Letters continued from p.19

Atapuerca bones: Homing in on *Homo?*

The Atapuerca fossils ("Neandertals Take Big Step Back in Time," SN: 4/10/93, p.228) share many traits with Neandertals in cranial, mandibular, and postcranial bones; therefore, the first evaluations of the Atapuerca skulls have focused on the evolutionary relationships between them and Neandertals. However, many of these traits are also present in modern humans and absent from Asian *Homo erectus* (i.e., cranial vault high in lateral view, rounded occipital bone, and general morphology of the temporal bone). In other traits, the Atapuerca skulls do not display the Neandertal pattern; rather, they show more primitive hominid traits (i.e., very large facial size, marked general prognathism, low position of the maximum cranial breadth). Thus, the Atapuerca skulls do not share any trait exclusively with Asian *H. erectus.* Moreover, some of the fossils assigned to *H. erectus* are contemporary with or more recent than the Atapuerca skulls.

It seems, therefore, that there were two ways of being *Homo* in the middle Pleistocene: the population represented by the Atapuerca sample and other fossils from Europe, Africa, and Asia (called by some authors "archaic *H. sapiens"),* and the specimens generally attributed to *H. erectus.* The Atapuerca evidence strengthens the hypothesis that Neandertals and modern *H. sapiens* had a common ancestor. The Atapuerca population was not that common ancestor, but it seems to be morphologically close to it. The where and when of the origin of modern humans remains open because some fossils in the middle Pleistocene of Asia have been reported to display many traits (especially in the facial skeleton) shared with modern populations. Future comparisons of the Atapuerca sample, the Asian *H. erectus,* and the *Homo* fossils from the lower Pleistocene of Africa will help to elucidate the evolutionary history of *Homo.*

Juan-Luis Arsuaga
Ignacio Martínez
Ana Gracia
José-Miguel Carretero
Department of Paleontology
Complutense University
Madrid, Spain

Curveball question hits fever pitch

In response to Maharg and Thorpe's letters (SN: 5/8/93, p.291), I would like to clarify that neither I nor the other authors mentioned in "Baseball pitchers hurl illusions home" (SN: 2/20/93, p.116) dispute the fact that pitched baseballs follow trajectories that deviate in the direction of ball spin (a finding first noted with tennis balls in 1671 by Isaac Newton). The central point is that the extent and pattern of *perceived* deviation can differ considerably from *actual* deviation.

The rising fastball is of particular interest because the ball does not appear to be falling at a rate slower than the normal gravitational trajectory, as it actually does. Rather, it appears to accelerate upward right in front of the batter, with a vertical hop that ranges from several inches to over a foot. The perceptual model that I introduced and that Bahill and Karnavas elaborated on and tested empirically shows that misjudgment of the initial speed of the approaching ball can account for the vertical and horizontal spatial misperceptions, as well as the illusory acceleration, or hop, at the end.

I might also point out that baseball aerodynamics involves more than simply Bernoulli's principle. This principle, the differential force on opposite sides of a moving object caused by differing rates of airflow, may contribute to the curvature of knuckleballs but seems to be a minor factor in the case of spinning baseballs. The Magnus effect, the force that occurs when a spinning projectile has laminar airflow on one side and turbulent flow on the other, is the principal factor influencing curvature of pitched baseballs. In addition, some physicists argue that "drag crisis," a reversal of resistive force that occurs when a projectile travels near a certain critical velocity, may also contribute to trajectory curvature. Golf balls have dimples to limit drag crisis.

The magnitude of trajectory curvature caused by Bernoulli's principle, the Magnus effect, and drag crisis is a function of ball size, mass, roughness, spin rate, and velocity, as well as air temperature and density, and can differ dramatically for different kinds of balls. My perceptual model is intended to complement the physics research, thus helping explain perceived trajectories that do not actually occur.

Michael K. McBeath
Assistant Professor of Psychology
Kent State University
Kent, Ohio

Address communications to:
Editor, SCIENCE NEWS
1719 N Street, NW
Washington, DC 20036
All letters subject to editing