behavioral neuroscientist at Rutgers University in New Brunswick, N.J. The onset of nursing is a chance to examine the effects of increasingly strong stimuli on the brain, she adds. "It's . . . little paws treading on [the mother] and little snouts nuzzling [her]," as well as the sensation of nursing itself.

"We don't think this [increase in sensitivity] is due to an increase in the number of neurons," says Stern. "We don't know for sure, but [we think that connections] that were already there are being strengthened. . . . Think of a path in the forest that hasn't been used and has grown over. It gets cleared as it gets increasingly tromped on."

This study reinforces a relatively new appreciation of the rapid, fluctuating changes that take place in the brain, says Jon H. Kaas of Vanderbilt University in Nashville. Most earlier work involved the effects of sensory deprivation — what happens when researchers take away the ability of an animal to behave in a certain way. "It's hard to think of a way to overstimulate neurons," he says. "Their great insight is that they took a behavior that normally changes dramatically."

Stern's team noticed changes in the cortex after as little as 6 days. One rat studied after it stopped nursing seemed to have lost any increased sensitivity in its trunk, implying that these changes may be reversible. One of the most surprising results, says Stern, was that touching the nipples and the surrounding hairless skin did not trigger a response in the cortex.

"We don't know why," she adds, "[but] all we have done is look at a very small portion of the cortex. There are presumably many more changes."

"It surprises me that they didn't find [nipple stimulation affecting] the cortex," says neurophysiologist Thomas R. Insel, who works for the National Institute of Mental Health in Poolesville, Md. "It only underscores the importance of [underbelly] sensory stimulation."

The hormonal basis for maternal behavior has been worked out in great detail, says Insel, but "this comes out of left field. It's a wonderful piece of work."

It implies that maternal behavior is more complicated than previously thought, he adds. "The cortex is a vast interconnected wiring scheme, a place that gets lots of inputs and lots of outputs and can be affected by many things." This implies both that "maternal behavior may be influenced by changes in the cortex and that behavior can change the brain."

— D. Christensen

An interstellar tale writ in space dust

Space, it turns out, is not a pristine place. When stars explode, they make an awful mess.

On an earthly scale, think of the diffusing black plumes that blot the sky when Hollywood detonates a Chevrolet. On a stellar scale, hydrogen-gas clouds speckled with dirty carbon grit drift between stars, blocking light, soaking up heat, and emitting characteristic radiation.

But what is that sticky interstellar soot really like?

To find out, Adolf N. Witt, a physicist at the University of Toledo in Ohio, and his colleagues cooked up hydrogenated amorphous carbon, or HAC, exposed it to ultraviolet light, and studied its unique glow. In essence, they find that exposing loose HAC grains to hot hydrogen gas and ultraviolet radiation — a striking parallel to known conditions near expanding and exploding stars — sharply perks up their red light radiation.

In fact, the distinctive red glow of certain carbon-rich nebulae, including one called the Red Rectangle, bears a strong resemblance to the photoluminescence of synthesized HACs, Witt says. In deep space, radiation from nearby stars causes dust clouds to give off a reddish hue. The dust grains themselves — each a mineral core with an HAC coating — soak up light of one wavelength, then emit light of another. Yet when conditions around the dust change, so does its photoluminescent efficiency, says Witt.

He reported these findings at a meeting of the Materials Research Society in San Francisco this week.

To simulate conditions near expanding and exploding stars, Witt's team formed HAC films at 300 kelvins in a vacuum, then exposed them to ultraviolet light and high-energy hydrogen atoms and measured the HAC's spectra. In a series of experiments, they found that carbon exposed separately to ultraviolet rays or hydrogen yields a paltry red glow.

However, when carbon meets up with hydrogen in the presence of ultraviolet light, the two bond. This increases the HAC's photoluminescence, brightening the distinctive red radiation.

The upshot, says Witt, is that astronomers can use naturally occurring HACs hovering among the stars as remote sensors, sending back to Earth information about the deep space environment.

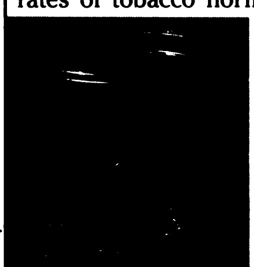
"Call them sensors or probes, if you like," Witt says. "What we now have is a laboratory material whose photoluminescence varies in efficiency under measurable conditions. This is very useful. Astronomers can use telescopes to locate dust clouds in space that can tell us by their light they emit what their interstellar environments are like."

— R. Lipkin

Climate change may make insects winners

While many people fear global warming, insects should probably celebrate it, a new study indicates.

If changes in Earth's climate continue to bring day and evening temperatures more in line with one another (SN: 1/4/92, p.4), insects may find themselves less troubled by plant toxins, according to a study comparing growth rates of tobacco hornworms living in either fluctuating or constant temperatures.



Stamp

A caterpillar's lab dining room.

Researcher Nancy E. Stamp of the State University of New York at Binghamton exposed tobacco hornworm caterpillars to either a steady 20°C environment or to a temperature that alternated between 23°C for 15 hours and 15°C for 9 hours. She fed them either a standard diet or one doctored with rutin, a plant toxin that wards off insects and other plant pests.

The different concentrations of rutin in the feed covered the range found in one of the tobacco hornworm's common meals — tomato plants — Stamp reports in an upcoming Entomologia Experimentalis et Applicata.

At higher concentrations, rutin hindered the eating and growth rates of caterpillars living in the variable temperature. But at a constant temperature, the rutin failed to have this effect.

"It didn't matter how much more toxin was in the diet, [the caterpillars] acted like there was no toxin," Stamp says.

Typically, plant toxin experiments are done at one temperature, says Frank Slansky at the University of Florida in Gainesville. Stamp's work indicates that "much of [this] prior work may not reflect biological reality," he adds.

This study carries "an important message about the interactive effects of [plant toxins] and temperature under field conditions," Stamp writes. Data from the last 40 years reveal that the average annual minimum temperatures have risen, while maximum temperatures have not changed. "We are not paying any attention to the fact . . . [that] this may interfere with plants' abilities to defend themselves," she says.

The interaction between other insects and plant toxins exposed to steady temperatures would likely be similar to that seen with hornworms, Stamp predicts.

But, warns Slansky, "We must be cautious not to overgeneralize from these results." The poison-resistance mechanisms of insects vary widely, and plant toxins have diverse modes of action, he explains.

— T. Adler