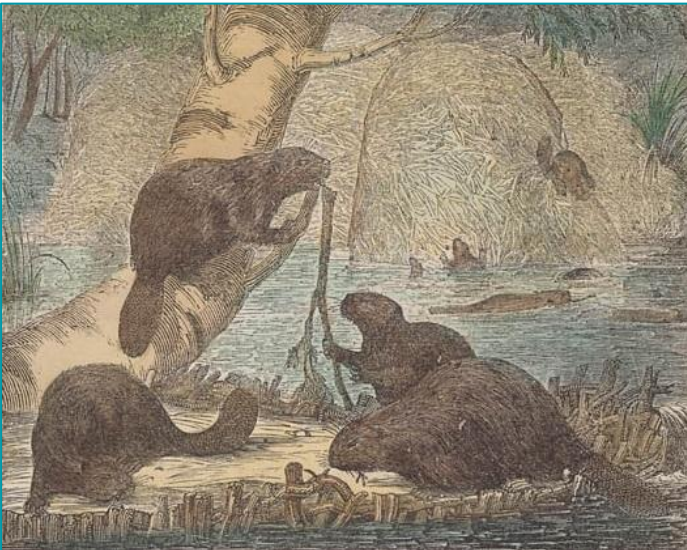


2023 MAMMADNESS

March 20, 2023

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Tonight's combatants are all crafty engineers that build homes, reshape items to move across the landscape, create & use tools, build or secrete protections for themselves, or construct elaborate installations to attract the ladies. In doing so they also often reshape their environment and the ecosystem in which they live.



READ ALL ABOUT IT Prepared by Katie Hinde, Margaret Janz, Melanie Beasley, Anali Perry, & Abbie Thacher.

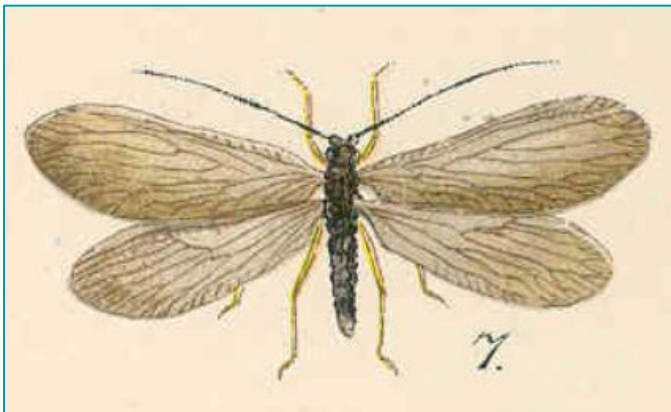
Golden Eagle (1) vs. Spongilla Fly (16) - Golden Eagles (*Aquila chrysaetos*) are widely distributed in the Northern Hemisphere and are North America's largest raptor with an up to 7 foot wingspan. Females are larger than males, and adult eagles are largely brown, with golden coloration on their heads, neck, & nape. Golden Eagles build incredible nests, sometimes building on top of nests of previous generations of Golden Eagles, with long-time use of the most preferred nest locations. A seven meter (21 foot) tall Golden Eagle nest on a basalt wall was studied near Sun River, Montana. The oldest, most foundational nest was radiocarbon dated to the early 1400s.



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Spongilla flies (*Climacia areolaris*) are widely distributed living within freshwater ecosystems from Mexico to Canada. After hatching & going through two stages of underwater development (one parasitizing freshwater sponges), the larva emerge from water, spin a protective net for a cocoon for their transformation into an adult stage. The little larvae selects a spot, fixes legs to surface, and then dabs their abdomen to the surface so "viscid, semi-liquid silk oozes out" swinging their abdomen in wide arcs to create fiber threads in a systematic pattern over 6-8 hours (Brown 1952).



