The trackmakers

Footprints mean nothing without scientific interpretation. Using mathematics, comparisons and inspired guesswork, scientists have examined the Lark Quarry tracks and figured out what happened, to which dinosaurs and when. They have learned much about the size, shape and behaviour of these long extinct animals living in a landscape that was very different to what we see today.

A latex mould was taken soon after the sit was excavated. Back in the laboratory each footprint print was measured and described. Where individual trackways could be followed, pace length, stride length and pace angulation were measured. All up, 150 individual dinosaur trackways were mapped.

Dinosaur skeletons from all over the world with feet roughly matching the Lark Quarry tracks were examined to identify the track-makers. The dinosaur's running speeds were then worked out using equations based on locomotion of living animals, incorporating size, weight and flexibility differences.

The Lark Quarry trackmakers

Three types of dinosaurs made the trackways – two types of theropods: two-legged meat-eaters of the suborder Saurischia ('lizard-hipped' dinosaurs); and ornithopods: two-legged plant-eaters of the suborder Ornithischia ('bird-hipped' dinosaurs). They are only known from their footprints, not from fossilised bones – hence their names ending in 'opus' (meaning foot of). These dinosaurs all stood on their toes, much as birds do. This is called a digitigrade stance.

Trackway type 1 — cf. Tyrannosauropus ('foot of Tyrannosaurus')

Track-maker	A large theropod
Size	Hip height 2.6 m; total length 8-9 m; head height 3-3.5 m
Average footprint size	51 cm
Average stride length	3.3 m
Average walking speed	6.9 km/hr
Diet	Other dinosaurs

The Tyrannosauropus trackways were made by a large theropod, with feet that were very similar to those of Tyrannosaurus. Its footprints are symmetrical, with three long toes, each sporting a sharp claw. Large theropods such as this one may have been able to run as fast as 30 km/hr, combining bulk with a hunter's speed and power. Like the Lark Quarry theropod, these dinosaurs were probably solitary hunters. They had large teeth with serrated edges and sharp points for stabbing their prey.

No bones of large theropods have been found yet in Queensland. Ankle bones belonging to Allosaurus (another theropod) have been found in southern Victoria in rocks of a similar age to those at Lark Quarry.

Trackway type 2 — Skartopus australis ('southern nimble foot')

Track-makers	Small theropods, most likely coelurosaurs
Size	Hip height 13-22 cm; total length 45-75 cm; head height 15-25 cm
Average footprint size	4.5 cm
Average stride length	62 cm
Average running speed	12 km/hr
Diet	Insects, small animals (frogs, lizards and mammals), eggs, possibly fruit and berries

These tracks were made by agile, chicken-sized theropods called coelurosaurs. Most likely pack hunters, they were small, lightly built and could run fast. They had three toes of same length, with sharp claws. There are footprints of fully grown adults of various sizes and smaller juveniles.

Scientists think that some coelurosaurs may be the direct ancestors of modern day birds. Some were even covered with bristle-like filaments or true feathers.

No small theropod bones have been found in Queensland, but isolated bones have been discovered in Victoria, New South Wales, South Australia and Western Australia.

Trackway type 3 — Wintonopus latomorum ('Winton foot' + 'stonemason', in honour of the many volunteers who assisted with the Lark Quarry excavation)

Track-makers	Ornithopods
Size (small-medium)	Hip height 14-158 cm, length 45 cm-4.5 m, head height 20-160 cm
Size (large)	Hip height 1.6m, length 5.5m, head height 1.7 m
Average footprint size	4.5 cm long (small-medium)/30 cm long (large)
Average stride length	62 cm (small-medium)/3.3 m (large)
Average running speed	16 km/hr (small-medium)/17 km/hr (large)
Diet	Plants

The Wintonopus latimorum footprints are asymmetrical, broader than the theropod tracks, with a strongly divergent second toe. They do not show heel-pads or sharp claws. The ornithipods ranged from chicken to emu-sized. These dinosaurs traveled in herds and nested communally. Hatchlings were cared for by the parents for a short time. Wintonopus trackways have also been found near Broome, Western Australia.

There are also tracks of a larger ornithipod, about half the size of Muttaburrasaurus langdoni, crossing the mudflat before the stampede.

Lark Quarry Conservation Park and Dinosaur Trackways are jointly managed by Winton Shire Council and Queensland Parks and Wildlife Service. Queensland Museum provides ongoing trackways scientific advice.