

Designing Accessible Color Systems



- Contrast, non-color cues, and giving color a clear interface role



- Over 300 million people worldwide have color vision deficiency



- Accessible color benefits all users, not just those with impairments

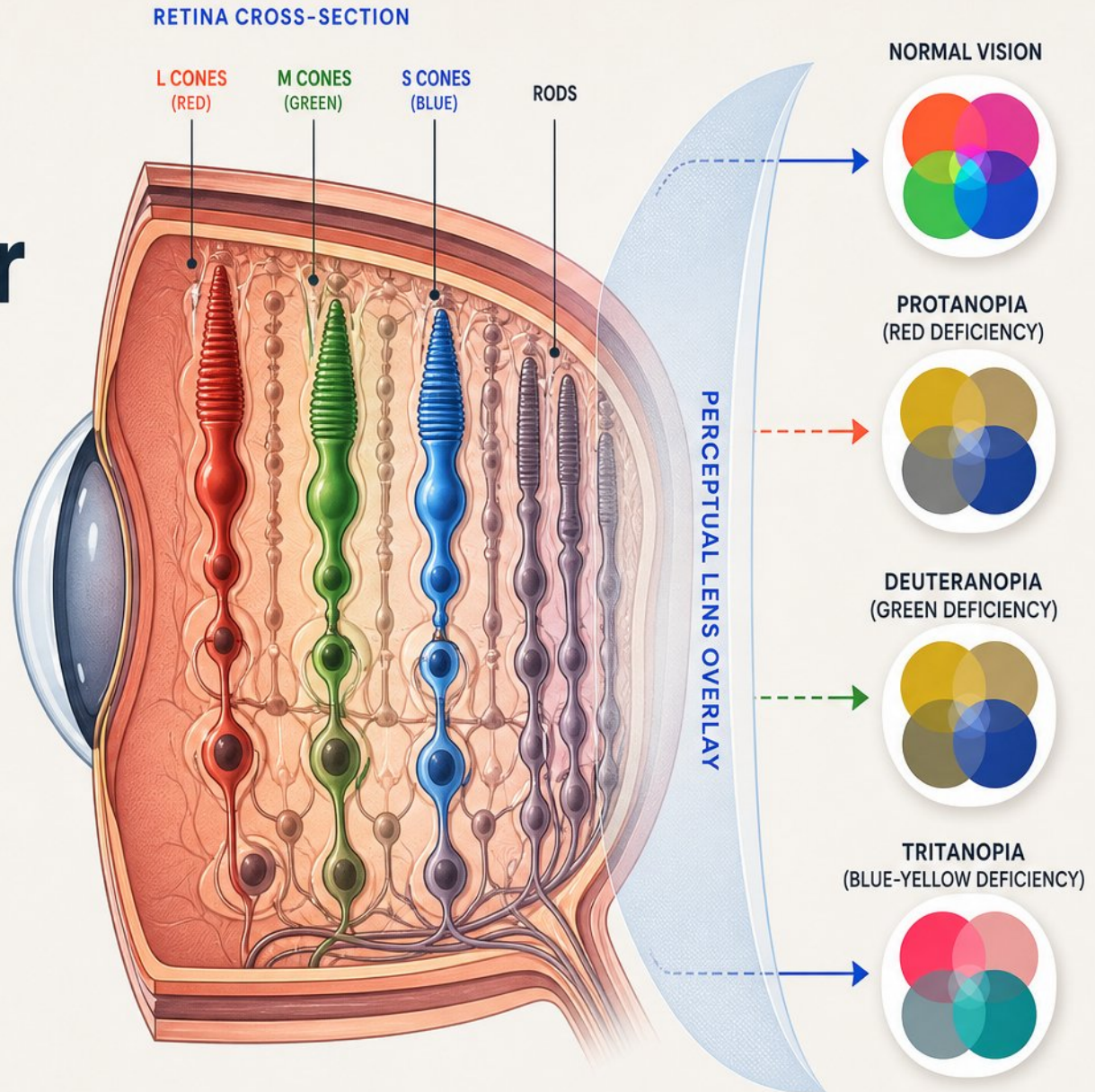


- Build a usable, compliant, and beautiful color system by course end



How Humans Perceive Color

- Three cone types enable trichromatic vision: L (red), M (green), S (blue)
- Common CVD types: protanopia (red), deuteranopia (green), tritanopia (blue-yellow)
- Roughly 1 in 12 men and 1 in 200 women have color vision deficiency
- Problematic hue pairs: red/green, blue/purple, green/brown, pink/gray
- CVD alters color distinction, not just perception — shape and contrast remain critical