Louis Hippolyte Joutel / Wikimedia Commons / Public Domain

Tonight's battle takes place in the Scottish Highlands where Golden Eagle populations have persisted even as their White-Tailed Eagle brethren were extirpated from the United Kingdom. In March, the Spongilla Fly has been

overwintering in suspended development in a larval stage (diapause). Currently a 2nd Instar, this insect is only about 1mm wide & 3mm long. Adult Spongilla Flies died off after breeding at the end of last summer. MMMagic transports Spongilla Fly Larva to Scotland directly onto the base of Golden Eagle's talon! Spongilla Fly Larva at this developmental stage should be under the water and the larva's gills flutter uselessly. The Golden Eagle, preening the feathers that reach down to her toes incidentally consumes Spongilla Fly Larva, without even noticing. GOLDEN EAGLE INCIDENTALLY EATS SPONGILLA FLY! Narrated by Prof. Katie Hinde.

Cathedral Termite (2) vs Dung Beetle (15) - The Cathedral termite (*Nasutitermes triodiae*) is native to Northern Australia and their colonies build mounds over 15 feet high. Like all termites, Cathedral termites are eusocial - with three types of castes - workers, soldiers and reproductives. Cathedral termite soldiers are called "nasute soldiers" because of the frontal projection (nasus) on their head. The whole termite colony cannot compete in March Mammal Madness, so our combatant is a single nasute soldier weighing in at a grand total of 10 mg. *Kheper larmarki* is a dung beetle species native to South Africa. Dung is used as a food source. In 2019, Dacke and colleagues





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found that South African dung beetles can navigate using both celestial and wind cues. *Kheper larmarki* is a model system for navigation studies in Dung beetles. When ready to roll a dung ball, *K. larmarki* does an orientation dance on top of the ball.



Jochen Smolka / Flickr / CC-BY-NC-SA 2.0

Our battle begins at midday in Litchfield National Park in northern Australia (aka "Top End"), home of some amazing Cathedral termite mounds. Dung beetle finds itself transported adjacent to a cathedral mound, and next to an unusual but welcome olfactory delight - dingo droppings! Dung beetle makes short work of the dingo dung - molding the feces into a ball- and does a little dance as the Dung Beetle prepares to roll the dung ball away. The beetle rolls the dung up the cathedral mound, mounting the alarm response of the colony. As the termite soldiers arrive at colony entrances, gravity overcomes the dung ball and it rolls off the mound. The beetle chases after the ball of feces and off the field of battle! CATHEDRAL TERMITE OUTLASTS DUNG BEETLE!! Narrated by Prof. Chris Anderson.

Homo habilis (3) vs. Pueblo Bee (14) - *Homo habilis* is a member of the group of fossil species closer to humans than to any other living primate. This group, called hominins, all walked on two legs. The earliest claimed *Homo habilis* is ~2.8 million years old and was found by Chalachew Seyoum in Ethiopia. Paleanthropologists estimate that a male *Homo habilis* would have stood about as tall as a 4th grader (about 1.5 meters). Hominin height is estimated from fossil limb bones and their stride length as seen in fossilized footprints. *Homo habilis* made what is known as the "Oldowan Industrial Complex"-tools, like choppers and flakes, made out of stone. These tools were used

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for removing meat from bones and to break open animal bones to get marrow. *Homo habilis* made stone tools by knocking rocks against each other. While the tools might not look fancy, it takes some practice to get the hang of making them.

Anthophora pueblo is a bee species with some buzzworthy news: *be*lieve it or not, using their strong jaw they excavate nests in sandstone. The long-lasting durability of these nests, and ability to reuse them, may be why natural selection has favored these bees making this kind of nest. This nesting in stone, though, is not without costs: "Mandible wear is consistently seen in older females, a consequence of excavation that likely limits their further use." (Orr et al. 2016). It is important to know the role all bees play in their niche: There are over 20,000 bee species and they provide "vital roles in ecosystems and agriculture around the globe." (De Jong & Lester, 2023).

