Excavation of an ancient battlefield in northern Germany revealed signs of a great battle, such as closely packed bones, as seen in this 2013 photo of the site. One area of 12 square meters held 1478 bones, including 20 skulls.

Landesamt für Kultur und Denkmalpflege Mecklenburg-Vorpommern/Landesarchäologie/C. Harte-Reiter
About 3200 years ago, two armies clashed at a river crossing near the Baltic Sea. The confrontation can't be found in any history books—the written word didn’t become common in these parts for another 2000 years—but this was no skirmish between local clans. Thousands of warriors came together in a brutal struggle, perhaps fought on a single day, using weapons crafted from wood, flint, and bronze, a metal that was then the height of military technology.

Struggling to find solid footing on the banks of the Tollense River, a narrow ribbon of water that flows through the marshes of northern Germany toward the Baltic Sea, the armies fought hand-to-hand, maiming and killing with war clubs, spears, swords, and knives. Bronze- and flint-tipped arrows were loosed at close range, piercing skulls and lodging deep into the bones of young men. Horses belonging to high-ranking warriors crumpled into the muck, fatally speared. Not everyone stood their ground in the melee: Some warriors broke and ran, and were struck down from behind.

When the fighting was through, hundreds lay dead, littering the swamplike valley. Some bodies were stripped of their valuables and left bobbing in shallow ponds; others sank to the bottom, protected from plundering by a meter or two of water. Peat slowly settled over the bones. Within centuries, the entire battle was forgotten.

*How warriors were equipped for battle:* Select a number to find out more.
In 1996, an amateur archaeologist found a single upper arm bone sticking out of the steep riverbank—the first clue that the Tollense Valley, about 120 kilometers north of Berlin, concealed a gruesome secret. A flint arrowhead was firmly embedded in one end of the bone, prompting archaeologists to dig a small test excavation that yielded more bones, a bashed-in skull, and a 73-centimeter club resembling a baseball bat. The artifacts all were radiocarbon-dated to about 1250 B.C.E., suggesting they stemmed from a single episode during Europe’s Bronze Age.

Now, after a series of excavations between 2009 and 2015, researchers have begun to understand the battle and its startling implications for Bronze Age society. Along a 3-kilometer stretch of the Tollense River, archaeologists from the Mecklenburg-Vorpommern Department of Historic Preservation (MVDHP) and the University of Greifswald (UG) have unearthed wooden clubs, bronze spearheads, and flint and bronze arrowheads. They have also found bones in extraordinary numbers: the remains of at least five horses and more than 100 men. Bones from hundreds more may remain unexcavated, and thousands of others may have fought but survived.

“If our hypothesis is correct that all of the finds belong to the same event, we’re dealing with a conflict of a scale hitherto completely unknown north of the Alps,” says dig co-director Thomas Terberger, an archaeologist at the Lower Saxony State Service for Cultural Heritage in Hannover. “There’s nothing to compare it to.” It may even be the
earliest direct evidence—with weapons and warriors together—of a battle this size anywhere in the ancient world.

Northern Europe in the Bronze Age was long dismissed as a backwater, overshadowed by more sophisticated civilizations in the Near East and Greece. Bronze itself, created in the Near East around 3200 B.C.E., took 1000 years to arrive here. But Tollense’s scale suggests more organization—and more violence—than once thought. “We had considered scenarios of raids, with small groups of young men killing and stealing food, but to imagine such a big battle with thousands of people is very surprising,” says Svend Hansen, head of the German Archaeological Institute’s (DAI’s) Eurasia Department in Berlin. The well-preserved bones and artifacts add detail to this picture of Bronze Age sophistication, pointing to the existence of a trained warrior class and suggesting that people from across Europe joined the bloody fray.

There’s little disagreement now that Tollense is something special. “When it comes to the Bronze Age, we’ve been missing a smoking gun, where we have a battlefield and dead people and weapons all together,” says University College Dublin (UCD) archaeologist Barry Molloy. “This is that smoking gun.”
The flint arrowhead embedded in this upper arm bone first alerted archaeologists to the ancient violence in the Tollense Valley.

