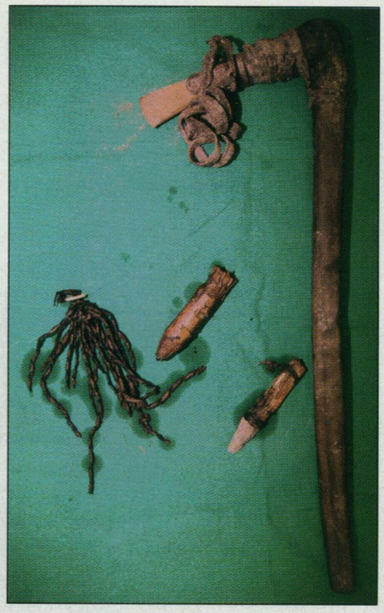
A Window on Life In the Bronze Age

The remains of a 4000-year-old man may shed light on the racial structure and culture of early Europe

S.N.S.—Pressbild



Well preserved. *Along with the Bronze Age man himself* (above), *archeologists found an ax with bronze blade and wooden shaft, a small stone knife or arrowhead, a stone amulet* (top right), *and a quiver with 14 partly feathered arrrows* (right).

Innsbruck, Austria—NOW THAT THE MEDIA blitz is finally dying down, Konrad Spindler, professor of prehistory at the university here and leader of the initial investigation into Austria's find of the century—the discovery of the frozen remains of a 4000-year-old Bronze Age hunter in a glacier in the Tyrolean Alps—is assembling a multidisciplinary team of experts from all over the world to decide the best course of investigation of the body. Needless to say, European archeologists and researchers into the origins of man are wild with excitement. The tattooed, mummified body—which appears almost perfectly preserved—together with the clothing, hunting weapons, and a wooden-framed rucksack found with it, looks set to provide a treasure trove for studies of how prehistoric man lived, and even of his genetic make-up. And new evidence gathered on the glacier this week is revealing details of how the ice man may have met his death.

Spindler's first priority, he told *Science* last week, will be radiocarbon dating to confirm the rough date (2200-1800 BC) that scientists have assigned to the ax, based on its style. It was found, complete with a perfectly preserved wooden handle, alongside the body. After that will likely come an autopsy, which would reveal what the Bronze Age man ate and perhaps how he died, and there will be attempts to extract DNA from his cells.

DNA analysis could provide the first direct data to examine theories about the genetic make-up of the peoples who populated Europe. "There is a very extensive database of European populations of today, based on both nuclear DNA and mitochondrial DNA, and many people have tried looking at the ancient racial structures of Europe in relation to language diversity, the Indo-European migrations, and so on," says Chris Stringer, head of the Human Origins Group at the Natural History Museum in London. In the past, genetic reconstructions have, he says, "all been hypothetical—now, if there has been good preservation of the DNA, we will actually be able to see how the real individual compares with the hypothetical."

The ice man comes from a period when there were probably large-scale population movements in Europe, and certainly major transformations in material culture as metallurgy spread rapidly over Europe from earlier, more localized, centers, says Stuart Needham, a specialist on the Bronze Age at the British Museum. The tentative date places the ice man close to the transition from the Copper to the Bronze Age, he says. Although he is doubtful about how much one individual will tell us about European populations, Needham says that the find is enormously exciting for archeologists because it will enable them to see how Bronze Age man really lived. The types of clothing, ax, bow and arrows, and other accoutrements found with the body have been seen before—but only at grave sites and in hoards, which are probably also ritual sites. Now, archeologists will be able to see how a complete ensemble of the gear was used in ordinary life.

Work on the body and accompanying gear will not start any time soon, however. Conservation of the body has "absolute priority," says Spindler. The find was at first transferred by helicopter to the University of Innsbruck, then last week all the items except the body were flown on to the Romano-German Central Museum in Mainz, Germany, which boasts one of the most sophisticated archeological conservation laboratories in Europe.

But European experts are entering new territory. "No one has experience with conserving mummified bodies from glaciers," Spindler explains, "so first we will have to figure out how this can best be done. For the moment we are trying to preserve the body in conditions as close to those in the glacier as possible, by cooling to minus 6°C. Beyond that, the only measure we have taken was to treat the body with a fungicide in order to stop an alarming growth of at least two species of fungus."

The preservation of the body for 4000 years appears due to a combination of three improbable events. First, Spindler says, was the rapid mummification of the body. The drying of human remains is a rare but well-known phenomenon in the Alps, caused by a particular combination of cold, sun, and warm, dry mountain winds. "From suicide cases it is known that the process can be completed in just a few weeks," says Spindler.

Quick coverage by snow was the second lucky step that preserved the body. As the skin does not show scars from maggots, Spindler believes that the man must have died during the late fall when cold weather and heavy snow set in. The only damage to the body consists of some minor wounds inflicted by scavenging animals.

The third factor was that the man was found in a chamber-like depression in the rock, where his body lay undamaged by the movement of the glacier. Normally, bodies frozen in glaciers "are transported all the way down the valley and tend to get mutilated beyond recognition," Spindler explains.

