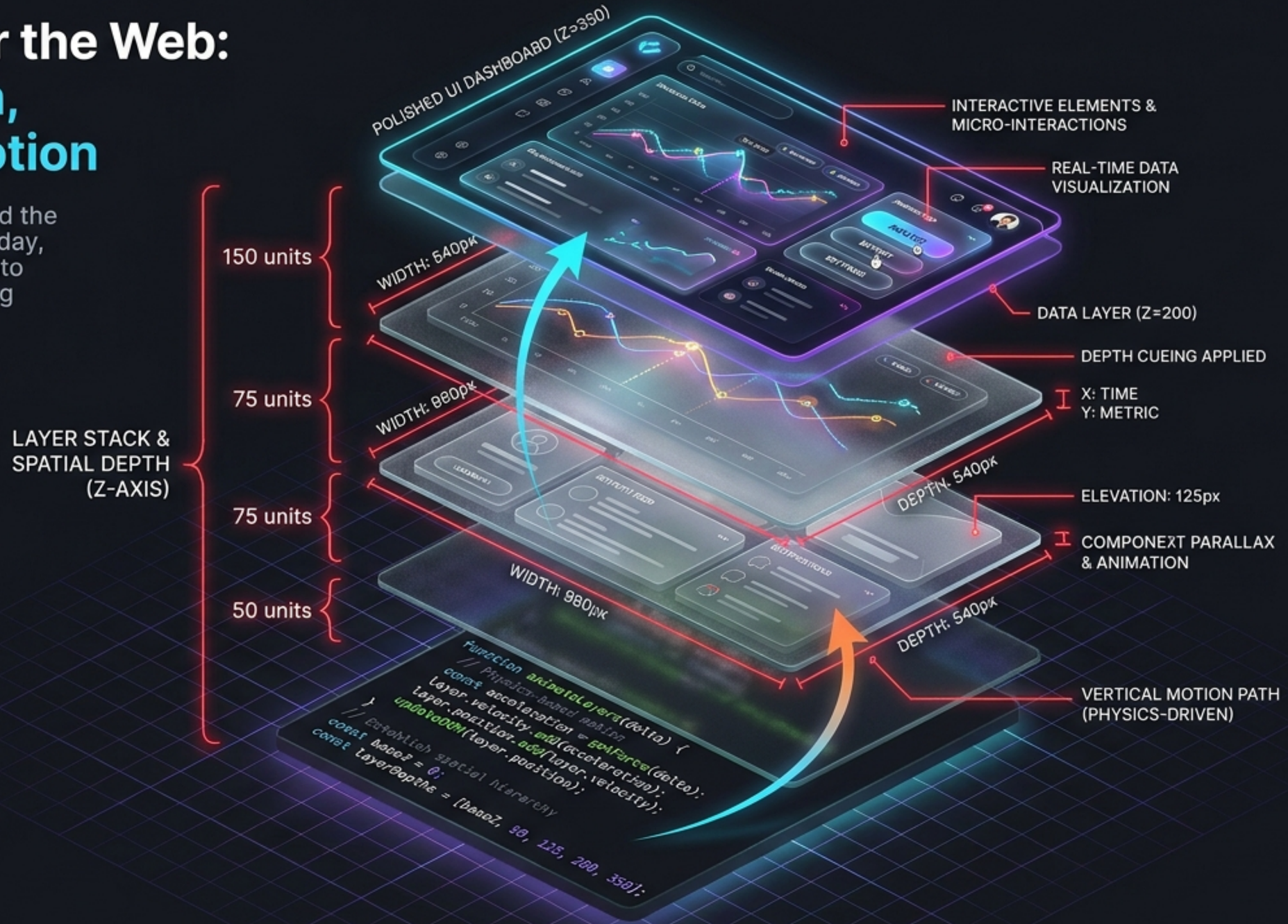
Visual Design for the Web: S09E10 — Depth, Surfaces and Motion

Previously in S09E09, we mastered the anatomy of interface elements; today, we elevate them, stacking them into spatial, moving environments using physics and math.



