are in a lower brain area called the dorsal horn of the medulla, but are comparable to cells found in the spinal cord that respond to pain elsewhere on the body.

In each test, whether the monkey was to respond to the heat or the light cue, the scientists applied the same amount of heat to the monkey's face. But the response of the dorsal horn cells differed according to the cue relevant to the monkey's current task. When the monkey was instructed to respond to the heat cue, its dorsal horn cells showed increased activity after the heat increment. But when the monkey was instructed to respond to the visual cue, the dorsal horn cells responded to the heat increment with half this activity or less.

The dorsal horn cells receive the message instructing whether or not to pay attention to the pain input from higher brain regions, but the scientists do not yet know what brain areas are involved. The magnitude of the dorsal horn response reflects how well the animal can detect a small change in stimulus, Bushnell reports. The animal is better able to analyze an expected stimulus than an unexpected one. The scientists expect to find the same sort of early screening in cells of the spinal cord. They have recently trained monkeys to respond to heat on their hands, but have not yet recorded the activity of the spinal cord cells. *—J.A. Miller*

Arid land: Sheep may safely graze

Very often goats are the last domesticated animals seen grazing on severely degraded, arid rangelands, like those covering so much of the African Sahel. Overgrazing by livestock — especially by the goats and sheep of subsistence herders — is often blamed for the desertification of these dry lands and the famine that follows (SN: 5/4/85, p. 282). But a new study calls into question this apparent cause-and-effect relationship.

Focusing on the Ngisonyoka people in northwest Kenya, a team of ecologists and anthropologists from Colorado State University in Ft. Collins and The State University of New York in Binghamton studied how use of arid-land resources by nomadic subsistence herders affects the dry-range ecosystem they inhabit. And contrary to what had been assumed for decades by many authorities, the scientists found that traditional subsistence herding practices "may be cornerstones of [ecological] stability and sustainable [agricultural] productivity rather than prescriptions for degradation and famine."

For roughly four years, the researchers studied 9,650 herders and their livestock: 85,200 sheep and goats, 9,800 cattle, 9,800 camels and 5,300 donkeys. Their goal was an "energy flow" analysis of the ecosystem: a quantitative picture of how much of the energy contained in native vegetation was being extracted — primarily through grazing animals — to feed and shelter the nomad community. An account of their findings appears in the Nov. 8 SCIENCE.

Milk — more than half of which came from camels — accounted for 80 percent of the nomads' livestock-derived diet; meat and blood each contributed another 9.5 percent. Livestock accounted for three-fourths of the total nomad diet, more than twice its percentage in the typical U.S. diet, according to Michael Coughenour of Colorado State. Most of the rest came from food purchased with livestock products.

The overall effect of this "flow" amongst the land, animals and nomads, the researchers conclude, was that subsistence herding did not degrade the ecosystem. One reason for this is that the primary human staple, camel's milk, is ultimately derived from the plentiful, hardy, woody plants.

Not only does this traditional subsistence pastoralism (livestock agriculture) apparently preserve the fragile arid ecosystem, the scientists found, but also "it appears that the negative effects of drought, including famine, could be lessened if development policies and procedures recognized the appropriateness of pastoral ecosystems in these environments."

Research on subsistence pastoralism in Brazil and northern Peru by James Phister, a Texas Tech University range scientist based in Lubbock, shores up that conclusion. Since subsistence herders tend to be "in harmony with environmental fluctuations," Phister says, it's unlikely their animals will overgraze — unless outside subsidies, such as water (for irrigation), fertilizer (for cultivation) or money (for food and animals), encourage the herders to settle in one place. *— J. Raloff*

A brain-damage advantage for lefties?

For an as yet unexplained reason, people who are predominantly left-handed apparently are able to withstand moderate brain damage with relatively few of the motor problems observed in right-handed victims of brain damage.

Studies of a limited number of brain-damaged left-handers also indicate that they have a quicker and superior recovery of other functions, such as language and visual-spatial processing, than do their right-handed counterparts, says neuropsychologist Jordan Grafman of Walter Reed Army Medical Center in Washington, D.C.

"You can speculate that more transfer of information and shared information processing between left-handers' brain hemispheres might allow for their better recovery after brain damage," observes Grafman. "But so far there is no evidence for this theory."

Grafman and his colleagues chose subjects from a group of left-handed Vietnam veterans who suffered brain wounds without paralysis about 15 years ago. The study sample was composed of 13 men with right-hemisphere damage, 11 with left-hemisphere damage and 13 healthy, non-brain-damaged veterans. The researchers administered eight tests of simple motor functions, including grip strength, finger dexterity (manipulating pegs on a pegboard), coordination (finger tapping and movement tasks) and reaction time (pressing a button as rapidly as possible after seeing a brief flash of light).

Left-handed veterans with damage to either hemisphere performed almost as well as the healthy controls and displayed no severe motor problems, report the investigators in the October PERCEPTUAL AND MOTOR SKILLS. The size of a brain wound, language comprehension and preinjury intelligence scores were not related to motor performance, they note. Curiously, says Grafman, patients with left-hemisphere damage were more likely to have received both physical and occupational therapy, although the reasons for this are unclear.

In an unpublished study conducted by the same scientists, substantial deficits in motor functioning on the same tests appeared among right-handed veterans who suffered damage to either brain hemisphere, compared with a control group.

There are some data suggesting that left-handers have a more equitable distribution of motor and cognitive skills across brain hemispheres than right-handers (SN: 8/17/85, p. 102), as well as indications that left-handers are more likely to have allergies, myopia and learning disabilities, and, paradoxically, are more likely to be intellectually gifted (SN: 4/27/85, p. 263). "It's not clear if left-handers have a developmental disadvantage [compared with right-handers] and an advantage in adapting to brain damage," says Grafman. One reason he is reluctant to interpret his data is that it was not possible to conduct handedness tests on brain-damaged veterans before their injuries occurred. Also, it is not known if healthy left-handers have somewhat poorer motor skills than healthy right-handers across a critical range of performance affected by brain damage; if this were the case, explains Grafman, deficits would appear more pronounced in right-handers because they have more motor ability to lose.

"Unfortunately," he notes, "there is a lack of studies on left-handers, and it's hard to develop an animal model of handedness." *—B. Bower*