The latest news from an expedition sent this week to reexamine the site where the body was found clearly shows that the location of his body was anything but accidental. Investigation of the 6 x 25-meter chamber shows that the man had carefully put down his various weapons and rucksack within the chamber before lying down. New finds include a braided mat of grass, a bag, and a coarsely woven net of grass fibers, which may have been used as a carry bag. But more important is evidence that the man had been successful in his hunt and had food with him. He had a pile of berries and at the same position as his rucksack (and presumably inside it before decay set in) were residues of chamois skin, as well as animal bones and the skin of a smaller animal.

The man was plainly well equipped for traveling in the high mountains. He wore a fur jacket, trousers, and boots, stitched together with fine bands of leather, and stuffed with an insulating layer of hay. He was armed with a knife, ax, and a long bow, and carried at least 14 arrows in a leather quiver. X-ray examination reveals that some of the arrows had bone heads; others had only wooden points and may have been used for hunting birds, Spindler says.

But why exactly did he die? He was found lying with his face down, resting on one arm, a posture that forensic scientists say is common in victims of death by exhaustion or exposure. But it now appears that he had found shelter and he had warm clothing and food still left to eat. Was he sick? The autopsy that scientists are anxious to perform could conceivably provide an answer. Other clues too may turn up in a further excavation of the chamber planned to take place as soon as the spring thaw is over next year. Unbelievable though it may sound, we may yet learn the secret of the last lonely hours of a Bronze Age man who died 4000 years ago.

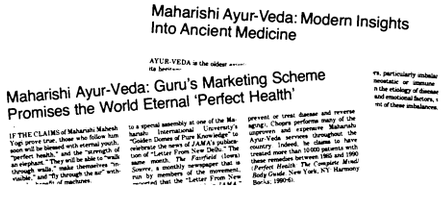
■ FELIX EIJGENRAAM and ALUN ANDERSON

Felix Eijgenraam is a science writer with the Dutch newspaper NRC Handelsblad.

JAMA Gets Into an Indian Herbal Jam

Three authors who wrote about traditional Indian healing have conflicts of interest, the journal finds

WHAT CAN A PRESTIGIOUS MEDICAL JOURNAL do if the authors of a peer-reviewed article fail to disclose a financial conflict of interest that could seriously undermine the credibility of their publication? Precious little, perhaps, since a journal can't be a detective agency, and all journals have limited resources. But when the conflict of interest is disclosed, the journal can weigh in with a lengthy rebuttal, pointing out the conflict and taking issue with the original article. And that's what the *Journal of the American Medical Association (JAMA)* did last week, in an attempt to resolve an ugly episode that has implications for all scientific journals and for scientists who could possibly be construed as having a conflict of interest.


Maharishi Ayur-Veda: Modern Insights Into Ancient Medicine

Maharishi Ayur-Veda: Guru's Marketing Scheme Promises the World Eternal 'Perfect Health'

Nowhere men. *Maharishi in the Beatle days; recent* JAMA *headlines.*

The paper that caused the fuss was a "Letter from New Delhi," by three Indian scientists, published in *JAMA* on 22 May. The article purported to be a scientific evaluation of a traditional form of Indian medicine called Ayurveda. The article appeared to combine the theory of Ayurveda with an explanation of methods of diagnosis, and included citations on the clinical use of meditation and in vivo and in vitro studies on herbal medicine. That apparently sounded reasonable not merely to the *JAMA* editors who accepted it for publication but to the journal's peer reviewers—whose number and comments *JAMA* editor George Lundberg refused to disclose. Whether those reviewers were sufficiently savvy or not, the facts turned out to be, according to *JAMA* associate editor Andrew Skolnick, that the paper was actually a thinly disguised advertisement for the international Transcendental Meditation (TM) movement and its products.

Which brings us to last week's six-page counterattack. In that piece Skolnick writes: "The authors misrepresented Maharishi Ayur-Veda to *JAMA* as Ayurvedic medicine, the ancient traditional health care system of India, rather than a trademark for a brand of products and services marketed since 1985 by the Maharishi Mahesh Yogi's complex network of research, educational, and commercial interests."

What's more, Skolnick reports, the authors, pathologist Hari Sharma of Ohio State University, endocrinologist Deepak Chopra, former chief of staff at New England Memorial Hospital in Stoneham, Massachusetts, and Brihaspati Dev Triguna, an Ayurvedic practitioner who runs a large pharmacy in New Delhi, had extensive past and present links, including financial ones, to the Maharishi's movement (best known for attracting the brief adherence of the Beatles in the late 1960s). Chopra, for example, was president, treasurer, and clerk of Maharishi Ayur-Veda Products International (MAPI), the company that distributes the movement's herbal products, until 1988. Sharma served as a consultant to several Maharishi-linked organizations, including MAPI. But none of those connections was disclosed on the pre-publication form *JAMA* requires all its authors to sign.


Bettmann

Chopra, reached in Los Angeles, where he is promoting his new book, "Unconditional Life" (Bantam, 1991), denies any conflict of interest. "I now donate my services," to the TM movement, he said. In fact, he said, the financial tie runs the other way—rather than receiving money from the Maharishi's movement, he gives money to it. "I generate a lot of money...and if I want