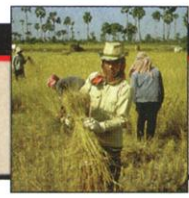


Foundation in Ithaca, New York, and president of the Association of University Technology Managers, which monitors patenting activity on U.S. campuses. Still, he notes, "the kinds of patents that have this kind of potential financial impact are relatively rare, maybe one out of 1000."

–DAVID MALAKOFF

PALEOANTHROPOLOGY

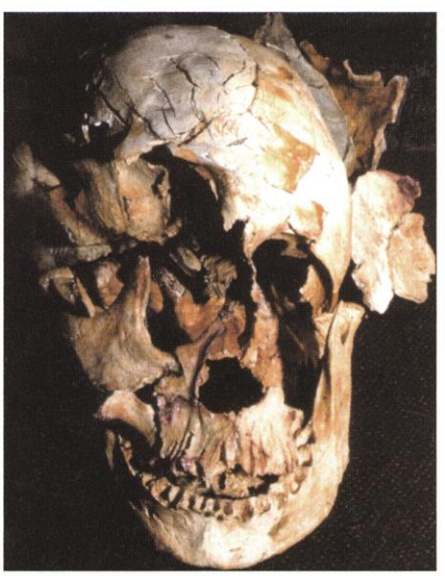
Is Alexander the Great's Father Missing, Too?

The remains of Alexander the Great—the warrior who conquered much of the known civilized world in the fourth century B.C.—have been lost for more than 1500 years. But in 1977, Greek archaeologists unearthed a tomb in the town of Vergina, in northern Greece, that they claimed contained a worthy consolation prize: the remains of Alexander's powerful father, Philip II, who had started expanding the Macedonian empire and had enlisted Aristotle to tutor the precocious prince. A team of British scholars confirmed this identification in 1984. But on page 511, a paper by Greek paleoanthropologist Antonis Bartsiokas argues that close-up photographic analysis of the remains suggests that they are not those of battle-scarred Philip II, but belonged to a less important historical figure: Philip's son (and Alexander the Great's half-brother), Philip III Arrhidaeus.

The new report also offers the tantalizing possibility that some of the tomb's artifacts, including a helmet and a ceremonial shield, may have actually belonged to the great conqueror himself. "Are we lucky enough to have found the helmet of Alexander the Great?" wonders Eugene N. Borza, a leading expert on the ancient Macedonians and professor emeritus of ancient history at Pennsylvania State University, University Park. "It's too good to be true, but a tempting thought nonetheless."

There is general agreement that the Great Tumulus of Vergina, originally excavated by Greek archaeologist Manolis Andronicos, was a burial ground for some members of Alexander's royal family. Of the four tombs, one almost certainly contains the remains of Alexander's only son—murdered at a young age—but questions have always surrounded the identity of the male and female remains in the richest tomb, Royal Tomb II. A team including University of Bristol anatomist Jonathan H. Musgrave concluded in 1984 that markings on the skull and other bones appeared to correlate with reported injuries suffered by Philip II, including an arrow wound to his right eye during the siege of Methone in 354 B.C., 18 years before his assassination. That identification forms the centerpiece of a new museum at Vergina.

But Bartsiokas, the director of Greece's Anaximandrian Institute of Human Evolution and an assistant professor at Democritus University of Thrace, says his new close-ups of the bones, taken in 1998, do not reveal such damage. He scrutinized the bones to see whether the previously reported "notch" and "bone pimple" on the skull were consistent with healed wounds from an arrow injury. He rejects this hypothesis, reporting that the marks "bear no evidence of healing or callus formation" and are simply normal anatomical features. "Despite the severe injuries suffered by Philip II, there is no skeletal evidence whatsoever of any injuries to the male occupant of Royal Tomb II," he concludes.



Identity crisis. This skull, once thought to be that of the warrior king, Philip II of Macedonia, may instead belong to his son, Philip III Arrhidaeus.

He also notes that historical records show that Philip III Arrhidaeus—who had ruled for 6 years after Alexander's death and was murdered in 317 B.C.—had been buried for about 6 months before his exhumation and cremation by Cassander. And the condition of the skeletal remains were consistent with bones that had been "dry" of flesh before cremation. "Only the bones of Arrhidaeus would show these characteristics," Bartsiokas contends. As for the Vergina museum's description of Tomb II as that of Philip II, Bartsiokas says: "I hope they change that."

The later burial date leaves open the possibility that some of the artifacts in the tomb—including a helmet, a gilded silver diadem, an iron-and-gold cuirass, and the ceremonial shield—may have belonged to Alexander himself, who had died in 323 B.C. and whose remains were interred in Egypt before being lost. Borza says the Vergina tomb's items fit several historical descriptions of Alexander's paraphernalia.

Despite that exciting prospect, Musgrave—who made the original identification along with Manchester archaeologist John Prag and medical artist Richard Neave—stands by his group's findings. He insists that the facial bones he examined showed signs of healed wounds and suggests that the bones' condition may have degraded during the 15 years between his examination and that of Bartsiokas. He also contends that several details of Tomb II—including its apparent hasty construction—argue against it being the tomb of Philip III Arrhidaeus. Bartsiokas "has concentrated on evidence that is limited in the extreme to postulate a hypothesis that cannot be sustained," Musgrave says.

But Borza and Bartsiokas dismiss those objections. Borza argues that two artifacts in the tomb—a piece of ceramic pottery and a Macedonian silver wine strainer—are clearly dated later than Philip II's death. The new analysis of the bones, along with the late artifacts, says Borza, "drive the final nail in the coffin of the Philip II identification. Clearly, this is not the tomb of Philip II, but of the next generation."

–ROBERT KOENIG

GERMAN VOTE

Animal Rights Amendment Defeated

German scientists who experiment on laboratory animals can breathe a bit easier—for now. On 13 April Germany's lower house of parliament narrowly defeated an effort to amend the nation's constitution to guarantee animal welfare. Such an amendment could have led to court challenges of much of the country's lab-animal research.

The amendment, supported by the ruling

CREDIT: ANTONIS BARTSIOKAS/ANAXIMANDRIAN INSTITUTE OF HUMAN EVOLUTION