

How Do We Turn Hotness into Numbers?



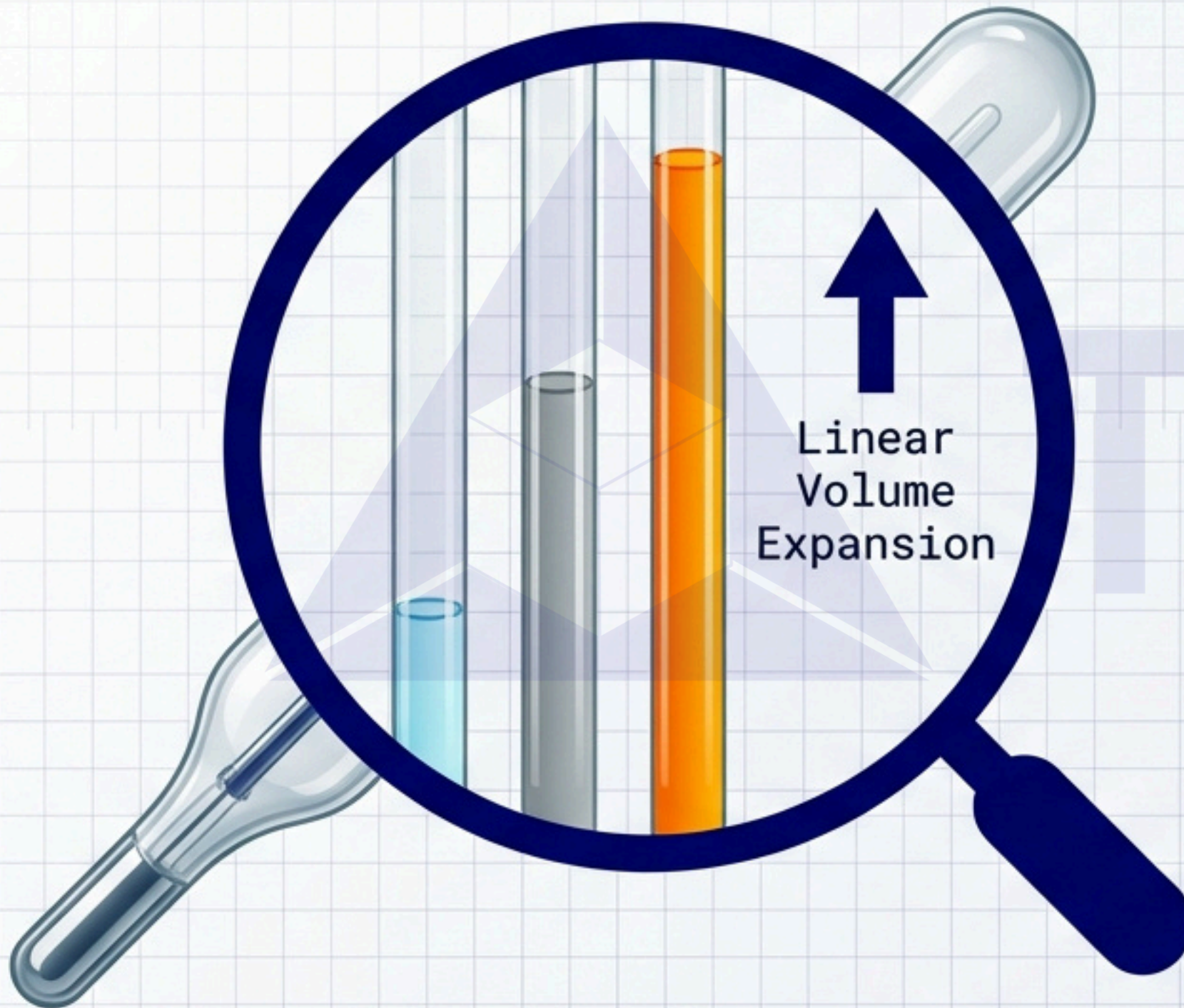
Our sense of touch is unreliable for science.
'Hot' and 'cold' are relative terms.

We need an objective, relative measure of
hotness—we need a Thermometer.

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The Principle: Property Variation with Temperature

To measure temperature, we use materials whose physical properties change sufficiently with heat.