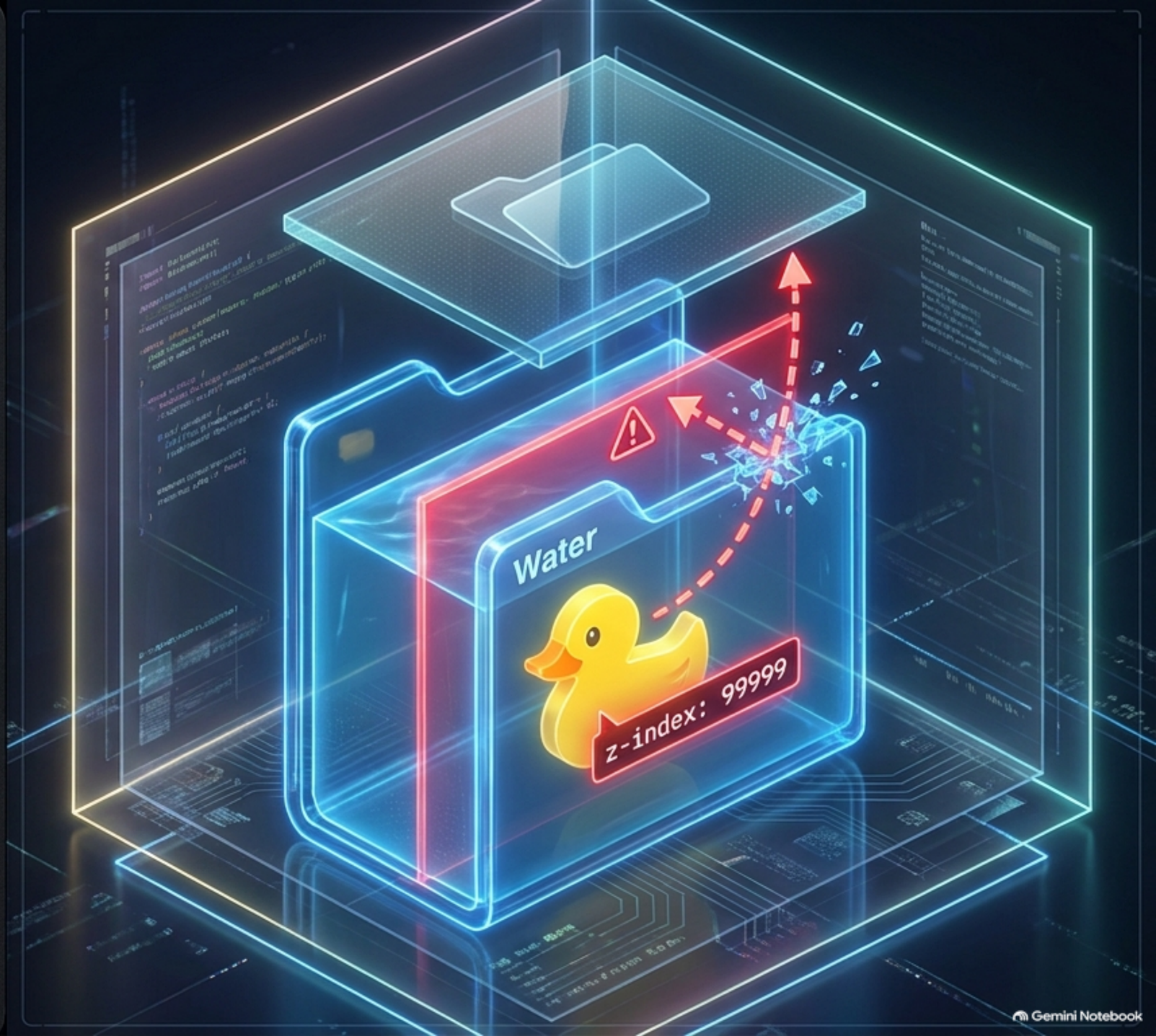
Gemini Notebook

Spatial X-Ray Inspector

1.0 Escaping the `z-index: 99999` Wars

Depth on the web isn’t an absolute number—it’s a series of nested folders. Applying `position: relative` and a `z-index` creates an inescapable *stacking context*.

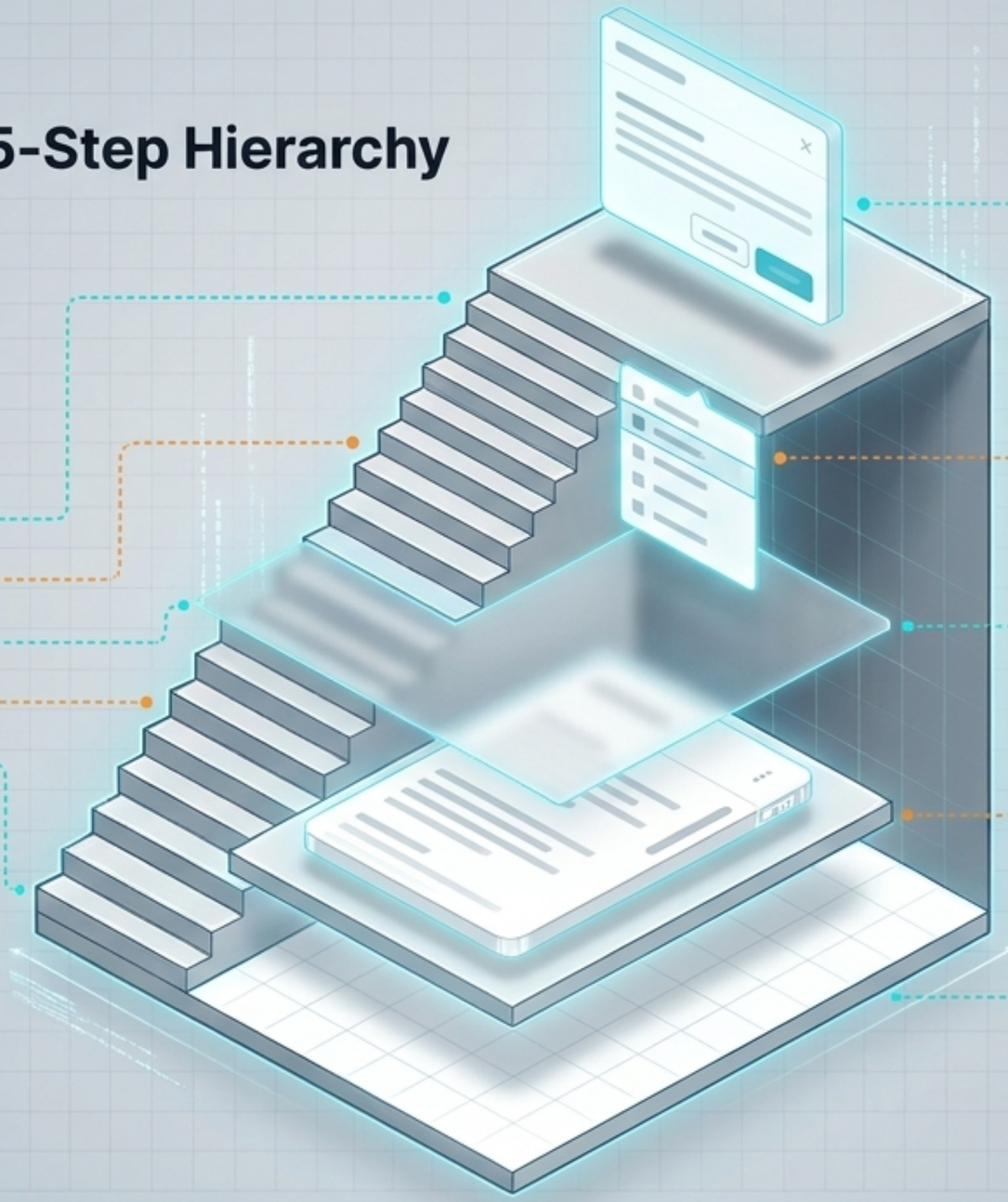
```
position: relative;
z-index: 1;
/* Creates a new dimension */
```



Spatial X-Ray Inspector

1.1 The Predictable 5-Step Hierarchy





4 - Modal Dialog: The ultimate focus layer—managed natively, no chaotic Z-wars required.

3 - Popover API Menu: Top-layer contextual actions.