The lakeside hunting lodge called Schloss Wiligrad was built at the turn of the 19th century, deep in a forest 14 kilometers north of Schwerin, the capital of the northern German state of Mecklenburg-Vorpommern. Today, the drafty pile is home to both the state’s department of historic preservation and a small local art museum.

In a high-ceilinged chamber on the castle’s second floor, tall windows look out on a fog-shrouded lake. Inside, pale winter light illuminates dozens of skulls arranged on shelves and tables. In the center of the room, long leg bones and short ribs lie in serried ranks on tables; more remains are stored in cardboard boxes stacked on metal shelves reaching almost to the ceiling. The bones take up so much space there’s barely room to walk.

When the first of these finds was excavated in 1996, it wasn’t even clear that Tollense was a battlefield. Some archaeologists suggested the skeletons might be from a flooded cemetery, or that they had accumulated over centuries.
There was reason for skepticism. Before Tollense, direct evidence of large-scale violence in the Bronze Age was scanty, especially in this region. Historical accounts from the Near East and Greece described epic battles, but few artifacts remained to corroborate these boastful accounts. “Even in Egypt, despite hearing many tales of war, we never find such substantial archaeological evidence of its participants and victims,” UCD’s Molloy says.

In Bronze Age Europe, even the historical accounts of war were lacking, and all investigators had to go on were weapons in ceremonial burials and a handful of mass graves with unmistakable evidence of violence, such as decapitated bodies or arrowheads embedded in bones. Before the 1990s, “for a long time we didn’t really believe in war in prehistory,” DAI’s Hansen says. The grave goods were explained as prestige objects or symbols of power rather than actual weapons. “Most people thought ancient society was peaceful, and that Bronze Age males were concerned with trading and so on,” says Helle Vandkilde, an archaeologist at Aarhus University in Denmark. “Very few talked about warfare.”

Archaeologists have recovered a wealth of artifacts from the battlefield. The 10,000 bones in this room—what’s left of Tollense’s losers—changed all that. They were found in dense caches: In one spot, 1478 bones, among them 20 skulls, were packed into an area of just 12 square meters. Archaeologists think the bodies landed or were dumped in shallow ponds, where the motion of the water mixed up bones from different
individuals. By counting specific, singular bones—skulls and femurs, for example—UG forensic anthropologists Ute Brinker and Annemarie Schramm identified a minimum of 130 individuals, almost all of them men, most between the ages of 20 and 30.

The number suggests the scale of the battle. “We have 130 people, minimum, and five horses. And we’ve only opened 450 square meters. That’s 10% of the find layer, at most, maybe just 3% or 4%,” says Detlef Jantzen, chief archaeologist at MVDHP. “If we excavated the whole area, we might have 750 people. That’s incredible for the Bronze Age.” In what they admit are back-of-the-envelope estimates, he and Terberger argue that if one in five of the battle’s participants was killed and left on the battlefield, that could mean almost 4000 warriors took part in the fighting.

Brinker, the forensic anthropologist in charge of analyzing the remains, says the wetness and chemical composition of the Tollense Valley’s soil preserved the bones almost perfectly. “We can reconstruct exactly what happened,” she says, picking up a rib with two tiny, V-shaped cuts on one edge. “These cut marks on the rib show he was stabbed twice in the same place. We have a lot of them, often multiple marks on the same rib.”

Scanning the bones using microscopic computer tomography at a materials science institute in Berlin and the University of Rostock has yielded detailed, 3D images of these injuries. Now, archaeologists are identifying the weapons responsible by matching the images to scans of weapons found at Tollense or in contemporary graves elsewhere in Europe. Diamond-shaped holes in bones, for example, match the distinctive shape of bronze arrowheads found on the battlefield. (Bronze artifacts are found more often than flint at Tollense, perhaps because metal detectors were used to comb spoil piles for artifacts.)
A bronze arrow penetrated this skull, reaching the brain.