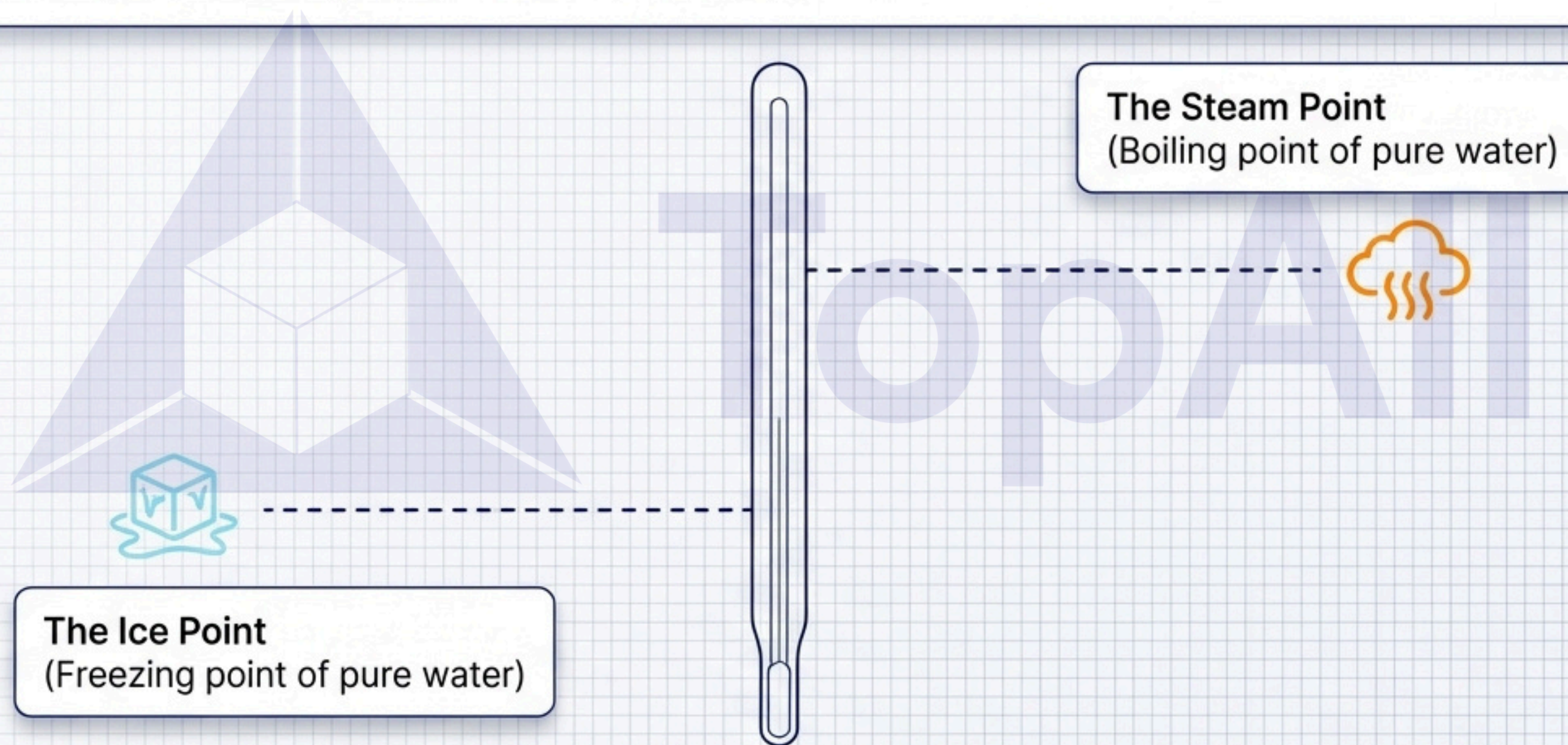


Liquid-in-Glass Thermometers

- Uses mercury or alcohol.
- Relies on the variation of volume with temperature.
- Volume varies linearly over a wide range.

