understand Neandertal biology … [but] it's already been done," Reich says. "It happened 60,000 years ago, and a lot of that Neandertal variation is still there."

But what struck the researchers most was what they didn't see. In about 20 regions of the modern human genome, both teams detected "deserts" of Neandertal genes. The starkest were on the X chromosome, which held one-fifth as much Neandertal DNA as the rest of the genome, and in genes expressed in testes. Such deserts can't be accidental, Reich says. They suggest that men carrying Neandertal genes for the testes, for example, were less likely to reproduce. "A massive process has removed at least one-third of the Neandertal ancestry that initially came into the modern human genome," he says.

In animal studies of mice, rabbits, or fruit flies, such patterns appear when two subspecies are diverging into separate species. Hybrid males eventually become infertile before females, because men carry only one X chromosome, and so become infertile if the DNA on it is incompatible with their mates' X chromosome. Women carry two Xs and so have better odds of staying fertile. Now, researchers are exploring whether we have inherited more DNA from Neandertal females than from males. In any case, "these Neandertals and humans were in the process of becoming reproductively isolated," says evolutionary geneticist Bret Payseur of the University of Wisconsin, Madison, who was not a co-author.

Finding traces of incipient speciation in human DNA is a stunning switch for biologists used to focusing on animals. "Seeing the signature of these rules of speciation in our own history is really amazing," says speciation expert Daven Presgraves of the University of Rochester in New York.

Paleoanthropologist John Hawks of the University of Wisconsin, Madison, however, notes that other evolutionary forces might have purged Neandertal genes, particularly on the X chromosome, where natural selection acts more strongly on males' single copy. Instead of biological incompatibility, he argues that DNA from a small number of Neandertal ancestors might have been swamped later by the sheer abundance of modern human DNA. "The ordinary person hearing about this is going to think of Neandertal mules," or sterile hybrids, Hawks says. "The evidence is against that because we still have a lot of their DNA."

Therein lies the mystery: Modern humans inherited key DNA from Neandertals. But much of it, like the Neandertals themselves, is long gone.

–ANN GIBBONS

ECOLOGY

Ecosystems Say 'Pass the Salt!'

After Roman troops razed and burned the city of Carthage 2000 years ago, legend has it they delivered a final blow, salting the soil so no crops could grow again. Michael Kaspari salts the ground, too, but with a different effect: His experimental plots teem with ants and other invertebrates. In sodium-poor soil, the University of Oklahoma, Norman, ecologist has found, small amounts of added salt boost biomass of these creatures and increase plant decomposition—so much so, his latest work suggests, that a lack of salt could be having a major impact on the global carbon cycle.

The finding, presented at a meeting* earlier this month, caps Kaspari's years-long campaign to persuade other researchers to pay more attention to the ecological significance of sodium, one of the two components of table salt. Not everyone accepts his claim that sodium limitation is a major factor affecting global carbon storage. But he has convinced many of his colleagues that salt is critical to the well-being of an ecosystem. "He's shed new light on the importance of sodium," says Spencer Behmer, an insect physiologist at Texas A&M University, College Station. "It will refocus people on what the consequences of salt are."

Online
sciencemag.org
Podcast interview with Elizabeth Pennisi (http://scim.ag/pod_6170a).

Animals use sodium in many ways, but arguably its most basic function is to help cells hold on to their contents. Bacteria and plants physically lock in nutrients and other necessary cellular components with their impermeable cell walls, but animal cells have leaky membranes that could let material inside flow out. Indeed, animal cells use up one-third of their energy budgets to prevent this loss, pumping sodium and other ions across their cell membranes to maintain osmotic balance so that other essential molecules don't diffuse out.

But because sodium exists as a charged element, organisms can't warehouse it as they do other elements including nitrogen, carbon, and phosphorous. So they need a constant source.

Carnivores tend to have enough salt in their diets, as they consume other animals that worked hard to keep an adequate supply of salt. But herbivores, and, as Kaspari has recently shown, termites and other detritivores that depend on dead and decaying material for sustenance, require much more sodium than they can get from their primary food choices. Farmers put out salt licks for their livestock for this reason.

Many other animals go to extremes for sodium. Male butterflies lap up salts in evaporating water puddles, packaging the sodium with sperm as a gift to females they court. The salts are transferred to eggs and provide newly emerging caterpillars with a starter supply. Moose wade into frigid waters—energetically, a costly move—to feed on submerged aquatic plants, which have more sodium than their terrestrial counterparts. And mountain gorillas like to munch on rotten wood, which is riddled with salty fungi.

Although he was aware of such observations, Kaspari didn't really begin to think about sodium as a driver of ecosystem dynamics until a field expedition to Peru in 2007. A colleague had documented that rainwater went from salty to almost distilled moving inland from the coast. The researchers wondered whether that salinity change had any effect on animals' behavior. So Kaspari and his colleagues did a simple experiment when they stopped to refuel on their cruise up the Amazon River. They put

* The Society for Integrative and Comparative Biology, Austin, 3–7 January.

