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."

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

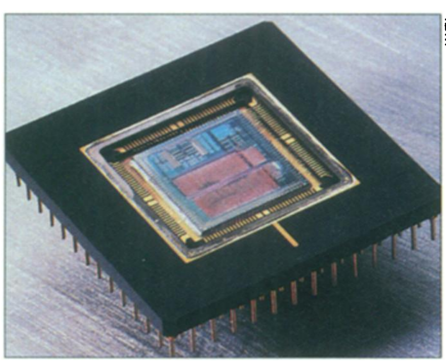
In contrast, the IBM team could not adjust Deep Blue's program during the match. Late in the fifth game, for example, the computer's calculations indicated that it had a losing position, and it moved pieces in ways that actually made the situation worse.

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*



IBM

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

# 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*