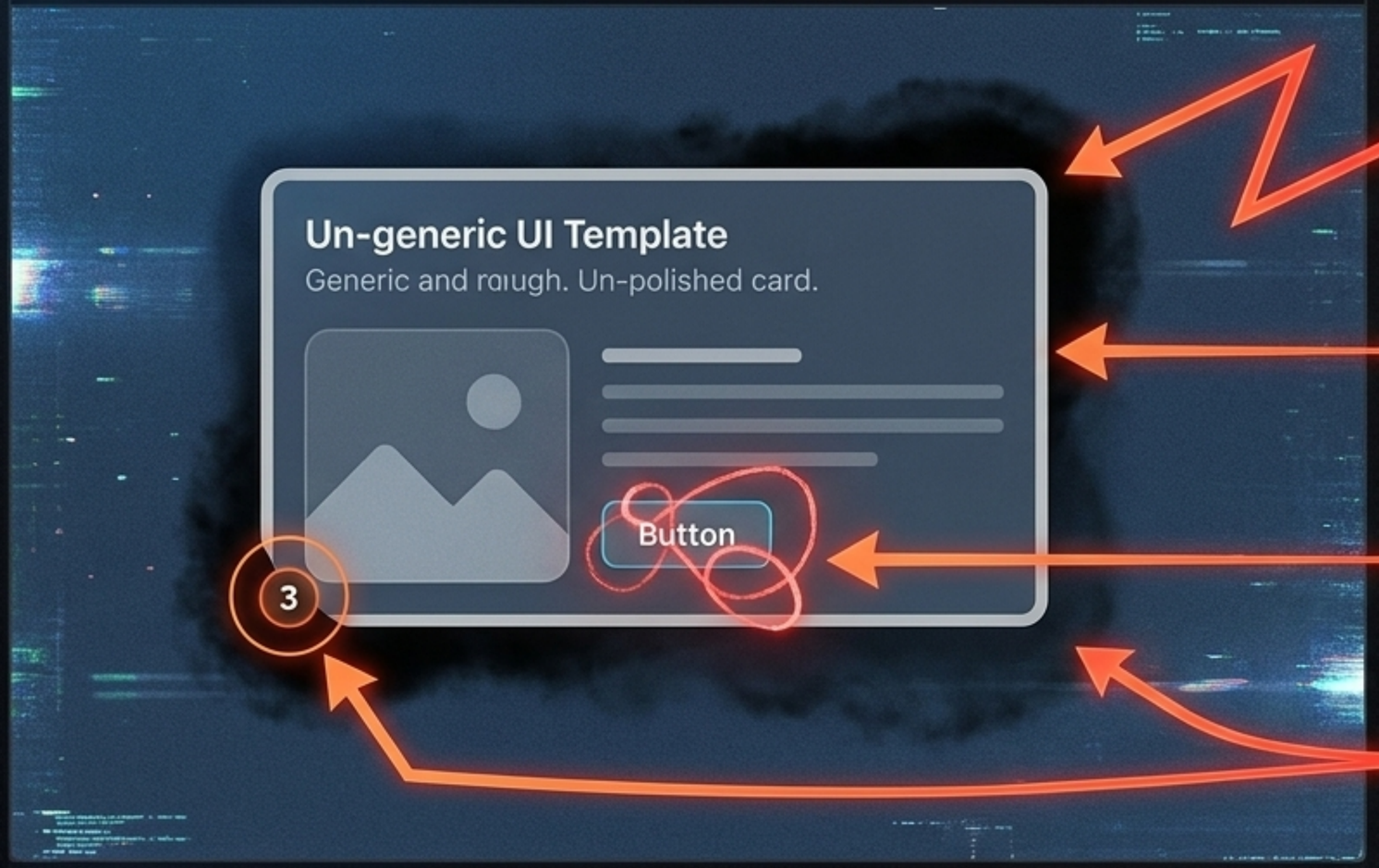
2 - Sticky Header: Translucent `backdrop-filter: blur(16px)` masks (Apple HIG Materials).

1 - Raised Card: Scrollable content layers.

0 - Background Canvas: The foundation.

Gemini Notebook

2.0 The ‘Muddy Default’ Trap



1. **Soot Shadow:** A single, dead layer of `rgba(0,0,0,0.35)` creating a smudged look.
2. **Harsh Borders:** Opaque `#cccccc` borders that clash with colored backgrounds.
3. **Pinched Radii:** 16px outer corners wrapping 16px inner corners.
4. **Sluggish Motion:** A chaotic 600ms bounce on hover.

Gemini Notebook

2.1 Environmental Surface Physics

True craft treats UI elements as physical objects existing in a cohesive, lit environment.

- **Material 3:** Tonal surface fills replacing reliance on harsh shadows.
- **Apple HIG:** Dynamic, layered materials that respond to the background.
- **Linear:** Sub-pixel perfect, multi-layered spatial rendering.



Barely-there Hairline Border: Semi-transparent, specular reflection catching light.

Perfect Mathematical Radii: Inner corner matches outer container curve.

Frosted Glass Surface: Dynamic blur effect reacting to background gradient.

Soft, Multi-layered Shadow: Tinted with background hue, zero dead black.

