for early stages of protein misfolding in Alzheimer's disease.

What this all means is yet to be determined. In people, as opposed to the test tube, "this doesn't happen to every protein," says Jeffery Kelly, a chemist at the Scripps Research Institute in La Jolla, California. No one knows what qualities, if any, are unique to the 20 proteins known to form amyloid fibrils in humans, or whether most proteins have evolved properties to prevent certain kinds of misfolding.

A small but growing cohort of scientists suspects that if this style of misfolding is a generic property of proteins, it's likely to play a still-hidden but useful role in normal biology. "My view is that there are some cases where these kinds of transitions are beneficial," says Susan Lindquist, a molecular biologist and director of the Whitehead Institute for Biomedical Research in Cambridge, Massachusetts. Her work suggests that this applies to yeast, sometimes moderating gene expression in helpful ways; other researchers are examining whether this is also true in other organisms, including humans.

–JENNIFER COUZIN

Early bird? Blue tits use information from past years to synchronize their nesting with peak insect abundance.

CREDIT: DAVE WATTS

ANIMAL BEHAVIOR

Last Year's Food Guides This Year's Brood

Timing is everything for some breeding birds. They must hatch their young in time to exploit a brief springtime abundance of food. Seasonal cues such as day length help birds calibrate their breeding. But now a study on page 136 shows that some birds adjust their efforts according to lessons they learned the previous year. The finding implies that such birds might be able to accommodate some environmental changes spurred by global warming, but scientists caution that such adjustments may be limited.

As oak trees leaf out in European woodlands each spring, caterpillars hatch and devour fresh young foliage before the trees pump too many noxious tannins into the leaves. The 2-week burst of caterpillars provides blue tits, small birds akin to chickadees, the food they need to satisfy a nest full of clamoring little mouths.

Birds likely use a host of cues to sense that spring is in the air, such as temperature, young leaves, or hatching caterpillars. But some researchers have suggested that birds breeding too late or too early one year might learn from their mistake and adjust their timing the next. Indeed, a few studies have suggested that past experience can guide other reproductive decisions. For example, collared flycatchers adjust their clutch size, and great tits decide whether to stick with the same mate, based on past breeding success. Now, Fabrizio Grieco, Arie J. van Noordwijk, and Marcel E. Visser of the Center for Terrestrial Ecology in Heteren, the Netherlands, provide the first experimental evidence that experience can influence reproductive timing.

The group monitored pairs of blue tits as they bred in nest boxes for two consecutive years. In the first year, the team supplied half the pairs with caterpillars and mealworms as they tended their broods. The researchers took advantage of the birds' tendency to nest later than the natural caterpillar peak during their first year of breeding, due to inexperience, unfamiliarity with their territories, and the challenges of finding a mate. Thus, most unfed control birds bred late in the first year, then advanced their breeding to match the caterpillar peak in the second. But the pairs given food did not move up their breeding time in the second year. In fact, they delayed it, apparently because the first year's supplemental feeding led them to expect that food abundance would peak later.

The results show that timing reproduction "is more complex than we previously thought," says ornithologist Ruedi Nager of the University of Glasgow, U.K. Although past experience may be only one among many cues, others say, it is probably important for a species that returns to the same territory year after year and would benefit from learning the idiosyncrasies of its real estate.

But in another way, the blue tit seems to be an unlikely candidate for long-term

ScienceScope

Interim Quartet Health and Human Services Secretary Tommy Thompson last week appointed a four-member team heavy on bioterrorism expertise to temporarily lead the U.S. Centers for Disease Control and Prevention (CDC) in Atlanta. The quartet succeeds Jeffrey Koplan, who will become a vice president at Atlanta's Emory University (*Science*, 1 March, p. 1624).

CDC deputy director David Fleming leads the new crew, with James Hughes and Julie Gerberding, the director and acting deputy director of CDC's National Center for Infectious Diseases, fronting bioterrorism efforts. The fourth member is bioterrorism guru Michael Osterholm of the University of Minnesota, Twin Cities, who will be Thompson's "representative" to CDC until a new chief is found.