V. Minkus for the Tollense Valley Research Project
The bone scans have also sharpened the picture of how the battle unfolded, Terberger says. In x-rays, the upper arm bone with an embedded arrowhead—the one that triggered the discovery of the battlefield—seemed to show signs of healing. In a 2011 paper in Antiquity, the team suggested that the man sustained a wound early in the battle but was able to fight on for days or weeks before dying, which could mean that the conflict wasn’t a single clash but a series of skirmishes that dragged out for several weeks.

Microscopic inspection of that wound told a different story: What initially looked like healing—an opaque lining around the arrowhead on an x-ray—was, in fact, a layer of shattered bone, compressed by a single impact that was probably fatal. “That let us revise the idea that this took place over weeks,” Terberger says. So far no bodies show healed wounds, making it likely the battle happened in just a day, or a few at most. “If we are dealing with a single event rather than skirmishes over several weeks, it has a great impact on our interpretation of the scale of the conflict.”

In the last year, a team of engineers in Hamburg has used techniques developed to model stresses on aircraft parts to understand the kinds of blows the soldiers suffered. For example, archaeologists at first thought that a fighter whose femur had snapped close to the hip joint must have fallen from a horse. The injury resembled those that result today from a motorcycle crash or equestrian accident.

But the modeling told a different story. Melanie Schwinning and Hella Harten-Buga, University of Hamburg archaeologists and engineers, took into account the physical properties of bone and Bronze Age weapons, along with examples of injuries from horse falls. An experimental archaeologist also plunged recreated flint and bronze points into dead pigs and recorded the damage.

Schwinning and Harten-Buga say a bronze spearhead hitting the bone at a sharp downward angle would have been able to wedge the femur apart, cracking it in half like a log. “When we modeled it, it looks a lot more like a handheld weapon than a horse fall,” Schwinning says. “We could even recreate the force it would have taken—it’s not actually that much.” They estimate that an average-sized man driving the spear with his body weight would have been enough.

Why the men gathered in this spot to fight and die is another mystery that archaeological evidence is helping unravel. The Tollense Valley here is narrow, just 50 meters wide in some spots. Parts are swampy, whereas others offer firm ground and solid footing. The spot may have been a sort of choke point for travelers journeying across the northern European plain.
In 2013, geomagnetic surveys revealed evidence of a 120-meter-long bridge or causeway stretching across the valley. Excavated over two dig seasons, the submerged structure turned out to be made of wooden posts and stone. Radiocarbon dating showed that although much of the structure predated the battle by more than 500 years, parts of it may have been built or restored around the time of the battle, suggesting the causeway might have been in continuous use for centuries—a well-known landmark.

“The crossing played an important role in the conflict. Maybe one group tried to cross and the other pushed them back,” Terberger says. “The conflict started there and turned into fighting along the river.”

In the aftermath, the victors may have stripped valuables from the bodies they could reach, then tossed the corpses into shallow water, which protected them from carnivores and birds. The bones lack the gnawing and dragging marks typically left by such scavengers.
Elsewhere, the team found human and horse remains buried a meter or two lower, about where the Bronze Age riverbed might have been. Mixed with these remains were gold rings likely worn on the hair, spiral rings of tin perhaps worn on the fingers, and tiny bronze spirals likely used as decorations. These dead must have fallen or been dumped into the deeper parts of the river, sinking quickly to the bottom, where their valuables were out of the grasp of looters.

At the time of the battle, northern Europe seems to have been devoid of towns or even small villages. As far as archaeologists can tell, people here were loosely connected culturally to Scandinavia and lived with their extended families on individual farmsteads, with a population density of fewer than five people per square kilometer. The closest known large settlement around this time is more than 350 kilometers to the southeast, in Watenstedt. It was a landscape not unlike agrarian parts of Europe today, except without roads, telephones, or radio.

And yet chemical tracers in the remains suggest that most of the Tollense warriors came from hundreds of kilometers away. The isotopes in your teeth reflect those in the food and water you ingest during childhood, which in turn mirror the surrounding geology—a marker of where you grew up. Retired University of Wisconsin, Madison, archaeologist Doug Price analyzed strontium, oxygen, and carbon isotopes in 20 teeth from Tollense. Just a few showed values typical of the northern European plain, which sprawls from Holland to Poland. The other teeth came from farther afield, although Price can’t yet pin down exactly where. “The range of isotope values is really large,” he says. “We can make a good argument that the dead came from a lot of different places.”

