

IRON AND INDUSTRY:



Ancient Links



Investigators dig into one of Iron Age Europe's first cities

By BRUCE BOWER

Scattered throughout central Europe lie nearly 40 prehistoric "time capsules" harboring remnants of an urban revolution that took place more than 2,000 years ago, near the end of the Iron Age. Each stands behind the remains of massive walls made of earth, stone and wood. The land behind the barriers, encompassing from 25 acres to more than 1,500 acres, holds what is left of the first cities of temperate Europe.

These sites are called oppida, a term coined by Julius Caesar to describe the walled settlements in Gaul (modern France) against which he led the Roman legions. Archaeological work at various oppida spans nearly a century, but only recently have scientists begun to understand why these urban centers emerged between about 150 and 50 B.C.

"If we want to understand the special features of European urban development, we need to begin our investigation with these Iron Age communities," says archaeologist Peter S. Wells of the University of Minnesota in Minneapolis.

One of Europe's largest prehistoric cities, Kelheim in Bavaria, West Germany, is yielding important new evidence about Europe's Late Iron Age life, according to research presented at the recent First Joint Archaeological Congress in Baltimore.

"We've only excavated a small area so far," says Wells, who is directing the Kelheim project. "But it appears the opportunity to trade for exotic goods from the Romans led to intensified iron production in the 2nd century B.C., and this may have gotten the ball rolling in regards to Late Iron Age cultural changes."

The narrow band of land claimed by the Kelheim oppidum stretches for nearly 2 miles along the base of a limestone plateau. Modern Kelheim, a small industrial city, lies adjacent to the Iron Age site.

The landscape and resources around Kelheim attracted prehistoric peoples as

far back as 50,000 years ago, Wells says. But the location's commercial potential was not realized until the final two centuries B.C.

Work at other oppida suggests iron production increased dramatically during that time. Workers smelted tons of ore and forged its metal into a plethora of groundbreaking steel implements. Metal plowshares with sharp iron disks mounted in front allowed the cultivation of heavier, richer soils. Iron hammers, axes, drills and other tools greatly improved building and manufacturing capabilities.

"The final centuries of the Late Iron Age marked the first time in Western cultural history that metal became available for everyday uses," Wells notes.

Kelheim's main attraction was its limestone plateau studded with rich deposits of iron ore. More than 6,000 pits from which miners extracted ore now pock the plateau. In addition, surrounding forests supplied the charcoal needed for smelting the ore.

Moreover, the site is flanked by the Altmühl and Danube rivers, placing it along a prime trade route.

Several thousand people probably inhabited Late Iron Age Kelheim, Wells says, but little is known about life inside the 4-mile-long, 16-foot-high wall strung between the two surrounding rivers. Modern-day farmers have periodically stumbled across prehistoric pottery, iron tools and animal bones while working portions of Kelheim's 1,500 acres, and an early 20th-century building project at the eastern edge of the site uncovered pits with numerous Late Iron Age artifacts.

In the summer of 1987, however, Wells and a field team of graduate students, undergraduates and volunteers took a more systematic approach. They excavated about 300 square yards of the

settlement surface where it appeared occupation was most dense.

What the scientific team discovered was a surprisingly broad range of artifacts and abundant evidence of iron processing.

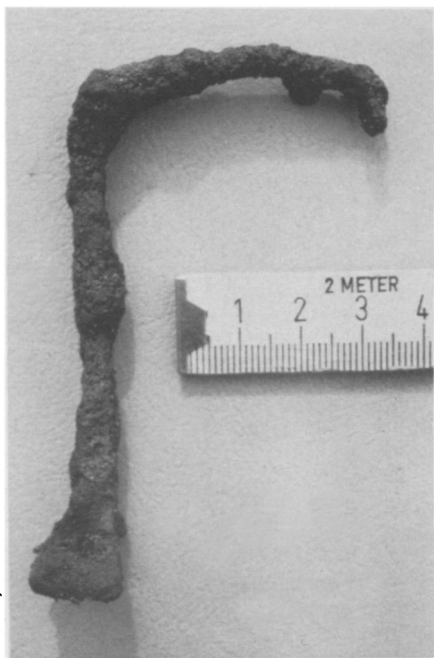
The team unearthed nearly 400 iron objects, including chisels, knives, clamps, nails, sheet metal pieces and keys. A few bronze ornaments, such as rings and pendants, also turned up. The presence of several unformed lumps of bronze suggests Kelheim's ancient artisans cast bronze jewelry on the site. Along with fragments of glass bracelets and beads, the investigators found a chunk of unshaped blue glass, indicating the city also produced glass jewelry. Four coins, two silver and two bronze, minted at other central European sites were recovered, apparently brought to Kelheim in trade. The Kelheim community also minted its own coins, Wells says, noting that German investigators previously found ceramic molds used for casting blanks from which coins were struck.

Of the thousands of pottery shards excavated by the Minnesota team, most represent vessels manufactured at the Bavarian site.

Perhaps the most important aspect of unearthing the Kelheim of Caesar's time, Wells says, is the opportunity to study its iron-producing technology. At least three stages in iron processing are represented at the excavation—unworked ore, roasted ore (heated in preparation for smelting in a furnace or hearth) and slag, the waste produced during smelting. Laboratory analyses of samples from each stage are underway.