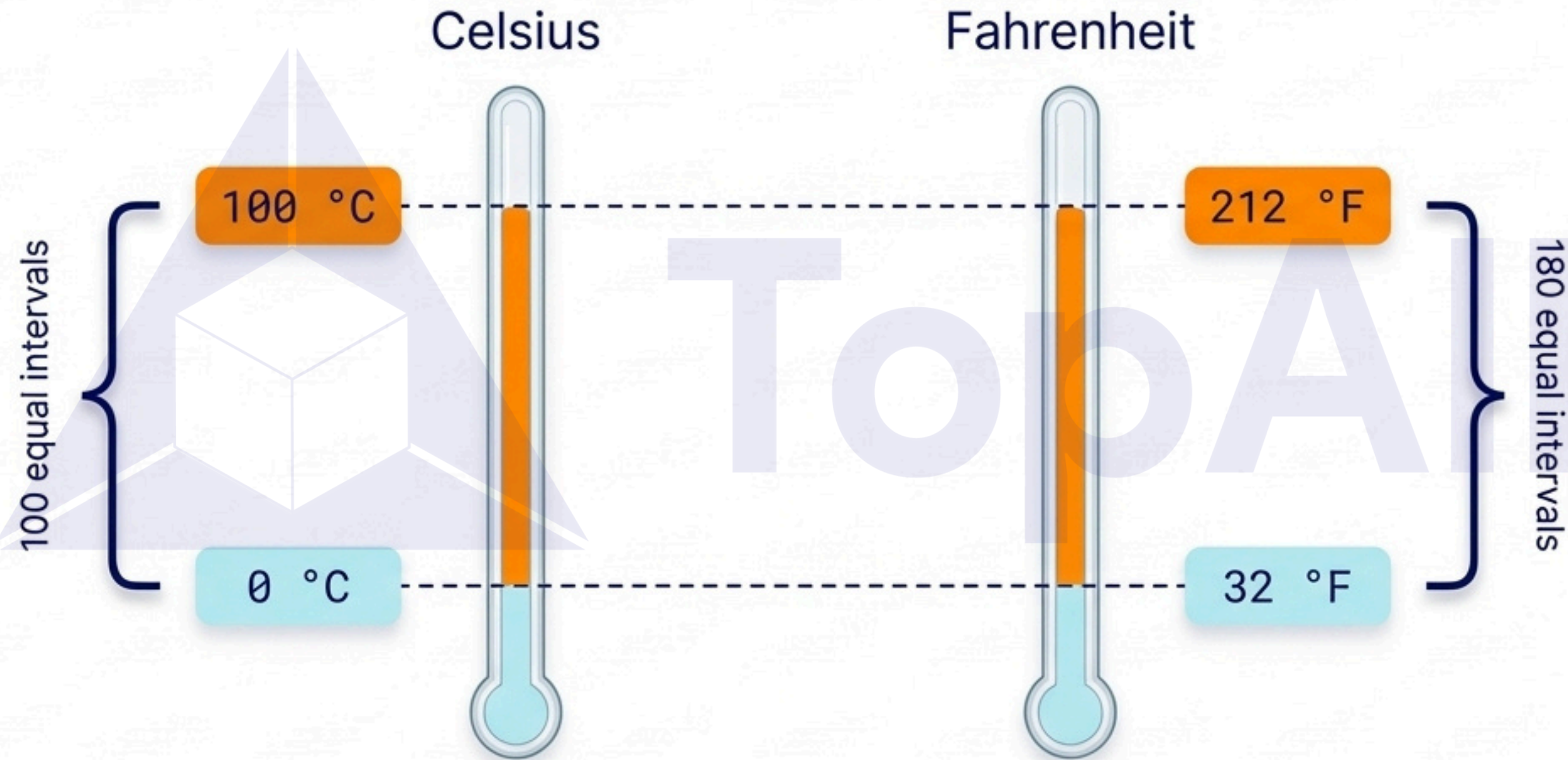
Calibration: The Two Fixed Reference Points

To define any standard scale, we need two fixed reference points correlated to physical phenomena that always occur at the same temperature (under standard pressure).