Further clues come from isotopes of another element, nitrogen, which reflect diet. Nitrogen isotopes in teeth from some of the men suggest they ate a diet heavy in millet, a crop more common at the time in southern than northern Europe.

“**They weren’t farmer-soldiers who went out every few years to brawl. These are professional fighters.**”

*Thomas Terberger, archaeologist at the Lower Saxony State Service for Cultural Heritage*

Ancient DNA could potentially reveal much more: When compared to other Bronze Age samples from around Europe at this time, it could point to the homelands of the warriors as well as such traits as eye and hair color. Genetic analysis is just beginning, but so far it
supports the notion of far-flung origins. DNA from teeth suggests some warriors are related to modern southern Europeans and others to people living in modern-day Poland and Scandinavia. “This is not a bunch of local idiots,” says University of Mainz geneticist Joachim Burger. “It’s a highly diverse population.”

As University of Aarhus’s Vandkilde puts it: “It’s an army like the one described in Homeric epics, made up of smaller war bands that gathered to sack Troy”—an event thought to have happened fewer than 100 years later, in 1184 B.C.E. That suggests an unexpectedly widespread social organization, Jantzen says. “To organize a battle like this over tremendous distances and gather all these people in one place was a tremendous accomplishment,” he says.

So far the team has published only a handful of peer-reviewed papers. With excavations stopped, pending more funding, they’re writing up publications now. But archaeologists familiar with the project say the implications are dramatic. Tollense could force a re-evaluation of the whole period in the area from the Baltic to the Mediterranean, says archaeologist Kristian Kristiansen of the University of Gothenburg in Sweden. “It opens the door to a lot of new evidence for the way Bronze Age societies were organized,” he says.

For example, strong evidence suggests this wasn’t the first battle for these men. Twenty-seven percent of the skeletons show signs of healed traumas from earlier fights, including three skulls with healed fractures. “It’s hard to tell the reason for the injuries, but these don’t look like your typical young farmers,” Jantzen says.
This skull unearthed in the Tollense Valley shows clear evidence of blunt force trauma, perhaps from a club.

Standardized metal weaponry and the remains of the horses, which were found intermingled with the human bones at one spot, suggest that at least some of the combatants were well-equipped and well-trained. “They weren’t farmer-soldiers who went out every few years to brawl,” Terberger says. “These are professional fighters.”

Body armor and shields emerged in northern Europe in the centuries just before the Tollense conflict and may have necessitated a warrior class. “If you fight with body armor and helmet and corselet, you need daily training or you can’t move,” Hansen says. That’s why, for example, the biblical David—a shepherd—refused to don a suit of armor and bronze helmet before fighting Goliath. “This kind of training is the beginning of a specialized group of warriors,” Hansen says. At Tollense, these bronze-wielding, mounted warriors might have been a sort of officer class, presiding over grunts bearing simpler weapons.

But why did so much military force converge on a narrow river valley in northern
Germany? Kristiansen says this period seems to have been an era of significant upheaval from the Mediterranean to the Baltic. In Greece, the sophisticated Mycenaean civilization collapsed around the time of the Tollense battle; in Egypt, pharaohs boasted of besting the “Sea People,” marauders from far-off lands who toppled the neighboring Hittites. And not long after Tollense, the scattered farmsteads of northern Europe gave way to concentrated, heavily fortified settlements, once seen only to the south. “Around 1200 B.C.E. there’s a radical change in the direction societies and cultures are heading,” Vandkilde says. “Tollense fits into a period when we have increased warfare everywhere.”

Tollense looks like a first step toward a way of life that is with us still. From the scale and brutality of the battle to the presence of a warrior class wielding sophisticated weapons, the events of that long-ago day are linked to more familiar and recent conflicts. “It could be the first evidence of a turning point in social organization and warfare in Europe,” Vandkilde says.

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Andrew Curry

Andrew Curry is a writer based in Berlin.

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