Late afternoon at Naibor Soit, a quartzite outcropping at Olduvai Gorge, Tanzania 1.7 million years ago. The savannah grassland with scrub and bush is home to giraffe, antelope, hyena, and other MMM favorites. *Homo habilis* is selecting raw materials for tool-making. Pueblo Bee finds itself transported by MMMagic from the desert shrublands of Utah to the same spot where *Homo habilis* is making tools, *be*wildering



William Daniel Snyder / Wikimedia Commons / CC-BY-SA 4.0; USDA / public domain; Bee & *Homo habilis* not shown to relative scale

Anthophora pueblo. Pueblo Bee beelines to the rocks, looking for a soft sandstone to excavate a nest, but the quartzite rock here is harder than the soft sandstone at home. The Pueblo Bee's mandibles have trouble making any scrapes to start the nest. WHACK! WHACK! WHACK! *Homo habilis* is striking rocks and assessing break patterns for the perfect flake. Pueblo Bees, unlike many some other bee species, are not aggressive. The *whacky* action and hard stone motivates the Pueblo Bee to fly away from the field of battle. **HOMO HABILIS DIVERTS PUEBLO BEE!**
Narrated by Prof. Marc Kissel.



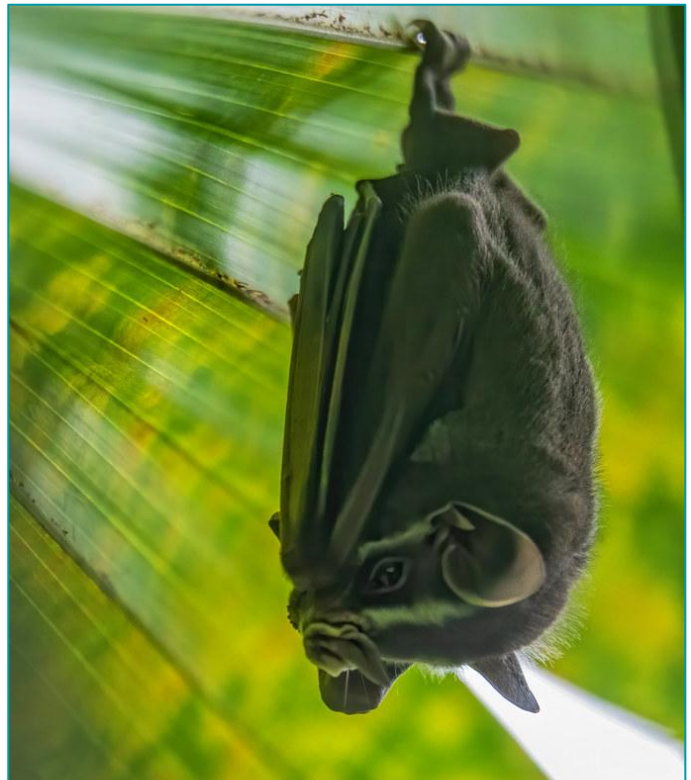


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Lungfish (4) vs. Tent-making Bat (13) - Most species of lungfish can "terrestrialize" during droughts or dry seasons. The Lungfish will secrete a protective mucus cocoon in a mud nest, lowering their metabolic rate & changing their waste processes (aestivation) to survive months or even years. Our Lungfish combatant, *Protopterus dolloi*, living in a habitat that retains moisture year-round, does not typically "terrestrialize" but can under extreme conditions. Lungfish could have been in Dad Bods Division as males build the mud nest and protect eggs during the summer breeding season.

The Tent-Making Bat (*Uroderma bilobatum*) is common in lowland forests of Central America and eats fruit (frugivorous) with a particular fondness for figs, and typically lives in social groups of 2-59 individuals. Mostly greyish-brown, this combatant could have also been in the Mighty Stripes Division due to the two white stripes that run from behind its ears and down its face, and one white racing stripe down its back.

Tonight's battle takes place on the muddy floodplains of Lake Nkuna of the Congo River in central Africa. Recent heavy rains have drenched the region, creating many muddy pools and braided streams. An obligate airbreather, Lungfish "walks" in shallow, muddy water hunting small vertebrate and invertebrate prey. Tent-making Bat, although alone, immediately begins to make a tent to have an out-of-the-rain sleeping site.



