

Archaeoraptor's better half

The other component of this infamous fossil forgery is identified as a fish-eating bird.

The 'Archaeoraptor' fossil, once proclaimed as a key intermediate between carnivorous dinosaurs and birds¹ but now known to be a forgery, is a chimaera formed of bird and dromaeosaur parts^{2,3}. Although the non-avian dinosaur tail of this controversial specimen from the Early Cretaceous Period of China has been identified⁴, the avialan parts of the specimen have not. Here we reveal that these avialan parts, including the hindlimbs, which were previously designated as unverifiable "attached bones"³, can be referred to a single species, *Yanornis martini*⁵, and are supported as pieces of a single, almost complete specimen. A new specimen that is also referable to this species, and which has its gut contents preserved, indicates that the principal part of this false raptor dinosaur–bird fossil is in fact a fish-eating bird.

High-resolution computed X-ray tomography revealed that two to five specimens belonging to two or more species could comprise the *Archaeoraptor* forgery³. However, the morphology and proportions of all of these parts, other than the dromaeosaur tail, supports referral to a single species, *Y. martini*⁵. Measurements (see supplementary information) and anatomical features of the *Archaeoraptor* parts correspond closely and, taking breakage into account, are almost identical to those of the *Yanornis* holotype.

The premaxillae are partially fused and toothed in both specimens (Fig. 1). The tip of the exposed right premaxilla of the *Archaeoraptor* specimen lacks associated teeth. The length of this portion of the facial margin is identical to that of the edentulous portion of the premaxilla in the *Yanornis* holotype. In both specimens, the coracoid has a prominent procoracoid process and deeply concave scapular cotyla (Fig. 1). These skull and pectoral-girdle features are preserved as impressions in the *Archaeoraptor* specimen (Fig. 1a). Both preserve prominent lateral processes of the coracoids, as well as extremely robust furculae ('wishbones'). The combination of the aforementioned morphologies is unique to *Yanornis*, and the dimensions of these elements are equivalent (Fig. 1b).

The dimensions of the femur, tibia and tarsometatarsus, as well as the lengths of the pedal phalanges, are also nearly identical and are consistent with referral of these parts to *Yanornis* (see supplementary information). The foot shares with the *Yanornis* holotype morphological features, including proximal and distal fusion of metatarsals II–IV, and metatarsal II being shorter than IV.



Figure 1 Analysis of the avialan half of the 'Archaeoraptor' forgery. **a**, Front half of the *Archaeoraptor* specimen IVPP V12444 (excluding the tail); **b**, front half of the *Yanornis martini* holotype specimen IVPP V 12558, shown for comparison; inset, gut contents of a new *Yanornis* specimen, IVPP V13259. ed, edentulous portion of premaxilla; fe, femur; fr, fin rays; fu, furcula; lp, lateral process of coracoid; op, teleost fish opercular fragments; pm, premaxilla; pr, procoracoid process of coracoid; ri, ribs; sc, scapular cotyla of coracoid; st, sternum; ve, teleost fish vertebra. Scale bars, 2 cm. For further data used in the analysis, see supplementary information.

On the basis of the presence of a combination of morphologies unique to *Y. martini* in the associated front part of the *Archaeoraptor* specimen listed here, we refer this portion of the specimen to that taxon. Because of the correspondence in measurements and morphology, the hindlimb elements are identified as being consistent with these separate blocks that make up parts of a single *Yanornis* specimen. The avialan portion of the *Archaeoraptor* specimen also provides further evidence of the anatomy of *Y. martini*. For example, it preserves a distally tapering scapular blade, a short, slightly recurved acromion, and remnants of an anteriorly developed sternal keel, features that are not preserved in the holotype.

A recently discovered specimen of *Yanornis* (IVPP V13259) contains preserved macerated fish remains, including a teleost vertebra, fin rays and opercular fragments (Fig. 1b, inset), and is only the second bird from the exceptionally diverse Jehol Biota^{6,7}

to be discovered with its gut contents preserved. The principal portion of the *Archaeoraptor* forgery, which we conclude was constructed from two different specimens belonging to two different species, is therefore representative of a fish-eating bird.

Zhonghe Zhou*, **Julia A. Clarke†**,
Fucheng Zhang*

*Institute of Vertebrate Paleontology and
Paleoanthropology, PO Box 643,
Beijing 100044, China

e-mail: zhonghe@yeah.net

†Section of Vertebrate Paleontology, American
Museum of Natural History, New York,
New York 10024, USA

- Sloan, C. P. *Natl Geogr.* **196**, 98–107 (1999).
- Dalton, R. *Nature* **403**, 689–690 (2000).
- Rowe, T. et al. *Nature* **410**, 539–540 (2001).
- Xu, X., Zhou, Z. & Wang, X. *Nature* **408**, 705–708 (2000).
- Zhou, Z. & Zhang, F. *Chinese Sci. Bull.* **46**, 371–377 (2001).
- Zhang, M., Chen, P., Wang, Y.-Q. & Wang, Y. (eds) *The Jehol Biota* (Shanghai Sci. Technol., Shanghai, 2001).
- Zhou, Z. & Zhang, F. *Nature* **418**, 405–409 (2002).

Supplementary information accompanies this communication on Nature's website.

Competing financial interests: declared none.