I also have asked who the person was that had heckled Ms. Bess during her presentation, since I would like to speak to that person and find out the whole story, a level of fairness that Eco-Farm has never been interested in apparently. They certainly never asked me if I was in any way responsible for whoever's behavior before Bob Cantisano started telling people that I was banned from Eco-Farm meetings.

I thought I might know who the heckler was, but when I asked him, he said he had been in the meeting, but had not heard any heckler. They said some man had asked some pointed questions of Vicki Bess, but he wouldn't call it heckling, and certainly nothing "distasteful".

Go figure. Heckling is relative to one's point of view, I guess. Who complained about heckling? Did a speaker complain that they had been asked some tough questions? Does that constitute a "distasteful incident?"

None of my employees were at Eco-Farm in 2002, or in 2003. I did not send a representative to the meeting and I did not attend Eco-Farm. I believe I was in Australia at the time. I did pay for some of the travel expenses for some friends to be able to travel through California, and they went to the Eco-Farm meeting. I wonder if they asked the tough questions? Did some people view the way the questions were asked as heckling, while others did not? How can I tell? I wasn't there.

I had many people ask me to explain the *E. coli* report Ms. Bess presented at Biocycle, which appeared in written form in a Biocycle conference proceeding. I wrote some information and gave that out to quite a number of people so they could ask Ms. Bess about the important points when they saw her. These were points relative to how oxygen concentration had been measured, the fact that oxygen was not measured throughout the tea brew, that oxygen was not measured during the brew period when oxygen is most likely to drop into anaerobic conditions and therefore allow *E. coli* to grow unhindered by competitors, especially in a brew where *E. coli* laden compost was purposefully added. By definition, compost used in compost tea should at least pass the organic regs for composting, if it is going to be used in compost tea.

Tea made using manure should be called manure tea. It is not compost tea and should not be confused with compost tea. If people want to claim that organic composting regulations do NOT result in human pathogens being killed, then they need to PROVE that point. You cannot rely on people who SAY they are composting correctly, but still find human pathogens in the finished material. You have to have them document what they really did, and that they really composted correctly. Did the compost actually reach

temperature for the time required? Did they turn the compost properly? That's five times in 15 days of the compost being above 131 F. Show me you really composted correctly before you make statements that E. coli is still in the compost. Look for external contamination. That's more likely to be the problem, not that E. coli survived the proper composting process. A recent paper claims E. coli survived proper composting, but look at their methods. They turned the compost with a front end loader, which was used to move the fresh manure around, before turning the "finished" product.

Finished? Not if you use contaminated loaders to turn the compost! Using dirty equipment is NOT in keeping with organic regs.

But to ban further talks about Compost Tea from Eco-Farm, which is basically a ban on me ever presenting again at Eco-Farm, because of the actions of someone else is not appropriate. The Board of Eco-Farm should at least have let me defend myself before judging and "executing" me.

Why should a whole industry be excluded from a conference because ONE person wants to get a speaker to answer the questions put to them? When speakers side-step around the truth, and won't answer the question asked, doesn't that make you angry?

I suggested to Kristin that Eco-Farm put together a compost tea seminar where NONE of the manufacturers of compost tea speak, but instead have growers who ARE USING compost tea give talks about what they are doing, and how successful they have been. That would be the true test of what machine(s) work best.

But if Bob Cantisano doesn't like me because I infringe on what he views as "his territory" then be honest about the real reason that I will never be invited to speak at Eco-Farm again.

I mentioned this situation to another friend of mine and all he did was laugh, and said –

"Elaine, you are in very good company if you have been banned from Eco-Farm. I've been banned for years, Dr. Arden Anderson has been banned, Dr. Phil Wheeler has been banned, Dr. Phil Callahan, and of course, Neal Kinsey has been banned for years longer than you. When ACRES ran a meeting in Sacramento, Bob Cantisano called Fred Walter up and told him he couldn't have ACRES meetings in California, because this is Bob's territory. You are NOT unique in being banned from Eco-Farm meetings."

I feel really good about that comment. I stand in very good company, indeed, to be placed in the "banned from Eco-Farm box" with these other people whom I admire and respect.

But, I want people to know what has been happening with Eco-Farm. Those of you who have heard Bob say that I've been banned, please realize that I am not unique in the distinction.

In fact, I think it an honor to be banned from a group not interested in fair and impartial behavior. Any time the Eco-Farm Board wants to let me know who was the problem at the compost tea update, I'll investigate.

But they should investigate Bob Cantisano's behavior. I am happy to give the Board the names of those who have heard Bob say the board voted to ban me from Eco-Farm. Be glad to let them know where I'm hearing the information that Eco-Farm has banned all these great minds from their meetings. Maybe some resolution could occur, instead of letting stink continue to cloud the air.

