

What Lifts the Liquid Is Not Surface Tension but Its Difference

— Wine at **12** per cent is **0.039445** N/m; evaporation to **10** raises it to **0.042828** — the difference of **0.003383** N/m lifts a **20** μm film by **17.25** mm — pure water has the largest tension and no difference, so it makes no tears — [Paper 452]

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— *From thinking to syncing.* —

Abstract

The greater the surface tension, the higher the liquid climbs—so it is thought. This paper shows that what lifts the liquid is not the tension but its difference—which is why pure water, with the largest tension of all, makes no tears. No new theorem or law is claimed. First, pure water is **0.072800** and wine at **12** per cent is **0.039445** N/m (Section 2). Second, evaporation down to **10** per cent raises it to **0.042828** (Section 2). Third, this is the core of the paper. A difference of **0.003383** N/m lifts a **20** μm film by **17.25** mm (Section 3). Fourth, the height goes inversely with the film thickness, falling to **3.45** mm at **100** μm (Section 3). Fifth, in pure water evaporation does not change the composition, the difference is zero, and no tears form (Section 3). Sixth, the separator is whether the amount acts or the difference acts (Section 4). **Keywords:** Marangoni effect, surface tension, tears of wine, thin film.

Scope of this paper (scope note): No new theorem or law is claimed—the Marangoni effect, the concentration dependence of surface tension and the force balance in a thin film are all standard. No wine is evaluated—quality, origin and the relation of strength to taste are not the subject. The interpolation is a model—the surface tension of ethanol-water is interpolated exponentially; the endpoints match measurement but the shape between them does not. Evaporation rates are excluded—how fast the composition changes is not the subject; only the balance once a difference exists. The film thickness is not measured—20 μm is representative and varies across a real glass. The periodic flow is excluded—how a tear detaches into a drop is not the subject. Relation to earlier papers: Paper 451 showed that what insulates is the air, not the snow—there too, the named thing and the working thing differed. Paper 300 showed that common root and distinct root can be decided—“surface tension” and “a difference of surface tension” are distinct roots by that criterion. Paper 448 showed that the size of one photon acts—there too, it was not the total that mattered. What is added is giving the tension at two compositions, giving the difference as 0.003383 N/m, giving the lift as 17.25 mm, confirming the inverse dependence on thickness at two values, placing pure water as the boundary, and placing the separator at amount versus difference.

1. Notation and the Question

Setting: Interpolate the surface tension of an ethanol-water solution of volume fraction x exponentially, matching both endpoints to measurement.

$$\sigma(x) = \sigma_w + (\sigma_e - \sigma_w) \frac{1 - e^{-9x}}{1 - e^{-9}}$$

with $\sigma_w = 0.0728$ and $\sigma_e = 0.0223$ N/m. A film of thickness δ lifted by a tension difference $\Delta\sigma$ rises, by the force balance, to

$$h = \frac{\Delta\sigma}{\rho g \delta}$$

Observation 1.1

The greater the surface tension, the higher the climb—so it is thought. The capillary rise formula looks that way— σ sits in the numerator.

Observation 1.2

But the tears of wine appear in the liquid with the smallest tension. They do not appear in pure water—the direction is reversed.

Question: What is doing the lifting.

2. Evaporation Makes a Difference of 0.003383 N/m

Computation 2.1: Take the surface tension at three compositions.

Ethanol volume fraction	Surface tension [N/m]
0.00 (pure water)	0.072800
0.10	0.042828
0.12 (wine)	0.039445

Observation 2.2

At 12 per cent it is already down to 54.18 per cent of pure water. A little ethanol brings it far down—because ethanol gathers at the surface.

Observation 2.3

And as evaporation removes ethanol, the tension rises. From 0.12 down to 0.10 takes 0.039445 up to 0.042828—a difference of **0.003383** N/m.

Observation 2.4

That difference is only 4.65 per cent of the tension of pure water. Small in absolute terms—and it is the small one that acts.

3. 0.003383 N/m Lifts by 17.25 mm

Computation 3.1: Take the lift at two film thicknesses.

Film thickness	Height
20 μm	17.2465 mm
100 μm	3.4493 mm

Observation 3.2

17.25 mm is visible in a glass. Nearly two centimetres—the tears are seen because they are this large.

Observation 3.3

The height goes inversely with thickness. A factor of 5 between 20 and 100 μm —thin films climb high; thick ones lose to their own weight.

Observation 3.4

In pure water the difference is zero. Evaporation does not change the composition—so with the largest tension of all, 0.072800, no tears form.

Observation 3.5

This is the boundary. Mixture or single component—whether one component evaporates selectively decides whether the phenomenon exists at all.

Observation 3.6

So “high surface tension makes tears” is wrong twice. The direction is reversed, and what acts is not the amount but the difference—one phrase naming two quantities.

4. The Separator

The separator: does the amount act, or the difference.

Observation 4.1

If the amount acts, bigger is stronger. Capillary rise is of that type—pure water climbs highest.

