Discovering the sexy side of valued fungi

Soil fungi of the genus *Trichoderma* have numerous commercial applications. Clothing manufacturers use the cellulose-degrading enzymes produced by the fungi to give jeans a "stone-washed" look. Some household laundry detergents contain such enzymes to help remove fabric nubs. Farmers employ *Trichoderma* to attack fungi that harm crops.

Like most commercially valuable fungi, the available strains of this workhorse reproduce only asexually, which makes selective breeding impossible. But researchers now report finding sexual variants.

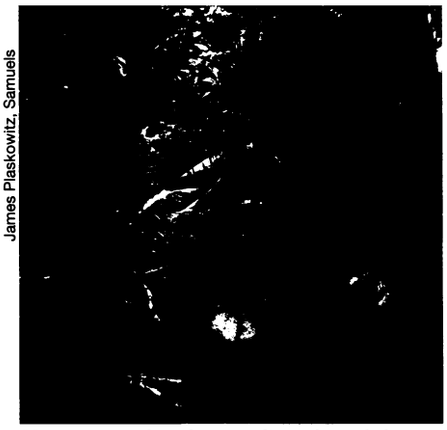
Scientists recently collected from Puerto Rico and Uganda samples of fungi identified as the rare *Hypocrea poronioidea,* last collected and studied at the turn of the century. This fungus reproduces sexually and can be grown in the laboratory.

Although the two fungi don't look alike, DNA and enzyme analyses suggest that *H. poronioidea* is actually the sexual version of a *Trichoderma* species—but which species remains unclear, report Gary J. Samuels of the U.S. Department of Agriculture's Agricultural Research Service (ARS) in Beltsville, Md., and D.J. Lodge of the USDA's Forest Service in Palmer, Puerto Rico, in an upcoming MYCOLOGIA.

Fungi commonly have sexual and asexual variants, which can go by different names. Samuels and Lodge observe that *H. poronioidea* generates both sexual and asexual spores. The asexual spores develop into *Trichoderma.*

Other genetic studies suggest that a well-known fungus called *Hypocrea jecorina* may be the sexual version of another *Trichoderma* species, *T. reesei*, contend Samuels, Adrian Leuchtmann of the Swiss Federal Institute of Technology in Zürich, and Orlando Petrini of Pharmaton in Bioggio, Switzerland. Their work is scheduled to appear in MYCOLOGIA later this year.

Manufacturers use a strain of *T. reesei* collected from a cotton tent on a South Pacific Island during World War II, says Amy Y. Rossman of ARS. The new studies will allow researchers to improve commercial strains through selective breeding, speculates Samuels.



James Plaskowitz, Samuels

H. poronioidea *fungus (inset) and the Brazilian rain forest, where it grows.*

Having these sexual fungi should help scientists classify *Trichoderma*, which has proved difficult, says Gary E. Harman of Cornell University's New York State Agricultural Experiment Station in Geneva. Correctly identifying fungi is important for securing patents on their uses. However, selective breeding will be possible only between sexually compatible strains, he notes. — *T. Adler*

Tots show signs of intentional minds

Each of us constantly makes assumptions about what other folks believe, want, and feel. Now, a new study shows that these inferences about our compatriots' mental states may have developmental roots in the first year of life.

By about age 1, infants tend to attribute positive or negative intentions to self-propelled objects that pursue simple goals, assert David Premack and Ann James Premack, psychologists at the National Center for Scientific Research in Paris, France.

This suggests that infants have an inherent capacity for discerning such intentions in the goal-directed actions of their parents or anyone else they observe, argues David Premack.

The researchers studied 56 infants, age 10 months to 15 months, at two middle-class nurseries in Paris. At first, each youngster sat in front of a computer monitor and watched one of four brief, animated scenes. In these, a gray ball follows and either hits or gently rubs against a black ball seven times, or a black ball moves up against a narrow open space in a vertical line and either gets pushed away from or through the space by a gray ball. The balls interact "negatively" in the hitting and blocking scenes and "positively" in the rubbing and helping scenes, the researchers hold.

During repeated presentations, infants looked at an initial scene for progressively shorter spans of time, indicating that they lost interest in familiar material. They then saw a second scene. Youngsters shown first a positive and then a negative interaction, or vice versa, displayed large rebounds in the amount of time they gazed at the spheres in action. Time spent looking remained low if the second scene matched the negative or positive thrust of the first one.

