Applied Physics

BY BRETT KRAABEL

Stop the Screech

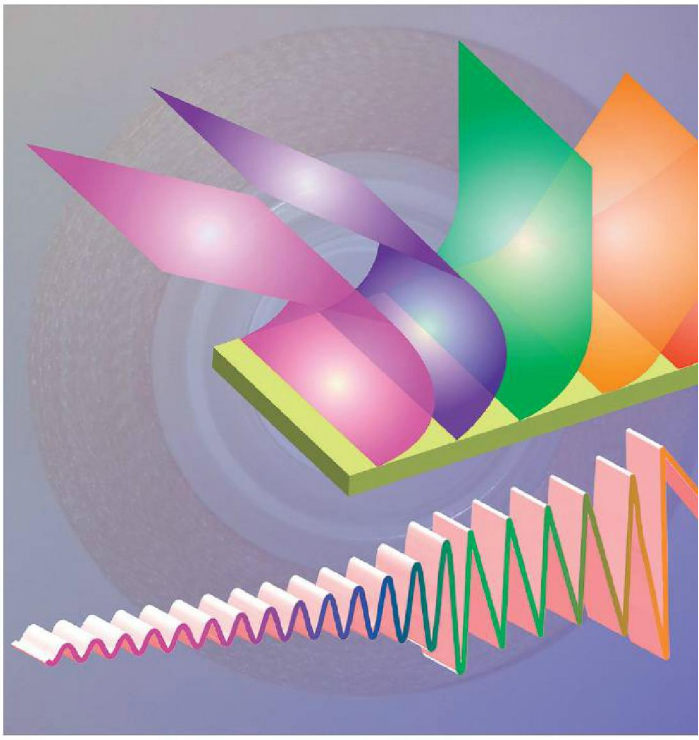

Illustration showing how different peeling angles (top) cause stick-slip instability in the tape (bottom).

There is no mistaking the screech of adhesive tape being removed from a substrate. This sound in fact indicates an instability in the peeling process that not only damages the adhesive, but also produces unacceptable noise levels in industry. In medical applications, this instability can cause pain or even additional injuries when removing bandages. To help the adhesive industry overcome this problem, researchers from three CNRS laboratories[1] have conducted an extensive study[2] with the support of the French National Research Agency (ANR). They analyzed how the speed and angle at which tape is peeled from its substrate affects stability, and found that the latter significantly decreases at large peeling angles.

The resulting instability is called "stick-slip instability," where the speed at which the strip separates from the substrate alternates rapidly between fast and slow. The precise characteristics of this instability, explains co-author of the study Marie-Julie Dalbe, "depend on factors such as the velocity applied to the free end of the ribbon, the properties of the glue, the elasticity of the tape, its inertia, and the angle of separation." By using a custom-made device

1. Laboratoire de physique (ENS de Lyon / CNRS / Université de Lyon); Institut lumière matière (CNRS / Université Claude Bernard Lyon-I); Laboratoire Fluides, automatique et systèmes thermiques (CNRS / Université Paris-Sud). 2. M.-J. Dalbe et al., "Peeling-angle dependence of the stick-slip instability during adhesive tape peeling ," *Soft Matter*, 2014. 10 (48): 9637–43.

Plant Biology

Gone with the Smell of Roses

BY LÉA GALANOPOULO

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The scent of roses is an extremely fragile trait that is difficult to preserve from one flower to another.

Customers in florist shops tend to agree: roses seem to have lost their scent. "By only selecting blooms that can survive longer than ten days in a vase, the world's most popular cut flower has lost its fragrance," explains Jean-Claude Caissard.[1] Like other scientists, this plant biology specialist has been trying to solve the mystery of roses. "The Romans were the first to domesticate them," he explains, "but this practice was abandoned during the Middle Ages, when roses were only used for their pharmaceutical properties." However, in the 19th century, with the advent of the English garden, they were all the rage in France. "Growers therefore bred new varieties to meet increasing demand," points out Blandine Veith,[2] a sociologist specialized in the commoditization and patrimonialization of ornamental plants.