Digital Color Spaces and Perceptual Uniformity

- **OKLCH:** A perceptually uniform space using Lightness, Chroma, Hue — its numbers match what the eye sees
- HSL lightness is just a math shortcut; in OKLCH, equal L steps look equally bright across all hues
- Fixing hue while stepping lightness and tapering chroma builds consistent, predictable scales
- Practical payoff: reliable palettes, balanced dark mode, and contrast ratios you can trust



Contrast: The Foundation of Legibility



- Normal text needs 4.5:1, large text needs 3:1, UI components need 3:1



- APCA is a perceptual model; WCAG 3 algorithm is still undetermined, years from finalization

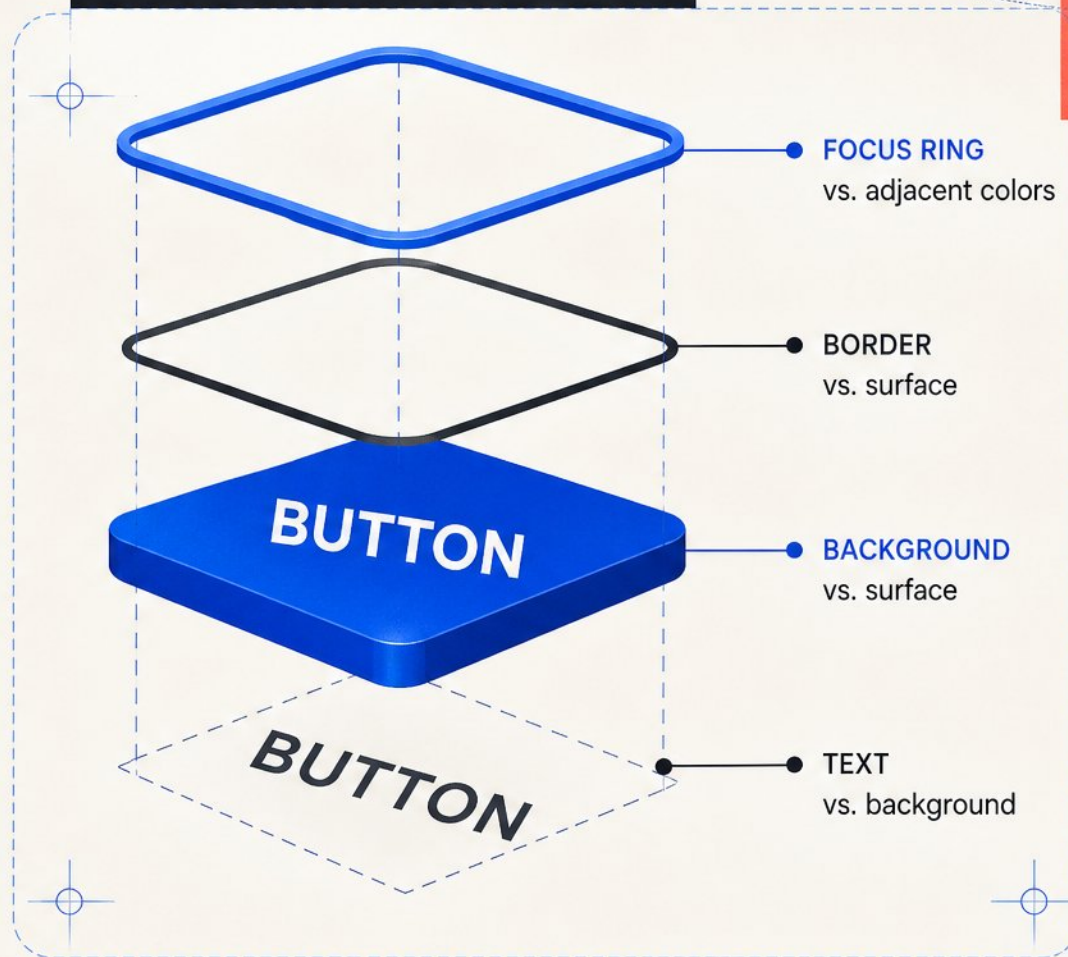


- Test button bg vs. text, border vs. surface, focus ring vs. adjacent colors



- Disabled states and logos are exempt from contrast requirements

ANATOMY OF A COMPONENT



Building a Usable Color Palette



- **Define clear roles:** primary, secondary, accent, neutral, and semantic (success, warning, error, info).



