

observations of X-ray binaries and pulsars for more than a year, has accumulated about 1,000 hours of data, and has made many observations of the supernova at almost every opportunity since its discovery. Indeed the telescope was making measurements of the pulsar PSR0540, at the position of the supernova, in February 1987. (One observing run started just a few hours after the neutrino burst.)

Observations on several days before and after the core collapse indicate a limit on the continuous emission of 250-GeV γ -rays of 10^{-10} photons $\text{cm}^{-2} \text{s}^{-1}$ immediately following the supernova. This result is not surprising, as it is uncertain within a year or so when, how quickly and, indeed, if the supernova will become a source of VHE γ -rays. Other results taken in September 1987 indicate a similar flux limit.

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How to avoid jet lag

SIR—In a News and Views article¹, Winfree asks whether the observation of Mrosovsky and Salmon² — that hamsters adjust much more quickly to a large change in the light-darkness cycle if, when this change is made, the animal is put on a running wheel so that it will be active at a time when, before the cycle change, it was asleep — is relevant to the problem of minimizing jet lag in people.

In my experience, after flights of 12 hours or so associated with a large change in longitude, one recovers much more quickly if the flight ends in the late afternoon or evening, as may be the case when travelling from London to Singapore or Los Angeles, than when one arrives in the early morning, as seems almost inevitable in London. In the former case one has dinner after arrival at about the time when, before the journey, one would probably still be asleep (although the local clock agrees that it is dinner time) and then goes to bed. In the latter case one either goes to bed when the local clock says that it is time to get up, or goes to work while suffering from lack of sleep.

This anecdotal evidence is purely subjective, and uncontrolled variables such as the direction in which one was travelling and how well one slept on the aircraft may affect the situation. It might be rewarding, however, to conduct some experiments in which these variables were controlled and subjective feelings were supplemented by objective tests of recovery from jet lag.

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1. Winfree, A.T. *Nature* 330, 311–312 (1987).

2. Mrosovsky, N. & Salmon, P.A. *Nature* 330, 372–373 (1987).

Joints of the crocodile-reversed archosaurs

SIR—Cruikshank and Benton¹ challenged the hypothesis of monophyly in the so-called crocodile-reversed archosaurs (Euparkeriidae and Ornithosuchidae). Their arguments hinged on the idea that a unique derived tarsal structure is not synapomorphic for the two families and questioned the concept of two divergent early archosaur lineages^{2–7}. Here we present synapomorphies of the tarsi of *Euparkeria* and ornithosuchids as evidence of the monophyly of the crocodile-reversed lineage.

In crocodile-reversed archosaurs, the proximal of two primitive intratarsal facet pairs became the principal ankle joint^{2,7,8}. The mobile astragalocalcaneal joint in *Euparkeria* is a cylinder-in-cylinder, whereas it is a true ball-in-socket in the ornithosuchid *Riojasuchus*. The rotational axis of the calcaneum on the astragalus (MAJ) is oblique to the long axis between crus and tarsus (UAJ) in *Euparkeria*, whereas the two axes are parallel in *Riojasuchus* (Fig. 1). The calcaneal facet on the astragalus faces ventrolaterally, is oriented horizontally, and terminates medially in the main concavity for calcaneal articulation. Its location is ventrolateral, not distal, in both *Euparkeria* and *Riojasuchus*. The facet is an anteroposteriorly elongate groove in *Euparkeria*, whereas it is medio-laterally aligned and terminates medially in a conical depression in *Riojasuchus*.

The calcaneal facets for astragalur articulation are similar in structure in *Euparkeria* and *Riojasuchus*. A surface shaped like a partial cylinder terminates medially in a conical eminence. The two genera differ in that the conical eminence

of the astragalur facet in *Riojasuchus* fits into the conical concavity on the ventrolateral astragalus, whereas the entire articulation in *Euparkeria* is by the hemicylindrical convexity on the anteromedial calcaneum fitting into the cylindrical concavity on the astragalus. The structure of the astragalur facet and the medially recurved distal end of the calcaneal tuber lacking a medial groove are derived characters shared only by *Euparkeria* and the ornithosuchids⁷.