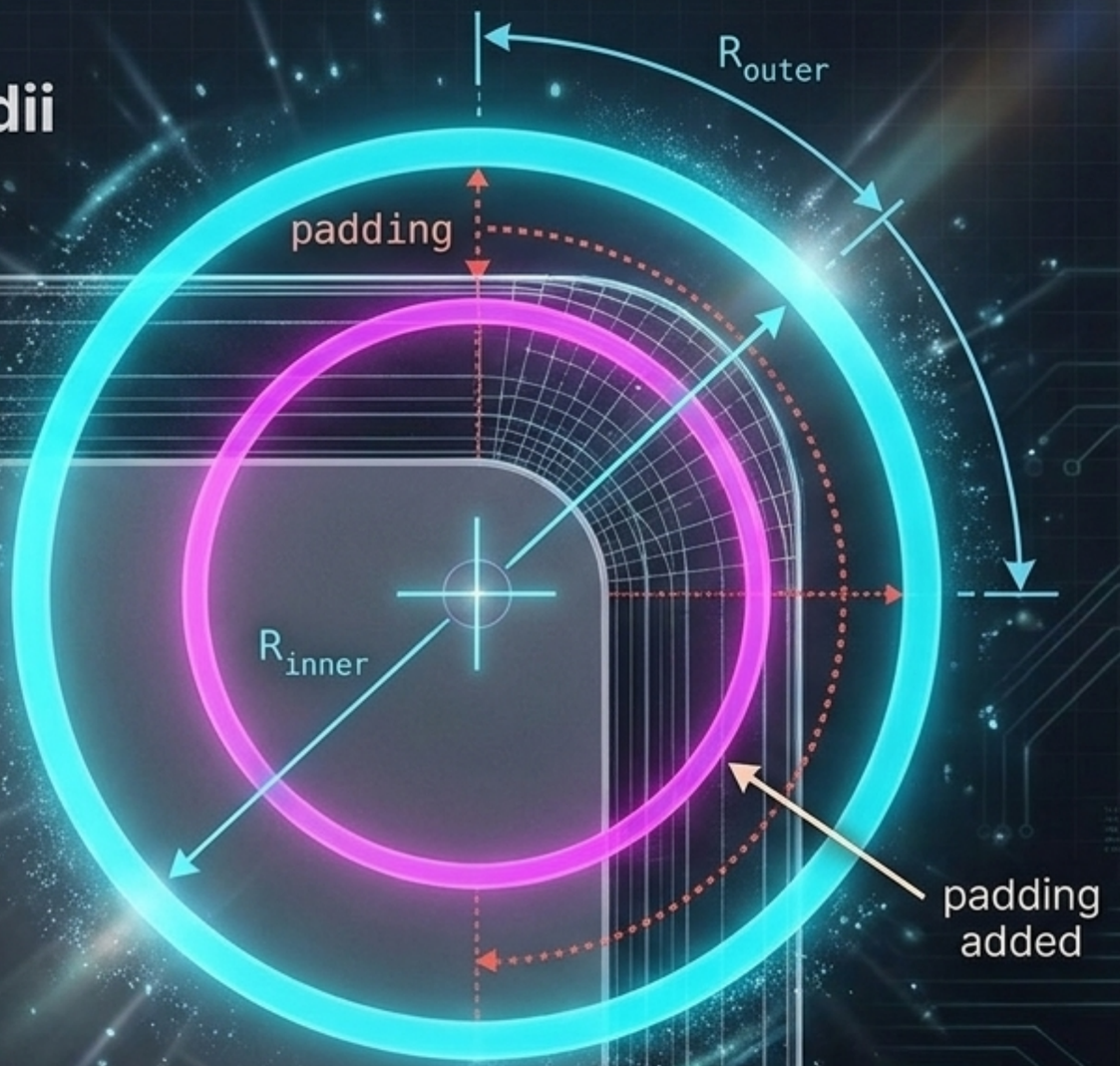
Gemini Notebook

3.0 The Mathematics of Concentric Radii

Inner elements must have a smaller radius than their container. If `padding` exceeds the outer radius, the inner element must be square.

$$R_{outer} = R_{inner} + padding$$

```css
border-radius: max(0px, min(8px,
  calc((100vw - 4px - 100%) * 9999)));
```



Gemini Notebook

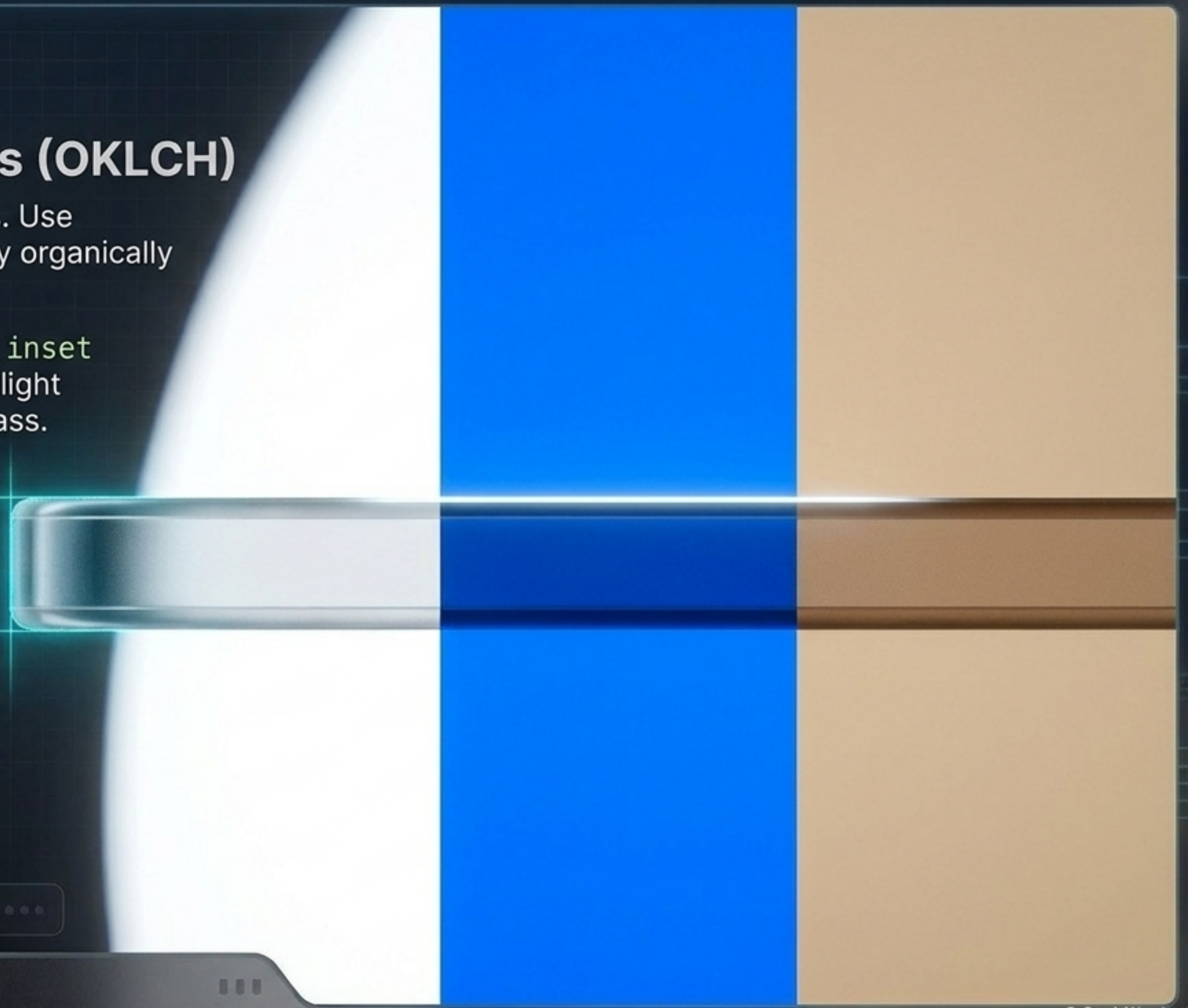
3.1 Hairline Alpha Borders (OKLCH)

Never use opaque hex codes for borders. Use semi-transparent OKLCH borders so they organically blend over any tinted surface.

Add an inset top border (`box-shadow: inset 0 1px 0 rgba(…)`) to mimic a specular light highlight catching the top edge of the glass.

Light Mode:
`oklch(0 0 0 / 8%)`

Dark Mode:
`oklch(1 0 0 / 8%)`



Gemini Notebook

4.0 Light Mode: Realistic Layered Shadows

Every **shadow on the page** must share the same horizontal/vertical ratio to imply a single global light source.

1. **Tight Contact (1px):** Grounds the object `hsl(220 60% 50% / 0.075)`.
2. **Mid Key (2-4px):** Defines the elevation.
3. **Soft Ambient (8-16px):** Negative-spread ambient at 2–6% alpha for environmental realism.