- **Generate CVD-safe scales in OKLCH:** fix hue, step lightness evenly, and taper chroma at extremes to stay in-gamut.



- **For dark mode,** mirror palettes with perceptual adjustments; avoid halation and perceived contrast reversal.

PALETTE ROLES

PRIMARY

Core brand color for key elements



SECONDARY

Supportive color for balance and variety



ACCENT

High-energy color for emphasis and highlights



NEUTRAL

Foundational tones for backgrounds, surfaces, and text



SEMANTIC



SUCCESS



WARNING



ERROR



INFO



Going Beyond Color: Non-Color Cues

- ✓ WCAG 1.4.1: color cannot be the only way to convey information
- ✓ Redundant encoding: pair color with icons, labels, underlines, or patterns
- ✓ High-risk areas: form errors, data viz, badges, inline links
- ✓ Direct labels in charts remove reliance on color legends entirely

ONLY COLOR

Email

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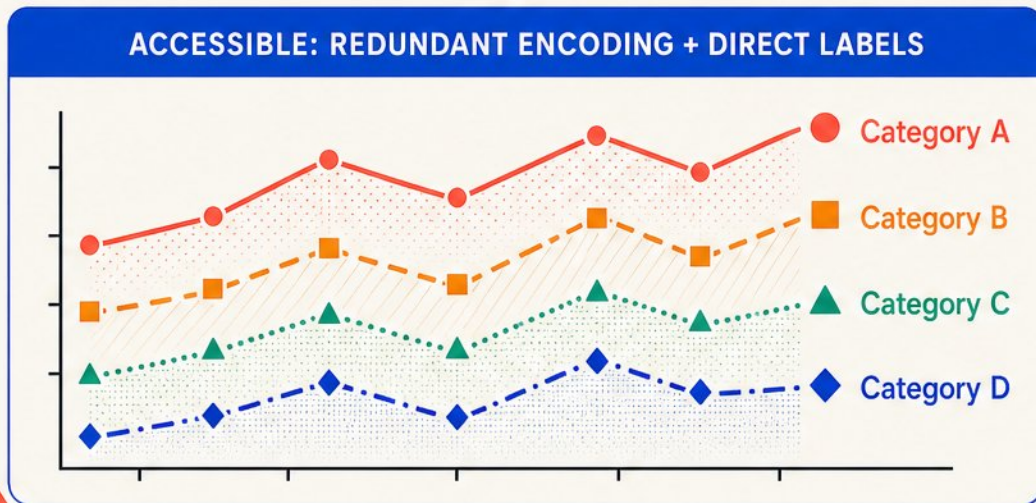
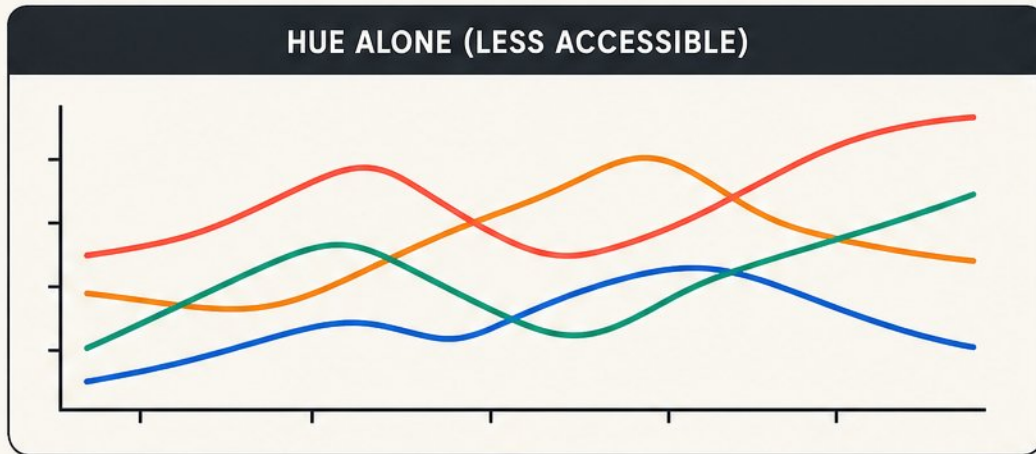
COLOR + ICON + BORDER