So, I apologize to all of you who don't like to hear negativity, but we are dealing with human beings, and with egos. When someone tells people I know that I'm banned from speaking someplace, I don't take that lightly. I will do something about it. When I am prevented from getting a situation resolved through the logical pathway, I'll find another way to get it resolved. The resolution I seek is to make certain that people know and understand the truth about what is going on with Eco-Farm, and why I, and apparently many other people, won't appear there.

Elaine Ingham  
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## **9. Article "Interview with a fungus"**

**This prize-winning essay was just too good to pass up. Of course, you have to be able to understand the fungal point-of-view to appreciate it..... ERI**

My thanks to mish for forwarding this to the SANET list

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The essay competition run by Royal Dutch/Shell and The Economist has reached its fourth year. This time the question posed was "Do we need nature?" Nearly 6,000 people, from all over the world, offered answers.

The first prize of \$20,000 was won by Diane Brooks Pleninger from Anchorage, Alaska, whose essay, printed here in slightly abridged form, inverted the question neatly and informatively

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D.P. Good evening, viewers. Our guest is *Pilobolus crystallinus*, author of the award winning bestseller, "Do We Need Mankind? A Fungal Perspective". Mr Pilobolus is a member of the kingdom Fungi, class Zygomycetes. He is a scholar, lecturer, dung-dweller, and author. Welcome, Mr Pilobolus.

P.c. Thank you, Diane. Good to be here.

D.P. Mr Pilobolus, your most recent book raises tantalising questions about the future of the biosphere and the role that you and other inhabitants will play in it. Tell us how you came to write it.

P.c. The book resulted from a series of symposia I attended over the past two centuries under the sponsorship of the World Federation of Fungi, on the topic, "What Does Nature Need?" The Academy of the WFF is constituted of one delegate from each family of fungi. I was fortunate to represent the Pilobolaceae.

D.P. The 19th, 20th and 21st centuries have been a revolutionary period in the biosphere. How have fungi been affected by the events of modern history?

P.c. The modern history of the fungi, which I date from about 400 million years ago, has been a remarkable success story. The fungi occupy two vital niches in nature whose importance has never been challenged. In one niche, we are drivers of the carbon cycle, elite teams of detritivores whose mission is to digest organic matter and return the component parts to the ecological system. Without our work, life on earth would long since have ground to a halt for lack of raw materials. In another niche, we act in partnership with the roots of plants to extend their reach into the soil environment and enhance their uptake of water and nutrients. These partnerships are called mycorrhizas. Myco for the fungus, rhiza for the root. Animals in turn feed on plants and benefit from this arrangement. So the fungi play two very distinct roles worldwide, and both roles are critical to maintaining the biosphere.

D.P. When does mankind come into your history?

P.c. Mankind comes into our history about 20,000 years ago, at the time they discovered the uses of alcoholic fermentation. We credit the genus *Saccharomyces* with this development. Ancestral spores of that yeast settled in a pot of gruel prepared by a group of hominids whose existence up to that point was best described as nasty, brutish and short. This began what we call the honeymoon period in the relationship of man and fungus. Unfortunately, it didn't last long.

D.P. What happened to end it?

P.c. Two things. Agriculture was one. Monocropping and animal husbandry led to concentrations of plant and animal populations that were vulnerable to certain of our members, particularly the smuts, rusts, mildews and blights. Some crops and herds proved to be sensitive to basic fungal metabolites. For instance, my colleague *Claviceps purpurea* produces the biochemical ergot. Ergot causes gangrene, madness and death in humans.

However, there is no credible scientific evidence that it evolved in *C.purpurea* with harm to mega-fauna in mind. The same may be said of *Aspergillus flavus*, which occurs on nuts and grains. The aflatoxins produced by *A. flavus* are among the most powerful poisons and carcinogens on earth. To *A. flavus*, they are merely metabolic by-products, with a touch of self-defense function as well.

The other change for the worse resulted from transportation. The rapid movement of species allowed no time for immunities to develop in local populations. Many fungal species have been vilified for causing mass exterminations of elms, chestnuts, potatoes and other plants. This mirrors the unhappy experience of animal and viral micro-organisms implicated in plagues and epidemics. The real culprits, of course, are the humans who transport exotics from continent to continent.

D.P. As you see it, what has been the human purpose during recent centuries?

