Seeds of Warfare Precede Agriculture

Stone Age hunter-gatherers are often billed as the peaceful precursors of agricultural peoples who cultivated frequent warfare along with their crops beginning around 5,000 years ago. But cave paintings in northern Australia, some dating to 10,000 years ago or more, bluntly blast that assumption.

In fact, these scenes painted by aboriginal peoples represent the earliest known portrayals of organized warfare, according to two researchers who have studied paintings at more than 650 Australian sites.

Depictions of large battles, small skirmishes, and people attacking one another with spears and boomerangs document an ancient tradition of warrior art by aboriginal hunter-gatherers that extends from pre-agricultural times to the early part of this century. Stone Age humans thus possessed a full-fledged capacity for waging war, argue Paul Taçon, an anthropologist at the Australian Museum in Sydney, and Christopher Chippendale, an archaeologist at the University of Cambridge in England.

"Warfare is often seen as a side effect of sedentary farming and then of urban societies," Chippendale contends. "But organized conflict is decidedly a characteristic of mobile hunter-gatherers and *Homo sapiens* in general."

The researchers describe their findings in the just-released October 1994 CAMBRIDGE ARCHAEOLOGICAL JOURNAL.

The roots of warfare may stretch back millions of years (SN: 2/9/91, p.88), but little archaeological evidence of such activity exists. However, violence does occur in modern hunter-gatherer groups; in fact, overall murder rates in some groups exceed those in Western nations (SN: 2/6/88, p.90).

Taçon and Chippendale's analysis, based on 5 years of fieldwork in which they recorded details from many previously discovered cave paintings as well as from some at new sites, uncovers three phases of aboriginal warfare in the Arnhem Land region of Australia's Northern Territory.

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Ancient Australian cave painting shows fallen figure speared through the torso.

In the earliest phase, dating roughly to between 10,000 and 6,000 years ago, paintings show human figures engaged in small skirmishes and one-on-one combat, throwing boomerangs, dodging spears, and chasing each other with their weapons raised.

A second phase, coinciding with a rise in world sea levels around 6,000 years ago and continuing for several thousand years, reveals more simply drawn figures wielding weapons such as boomerangs, barbed spears, and spear throwers. Several sites contain paintings of large battles between opposing groups of these figures.

Battle scenes occur most frequently in paintings of the third phase, which runs from 3,000 years ago to the present. Boomerangs as weapons had fallen out of use by this time. Combatants strike a variety of poses suggestive of warfare, and wounded or dying figures appear, often with spears sticking through their bodies.

Expansion and elaboration of aboriginal warfare took place because rising seas flooded coastal areas of Arnhem Land about 6,000 years ago and forced inhabitants of those regions to move inland, where others already lived, the researchers argue. Competition for land and food led to the formation of social groups with separate languages and cultures, they propose. Current aboriginal rock art, social organization, and stone tool use derive from those early population divisions, according to Taçon and Chippendale.

"Conflict, aggression, warfare, and militarism . . . are not unique to 'developed' civilizations," writes Joan Vastokas, an anthropologist at Trent University in Ontario, in a comment accompanying the new report. "Only the technology of warfare varies in scale and style from spears and boomerangs to fighter planes and nuclear warheads."

Several commentators object that the Australian rock art may portray symbolic or ritual events that had nothing to do with actual warfare.

Andrée Rosenfeld, an archaeologist at the Australian National University in Canberra, doubts the importance of this concern, "since the depictions must illustrate conceivable practice."

— B. Bower

Colliding protons: Building CERN's LHC

A decade from now, the world's particle physicists will have a new, powerful accelerator for studying fundamental particles and forces — if all goes according to plan.

After months of haggling over financial details, representatives of the 19 member nations of the European Laboratory for Particle Physics (CERN) have finally approved construction of the Large Hadron Collider (LHC). With the U.S. cancellation of the Superconducting Super Collider in October 1993 (SN: 10/30/93, p.276), the LHC now becomes the only game for particle physics at the highest achievable energies.

The decision assures a future for high-energy physics. But newly imposed constraints on the project, which will cost about $1.6 billion, mean it will take years longer to complete than originally anticipated. CERN may also have to cut back on smaller projects to help pay for it.

The LHC will be installed in CERN's existing tunnel, some 27 kilometers in circumference, which now houses the Large Electron-Positron (LEP) collider. Special accelerating units will kick protons to velocities close to the speed of light at energies of 14 tera-electronvolts (TeV).

The new facility will also require more than 1,000 high-powered, superconducting bending magnets — each 14 meters long — to keep two beams of protons, circulating in opposite directions, on a steady course around the ring. Made of a niobium-titanium alloy and cooled to 1.8 kelvins, these magnets will produce a magnetic field of 8.65 teslas.

Last December, CERN researchers succeeded in operating a string of three prototype bending magnets for 24 hours at the temperature and magnetic field required for the LHC. Test results indicate that the magnets can operate reliably under the same working conditions as the future accelerator.

To stay within budget, CERN will build the LHC in two stages. Installation of two-thirds of the bending magnets will enable physicists to start experiments in the year 2004 with particles accelerated to 10 TeV, making possible the study of the top quark in the debris of proton-proton collisions. With all the magnets in place by 2008, the LHC will be able to operate at 14 TeV, giving researchers a chance to investigate the interactions that give a particle its mass.

Financial contributions from the United States and other non-CERN nations could speed up the project's schedule.

— I. Peterson