There are now more than 30,000 rose varieties: "Breeders try to obtain blossoms that are increasingly large and colorful, on plants that can flower all year round," adds Caissard. "In nature, however, a rose only blooms one or two weeks a year." Yet hybridization is not the only culprit in this loss of perfume, which has always been a fragile trait. "Among the descendants of a specific rose line, 90% will not have the scent of their parents. In 10% of cases, the rose will keep a fragrance, but not necessarily the desired one: some may smell of pineapple, for example," says the researcher who, with his team, has set out to map the genes that give roses their scent.

"Fragrant roses sometimes have fragile petals, which makes them difficult to ship by air," explains Veith.

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2. Laboratoire dynamiques sociales et recomposition des espaces (CNRS / Université Paris Ouest).

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to peel the adhesive at constant speed, constant angle, and with a constant length of free tape, the researchers found three ways in which the strip separates from its substrate: stable separation, whereby the tape peels at constant speed; stick-slip separation; and bistable state, where stick-slip and stable separations alternate. Each of these dynamics occurs only at certain angles and separation speeds. Of industrial interest is stable separation, which the study shows to happen not only at low speeds and large angles, but also at high speeds and large angles.

To elucidate the screech of peeling tape, Dalbe and colleagues are already investigating the connection between the noise produced and the stick-slip instability. The results should be of great interest to the many industries that work with adhesive tape. II

In a context of massive commoditization, the rose trade has indeed become international. South America and East Africa are home to most of the world's largest rose farms, whose only focus is profitability. Their flowers ultimately flood the florist shops in the northern hemisphere, which leads to the marketing of only two types of cultivars, says Veith. Mass distribution could therefore cause loss of diversity in commercial varieties. To reverse this trend, some growers have decided to help bring old, highly scented roses back into fashion. And most breeders, aware that scent is important to customers, are seeking to return fragrance to the types of roses currently available. Meanwhile, they also experiment with extraordinary scents, including parsley, aniseed, and more surprisingly, red wine. II

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Paleontology

Hippos Boast New Ancestor

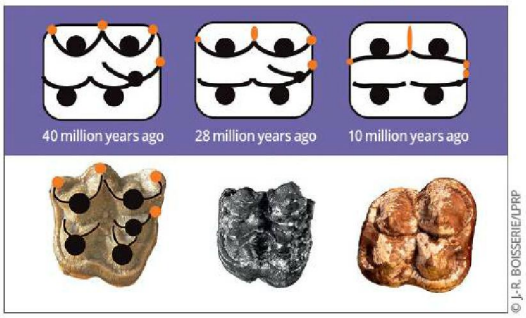
BY EMMANUELLE CRANE

Family ancestry is always somewhat of a mystery, regardless of the species, but this is especially true in the case of hippopotamuses. Yet a joint French-Kenyan team has now solved the enigma. Researchers at ISEM[1] and IPHEP,[2] working in collaboration with the National Museums of Kenya, recently discovered a fossil that bridges the evolutionary gap between hippos and the common ancestor they share with cetaceans. This finding, published last February,[3] also shows that the ancestors of hippos were among the most ancient mammals to colonize the African continent some 35 million years ago, long before large carnivores, giraffes, and bovids. Geneticists, using DNA comparisons, had highlighted the close relationship between hippos and cetaceans back in the 1990s and 2000s, but there were no fossils documenting hippo ancestry. The fossil species recently discovered in Lokone (Kenya) confirms an evolutionary scenario congruent with genetic data. *Epirigenys lokonensis* ("epiri" means "hippo" in the Turkana language) forms a transition between hippos and a lineage of anthracotheres, a now extinct ungulate family.

The interdisciplinary collaboration between geneticists and paleontologists is proving fruitful. While the fossils enabled paleontologists to determine precise dates and trace the evolutionary process, geneticists demonstrate well-established relationships between living organisms.

"Now we want to understand whether hippo ancestors had an aquatic life or a purely terrestrial one," says CNRS researcher Jean-Renaud Boisserie of the IPHEP. This would bring scientists closer to understanding the evolution of the group. The next step for the team is to go back in time some 40–55 million years, prior to the emergence of anthracotheres.

"New discoveries of fossils will be decisive to shed light on the common origin of hippos and cetaceans," Boisserie concludes. II



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◢ Left to right: evolution of a molar of *Anthracotherium*; *Epirigenys*; and primitive hippopotamus.

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