Observation 4.2

If the difference acts, a uniform liquid does nothing. Marangoni flow is of that type—however large, if it is even, nothing moves.

Observation 4.3

These are distinct roots by the criterion of Paper 300. Both are called “a surface tension effect”—one a field, one the gradient of that field.

Observation 4.4

The same shape as Paper 451. There, what insulated was the air, not the snow—here what lifts is the difference, not the tension. In both, the named thing and the working thing differ.

Observation 4.5

It overlaps Paper 448 as well. There, the size of one quantum acted rather than the total—here the change in a value acts rather than the value. In both, the naively summed quantity does not hold the answer.

Observation 4.6

So the strength of the tears follows not the alcohol content but the size of the compositional change by evaporation. A strong wine in an environment where little evaporates gives a small difference—which is why humidity and temperature matter.

Observation 4.7

To be honest—the interpolation is a model. The endpoints match measurement, but the shape between them was simply taken as exponential—the value 0.003383 depends on that model; the conclusion that zero difference gives no tears does not.

5. Roll Call and Closing

1. Pure water is 0.072800 N/m (Computation 2.1): **the largest.**
2. Wine is 0.039445 (Computation 2.1): **54.18 per cent.**
3. 0.042828 at 10 per cent (Computation 2.1): **evaporation raises it.**
4. A difference of 0.003383 N/m (Observation 2.3): **this is what acts.**
5. A lift of 17.2465 mm (Computation 3.1): **the core.**
6. 3.4493 mm at 100 μm (Computation 3.1): **inverse in thickness.**
7. Zero difference in pure water (Observation 3.4): **no tears.**
8. The boundary is mixture or single (Observation 3.5): **selective evaporation.**
9. The separator is amount or difference (Observation 4.3): **distinct roots by Paper 300.**
10. Humidity and temperature matter (Observation 4.6): **the size of the change.**

Closing: The greater the surface tension, the higher the liquid climbs—so it is thought—the capillary rise formula looks that way, with σ in the numerator. But the tears of wine appear in the liquid with the smallest tension and never in pure water. The direction is reversed. What acts is the smaller number—pure water is 0.072800 N/m and wine at 12 per cent is **0.039445**, already down to **54.18 per cent**, because ethanol gathers at the surface. And as evaporation takes the ethanol from 0.12 to 0.10, the tension rises to 0.042828, a difference of **0.003383 N/m**. That difference is only 4.65 per cent of the tension of pure water—small in absolute terms, and it is the small one that acts. The small difference makes a visible height—a 20 μm film is lifted **17.2465 mm**, nearly two centimetres, which is why the tears are seen at all. The height goes inversely with thickness, falling to 3.4493 mm at 100 μm —thin films climb high, thick ones lose to their own weight. And in pure water evaporation does not change the composition, so with the largest tension of all no tears form. This is the boundary: mixture or single component, and whether one component evaporates selectively decides whether the phenomenon exists at all. So “high surface tension makes tears” is wrong twice—the direction is reversed, and what acts is not the amount but the difference. One thing separates them—does the amount act, or the difference. If the amount acts, bigger is stronger, and capillary rise is of that type with pure water climbing highest. If the difference acts, a uniform liquid does nothing, and Marangoni flow is of that type: however large, if it is even, nothing moves. They are distinct roots by the criterion of Paper 300,

one a field and one the gradient of that field. It is the same shape as Paper 451, where what insulated was the air and not the snow: in both, the named thing and the working thing differ. It overlaps Paper 448 too, where the size of one quantum acted rather than the total: in both, the naively summed quantity does not hold the answer. So the strength of the tears follows not the alcohol content but the size of the compositional change by evaporation—which is why humidity and temperature matter. To be honest—the interpolation is a model. The endpoints match measurement, but the shape between them was simply taken as exponential, so the value 0.003383 depends on that model. The conclusion that zero difference gives no tears does not.

References

1. Thomson, J. (1855). On Certain Curious Motions Observable at the Surfaces of Wine and Other Alcoholic Liquors. *Philosophical Magazine*.
2. Marangoni, C. (1871). Ueber die Ausbreitung der Tropfen einer Flüssigkeit auf der Oberfläche einer anderen. *Annalen der Physik*.
3. Fournier, J. B., & Cazabat, A. M. (1992). Tears of Wine. *Europhysics Letters*.
4. Vazquez, G., Alvarez, E., & Navaza, J. M. (1995). Surface Tension of Alcohol + Water from 20 to 50 Degrees C. *Journal of Chemical & Engineering Data*.
5. Yamagishi, Y. (2026). *The Three Hundredth Census: Whether Two Things Share a Root Is Decidable* [Paper 300]. Zenodo. 10.5281/zenodo.22171914
6. Yamagishi, Y. (2026). *No Amount of Red Light Breaks What Blue Light Breaks* [Paper 448]. Zenodo. 10.5281/zenodo.22732565
7. Yamagishi, Y. (2026). *What Insulates Is Not the Snow but the Air It Holds* [Paper 451]. Zenodo. 10.5281/zenodo.22732772

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