Email



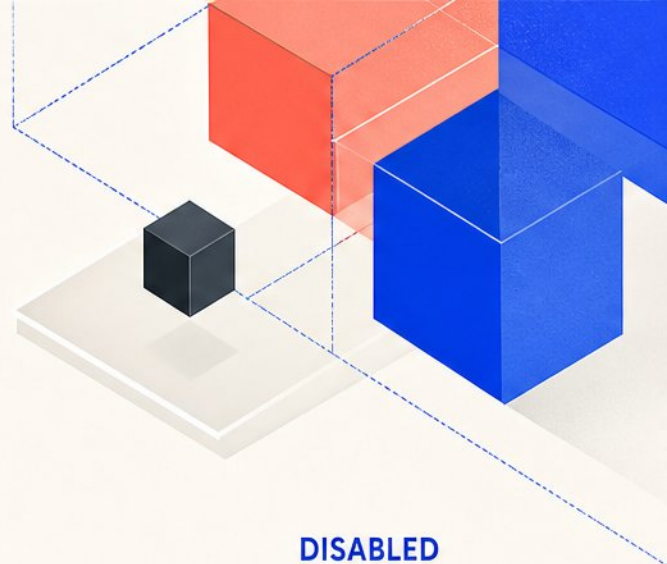
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Accessible Data Visualization



- Charts using hue alone fail for ~8% of male viewers with CVD
- Redundant encoding: pair color with shapes, dashes, or direct labels
- Contrast: axis labels 4.5:1, data marks 3:1, focus rings 3:1
- Limit to ~8 categorical colors; group extras or switch to small multiples
- Direct labeling eliminates legend round-trips and works in grayscale

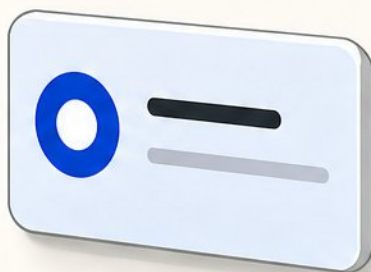
Designing Clear Interactive States



DEFAULT



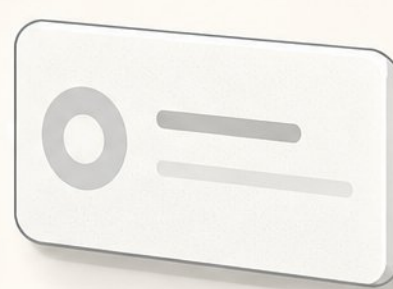
HOVER



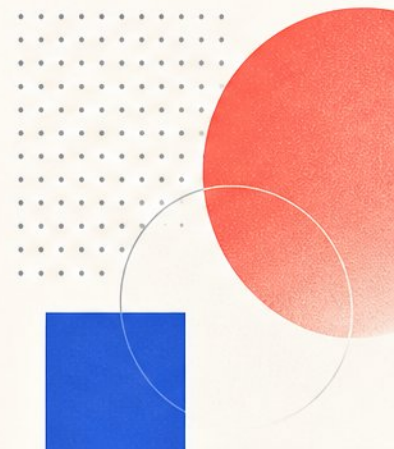
FOCUS



DISABLED



- Ensure focus, hover, active, and disabled states are distinguishable for all users.
- WCAG 2.4.7 requires visible focus; SC 2.4.11 avoids obscured indicators.
- Use `outline` + `outline-offset` over `box-shadow` for forced-colors safety.
- Replace subtle opacity shifts with multi-cue changes: border + icon + color.



Designing for Environmental and User Modes

- Design for bright light, dashboards, and OS-level forced colors mode.
- Use ``forced-colors: active`` and system keywords (``ButtonFace``, ``CanvasText``) for resilient UIs.
- Let users customize themes via ``color-scheme`` and ``light-dark()`` without breaking contrast.



