characterize many carnivorous non-mammalian synapsids[24]. The molariform teeth at the back of the dentition of *Repenomamus* are small with blunt crowns; they probably played a minor role in food processing. Although mammals are considered definitive chewers within amniotes[25], the dental morphology and large pieces of prey in the stomach of *Repenomamus* suggest that chewing as a derived feature in mammals was probably not present in *Repenomamus*.

It is not easy to assess whether *Repenomamus* was a predator or scavenger. Scavengers are relatively rare among mammals—among extant carnivorous mammals, only two species of hyenas are habitual scavengers[12,26]. Compared to their hunting cousins, these hyenas have smaller second upper incisors and less jaw muscle leverage, which probably reflect their inability to capture and handle live prey. In contrast, the enlarged incisors and strong jaw muscles of *Repenomamus* are well shaped for catching prey, favouring it as a predator rather than a scavenger.

For fossil mammals, body size is one of the most important factors influencing life history strategy[27]. Early mammals or their close relatives, such as morganocodontids and kuehneotheriids in the Late Triassic to Early Jurassic periods, were small and considered to be nocturnal insectivores[2,3]; the same is true of most later Mesozoic mammals[28] (Fig. 4). The reason for the very small size of Mesozoic mammals is uncertain[5], but it has often been hypothesized that well-established larger (and presumably diurnal) reptilian carnivores and herbivores, particularly dinosaurs, prevented mammals from invading those niches[29]. *Repenomamus* extend significantly the upper limit of body size of Mesozoic mammals (Fig. 4) and are actually larger than several small dinosaurs, particularly dromaeosaurid dinosaurs, from the same fauna[11]. Larger animals can live longer and move faster, but they also need a larger food supply and broader home range[30]. Judging from their body size, *R. giganticus* could feed on larger prey and forage a wider area for food. These large Mesozoic mammals were probably carnivores that competed with dinosaurs for food and territory. □

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The simplicity of metazoan cell lineages

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Developmental processes are thought to be highly complex, but there have been few attempts to measure and compare such complexity across different groups of organisms[1–5]. Here we introduce a measure of biological complexity based on the similarity between developmental and computer programs[6–9]. We define the algorithmic complexity of a cell lineage as the length of the shortest description of the lineage based on its constituent sublineages[9–13]. We then use this measure to estimate the complexity of the embryonic lineages of four metazoan species from two different phyla. We find that these cell lineages are significantly simpler than would be expected by chance. Furthermore, evolutionary simulations show that the complexity of the embryonic lineages surveyed is near that of the simplest lineages evolvable, assuming strong developmental constraints on the spatial positions of cells and stabilizing selection on cell number. We propose that selection for decreased complexity has played a major role in moulding metazoan cell lineages.

Biological systems are obviously complex in both structure and