OF NOTE

NUTRITION

Strong support for a basic diet

Body builders and grannies take note: To preserve muscle, eat salads.

A new study by researchers at the federal Human Nutrition Research Center on Aging, at Tufts University in Boston, finds that diets rich in potassium appear to protect muscle. And fruits and veggies are a primo source of dietary potassium.

Bess Dawson-Hughes and her colleagues recruited nearly 400 men and women for a 3-year dietary trial on calcium and vitamin D. The researchers wanted to keep bones strong, so the participants—all 65 or older—would suffer fewer falls and disabling fractures. However, strong muscles also help prevent falls, and those muscles usually begin a seemingly inexorable wasting by age 40 (*SN: 8/10/96, p. 90*).

So the researchers correlated the amount of muscle with other components of the participants' diets—and found a strong link to potassium. The more of it individuals consumed, the more muscle they had, all other things being equal, report the researchers in the March *American Journal of Clinical Nutrition*. Seen in people eating the most potassium, the protective effect appears to "be enough to offset a good chunk of, if not all of, the age-related decline in muscle that normally occurs," notes Dawson-Hughes.

It boils down to pH (level of acidity). The body converts protein and cereal grains, major parts of the U.S. diet, to acid residues. Excess acid triggers breakdown of muscle into components that ultimately make ammonia, which removes the acids. Potassium-heavy diets, being alkaline, can buffer those acids without sacrificing muscle. —JANET RALOFF

ANTHROPOLOGY

A hip stance by an ancient ancestor

Fossil hunters discovered remains of a 6-million-year-old human ancestor, dubbed *Orrorin tugenensis*, at a Kenyan site in 2000. Their analysis of upper-leg fossils from *Orrorin* suggested that it walked upright in a surprisingly modern way, more like 2-million-year-old *Homo erectus* than the 3- to 4-million-year-old australopithecines, the group that includes the partial skeleton known as Lucy.

A new study of the most complete *Orrorin* leg bone, which includes the shaft and knob that connected the upper leg to the pelvis, reaches a different conclusion. *Orrorin* in fact shared a distinctive hip arrangement with australopithecines, as well as with a related line of fossil species (*Paranthropus*) that eventually died out, say Brian G. Richmond of George Washington University in Washington, D.C., and William L. Jungers of Stony Brook University in New York.

So, hips conducive to walking slowly with legs wide apart evolved in *Orrorin* and remained unchanged for almost 4 million years, until the demise of australopithecines, Richmond and Jungers propose in the March 21 *Science*. Around that time, *Homo* species evolved hips designed for a rapid stride with legs close together.

The scientists compared *Orrorin*'s upper leg to corresponding specimens from 130 modern humans, 49 common chimpanzees, 14 pygmy chimps, 59 gorillas, 32 orangutans, and nine fossil ancestors of people. Fossils came from australopithecines, *Paranthropus*, and early *Homo* species.

Earlier computerized tomography scans of the pattern of bone thickness in *Orrorin*'s hip connection raise the possibility that *Orrorin* also assumed apelike postures to climb trees, the researchers note.

The Kenyan fossil, which was found in several pieces and then glued together, should be unglued to examine its internal structure before drawing conclusions about how *Orrorin* moved about, remarks anthropologist Tim D. White of the University of California, Berkeley. —BRUCE BOWER

EVOLUTION

Crustacean shuffle

A modified joint might have made all the difference to scurrying crabs as they diverged from their plodding lobsterlike brethren.

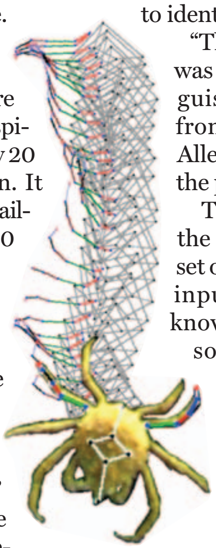
Comparing leg shape, size, and motion among three living crustaceans from increasingly ancient origins allowed Andrés Vidal-Gadea, at Louisiana State University in Baton Rouge, and his colleagues to get at

OF NOTE

the mechanics of crab walking: specifically, how some crustaceans changed their forward march into a sideways scuttle.

Forward-walking crayfish were the most primitive of the three lineages, and sideways-striding shore crabs the most recent. The portly spider crab, which plods sideways only 20 percent of the time, falls between. It belongs to one of the first groups of tailless crabs, which evolved about 320 million years ago.

"These guys [spider crabs] walk completely differently from sideways walking crabs," says Vidal-Gadea. "Anatomically they look like forward-walking lobsters."



SCUTTLE Analyses of walking crustaceans (pictured is a spider crab) help map the evolution from forward to sideways strides.

In forward-walkers, each limb's movement is limited by the leg ahead or behind it. Yet as crabs' fourth leg joints evolved to be more flexible, their limbs could glide side-to-side, the team suggests in the March *Arthropod Structure & Development*. And crabs took off, moving equally fast in two directions.