BRIGHT SUNLIGHT

High ambient light can wash out colors and reduce clarity.



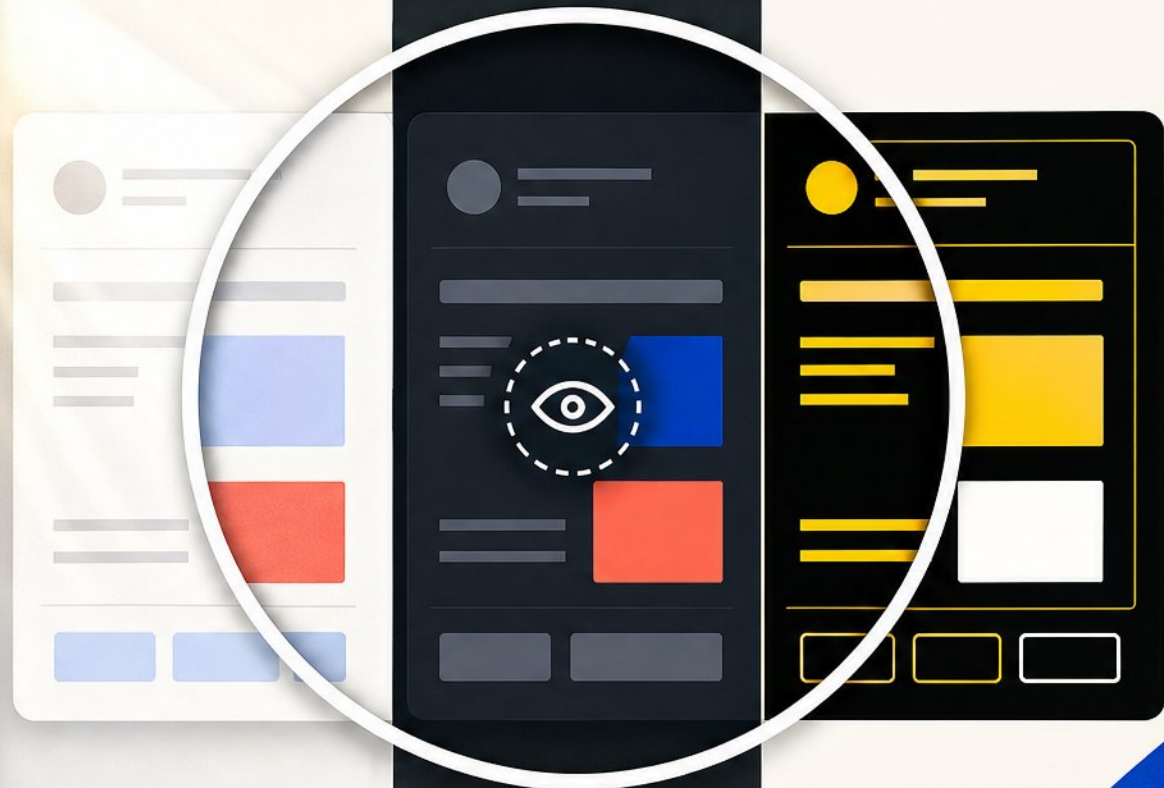
DASHBOARD DARK

Low-light environments need balanced contrast and restrained glare.



