VAL® Scale

VAL® - The Digital Unit of Sensory Impact

VAL® is an objective digital unit that quantifies the impact of any organoleptic sensation - taste, odor, texture, trigeminal effects, and more. It replaces subjective human thresholds with a consistent, data-driven digital scale, enabling precise comparison across compounds, products, and sensory modalities.

VAL® Intensity Scale

- ~1val® - Digital threshold (baseline impact)
- ~10val® - Notable
- ~20val® - Medium
- ~30 val® - High
- ~40val® - Strong
- ~60val® - Very strong
- ~80val®+ - Additional intensity no longer produces meaningful perceptual change

This scale functions like grams, meters, or decibels - a universal digital interval scale reference for sensory intensity.

What VAL® Represents

Organoleptic sensations arise when compounds activate human sensory receptors. Each compound may influence:

- One sensation (e.g., sweetness),
- Multiple sensations (e.g., bitterness + astringency),
- Or none.

1val® defines the digital baseline of perceptual impact, allowing all sensations to be measured on a unified scale.

Traditional sensory science relies on thresholds, but thresholds:

- Vary dramatically across studies,
- Depending on panelist training and genetics,
- Fail to reflect real-world product matrices,
- Not quantify intensity - only detectability.

Why VAL® Is Better Than Thresholds

VAL® integrates:

- Physical properties (molar mass, molecular volume, polarizability, free rotating bonds etc.)
- Non-linear impact curves (dynamic thresholds across concentrations)
- Synergy and masking effects (e.g., *Glucose + Thaumatin (1:1) reduces sweetness by 14%*)
- Normalization factors aligning all sensations to a common human perception baseline

This creates a robust, reproducible, and scientifically grounded measurement system.

Additional:

Appendix #A - **The Challenges & Disadvantages of Using Thresholds**
Appendix #B - **The Value of Digitization**

Appendix #A

The Challenges & Disadvantages of Using Thresholds to define a Compound's Impact on Taste Buds

1. Thresholds ignore intensity above the threshold

A threshold only tells you about the **minimum concentration** at which a compound is detectable. It does **not** tell you:

- how strong the taste becomes at higher concentrations
- how intensity grows (linearly, exponentially, or with saturation)
- how the compound behaves in real food matrices

This makes thresholds a **poor predictor of real sensory impact**.

2. Large variability between individuals

Taste thresholds vary dramatically between people due to:

- genetics
- age
- health
- cultural exposure
- receptor density

A compound with a threshold of 5 mg/L may be detected at 2 mg/L by one person and 20 mg/L by another. Thresholds represent **population averages**, not real-world perception.

3. Matrix effects distort thresholds

Thresholds are usually measured in **water**, but real products contain:

- fats
- proteins
- acids
- sugars
- viscosity agents

These components can **suppress, enhance, or mask** the compound's taste.
So, a threshold measured in water often **does not apply** to the actual product.

4. Compounds interact with each other

Taste perception is not additive. Compounds can:

- **mask** each other (bitterness suppressed by sugar)
- **enhance** each other (umami + salt)
- **create new sensations** (synergy)

Thresholds treat compounds as if they act **alone**, which is rarely true in food or beverages.

5. Thresholds ignore temporal effects

Taste has a time dimension:

- onset speed
- lingering
- aftertaste

- buildup
- decay

A compound may have a low threshold but a **very short duration**, or vice versa. Thresholds cannot capture these dynamics.

6. Thresholds do not reflect hedonic value

Thresholds tell you **when you can detect** a taste - not whether it is:

- pleasant
- unpleasant
- balanced
- acceptable

A compound may be detectable at 1 mg/L but only **pleasant** at 5 mg/L. Thresholds misses this nuance.

7. Thresholds are sensitive to testing conditions

Thresholds change with:

- temperature
- pH
- viscosity
- carbonation
- serving method
- adaptation (taste fatigue)

This makes threshold values **unstable** and sometimes misleading.

Summary: Why Thresholds Are Limited

Thresholds are useful for basic sensory mapping, but they are **too simplistic** to describe real taste impact. They fail to capture:

- intensity
- interactions
- matrix effects
- temporal behavior
- individual variability
- hedonic perception

Appendix #B

The Value of Digitization

Digitizing sensory impact unlocks capabilities that were impossible with human-based thresholds:

1. True Comparability Across Products

VAL® puts all sensations on a single digital scale, enabling:

- Comparison of sweetness between two beverages,
- Comparison of bitterness between two proteins,
- Comparison of aroma intensity across categories (e.g., citrus vs. dairy).

Thresholds cannot do this - they are not standardized, not linear, and not comparable.

2. Repeatability Without Human Variability

Digitization removes:

- Panel fatigue,
- Genetic differences,
- Training bias,
- Cultural bias.

VAL® delivers the same result every time, regardless of who measures it.

3. Faster R&D and Reformulation

Digital sensory values allow teams to:

- Predict sensory outcomes before bench work,
- Simulate formula changes,
- Identify which compounds drive which sensations,
- Optimize cost-in-use by targeting only impactful molecules.

4. Scalable, Global, and Automated

Once digitized, sensory data can be:

- integrated into AI models,
- compared across regions,
- used for automated quality control,
- embedded into digital twins of products.

Thresholds cannot scale - VAL® can.

5. A Universal Language for Sensory Science

VAL® creates a standardized, quantitative vocabulary for R&D, marketing, regulatory, and manufacturing teams.

What VAL® Enables

Compared to thresholds, VAL® provides:

- Full intensity measurement, not just detectability
- Objective, repeatable results, free from human variability
- Accuracy in real product matrices, not just water
- Detection of interactions (masking, enhancement, synergy)
- Temporal profiling (onset, peak, aftertaste)
- A complete sensory fingerprint