

How Maya culture withstood colonial force

Populations conquered by invading forces do not always forfeit their cultural traditions. As historians have documented, subjugated people often infuse their own long-standing religious and economic practices into those of their political masters.

This subtle cultural resistance to foreign rule, accompanied by periodic bouts of outright rebellion, apparently characterized the Maya living on the Yucatán peninsula during Spanish colonial dominance in the 16th and 17th centuries, according to a report in the Dec. 8 SCIENCE.

In 1521, Spaniards led by Hernán Cortés defeated Mexico's Aztec empire, and in 1544 Spain took control of the Maya-occupied Yucatán. The hand of colonial rule fell heavily in resource-rich central Mexico and western Yucatán, where native residents became laborers for the Spanish and were barred from practicing any religion save Catholicism.

But many Maya fled to the densely forested, less desirable southern lowlands of Belize and Guatemala, where they developed strategies to retain their own culture while accommodating Spanish religious and economic doctrines, assert anthropologist Elizabeth Graham of York University in North York, Ontario, and her colleagues. They base their contention on archaeological work at two Belize sites, Tipu and Lamanai, as well as on Spanish historical documents.

During the postconquest period from 1544 to 1638, when the Maya expelled the Spanish from most of Belize, "it can be argued quite convincingly that Spanish material culture was never more than an overlay on that of the Maya," the researchers say. Pre-Columbian traditions in the manufacture of ceramics, tools and weapons remained largely unchanged at Tipu and Lamanai, they observe. Traditional religious ceramics reappeared soon after 1638.

Spanish records from the 16th century offer few details on the economies of remote "fringe" towns such as Tipu and Lamanai, but they do mention substantial tribute payments collected by Spanish authorities.

Excavations at the Belize sites indicate the Maya ran these communities in cooperation with Spanish authorities living elsewhere. Building features and artifacts reflect a mix of Maya and European styles, suggesting Tipu and Lamanai were part of a trade network that distributed European products throughout the Yucatán peninsula, the researchers contend.

Prior to Spanish conquest, Lamanai was a hub in an extensive Maya trade network (SN: 7/8/89, p.20).

Furthermore, the researchers argue, Maya on the geographic fringes of Span-

ish conquest forged a faith and a way of life in which two disparate religions coexisted. Small churches, served by circuit-riding Spanish priests and local Maya trained in Catholic practices, were established at Tipu and Lamanai, but lapses into pre-conquest religious customs occurred frequently, Graham and her co-workers note. For example, residents of Tipu and Lamanai rigidly followed Christian burial procedure and kept churches in good shape; nevertheless, traditional Maya religious effigies of animals and mythic creatures turn up in refuse deposits and buildings.

Lead upsets menstrual cycle in monkeys

Although people have known for centuries that lead can disrupt health and reproduction, the toxic metal permeates modern life in vehicle exhaust, pipe solder and certain industrial settings. It now appears lead's reproductive tampering may be even more insidious than previously believed. A study of rhesus monkeys shows how lead in the bloodstream — even at levels too low to trigger other symptoms — can subtly upset the menstrual cycle, interfering with the animals' fertility.

After drinking lead-tainted water for 33 months, seemingly healthy female monkeys produced less of the hormone progesterone than their unexposed counterparts, report toxicologists at the University of Wisconsin-Madison in the December BIOLOGY OF REPRODUCTION.

Normally, mammalian ovaries produce a burst of progesterone a few days after ovulation. Without enough progesterone, the reproductive system cannot properly nurture a fertilized egg. The lead-exposed monkeys showed a smaller progesterone peak in the first days after ovulation in addition to lower total production, says coauthor Nellie K. Laughlin. Similar changes have been noted in lead-exposed rats, she says, but the monkey reproductive system more closely resembles that of humans.

In 1987, Laughlin and co-workers reported that long-term lead exposure made monkeys' menstrual cycles longer and more irregular. Menstrual timing is regulated during the first phase of the cycle, before ovulation. The 1987 finding and the new study suggest low concentrations of lead can disrupt both phases, and so might reduce fertility by making ovulation irregular and implantation less likely, Laughlin says.

Studies have documented that women who work with lead in factories suffer higher rates of sterility, miscarriage, premature birth and birth defects. In cases of low-level exposure without other symptoms, Laughlin says, a woman who

The researchers maintain that archaeological evidence at Tipu and at several other Yucatán sites from the conquest period indicates the Maya practiced pre-Columbian rituals, including human sacrifice, within Christian churches, accompanied by offerings of Spanish wine and references to Jesus Christ.

When the Maya ousted the Spanish from the Belize region in 1638, "rejection of Spanish authority clearly did not necessarily mandate rejection of Christianity," the investigators add. At Tipu, for instance, some inhabitants still followed Christian burial practices even after church walls had collapsed, a behavior overlooked in Spanish accounts of the period. — B. Bower

does not keep precise records of her menstrual periods might never recognize a lead-related hormonal change.

The monkeys' blood lead concentration was roughly 10 times higher than that of most women in the general population, notes Paul B. Hammond of the University of Cincinnati Medical Center. However, because the monkeys appeared otherwise healthy, the findings are "sufficiently provocative" to warrant attention from researchers studying human reproduction, he says. — A. McKenzie

A rare ménage à trois

Traditional organic chemistry teaches that a hydrogen atom can form a covalent bond with exactly one atom at a time. That's not the entire story, according to chemists John E. McMurry, Thomas Lectka and Carl N. Hodge of Cornell University. In specially designed, cage-like molecules, they say, a hydrogen atom can bond simultaneously with two carbon atoms while the resulting trio shares only two electrons — the typical amount of covalent glue for a single bond.

In 1981, a chemist reported making a 10-member carbon ring with a geometry that accommodated a similar C-H-C bond at very low temperatures, but the structure was too unstable to study in depth. By adding a bridge of carbon atoms in the ring between two opposing carbons — called bridgehead carbons — the Cornell chemists made a structure that withstands room temperature and accommodates a long-lived C-H-C bond between its bridgehead atoms. In the Nov. 22 JOURNAL OF THE AMERICAN CHEMICAL SOCIETY, they report that the three-atom bond is about one-fourth as strong as a normal carbon-hydrogen bond.

Chemist George A. Olah of the University of Southern California in Los Angeles notes that other compounds with similarly unusual bonds have been made but are stable only at lower temperatures. □