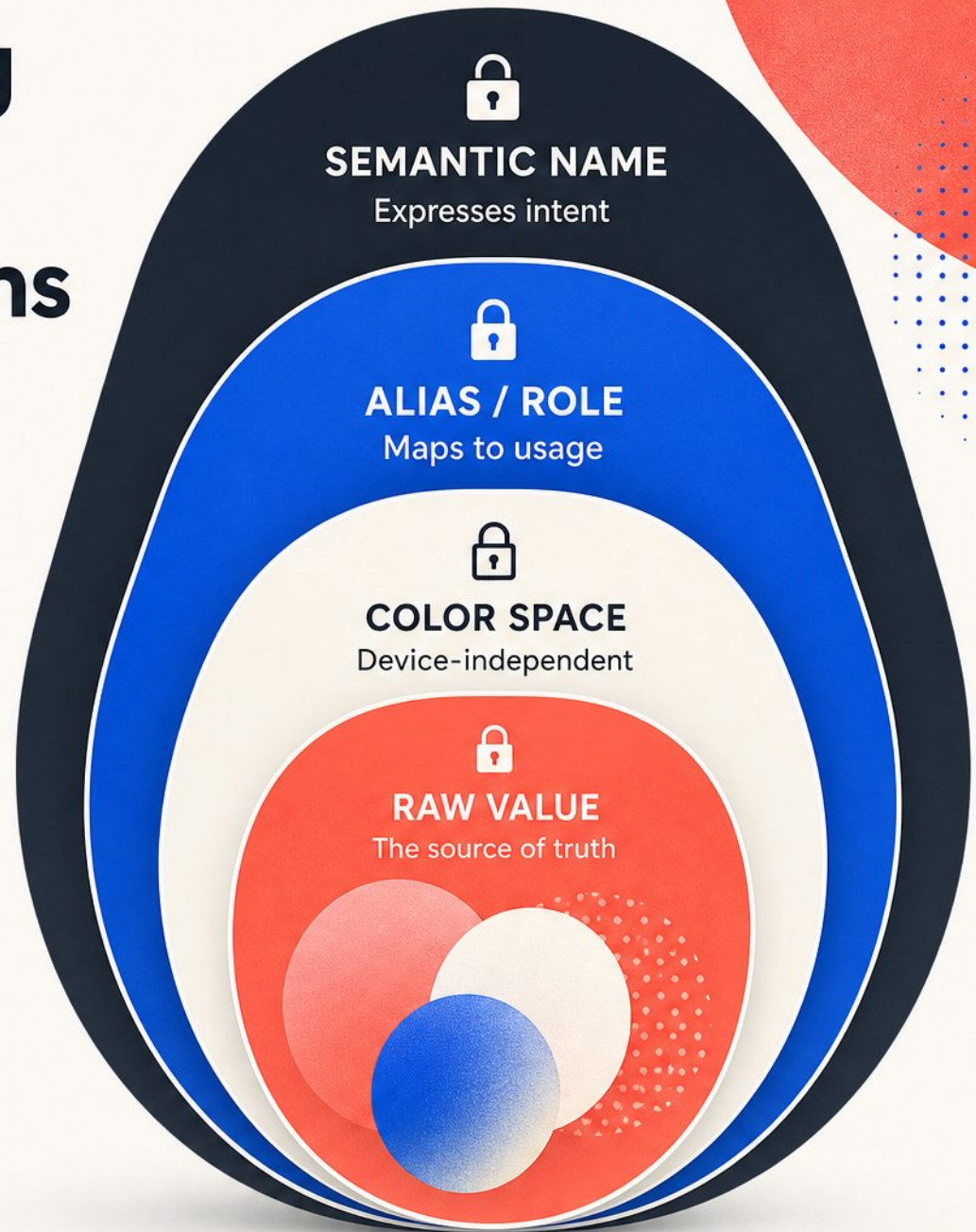
FORCED COLORS MODE

System-enforced contrast prioritizes clarity and information hierarchy.