Jonas Juodišius / Flickr / CC-BY-NC-SA 2.0

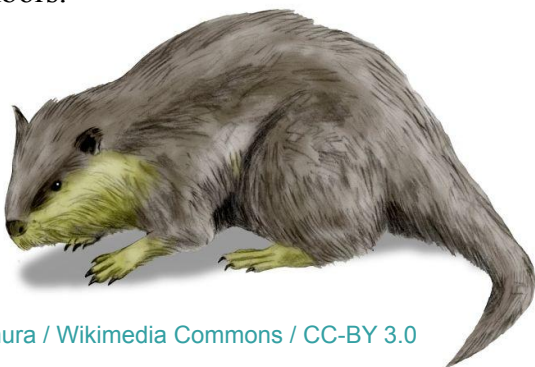
Laboriously making dozens of bites and chewing along the structural veins of a large tree leaf, the Tent-Making Bat weakens the leaf so it droops in a way that protects from wind, rain, and other weather, so the bat stays warmer. In the shallow muddy waters below, water sluices across the

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Lungfish. Without family or friends to help, the tent-making is slower-going than usual for the 16g Tent-Making Bat. Repositioning to bite a structural vein, a gust of wind blows the bat into the muddy puddle below. Omnivorous 8kg Lungfish is already at the surface, breathing air. Lungfish ravenously closes in on the struggling, floating bat. LUNGFISH DEVOURS TENT-MAKING BAT! Narrated by Katie Hinde.

Palaeocaster fossor (5) v. Trapdoor Spider (12)

– *Palaeocaster fossor* was a fossil beaver, but unlike the wetland associated beavers of modern beavers, *Palaeocaster fossor* lived in a dry grassland. *Palaeocaster fossor* excavated corkscrew burrows that could be 8+ feet deep, fossilized versions of these structures were termed ‘Daimonelix’ meaning "Devil's Corkscrew" when originally described. These burrows are found in high densities, with many burrows clustered together in towns, but the burrows did not connect with neighbors.



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Sydney Brown Trapdoor Spider (*Arbanitis rapax*) is typically found year-round waiting in ambush at the entrance to its burrow. These spiders will silk-tether a fallen leaf to close the entrance to their burrow or silk tether to fallen needles to detect steps of prey passers-by. Once prey are captured, Trapdoor Spider will back up a bit into the burrow to consume their prey, dropping uneaten bits into a carcass pit at the bottom of the burrow, or as scientists say "a midden of uneaten prey remains near the bottom of the burrow" (Bradley 1996).



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About 22 million years ago, the Harrison Formation of Western Nebraska was a semiarid, upland paleoenvironment of sandy substrate where *Palaeocaster fossor* lived in many Devil's Corkscrews. MMMagic transports the arid-adapted Trapdoor Spider who feels nearly at home in the sandy soil. Trapdoor Spider readily begins excavating a new silk-lined burrow.



The surrounding grasslands are a veritable smorgasbord-orgesboard-orgesboard for the Trapdoor Spider with the beetles, ants, and other insects the spider prefers. Periods of dispersal from the natal nest and the construction and establishment of their own burrow is a time of high mortality for Trapdoor Spiders from numerous predators. WHAMPF! *Palaeocaster* moving quickly into the only burrow entrance tumble-tramples over the Trapdoor Spider that had not yet crafted enough of a depression to avoid Paleocaster's stride. *PALAEOCASTOR TRAMPLES TRAPDOOR SPIDER!* Narrated by Prof. Katie Hinde and Dr. Yara Haridy.

Goanna (6) vs. Rufous Hornero (11) - Goanna (*Varanus panoptes*) is also known as the yellow-spotted monitor. At about 150 cm they are one of the largest of the Australian lizards. Like many monitors, they eat fish, rodents, and other lizards. And like another contender in this bracket, they make helix-shaped burrows that are then used by other animals! Rufous Hornero (*Furnarius rufus*), aka the red ovenbird, is the national bird of Argentina and Uruguay. Their domed nests weigh about 4 kg and are made out of mud and dung, to which they add straw, hair, etc to make a mortar. Some scientists think the nests help to keep the baby birds warm, freeing the parents to forage for food, but this is debated. While they rarely reuse old nests, other birds might use *Furnarius rufus*' abandoned nests. While recently fledged chicks will try to help build nests, even carry mud &



sussexbirder / Flickr / CC-BY 2.0

dung to help, adults often chase them away from the nest site (n.b. much like young kids helping to bake, it probably takes 3 times as long to do anything with the kids around).