So, for instance, infants avidly watched the helping scene after viewing one ball pummel the other but showed no interest in the helping scene after seeing one ball caress the other.

These responses support the theory that infants possess a basic knowledge about intentional actions, the investigators assert in a report accepted for publication in COGNITION.

Nonetheless, only older children, beginning between age 3 and 5, understand that others may hold distinct mental states, such as false beliefs (SN: 7/17/93, p. 40). "A major question is how the transition occurs from basic intentional knowledge to an understanding of mental states," David Premack contends.

"The notion that infants have inherent types of knowledge about the social world is beginning to attract scrutiny," notes Alan M. Leslie, a psychologist at Rutgers University in New Brunswick, N.J. "The Premacks' new findings are suggestive and should lead to further research." — *B. Bower*

Compound may cause wasting seen in cancer

Cancer kills, but often in more subtle ways than one might imagine. Large tumors can savagely destroy organs, yet small tumors may cause a wasting of the body that leaves patients too weak to fight pneumonia and other illnesses.

Now, investigators working with mice have found a compound, apparently made by cancer cells, that causes this mysterious wasting by attacking the body's muscles.

"It produces a syndrome in mice similar to that seen in cancer patients," says Michael Tisdale of Aston University in Birmingham, England.

More important, the compound appears in the urine of cancer patients suffering from the wasting, or cachexia, but not in the urine of other cancer patients or healthy individuals, Tisdale and his colleagues report in the Feb. 22 NATURE.

"It's exciting because they may have found a compound involved in cachexia. The important thing now is for someone to confirm [the result]," says David Kritchevsky of the Wistar Institute in Philadelphia, who helped organize a meeting on cachexia last December.

"If this agent can be established as a key player in cachexia, this would be a major advance," agrees Michael C. Perry, who studies the wasting phenomenon at University of Missouri in Columbia.

Perry notes that about 50 percent of patients have an unexplained weight loss by the time they're diagnosed with

Science Service, Inc. is collaborating with JSTOR to digitize, preserve, and extend access to *Science News*. www.jstor.org

cancer. "It's a very common problem in malignancy," he says.

In addition to making patients vulnerable to illness, wasting can severely reduce their tolerance for radiation and chemotherapy, adds Perry.

To find what causes the wasting, Tisdale and his colleagues transplanted a cachexia-causing tumor into healthy mice. The mice developed antibodies, which the investigators used to identify and purify a compound circulating in the blood of cachexic mice but not in that of normal mice.

The agent turned out to be a protein fragment decorated with an unusual jumble of carbohydrate groups and other side chains. Tisdale suggests that the protein fragment has a role in normal cells, but cancer cells tack on the extra clusters of atoms.

The compound degrades existing muscle proteins and inhibits the creation of new proteins, reports the British group. "The material acts directly on skeletal muscles," says Tisdale.

The researchers found the compound in the urine of cachexic patients with lung, breast, ovarian, or pancreatic cancers. "They all show this material in the urine if they're losing weight," says Tisdale.

He also told SCIENCE NEWS about two observations not reported in the NATURE article. First, injections of antibodies to the compound inhibited tumor growth in mice, suggesting that cancer cells may depend on the substance in some manner.

Second, the compound's discovery may explain the activity of a cachexia drug now under development. One of Tisdale's colleagues, Kenneth Fearon of the University of Edinburgh, is giving pancreatic cancer patients with cachexia a fatty acid derived from fish oil.

Though the trial involves only a few patients, the acid has demonstrated an ability to thwart cachexia, says Tisdale. This promising result may stem from the acid's ability to counteract the compound his group has discovered. When the investigators treat mice with the fatty acid before giving them the cachexia compound, the rodents suffer no wasting, says Tisdale. *— J. Travis*

Chess champion sinks Deep Blue's figuring

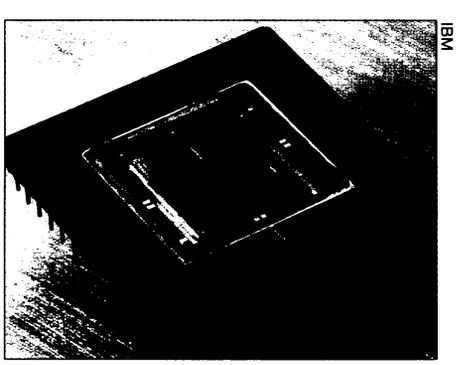
When world chess champion Garry Kasparov faced the chess computer Deep Blue in a six-game match, the contest was not so much man against machine as man against men with machine.