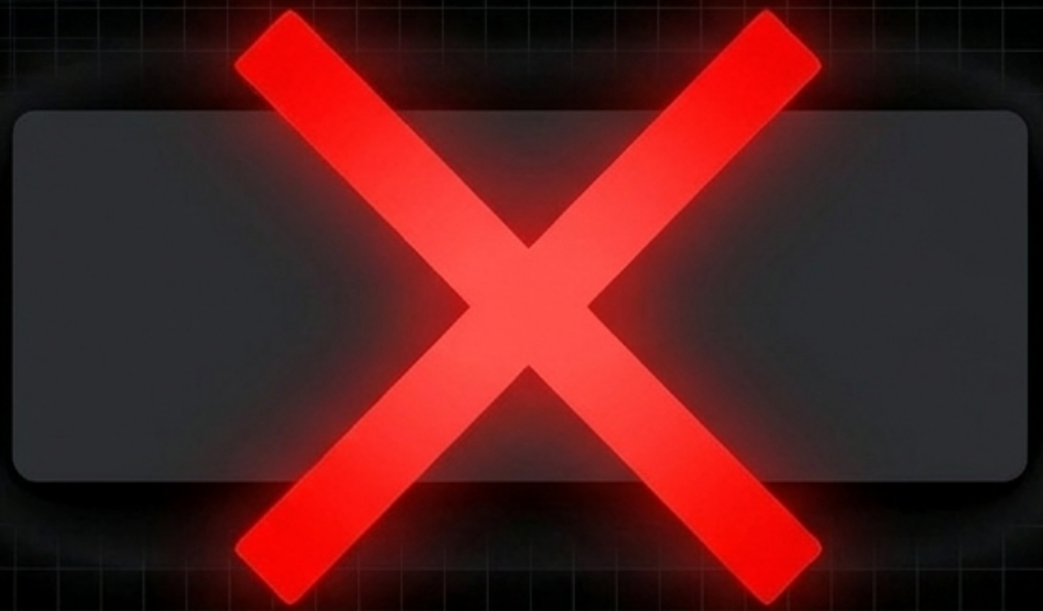


Gemini Notebook

4.1 Why Drop Shadows Fail in Dark Mode

You cannot cast a shadow on black. In dark environments, physical depth is perceived through proximity to the light source, not shadows.

The shador ring in uses, a 'naout "soot" oil dirties the edges the card without any of depth.



Apple HIG Principle:

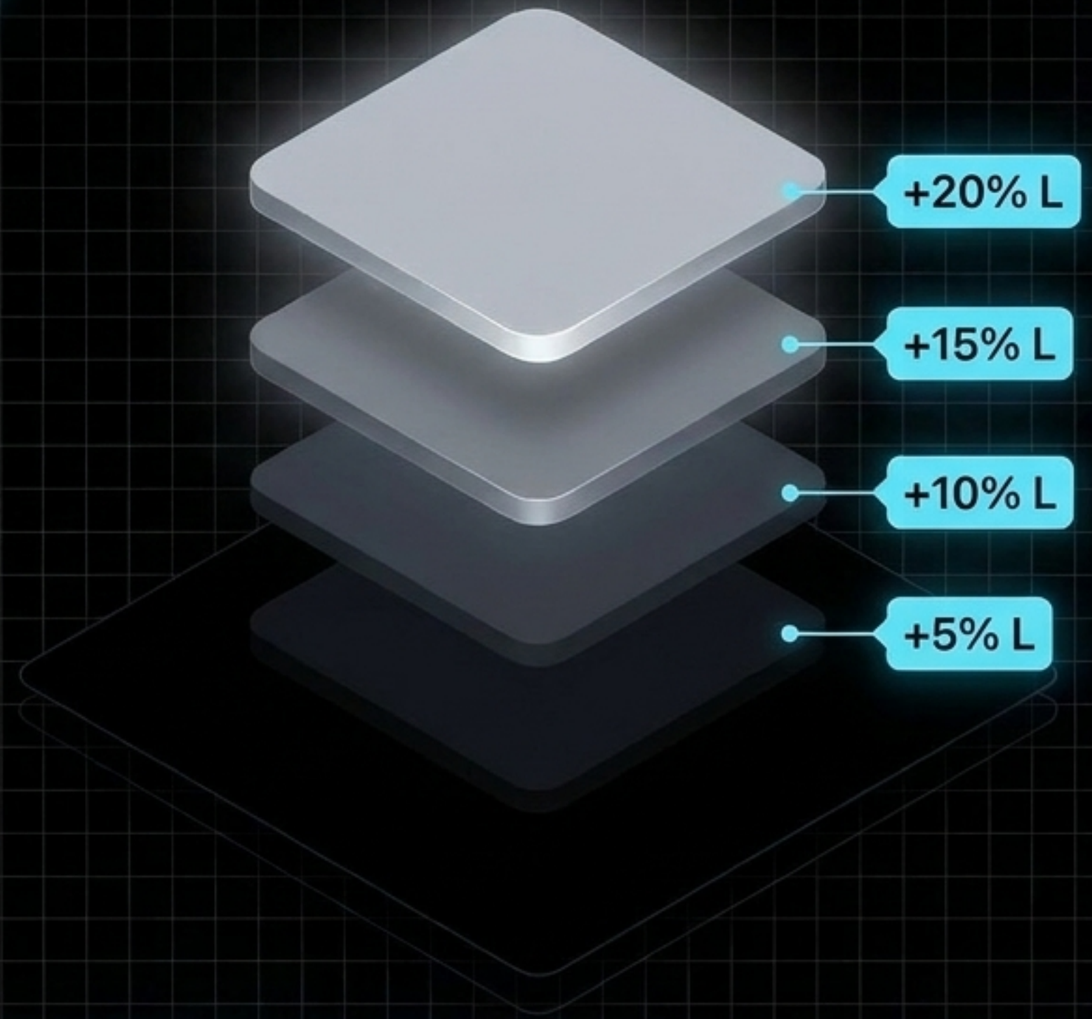
"Prefer system background colors... automatically changes from base to elevated."