Tonight's battle is the rocky eucalyptus woodland near Townsville, Queensland, home to many lizards, skinks, & snakes. The Ovenbird is transported by MMMagic to Townsville and, while not too distressed by the environment, the Ovenbird is none too happy that the nest he had begun to build for the upcoming breeding season has disappeared! Goanna emerges from the opening of a burrow deeper than almost any other vertebrate: the average depth is 2.3 meters (but some are as deep as 3.6 m) with a brief sloping section, followed by the helix, and then a nest chamber deep below. Ovenbird begins collecting materials to build a new nest. Vfovfovfovfovfovfo! The rhythmic drum vocalization of the poisonous cane toad. Cane toads, intentionally released by colonizers in 1935

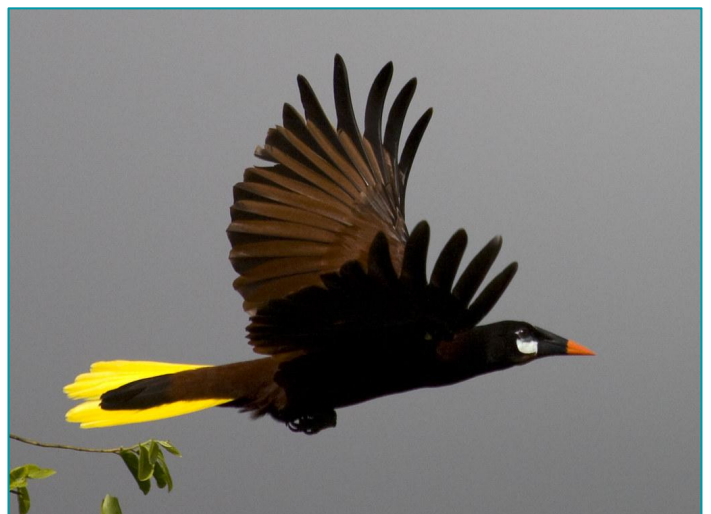
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for pest control in sugarcane fields, were lethally poisonous to many of Australia's native vertebrates. Eating adult cane toads has up to a 90% mortality risk for Goannas. Goanna approaches the cane toad, tongue flickering the air. The Ovenbird, as it often does, "utters a peculiar, loud, shrill, & quickly reiterated cry," as described by Charles Darwin in *Zoology of the Voyage of H.M.S. Beagle* (1842). The Goanna's flickering tongue tastes cane toad. But Goanna has a learned taste aversion to cane toads from a non-lethal exposure to a juvenile cane toad previously. Ovenbird watching from a perch now sees Goanna climbing the tree toward Ovenbird. Wasting no time, Ovenbird flies to a less active part of the forest. GOANNA DEFEATS RUFOUS HORNERO! Narrated by Prof. Marc Kissel.

Montezuma Oropendola (7) v. New Caledonian Crow (10) – Montezuma Oropendola (*Psarocolius montezuma*) are in the icterid bird family (the group that includes orioles and grackles) found in lowland Mexico and parts of Panama. These strikingly colored birds have a very distinctive call. The Females build pouch-like nests made from plant materials such as palm fronds and roots with the bottom of nests having leaf material for cushion. New Caledonian Crow (*Corvus moneduloides*) are ~40 cm long and found on the Pacific archipelago of New Caledonia. They eat a wide range of food but are most famous for their technique of obtaining insects hidden in crevices by using sticks as tools. They even will work the end of the stick into a hook, which makes it much faster for them to grab an insect snack.



