Food Science

Year-round lamb chops from the West?

It happens this time every year. Fresh lamb chops from the intermountain West become less noticeable in supermarkets, and this usually lasts until late summer. The reason is the seasonal clock of sheep, and as a result, the less plentiful lamb chops from Texas and California are sold.

In the intermountain West, which supplies most of the nation's lamb chops, "sheep usually mate when the daylight shortens in the fall and produce lambs in the spring," says James A. Fitzgerald, an animal physiologist for the U.S. Department of Agriculture (USDA) Research Service in Dubois, Idaho. "The time frame is slightly different in California and Texas because of the differences in climate, and also the sheep have longer breeding periods."

Ordinarily, the intermountain lambs are fattened up to about 120 pounds and placed on the market in fall and winter. But USDA researchers are using hormones and artificial light to try to reset the mating clocks of these sheep so that supermarkets can be stocked evenly with lamb chops year-round. And so far, the results have been promising.

When Fitzgerald was at Cornell University from 1980 to 1982, he placed ewes and rams in a windowless barn and controlled the amount of light they received. During the artificially short days and long nights, the sheep's brains released the hormone melatonin, which told the sheep it was time to mate. Normally, the hormone is released during nature's short days during fall and winter. A sheep's gestational period is five months.

But there was a problem. While only a few rams are needed for breeding — one ram can impregnate 50 ewes — a large number of ewes are needed, more than a typical barn can accommodate.

So when Fitzgerald relocated to Dubois in 1983, he combined his efforts with those of animal physiologist John N. Stellflug, who had been experimenting with giving melatonin to grazing ewes, first in the form of food supplements and then with implants. These ewes were paired with rams whose cycles had been manipulated in windowless barns; the experimental breeding was successful.

Because not every farmer has a windowless barn, Fitzgerald and Stellflug then decided to give melatonin to both ewes and rams to precipitate breeding during the early spring and lambing during the late summer.

Since December 1986 they have been comparing a fooled group with a nonmanipulated group. So far, lamb production has been the same for both groups.

Fitzgerald says the fooled group appears healthy and happy, but he and Stellflug still need to examine how long the sheep can be fooled and also melatonin's long-term effects.

Controlling diabetes with cooked cactus?

A type of cactus used in Mexico as an herbal remedy for non-insulin-dependent diabetes actually does lower patients' blood glucose levels, but how this happens is still unclear, according to Mexican scientists, whose report on the new research appears in the January DIABETES CARE.

After fasting for 12 hours, one group of subjects with non-insulin-dependent diabetes was given broiled stems of the cactus, *Opuntia streptacantha* Lemaire, which is a food source for Mexicans. Another group was given water. In the cactus group, blood glucose and insulin levels decreased, and in the water group, the levels did not change.

Alberto C. Frati-Munari and his colleagues at the Hospital de Especialidades in Col. La Raza say they do not understand how the cactus lowers blood glucose levels. But they suggest it may improve the effectiveness of available insulin, which stimulates the move of glucose from blood into the body's cells, where it is used as energy or stored as fat.

Mathematics

Ivars Peterson reports from Atlanta at the American Mathematical Society meeting

Calculus in the palm of your hand

Most banquets celebrating an important anniversary feature a prominent guest speaker. But when more than 1,700 mathematicians gathered in Atlanta to kick off a year-long celebration marking the centennial of the American Mathematical Society, the center of attention was a machine: an advanced scientific calculator with many of the mathematical capabilities of a computer. Nearly every mathematician present had exercised the option of purchasing along with a banquet ticket the brand-new HP-28S at a bargain price.

The delivery on Jan. 7 of 1,500 calculators, the first units of the HP-28S to come off the Hewlett-Packard assembly line in Corvallis, Ore., marked the dramatic debut of a calculating machine capable of handling not just numbers and simple operations such as multiplication but also algebraic expressions and complex tasks such as taking derivatives and plotting graphs. For example, with this compact, hand-held machine, a user can do the kinds of problems featured in beginning calculus textbooks (SN: 11/14/87, p.317). Entering the algebraic expression "sin x," then pressing a few keys to take its derivative, displays the answer "cos x" on the calculator's four-line liquid crystal display. A few more keystrokes generate a graph of the equation.

The HP-28S and its predecessor, the HP-28C introduced last year, are the most sophisticated hand-held calculators yet produced, says mathematician John W. Kenelly of Clemson (S.C.) University. Although a few calculators can now plot graphs if coordinates of points on a curve are supplied, no others can manipulate symbols and algebraic expressions. Kenelly has been teaching an introductory calculus course in which every student uses an HP-28C regularly. The HP-28S is even faster than the original and has a larger memory that allows it to do bigger problems, especially those involving series and matrices.

"What this machine does has been available on computers for quite a while," says Kenelly. "The convenience of it is the real breakthrough. I have had a very rich year with the 28C because it's been with me on airplanes, and the airline industry has made it very easy for me to find plenty of time to play with it."

The intense curiosity and sense of novelty with which many mathematicians at the banquet greeted the new calculator seemed a little worrisome to at least one mathematician who observed the proceedings. It showed, he said, how novel the idea of using a computer or a sophisticated calculator to assist in teaching college mathematics courses or in conducting mathematical research still is to many mathematicians.

Toward a new factoring record

First, there was the "Georgia Cracker," a custom-built machine for finding the prime factors of large composite numbers (SN: 3/30/85, p.202). It was an inexpensive answer to the time-consuming problem of factoring large numbers, and it worked reasonably well with numbers up to 70 digits long. Now, Jeffrey W. Smith, Randy Tuler and Carl Pomerance of the University of Georgia in Athens are constructing a new machine specially designed to implement a factoring method known as the quadratic sieve. The researchers expect that the machine can be built from readily available components at a cost of only $25,000. If all goes well, says Pomerance, the machine should be able to factor an arbitrary 100-digit number in a running time of only a few weeks. In contrast, a Cray X-MP supercomputer would have to run for a year to factor the same number.

"We think we're pretty close to completion," says Pomerance. "We have a lot of problems still to overcome, but we think we can overcome them." The new factoring machine may be tackling numbers of record length by next summer.