Gemini Notebook

4.2 Dark Mode: Elevation via Lightness

Replace drop shadows with +3% to +8% OKLCH Lightness (L) steps per Z-level. Elevation is communicated purely through tonal surface fills in dark environments.

```
oklch(from var(--surface-0) calc(l + 0.05)
c h)
```



Spatial X-Ray Inspector

16:9
Gemini Notebook

5.0 Restrained Motion: Good vs. Great

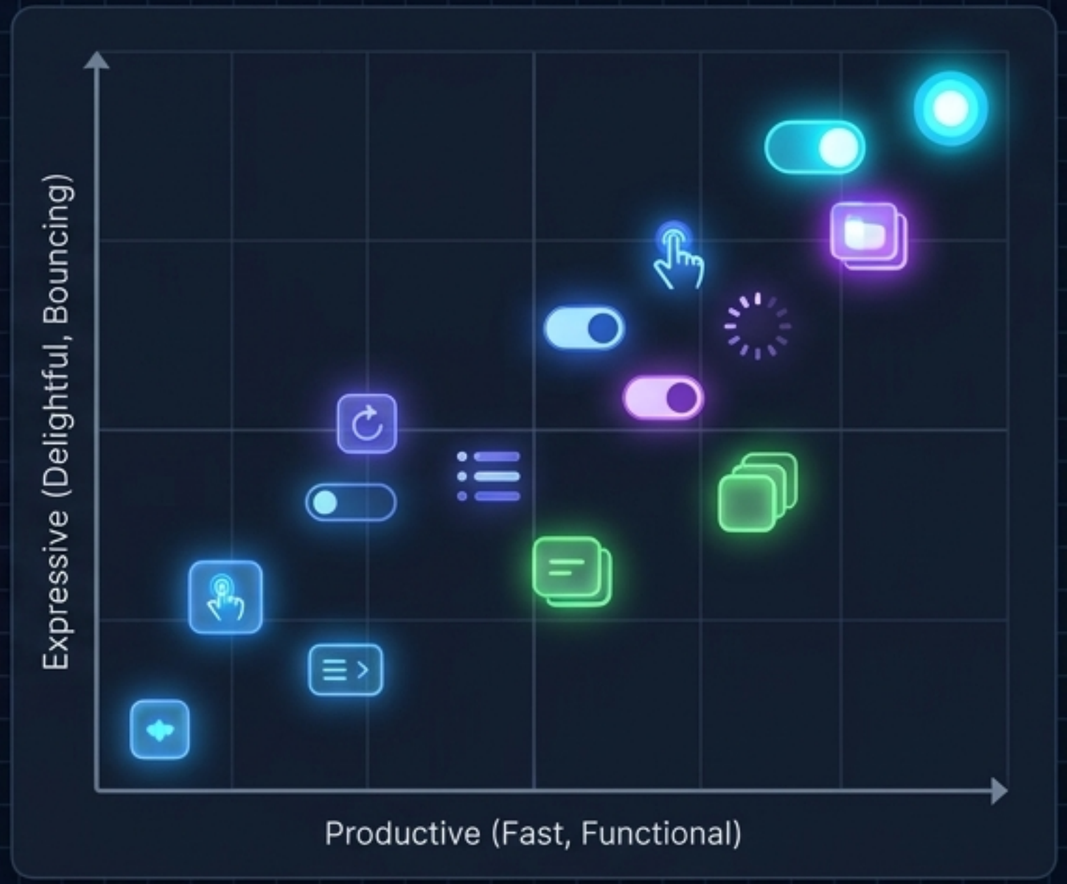
Great animations are invisible details. They feel tactile but never make the user wait.

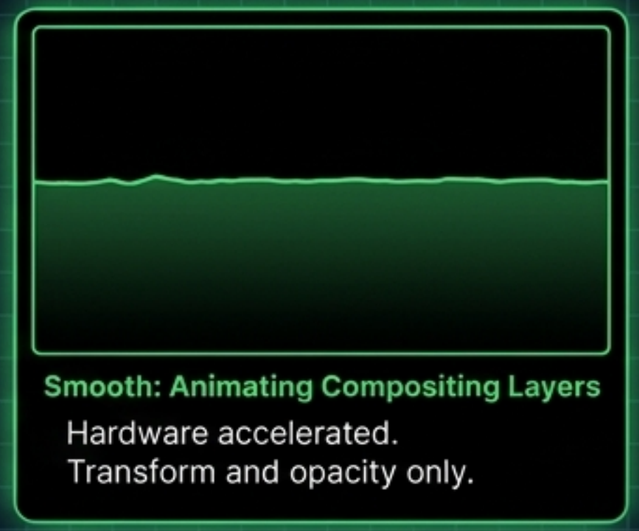
Performance Rule: GPU transform and opacity *only*. Never animate `height`, `margin`, or `box-shadow` directly.



Janky: Animating Layout

Layout thrashing detected.
Avoid height/margin.





Smooth: Animating Compositing Layers

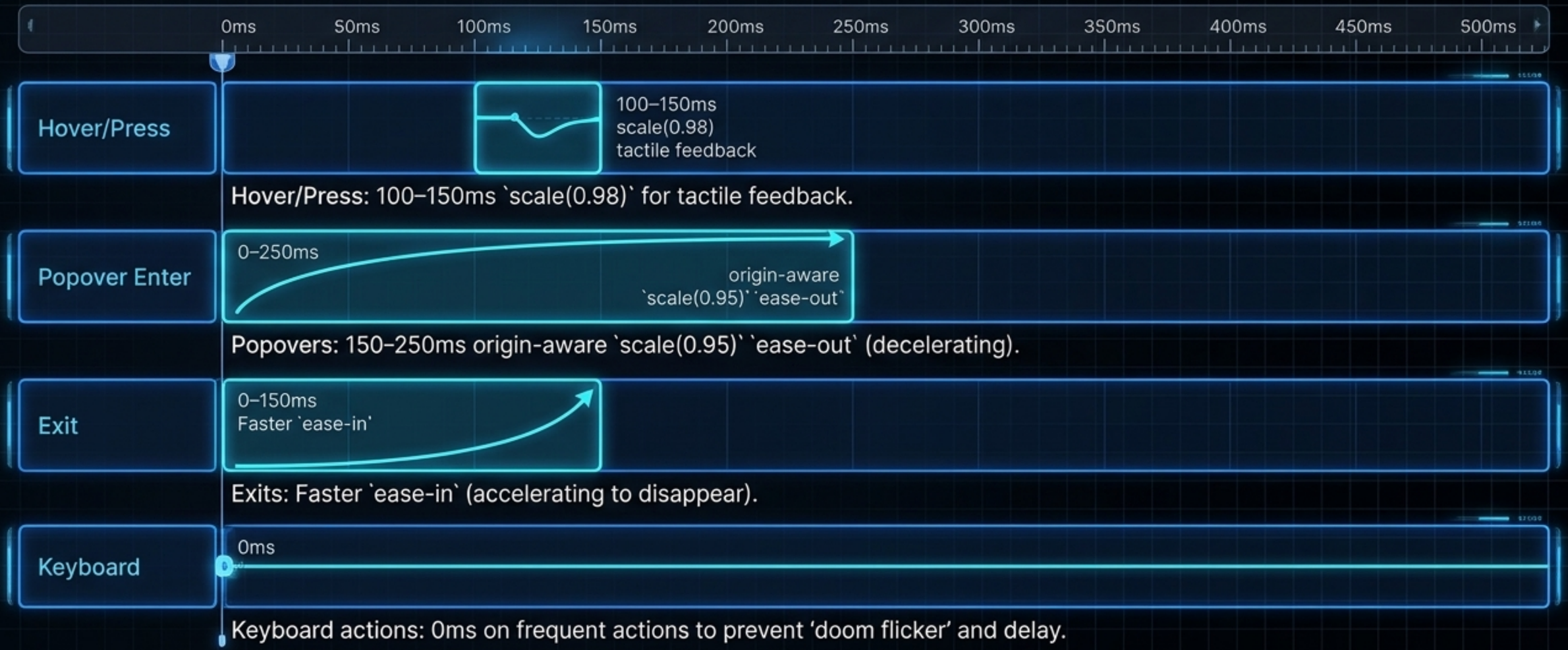
Hardware accelerated.
Transform and opacity only.