P.c. With the advantage of hindsight, I think we can summarise it as a failed experiment in individualism. The idea of the individual--and there is no fungal equivalent--arose during a period of rapid change in human society. In the abstract, individualism looked defensible, even appealing. The ideal individual was to be educated and enlightened, someone we'd all like to know. However, as a practical matter, the culture of enlightened individualism reformed itself after a brief period into a cult of personal freedom. Over the next several centuries, unbridled personal freedom and chance distributions of natural resources led to the creation of certain wealthy and isolated colonies of humans. Their prosperity excited envy and the rest of the world did what they could to emulate them. Large populations of humans moved from a very simple experience of the natural world to the expectation of a lifestyle similar to what the exploiters were enjoying. This clamour for plenitude put enormous stress on the biosphere.

D.P. As we know, humans failed to reverse this trend. Can you explain their failure to act?

P.c. It certainly wasn't for want of trying. If you visit the media archives of mankind--and we fungi are able to do so freely in spite of their efforts to exclude us--you will see that environmental issues were at the forefront of concern in all the wealthier nations for the past century and a half. Treaties, regulations, protocols, public opinion were used to stem the tide of harmful practices. But population growth outpaced the effectiveness of trade boycotts and outran the ability of the media to cultivate public awareness of environmental issues. And population growth added to the pressure on the biosphere as more and more people demanded higher standards of living.

A couple of analogies can help us visualise what was happening. One is the problem of the universal solvent. If there were such a substance, what would you keep it in? The phenomenon of affluence turned out to be a sort of universal solvent. Nothing could contain it. More insight is provided by the old canard about bread and circuses, which refers to the stultifying effects of amusement. Poor-quality information tends to ferment into low-grade entertainment. Under the sulphurous glare of continuous, worldwide news broadcasts, human institutions--government, military, religious, culture itself--became subjects of human amusement. This unrelenting, self-referential entertainment left a large part of mankind chronically inebriated and fundamentally uneducable.

D.P. Many times in your book, you mention what in earlier centuries would have been called "values"--altruism, moderation, that sort of thing. How do fungi define ethical values? Or perhaps you call them spiritual values?

P.c. (Laughs.) Much of what others consider spiritual, we call secular. This does not mean we are without a theology. There are two major systems of mycotheism in the fungal world. The more recent religion is only about 50 million years old, but it has a strong representation among the younger orders. The older religion is more widespread, although it is also more rationalised from the original texts. Overall, 99.4% of fungi are adherents of one or the other faith. But the important thing to note is that there are no tensions, no doctrinal disputes between the two theisms. The core principle of both religions is identical.

D.P. And that principle is...?

P.c. Whereas the root principle of virtually all the religions of mankind is behaviour modification, our core religious value is species recognition. The fungi comprise nearly a million and a half species and uncounted millions of mating types. The pressures that result from diversity of this magnitude cannot be overstated. We have long recognized that the best way to maintain order in

the system is to encourage institutionalized mycotheism. As a result, we are widely considered to be the polity most capable of reaching consensus among ourselves and acting in concert upon that consensus.

D.P. How do you describe the present relationship between nature and mankind?

P.c. I can only speak for the fungi, who characterise mankind as expendable. My chapter, "Many Keystones, One Arch", explores the uses that mankind has made of the fungi, which range from antibiotics and immunosuppressants to papermaking to bread, beer, cheeses and wines, and the familiar delights of mycophagy.

Our members observed and recorded millions of human-fungus interactions over a period of two centuries. Again, humans cannot escape our observation. We are everywhere: on their skin, in their homes, underground, in the stratosphere. After intensive analysis of these data, the Academy was not able to identify even one indispensable human-fungus transaction. No obligate parasitism, no essential relationships, no sine qua non. I ask readers to remember this important fact as they learn the startling outcome of our deliberations.

D.P. Without revealing the ending to your book, can you speak briefly about the last chapter?

P.c. Recently, the Academy convened a plenary forum to review our findings on the place of man-kind in the world ecosystem. We evaluated the state of the biosphere, giving due weight to man-kind's most recent energy policies, bioengineering innovations, developments in agriculture, industry and transportation, the efforts made towards environmental remediation and detoxification of hazardous and radioactive wastes.

We considered the question of just how much perturbation of the natural order we should tolerate from human activities. We agreed that the biosphere presently stands at 9.6 on a scale of disturbance from zero to ten. Based on these findings, the Academy adopted a position statement which we presented to the WFF. I have taken the title of that statement for my last chapter, "The Knot of a Thousand Tyings". I'd like to read from it, if I may.

D.P. Please do.

P.c. "Our members do not recoil from the future. We believe that life on earth is embarked on a unique trajectory, one that will not be repeated. We believe that the outward journey has entailed a long and intricate interweaving of the interests of all living things. We believe that the homeward path will entail the systematic unweaving of those threads. We believe we are eminently suited for a role in this process."

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