Agency watchers say Osterholm's slot is designed to give Thompson greater control over CDC, which was criticized for its handling of the anthrax crisis. Margaret Hamburg, a bioterrorism expert at the Nuclear Threat Initiative in Washington, D.C., says the pick "reflects Thompson's desire to have someone he knows and trusts on the team."

Pick Six The National Science Foundation (NSF) has chosen six new Science and Technology Centers (STCs) for its long-running and once-controversial experiment in large, collaborative research. The new centers—which will be formally unveiled this summer—could receive up to $40 million each over 10 years to explore everything from space weather to new cancer-detection technologies.

Then–NSF director Erich Bloch started the STC program in 1987 as an attempt to move the agency beyond its traditional emphasis on small grants to single investigators. Many scientists feared that the centers would focus on applied science and drain support for basic research, but outside reviewers have since endorsed the concept.

The six new centers, chosen from 143 applications, will join five existing centers created in 2000 (23 others have finished their runs). Another competition is scheduled to begin later this year. All the new centers have multiple partners—the University of California, Berkeley, for example, is involved in four new STCs. The winners are now negotiating their budgets and marching orders with NSF. (For a list, see sciencenow.sciencemag.org/feature/data/stc.shtml.)

Contributors: Jocelyn Kaiser, Andrew Lawler, Michael Balter, Martin Enserink, Jeffrey Mervis

learning: The species is among the shortest lived of all birds. More than half the population dies each year, making blue tits "just about the closest thing you get to an annual bird," quips University of Oxford behavioral ecologist Ben Sheldon. Long-lived species are thought to be more likely to evolve the capacity for learning, says Oxford ornithologist Christopher Perrins. Thus, if the blue tit shows this ability, Sheldon and Perrins reason, then long-lived species might well possess it in spades.

The birds' ability to adjust their reproductive timing implies a certain degree of resistance to the ill effects of climate change, note Sheldon, Nager, and others. Recent data have shown that global warming can lead to mismatches between phenomena that once were synchronous, such as leaf emergence, caterpillar hatching, and bird breeding. Although the study suggests that birds can deal with some environmental variation, ecophysiologist Donald Thomas of the University of Sherbrooke, Quebec, points out that it merely "provides the mechanism for fine-tuning." But "major climate change over decades," he says, "probably will overcome the birds' ability to learn."

–JAY WITHGOTT

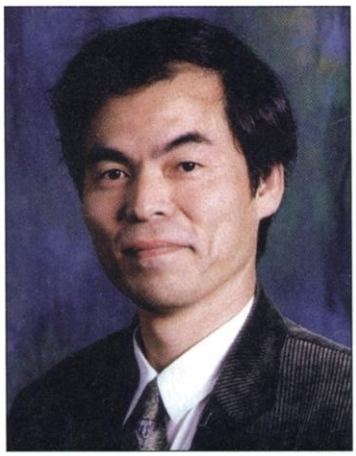
Jay Withgott writes from San Francisco.

PATENT LAW

Judge Casts Doubt On Scientist's Account

Materials scientist Shuji Nakamura is getting an unpleasant lesson in the take-no-prisoners style of the U.S. legal system. A federal judge last month accused the prominent University of California, Santa Barbara, researcher of lying in a high-stakes patent lawsuit and recommended that he be prosecuted for perjury, a charge that he and his lawyer strongly contest. The accusation comes just weeks before Nakamura is to receive one of his field's highest honors.

The Japanese-born Nakamura won acclaim in the 1990s as the inventor of a blue light–emitting diode (LED) that could lead to cheaper, more efficient lighting. But in 1999 he left Nichia Corp. and moved to the United States, saying that Japanese companies don't do enough to reward their inventors. Last year, Nakamura sued Nichia in a Japanese court, seeking a $16 million share of the firm's profits from his discoveries (*Science*, 31 August 2001, p. 1575). He now works as a consultant to a U.S.-based LED maker, Cree Inc. in Durham, North Carolina, which is embroiled in a patent fight with Nichia over the multibillion-dollar LED market.



Legal twist. Shuji Nakamura is caught up in a patent fight over his profitable blue LED invention.