By the end of the match, Kasparov had outmaneuvered Deep Blue's developers—Chung-Jen Tan and his team at the IBM Thomas J. Watson Research Center in Yorktown Heights, N.Y.—to win. But it was a tough battle.

"I did not expect that it would be that tough," Kasparov said after the final game of the match, held last week in Philadelphia. In 1989, he defeated Deep Blue's predecessor, Deep Thought, with relative ease (SN: 10/28/89, p. 276).

After a stunning loss in his first game against Deep Blue, Kasparov adjusted his playing style to exploit weaknesses in the computer's play, winning the second, fifth, and sixth games and earning ties in the other two.

"I think the main distinction between us and computers [is that we] can learn," Kasparov noted. "I learned a lot from game 1 and game 2."



One of Deep Blue's 256 specially designed processor chips.

In later games, he deliberately created crowded situations that gave the computer few options, limiting its ability to attack his major pieces.

In contrast, the IBM team could not adjust Deep Blue's program during the match. Late in the fifth game, for example, the computer's calculations indicated that it had a losing position, and it moved pieces in ways that actually made the situation worse.

A human player might have reacted by gambling on a strategy that could trick an opponent into making a mistake. Instead, Deep Blue always assumed that its opponent would play perfectly. The computer lacks a sense of "creative desperation," comments IBM team member A. Joseph Hoane Jr.

A number of glitches probably contributed to Deep Blue's defeat. For instance, the team routinely selects the computer's opening moves, but in game 2, the computer failed to play the chosen opening because someone had stored the information in the wrong place.

Deep Blue's main strength lies in its ability to select the best possible move after evaluating the consequences of various moves far more deeply into a game than a human player can. The games demonstrated that this brute force can go remarkably far in matching human intuition, experience, and knowledge.

"It's a really exciting experiment," Kasparov says. "I'm looking forward to future challenges." *— I. Peterson*

Waterborne arsenic poses a cancer risk

Hotly debated data on the bladder cancer risk posed by arsenic in drinking water are now confirmed in a new study, researchers say.

Studies in Taiwan had linked water naturally tainted with high concentrations of arsenic to a greatly elevated risk of bladder cancer. That finding raised concern in the United States, where this cancer remains one of the nine most common and where some water supplies contain high concentrations of the toxic element.

At issue was whether some additional factors might be exaggerating the risk among Taiwanese. Suspected culprits included an underlying genetic vulnerability to the cancer, the malnutrition endemic in arsenic-tainted Taiwan, and the presence of other water pollutants.

The new study, conducted by Claudia Hopenhayn-Rich of the University of California, Berkeley, and her coworkers, examined residents of Córdoba, an agricultural province in central Argentina with little incidence of malnutrition. The people have a European ethnic background similar to that of the U.S. population, and the water lacks the coincident pollutants seen in Taiwan.

In the March EPIDEMIOLOGY, Hopenhayn-Rich's team reports finding among Córdovans in rural areas a bladder cancer rate roughly double Argentina's average. The Córdoba water contains high natural concentrations of arsenic—an average of 179 micrograms per liter (μg/l). Risk was mildly elevated in towns with only moderate arsenic tainting.

Toxicologist Paul Mushak of PB Associates in Durham, N.C., argues that "if the new data are not irrefutable, they certainly are reasonably compelling" in justifying a lowering of the U.S. drinking water limit for arsenic, now 50 μg/l.

Barbara D. Beck of Gradient Corp. in Cambridge, Mass., also a toxicologist, remains unconvinced. Because the new study uses historical readings from area wells but lacks exposure estimates for individuals, she wonders whether the people who developed the cancer drank water from wells containing dramatically more arsenic than the reported average.

Hopenhayn-Rich says her group will attempt to compute actual arsenic exposures among Córdovan bladder cancer victims in a follow-up study to begin next month. If this and other studies find a similar link between arsenic and bladder cancer, says Kenneth P. Cantor of the National Cancer Institute in Bethesda, Md., "we'll have a much more compelling set of data to act on . . . [and people who challenged the Taiwan data] will be silenced totally." *— J. Raloff*