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In La Selva Research Station, Costa Rica, New Caledonian Crow has been transported by MMMagic to the base of a tree with a large Oropendola colony. Seeing a dead limb on the ground, the New Caledonian Crow begins to scan for a stick to forage for insects. The Montezuma Oropendola swoops to investigate the novel Crow, who looks somewhat similar to a Giant Cowbird. Giant Cowbirds are common brood parasites of Montezuma Oropendolas - they lay eggs in Oropendola nests and rely on Oropendolas to raise their young. Mistaking the New Caledonian Crow for a Cowbird, the Oropendola attacks! The New Caledonian Crow is an agile flyer - it evades raptors in it's native range - and escapes the diving Oropendola. Banking in midair, the New Caledonian Crow rounds on Montezuma's Oropendola in a counter-attack and drives it from the field of battle! NEW CALEDONIAN CROW DEFEATS MONTEZUMA'S OROPENDOLA!! Narrated by Prof. Chris Anderson.



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Veined Octopus (8) v. Pufferfish (9) – The Veined Octopus (*Amphioctopus marginatus*) is a relatively small cephalopod with a body sac (mantle) ~5.5cm long. Veined Octopus is named for the branching dark lines present over the body that extend down onto the arms that have a 25cm span. The Veined Octopus lives in the Indian Ocean occupying the muddy, sandy seafloors where the octopus hunts for shellfish. Divers observed long mysterious 2-meter geometric sand circles in the waters near Ryukyu Islands, Japan, which are now known to be made by 10-cm male white-spotted pufferfish. The white-spotted Pufferfish (*Torquigener albomaculosus*) has a muted grey-blue body with mottled white spots.

In the "subtidal soft-sediment substrates to 18 meters deep off the coasts of Northern Sulawesi, Indonesia" (Finn et al. 2009), home habitat of Veined Octopus the combatants will encounter each other. Pufferfish is often found only a bit deeper at the transitions to the mesophotic zone, waters where sunlight still penetrates.

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Pufferfish immediately begins constructing a geometric circle by rapidly moving fins to plough a trench in the sand toward what will become the center of the geometric circle. Pufferfish swims out to the perimeter of the radial design he is constructing and is just about to flutter-flap another trench when... SON OF A SAND DOLLAR! A floating coconut is... walking... through the radial circle messing up the design!? Holding two halves of coconut, the

Veined Octopus is striding along the ocean floor with its legs. The Pufferfish begins to reconstruct the trench as a shadow passes above the scene... The Veined Octopus grasps the two coconut halves tighter to its body to camouflage itself from predators while bobbing in the water. Pufferfish industrially continues its installation mating project as Veined Octopus coconut strolls off the field of battle. PUFFERFISH OUTLASTS VEINED OCTOPUS! Narrated by Prof. Katie Hinde.



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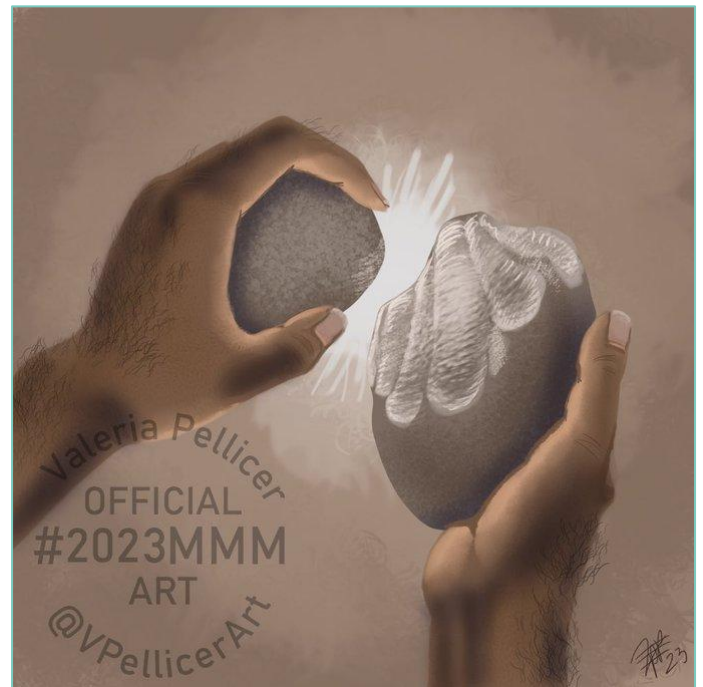
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