Cruikshank and Benton stated¹ that the tuber calcis of *Euparkeria* is lateral in orientation and “of the same basic pattern as in *Proterosuchus* and similar forms”. Relative to the long axis between crus and proximal tarsus (UAJ) in *Euparkeria*, the tuber long axis (TLA) projects posterolaterally, at an angle of 25°, slightly less than in living crocodylians (30°–58°). A posterolateral tuber allows flexion of the gastrocnemius to be transmitted to a laterally oriented pes in sprawling and ‘semi-erect’ archosaurs (for example, phytosaurs and crocodylians)⁷. A truly lateral tuber is only seen in early diapsids (for instance, *Proterosuchus*) with an immobile MAJ⁷. A posteriorly directed tuber of the type seen in *Riojasuchus* is seen elsewhere only in archosaurs with parasagittal limb mechanics (for example, aetosaurs and poposaurids)^{6,7}. Reorientation of the TLA, UAJ and MAJ can be linked to a shift from sprawling to erect posture⁷ along a gradient consisting of *Proterosuchus*, *Euparkeria* and *Riojasuchus*.

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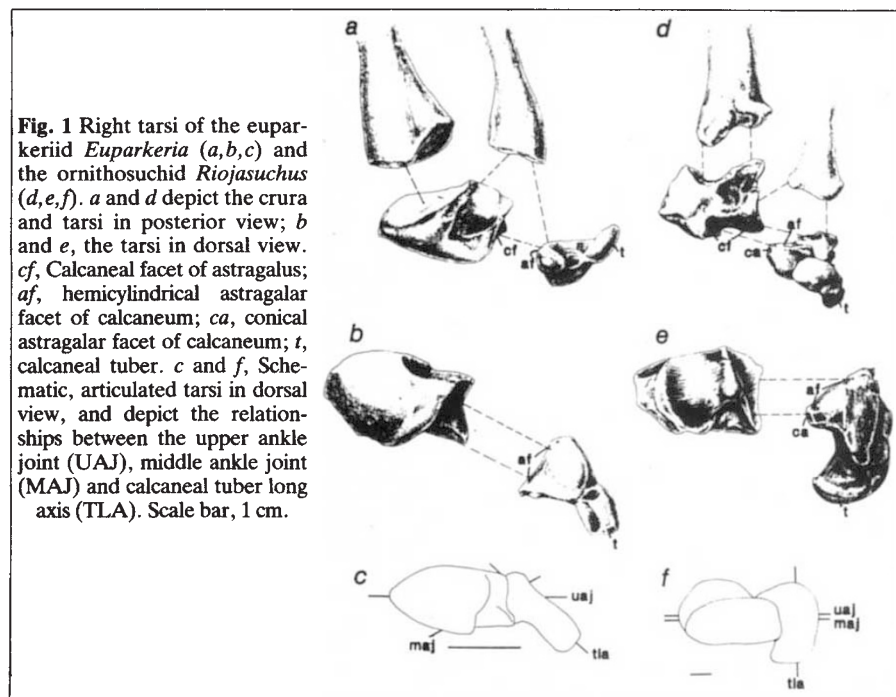


Fig. 1 Right tarsi of the euparkeriid *Euparkeria* (a,b,c) and the ornithosuchid *Riojasuchus* (d,e,f). a and d depict the crura and tarsi in posterior view; b and e, the tarsi in dorsal view. cf, Calcaneal facet of astragalus; af, hemicylindrical astragalur facet of calcaneum; ca, conical astragalur facet of calcaneum; t, calcaneal tuber. c and f, Schematic, articulated tarsi in dorsal view, and depict the relationships between the upper ankle joint (UAJ), middle ankle joint (MAJ) and calcaneal tuber long axis (TLA). Scale bar, 1 cm.