Gemini Notebook

Spatial X-Ray Inspector

5.1 The Choreography of Interaction

Great animations are invisible details. They feel tactile but never make the user wait.



Hover/Press: 100–150ms `scale(0.98)` for tactile feedback.

Popovers: 150–250ms origin-aware `scale(0.95)` `ease-out` (decelerating).

Exits: Faster `ease-in` (accelerating to disappear).

Keyboard actions: 0ms on frequent actions to prevent ‘doom flicker’ and delay.

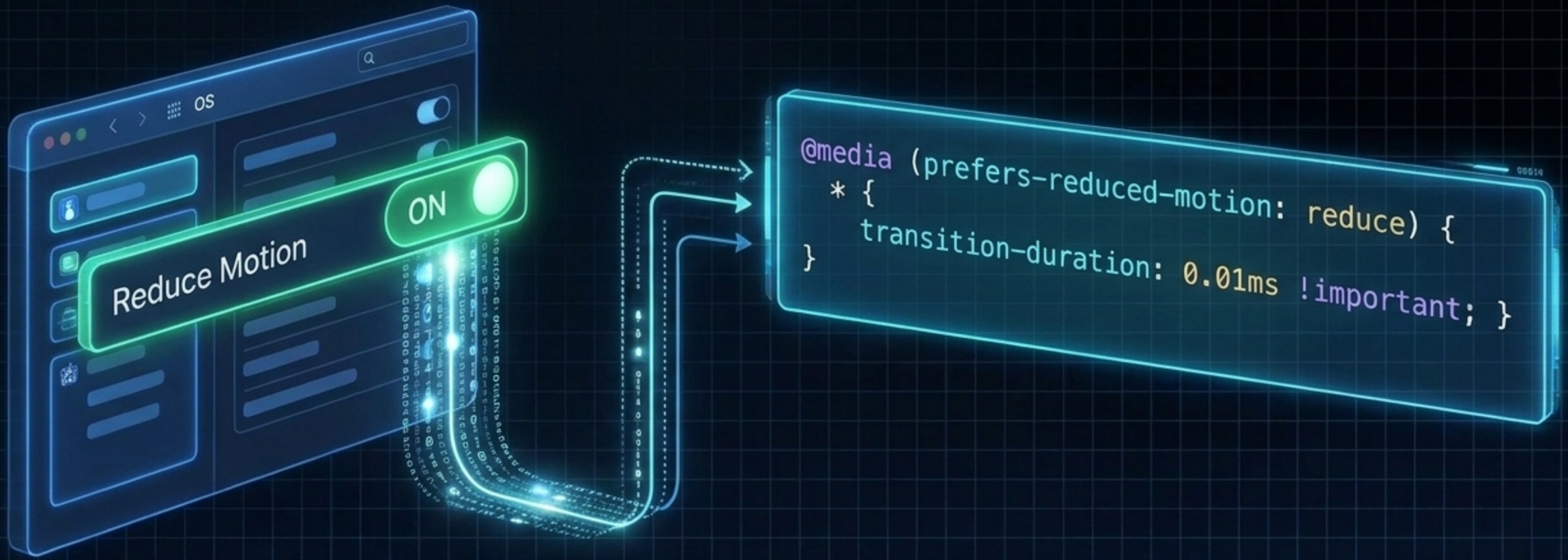
Gemini Notebook

Spatial X-Ray Inspector

5.2 Accessible Exits & Reduced Motion

Animation can cause malaise. We have a responsibility to respect OS-level motion preferences.

Never use `transition: none` if JavaScript relies on `animationend` events.