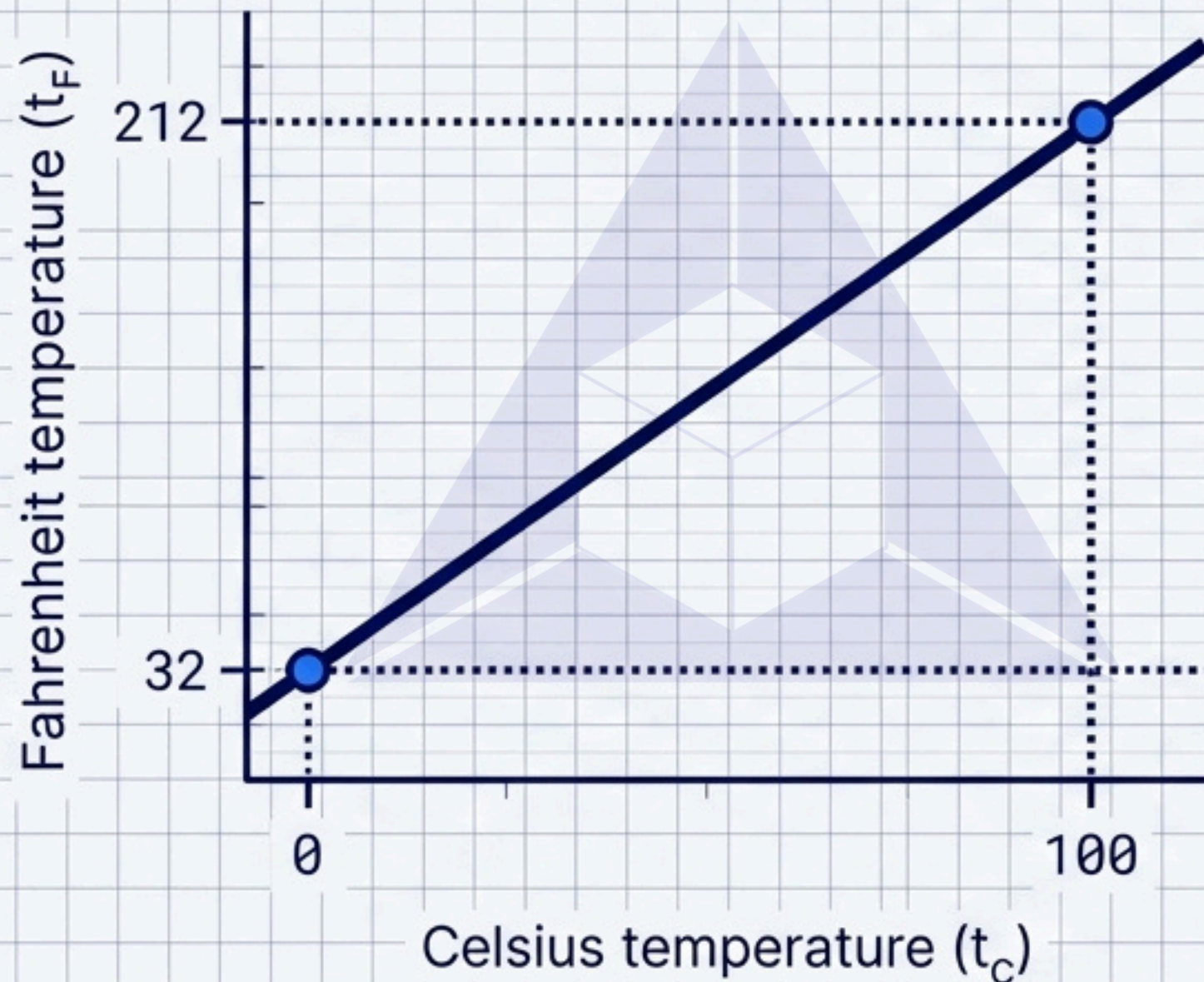


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Scale Comparison: Celsius vs. Fahrenheit



The Mathematical Translation



A relationship for converting between the two scales is obtained from a linear graph.

$$\frac{t_F - 32}{180} = \frac{t_c}{100}$$

Key Takeaways

- ✓ **Thermometric Property:** Liquid-in-glass thermometers rely on the linear variation of volume with temperature.
- ✓ **Calibration Anchors:** Standard scales require two fixed reference points: the ice point (freezing) and steam point (boiling) of water.
- ✓ **Scale Intervals:** Celsius spans 100 intervals (0°C to 100°C); Fahrenheit spans 180 intervals (32°F to 212°F).
- ✓ **Conversion Equation:** $(t_F - 32) / 180 = t_C / 100$

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