CREDITS: (TOP TO BOTTOM) LYNNE FIELDING/BOSTON UNIVERSITY; UC SANTA BARBARA

As part of Cree's legal struggle, Nakamura last November answered questions from attorneys about the history of the firm's patents. At least one of his answers caught the attention of the judge hearing the case, James Fox of the U.S. District Court for the Eastern District of North Carolina. In a 15 March letter to federal prosecutors, Fox said that Nakamura admitted that he had "intentionally submitted false data in conjunction with the applications for [Nichia's U.S.] patents."

Nakamura's words are still sealed in court documents. But Fox said in his letter that Nakamura either broke laws against submitting false information to the U.S. Patent and Trademark Office or lied about the accuracy of Nichia's patent filings as part of Cree's bid to invalidate them. Either way, Fox recommended that the government prosecute Nakamura for perjury—a crime that can be punished by a jail term. Prosecutors have several years to decide whether they will follow the judge's recommendation.

Nakamura was stunned by the letter, which was publicized last week by the electronic newsletter *Internet Patent News Service*. "Perjury? I don't understand," he told *Science* after being informed of the judge's complaint. Nakamura's attorney, William McLean of Thoits, Love, Hershberger, and McLean in Palo Alto, California, says Nakamura is not responsible for any allegedly false statements in Nichia's patent applications. "The judge has just a glimmer of all the pertinent information," McLean says.

Attorneys for Nichia and Cree declined to comment on the letter, and prosecutors and the judge did not return calls. But lawyers familiar with the case say the letter may reflect the judge's unhappiness about courtroom behavior by both sides. "The judge is signaling that he'll be tough on anyone who misbehaves," says one, who asked to remain anonymous.

In the meantime, Nakamura expects to be in Philadelphia on 25 April to receive the Benjamin Franklin Medal in Engineering. Some winners have gone on to receive a Nobel Prize.

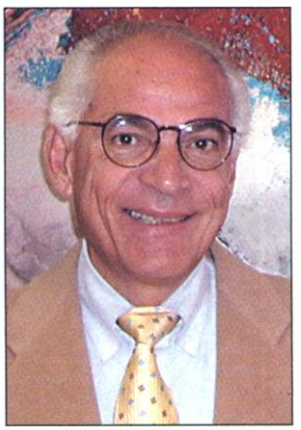
–DAVID MALAKOFF

MIDDLE EAST

Science Foundation Sets Priority Areas

A unique grantmaking foundation for Arab scientists, modeled on the U.S. National Science Foundation (NSF), hopes to award its first research grants next year.

The private 2-year-old Arab Science and Technology Foundation, which held its first international conference last week in Abu Dhabi and Sharjah, United Arab Emirates, is expecting a contribution of almost $20 million from a private donor in the next few months, says Farouk El-Baz, director of the Center for Remote Sensing at Boston University and one of the conference leaders. The foundation currently has about $1 million in cash—a gift from Sharjah's ruler. El-Baz says the foundation needs at least $10 million before it can begin to make grants.



Rich concept. Farouk El-Baz hopes that Arab philanthropy will bolster fledgling foundation.

The 900 participants at last week's meeting combined research presentations with discussions of how to run a scientific enterprise based on open peer review rather than top-down directives. The foundation has already recruited four Arab-born, U.S.-based scientists to lead panels that will manage grants competitions in the fields of water and energy, biotechnology, new materials, and information technology.

El-Baz says the foundation will be breaking new ground simply by following NSF-style procedures: "The whole concept of submitting proposals, and then being held accountable for how the money is spent, is alien to most Arab scientists, who are used to getting a budget from the government and then just spending it." The foundation would also welcome financial help from NSF, he adds.

That's unlikely to happen, says Osman Shinaishin, who oversees NSF's research programs in the Middle East. NSF "can't make that type of commitment" to a private organization, explains Shinaishin. But he says Arab scientists would do well to seek foreign collaborators, including those with NSF grants, to ensure that the research is high quality.

–JEFFREY MERVIS

With reporting by Adam Bostanci in Cambridge, U.K.