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Shear joy of watching paint dry

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The artist Holton Rower is best known for his "pour paintings," which are created by pouring color after color of paint (up to 190 L) onto flat surfaces or three-dimensional plywood shapes [1]. The technique forms expanding rings of color on a flat surface [Fig. 1(b)], but as the paint interacts with unique geometry, even more interesting patterns are created [Fig. 1(e)].

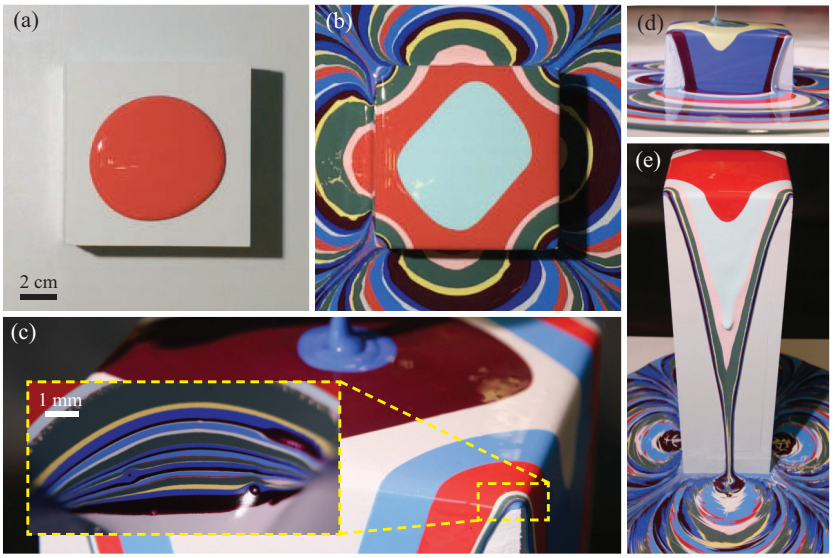

FIG. 1. (a) Paint poured at a single location spreads evenly outward due to gravity, creating a circular shape. (b) With subsequent pours, the extending paint reaches the sides of the tower, resulting in faster flow in four directions and leading to rectangular shapes. (c) While paint runs relatively quickly over the tower sides, the extending colored rings are brought to a standstill at the corners, where the entire history of the pouring sequence is preserved. (d) Shorter towers (∼5 cm) maintain the ring pattern created on top at the tower base as seen in panel (b). (e) Taller towers (∼36 cm) allow the paint to converge to a jet, which buckles as it interacts with the horizontal base. This buckling can be seen with greater detail in Fig. 2.

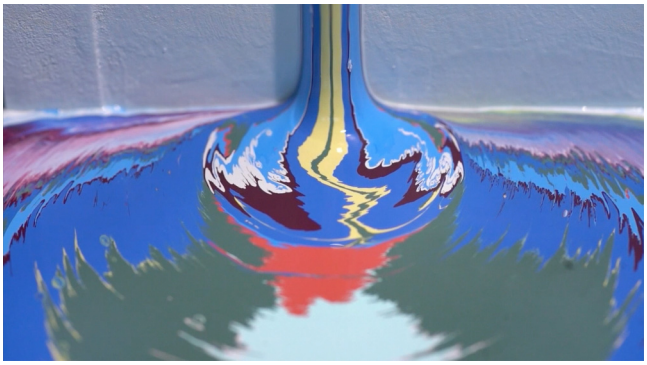

FIG. 2. Paint running down the side of a tall (∼36 cm) rectangular tower buckles as it reaches the bottom, creating complex patterns. Colors from previous pours are pulled along the sides of the jet to add to the complexity of the resulting pattern. (Photo by Andrea Speirs.)

In order to understand the fluid dynamics of this technique, we imitate Rower's painting style by pouring paints of assorted colors over two 10 × 10 cm cross-section plywood towers (heights of ∼5 and ∼36 cm). When the first color is poured, it spreads uniformly due to gravity, forming a circular shape [Fig. 1(a)]. Varying paint colors are added at the same location, creating concentric rings which extend radially outward. As the expanding rings reach the sides of the rectangular tower, paint runs down the sides, increasing flow rate in four directions, leading to rectangular shapes as seen in Fig. 1(b). While the majority of the poured paint flows over the sides of the tower, the entire history of the pouring event is preserved as bands in the top corners [Fig. 1(c)]. For relatively short towers (∼5 cm), the advancing paint preserves a thin film when flowing down the tower sides [Fig. 1(d)]. This wider flow is more stable, and the multicolored ring pattern formed on a flat surface is maintained around the tower base [Fig. 1(b)]. However, for relatively tall towers (∼36 cm), the paint advancing down the sides of the tower gains speed and transitions from a thin film to a narrow jet, as can be seen in Fig. 1(e) [2]. This narrow viscous jet buckles as it reaches the horizontal base, as can be seen in Fig. 2 (resembling work done by Brun *et al.* [3]). The buckling events are amplified as the paint spreads on the floor, resulting in larger scale zigzag patterns farther from the tower base [Fig. 1(e)]. Even after the pouring events, these fluid instabilities are beautifully preserved on the canvas.

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