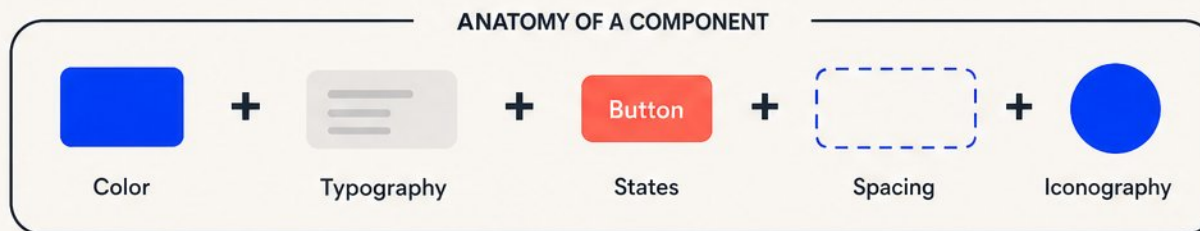
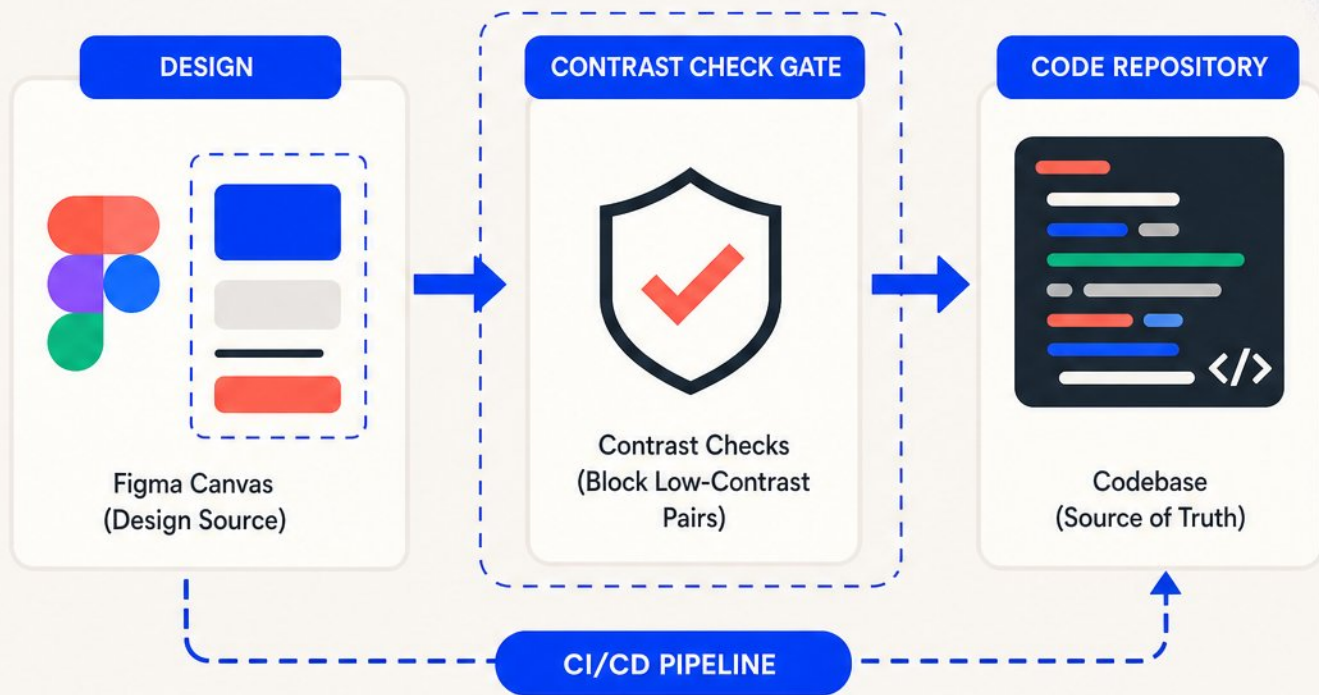
Communicating Color Decisions with Design Tokens

- Use semantic naming:
`color-bg-critical` instead of `color-red-500`
- Adopt the W3C DTCG format for vendor-neutral OKLCH and Display-P3 support
- Automate contrast checks in CI/CD and Figma plugins to prevent regressions
- Manage light/dark mode tokens explicitly to separate intent from value



Design Linting and Automated Enforcement

- Shift left: run contrast scans directly in Figma using plugins like Stark or Perception
- Token guardrails: bound Figma Variables or CSS custom properties to prevent low-contrast pairs
- Semantic naming catches misuse before handoff (e.g., `color-surface-primary`, not `blue-400`)
- Code-level checks: integrate axe-core into CI/CD to block contrast regressions on every commit