Previous work suggests that over evolutionary time certain crustaceans tucked their vulnerable tails—housing the meaty abdomen—under the body. The front claws shrunk to balance the loss of hind weight. In the absence of formidable pinchers, speed saved crab lives.

With RoboLobster, a lobsterlike robot, already in use, this research may inspire a new generation of mechanical crawlers, says Vidal-Gadea. —AMY MAXMEN

BIOTECHNOLOGY

Fingerprinting fugitive microbes

Even in a struggling economy, the job market is booming for genetically engineered bacteria.

These microscopic machines are being put to work making everything from pharmaceuticals to fuels, raising the question of how to track the invisible critters if they ever got loose—or worse, if engineered pathogens were ever released as an act of bioterrorism.

Scientists have developed a software tool that finds characteristic "fingerprints" in the microbes' DNA that can distinguish altered bacteria from natural ones.

Typically, scientists deliver foreign genes to bacteria on plasmids, small rings of DNA that bacteria naturally swap back and forth. Researchers have designed many kinds of artificial plasmids for various uses, but because new designs are usually based on older ones, artificial plasmids typically share many of the same segments of DNA.

Jonathan Allen and his colleagues at Lawrence Livermore National Laboratory in Livermore, Calif., reasoned that they might be able to use these shared segments to identify artificial microbes.

"The biggest question in our minds was how hard it would be to distinguish these [artificial plasmids] from just natural plasmids," says Allen, a computational biologist in the pathogen bioinformatics group.

The new software tool automates the process of finding the optimal set of genetic fingerprints. The team input the genetic code for 3,799 known artificial plasmids into the software, which compared the sequences and found hundreds of matching stretches, each with about 20 "letters" of genetic code. The program then computed the smallest set of these shared snippets that can accurately distinguish artificial plasmids from natural ones.

Applying the test to another group of artificial plasmids identified 98 percent of them with no false positives, the team reports in the March 18 issue of *Genome Biology*. —PATRICK BARRY

NANOTECHNOLOGY

Power from heat

The thermoelectric effect can produce small amounts of electricity from almost any source of heat, but its low efficiency has so far limited its uses. A team has now found a simple way to make one thermoelectric alloy more efficient.

When two ends of a stick of a thermoelectric material are exposed to different temperatures, a voltage appears. The electrons in the stick act like the molecules in a gas: Just as gas expands when heated, the heated electrons move from the hotter side to the cooler side. The resulting voltage can create current.

Since the 1950s, researchers have known that the alloy bismuth antimony telluride is a good thermoelectric material, says Gang Chen of the Massachusetts Institute of Technology. But Chen wondered if the effect could be made better. Chen and his colleagues ground up the alloy and recompressed it. The grinding reduced the size of the alloy's crystalline grains by about a factor of a thousand. This change slightly improved the material's ability to conduct electricity but, most crucially, made it a worse heat conductor. That was good because heat conduction tends to equalize temperatures, counteracting the whole thermoelectric principle.

The researchers made the alloy 15 to 30 percent more efficient without substantially increasing its cost, Chen says. The results appeared online March 20 in *Science*.

The material could have applications, including in a new kind of solar panel that harnesses the difference in temperature between the panel's hot, sunny side and its cool, shaded side. Such panels, the researchers say, might turn 5 to 7 percent of solar energy into electricity—less efficient than traditional photovoltaics, but potentially at a lower cost per watt. —DAVIDE CASTELVECCHI

PLANETARY SCIENCE

Titan may harbor underground ocean

Before the Cassini spacecraft began observing Saturn's largest moon, Titan, researchers had suggested that a vast ocean of methane and ethane covered the hydrocarbon-shrouded body. But the craft's penetrating radar, along with a probe that descended to the moon's surface in 2005, revealed a different portrait. Icy Titan appears to contain small hydrocarbon lakes, not oceans. Now, Cassini researchers have evidence that Titan may have a global ocean after all—100 kilometers below the surface and consisting of water and ammonia.

Ralph Lorenz, of the Johns Hopkins University Applied Physics Laboratory in Laurel, Md., and his colleagues base their findings on Cassini radar observations recorded from 2005 to 2007. During that time, hydrocarbon mountains and other prominent features on Titan shifted position by up to 30 km, the team reports in the March 21 *Science*. That displacement wasn't in sync with the moon's expected rotation because winds in Titan's dense atmosphere rocked the crust back and forth, the researchers propose. But they say the winds could do that only if the moon has an underground ocean, decoupling the icy crust from the core.

If so, Titan would be the fourth known solar system object—after three of Jupiter's moons—with an internal ocean. "Large reservoirs of water, a condition for life to form and develop," would therefore be common in the solar system, note Christophe Sotin of NASA's Jet Propulsion Laboratory in Pasadena and Gabriel Tobie of the University of Nantes in France in an accompanying commentary.

To test their hypothesis, researchers will look for seasonal changes in the shift in coming years, as the winds change, Lorenz says. —RON COWEN

VIDAL-GADEA