Gemini Notebook

6.0 Three Contrasting Visual Archetypes

Warm Editorial

Calm Cross-Fades

Crisp Swiss / Technical Utility

Ultra-Fast Snaps

Tactile Craft Brand

Expressive Bounces

Radii	Hairline
Lines	Hairline
Shadows	Soft Mid-Key
Animation	Calm Cross-Fades

Radii	0–4px
Lines	1px Keylines
Shadows	Zero Static
Animation	Ultra-Fast <120ms

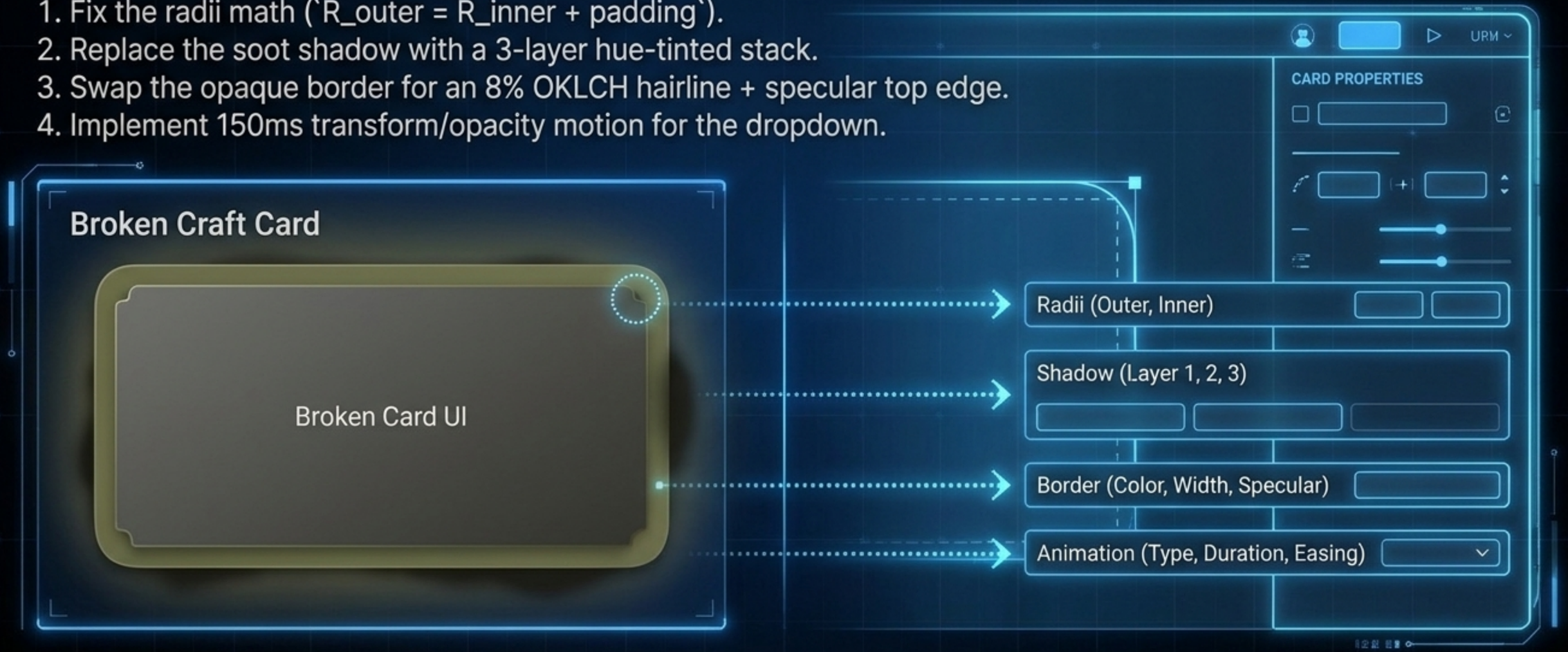
Radii	20px/12px Concentric
Lines	Specular Edges
Shadows	3-Layer Warm
Animation	Expressive 250ms

Gemini Notebook

7.0 Exercise: Fix the Broken Craft

Task: Take the provided broken template and apply today's environmental physics.

1. Fix the radii math (`R_outer = R_inner + padding`).
2. Replace the soot shadow with a 3-layer hue-tinted stack.
3. Swap the opaque border for an 8% OKLCH hairline + specular top edge.
4. Implement 150ms transform/opacity motion for the dropdown.



Gemini Notebook

7.1 The Depth & Motion Formula Sheet

```
[Radii]
  Inner R                = Outer R - Padding

[Light Border]           = oklch(0 0 0 / 8%)
[Dark Border]            = oklch(1 0 0 / 8%)

[Dark Mode Elevation]    = +5% L per Z-layer.

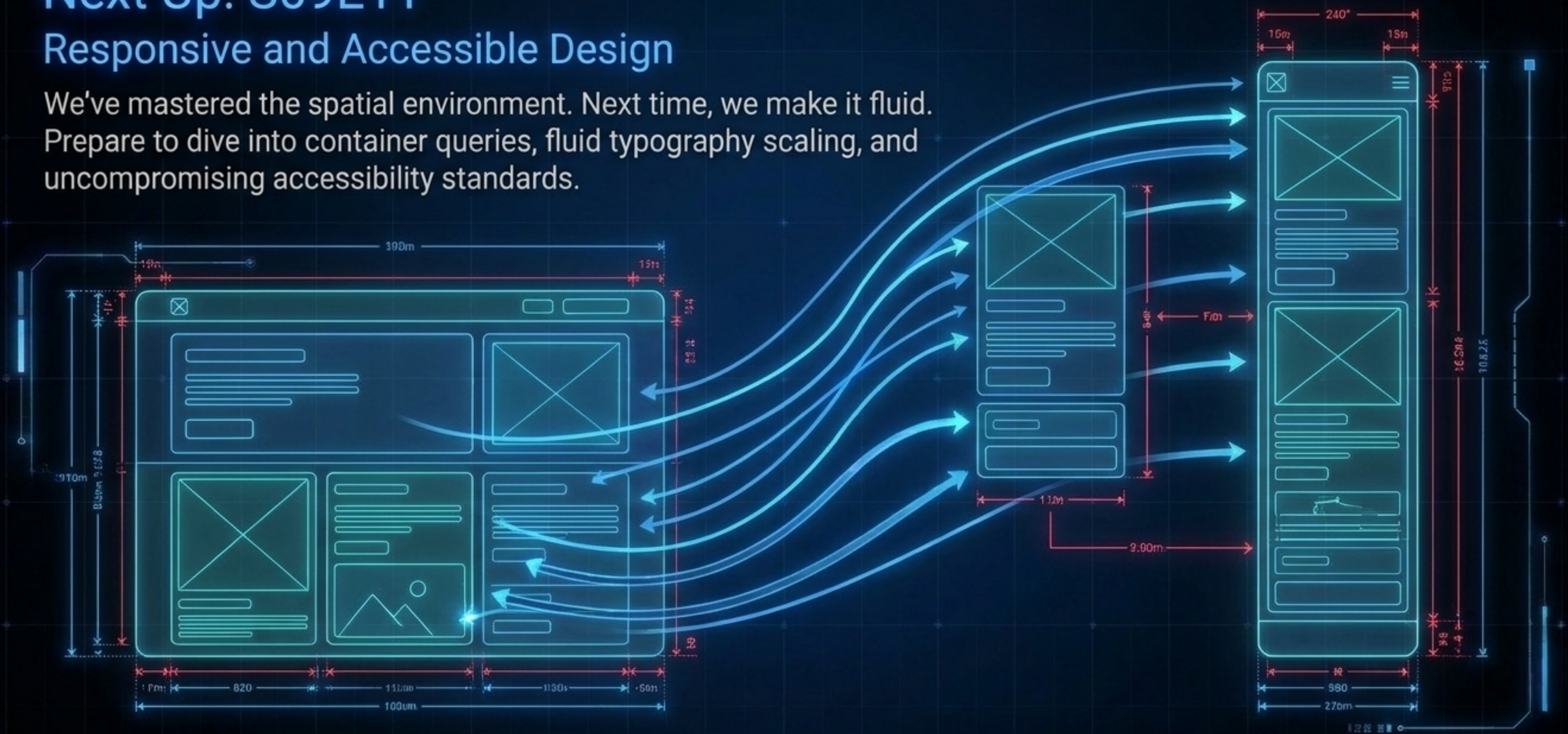
[Hover Motion]           = 150ms ease transform: scale(0.98).
[Popover Enter]          = 250ms ease-out.
[Popover Exit]           = 150ms ease-in.
```


Gemini Notebook

Next Up: S09E11

Responsive and Accessible Design

We've mastered the spatial environment. Next time, we make it fluid. Prepare to dive into container queries, fluid typography scaling, and uncompromising accessibility standards.



Gemini Notebook