Testing and Auditing with Tools and Real Users



- Use Chrome DevTools, grayscale, and blur to stress-test visual hierarchy



- Simulate CVD across all major types using built-in rendering tools



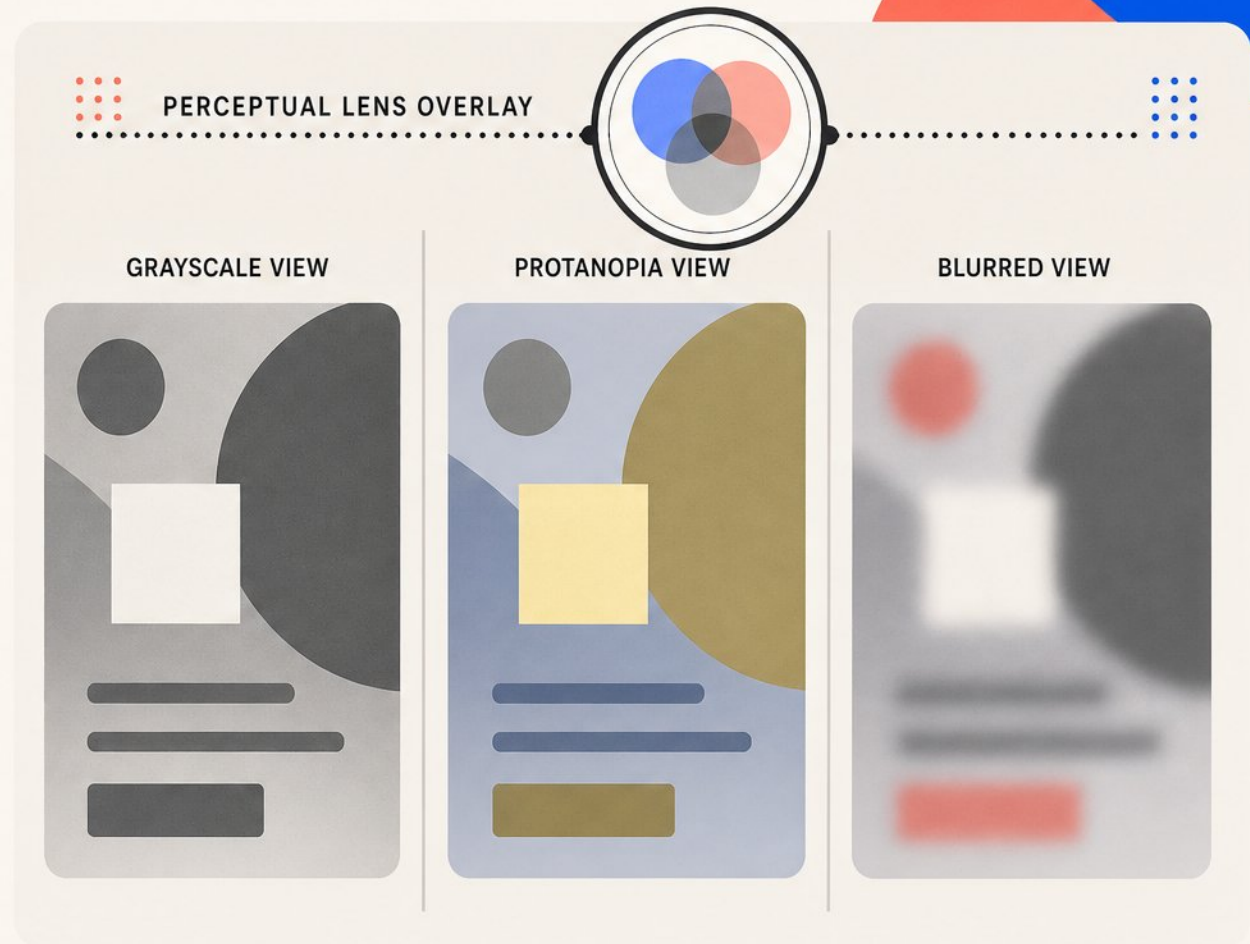
- Recruit testers with lived vision impairment for authentic feedback



- Grade severity of color-specific findings against WCAG 2.2 AA



- Combine automated scans, manual checks, and real-user validation



Advocating for Accessibility in Your Organization



Frame accessible color as risk mitigation (ADA, EAA) and market expansion



Resolve brand conflicts by shifting hue and reinforcing non-color cues



Showcase case studies where identity and AA compliance coexist



Build the business case with legal metrics and long-term cost savings



Emphasize proactive design over expensive retrofiting

**BRAND
IDENTITY**

**ACCESSIBILITY
COMPLIANCE**



Course Summary and Your Action Plan

- - Define roles, measure contrast, add non-color cues, build perceptual palettes, tokenize, lint, test continuously



Action 1:

Audit your UI for WCAG use-of-color failures



Action 2:

Rebuild your semantic palette using OKLCH



Action 3:

Add a robust global :focus-visible ring



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