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Published by AAAS

Different place; different tastes. Typically, ants swarm sugar, but these ants living far from a coast also crave salt.

out vials containing cotton soaked in salt or sugar solutions and waited. Within minutes, ants had swarmed the sugary balls, as Kaspari had expected. But they swarmed the salty ones just as avidly.

"It was one of the greatest things I have ever seen," Kaspari says. "Deep in the tropics, the ants will crave sodium as much as they crave sugar." His team even showed that this sodium craving among ants gradually rises with distance from the ocean.

For a follow-up study, they established 70 quarter-meter-square plots in a tropical lowland forest in Peru, where the earlier work indicated ants were salt-deprived. Every other day the researchers sprinkled half the plots with stream water and the other half with a more concentrated salt solution. They subsequently harvested all the invertebrates in each plot. These creatures make up the "brown" food web that breaks down leaf litter and recycles the forest's nutrients. In the sodium-enriched plots, the number of termites and ants increased and leaf litter decomposition jumped on average by 41%, Kaspari and his colleagues reported in 2009.

The work "suggested that global carbon balance may be affected by geographical patterns of nutrient limitations," says Daniel Hahn, a comparative physiologist at the University of Florida in Gainesville. So, Kaspari and his colleagues recently tried to estimate how much sodium influences the carbon cycle. They set up 10 pairs of 4-meter-square plots in Peru and, twice a month for a year, sprinkled half with water as salty as rain on the coast and half with river water. The plots were seeded with filter paper disks—stand-ins for leaves—and with chunks of three different types of wood. In the salted plots, termite populations increased 16-fold, leaf litter decomposition increased 26%, and wood decomposition increased by 32% to 76%, Kaspari's team reported at the meeting. (The results are also in press in *Ecology*.)

Saltshaker. Through his field studies Michael Kaspari has shown that salt can be a limiting nutrient in inland forests.

Kaspari calculates that about 80% of Earth's landmass is more than 100 kilometers from the coast, leading him to argue that the ecological effects of sodium limitation could be substantial, particularly where the natural geology fails to provide a concentrated sodium source. An estimated 30% of soil carbon is tied up in tropical forests, and Kaspari's results suggest that inland, the carbon stores build up faster and break down slower than on the coasts because of sodium limitation, a factor that researchers modeling the carbon cycle rarely consider. "Sodium can play an important role in regulating organic matter decomposition and thus terrestrial carbon storage," agrees Pablo García Palacios, a plant-soil ecologist at the Center of Evolutionary and Functional Ecology in Montpellier, France.

Not everyone is convinced. Sodium "will influence the landscape-level decomposition on the short term, but I'm not sure how it will influence the global cycle," says Michael Palace, an ecologist at the University of New Hampshire, Durham. And David Wardle, an ecologist at the Swedish University of Agricultural Sciences, Umeå, calls for more work to clarify how widespread sodium limitations are.

Still, Kaspari's colleagues say his work has given them a new appreciation for sodium's ecological and geochemical influence. "Mike takes [earlier observations] forward in a huge way," Hahn says. "He's not just looking at individual behavior and individual decisions. He's taking it to community function."

–ELIZABETH PENNISI

MEDICINE

Suspect Drug Research Blamed for Massive Death Toll

Research misconduct can ruin everything from scientific careers to institutional reputations and public confidence in science. But in a paper published 2 weeks ago, two British cardiologists claimed that misconduct in their field may have had a far greater toll. Tainted research by Don Poldermans, a disgraced cardiologist who was at Erasmus MC in the Netherlands, may have led to the deaths of 800,000 people in Europe, Darrel Francis and Graham Cole of Imperial College London wrote in a provocative article that appeared briefly in the *European Heart Journal* (*EHJ*) and was then withdrawn.

Poldermans, a prominent researcher who published more than 300 papers, was fired in November 2011 after a university investigation concluded that he had engaged in misconduct, including data fabrication. He was the lead author on two influential trials examining whether β-blocker drugs can protect patients undergoing surgery that doesn't directly involve the heart; those studies helped shape guidelines adopted in 2009 by the European Society of Cardiology (ESC) that recommended using the drugs. (U.S. guidelines are more cautious.) When Poldermans's studies are omitted, Francis and Cole say, the evidence shows that the recommendations don't save lives but endanger them.

The accusatory paper was removed from the *EHJ*'s website less than 48 hours after it appeared. It hadn't undergone peer review, as it should have, says Thomas Lüscher of the University of Zurich in Switzerland, the journal's editor; an official retraction was posted on 23 January, and the paper is now under review. But Cole and Francis say the staggering number of deaths they calculated was based on published data, and their claim has reignited a debate about giving β blockers to patients about to undergo surgery that might stress the heart. It is also a reminder, some scientists say, of the huge effects that a few uncertain and potentially flawed studies can have on clinical practice. "This is unfortunately what happens when you write a guideline that affects large numbers of people in a relatively common situation," Francis says.

Defenders of the guidelines counter that the estimate of 800,000 deaths is wildly inflated. It disregards explicit cautions in

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