About twice as much slag as iron is present at Kelheim, signaling inefficient production techniques, says University of Minnesota graduate student Carl Blair.

"Iron may have been integral to the oppidum economy," Blair adds, "but proof for large-scale production is still lacking."



Above, a work team at the start of the Kelheim excavation in July 1987. Late Iron Age artifacts appeared about 22 inches below the modern ground surface. At left, an iron key recovered during the excavation.

Nevertheless, according to Wells, the 1987 finds as well as recent discoveries in and around Kelheim by German archaeologists point to a powerful link between the iron industry and the emergence of a full-fledged urban center.

Considering what is known about European society at the beginning of the second century B.C., Wells suggests the union of iron and oppidum was brokered by an all-too-human trait: the desire to accumulate wealth.

This acquisitive urge took shape in European communities with no allegiance to emperors or kings. According to Caesar in his *Gallic Wars*, authority did not exist beyond "tribal groups" whose centers of power were the oppida. Caesar's conquest of Gaul from 58 to 51 B.C. succeeded so well because scattered tribal chieftains offered no unified resistance to his armies.

But more than a century earlier, in 181 B.C., Rome established a port at the head of the Adriatic Sea to open lands to the north to trade. Samples of what the Romans had to offer are found at Kelheim and other oppida — Roman wine jugs, bronze and silver vessels, fine pottery and gold and silver jewelry. Much of the jewelry was melted down to fashion local coins and ornaments, Wells says.

In return, the Romans most likely coveted large quantities of iron objects. Inscriptions scratched on the walls at an oppidum in modern-day Austria list the transactions of Roman merchants for locally produced metal objects, including iron. The inscriptions date to around the time of Christ, Wells says, and appear to describe long-standing trade practices. Archaeologists have not, however, found such inscriptions at Kelheim.

As increasing numbers of people from

surrounding communities established iron-producing operations in Kelheim, valuable objects may have been stockpiled and the wealth of the chieftain and other "elites" may have surged, Wells suggests. Thus, the massive wall may have been constructed as protection from occasional raids led by neighboring oppida chieftains bent on obtaining exotic Roman goods without bothering to trade for them.

While this scenario seems plausible, given the present state of archaeological knowledge, it remains only a general outline of the social forces at work in Late Iron Age Europe. For example, Bettina Arnold of Harvard University maintains

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Joseph says the program has since grown steadily to 62 participants and will meet its year-long goal of 200 enrollments.

The pilot has drawn heated criticism from those who say free access to needles will boost drug abuse.

One such critic is Harry W. Haverkos, chief of the clinical medicine branch at the National Institute on Drug Abuse. "There are hazards involved with that program," Haverkos argues. "If you have more needles, you have the potential that more people will use those needles."

Scientists defending the program contend no connection exists between needle access and drug use. As Chaisson sees it, people don't start to use heroin or cocaine simply because they find a discarded needle on the street. "People use drugs. The needles are a means of injecting them," he says.

The National Research Council panel agrees with Chaisson. "Current studies indicate that safer injection programs are not associated with increases in IV drug use and do lead to large-scale risk reduction among IV drug users," the report says. The committee points to a 1987 Amsterdam study that found no increase in drug users after the distribution of 700,000 free needles.

the larger oppida such as Kelheim probably were less densely populated than smaller oppida. "The really big cultural changes at that time may have been taking place at the smaller sites," she says.

Whatever the case, interesting parallels exist between the Late Iron Age and the Industrial Revolution in the early 19th-century United States, Wells contends. In both cases, he asserts, new industries sparked great increases in the production of material goods and led to the creation of commerce-based communities.

At Kelheim, Wells adds, "one is tempted to imagine an early Pittsburgh, where the fortunes of the entire community revolved around the production and trade of iron."

If the analogy fits, he says, future work at the site will establish that prehistoric villages dotting the countryside near Kelheim provided much of the labor for the booming iron industry as well as much of the food and other essential resources required by the oppidum.

But the sheer size of Kelheim and other Late Iron Age cities tests the mettle of curious scientists. A prime example is Manching, another Bavarian oppidum about the size of Kelheim. German archaeologists have excavated 22 acres over 30 years of work at Manching. Says Wells, somewhat wistfully, "They still haven't scratched the surface." □

Louisiana's experience may lend support to clean-needle programs. Clinic director Shorty attributes New Orleans' low rate of HIV infection to the fact that addicts can purchase syringes in drug stores without a prescription. In most states, people need a doctor's order to buy needles. The availability of needles keeps New Orleans free of shooting galleries, contends Shorty.

For the future, addiction experts argue firmly that aggressive intervention can minimize the spread of AIDS among drug abusers. The ultimate goal is to get addicts to stop taking drugs; but that is a slow process, and in the meantime anti-AIDS efforts must proceed, Chaisson says. Yet clean-needle programs and increased educational efforts require public support — a commodity that may be difficult to generate.

"Americans and politicians are very timid about showing any compassion toward intravenous drug abusers," says Chaisson. Panel chairman Lincoln E. Moses of Stanford University calls the matter urgent, noting that AIDS is expected to kill 50,000 in the United States in 1991. "Our committee believes that the public health threat posed by AIDS is so great," he says, "that we must find ways to overcome social and cultural taboos that stand in the way of improved AIDS prevention — and we must do so quickly." □