

# Color-vision deficiency

CEE Faculty Meeting/DEI Presentation  
February 2023

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**ENGINEERING**



## How Colorblind NHL Players See The Game

By Marisa Ingemi

MAR. 28, 2022, AT 6:00 AM

Philadelphia Flyers goalie Carter Hart is also red-green colorblind. He said he can confuse shades of brown, yellow, orange, red and green. It doesn't affect his plays that much, but it does affect how he experiences life outside of hockey. He hadn't truly seen his dog until the first time he tried color-corrective glasses.

When Jost, who was recently traded to the Minnesota Wild, joins a new team, he needs to explain his color vision deficiency so he can practice and participate without difficulty.

"I told the trainers to put me in white every time so I can tell what line I'm on," Jost said. "But you know your linemates and stuff, so it's not that big of a deal. ... I know we're burgundy, but I don't really know what that looks like, I guess."



Buffalo's Sammy Watkins, left, and New York Jets' Darrelle Revis on Nov. 12. (Seth Wenig / Associated Press) (Test)

Los Angeles Times

Youth hockey, however, is different. Jerseys aren't always the same dark-on-light contrast.

"In a few minor hockey tournaments or Hockey Canada events," Jost said, "we had to switch jerseys because I didn't know who was on the team."

Unlike in the NFL, where Color Rush jerseys once caused nightmares for colorblind athletes and fans, the NHL — and NCAA — hasn't strayed from dark against light for its uniforms.



# Color-vision deficiency: moving toward inclusion





# Color-vision deficiency (color blindness)

- It is common
  - 1 in 12 men
  - 1 in 200 women
- Colors, color intensity, and contrast are affected





# Not all types of CVD are the same

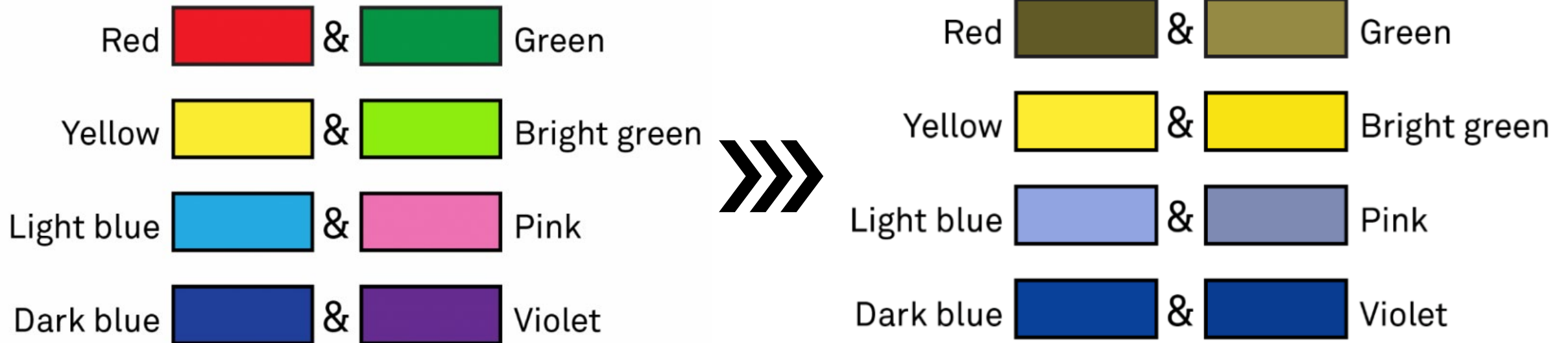
- Red-green (4 sub-types)
  - Most common
- Blue-yellow (2 sub-types)
  - Less common
  - Affects blue/green and red/yellow distinctions
- Monocromacy (least common)
  - No colors





# Tips for incorporating CVD considerations

- Avoid certain color combinations

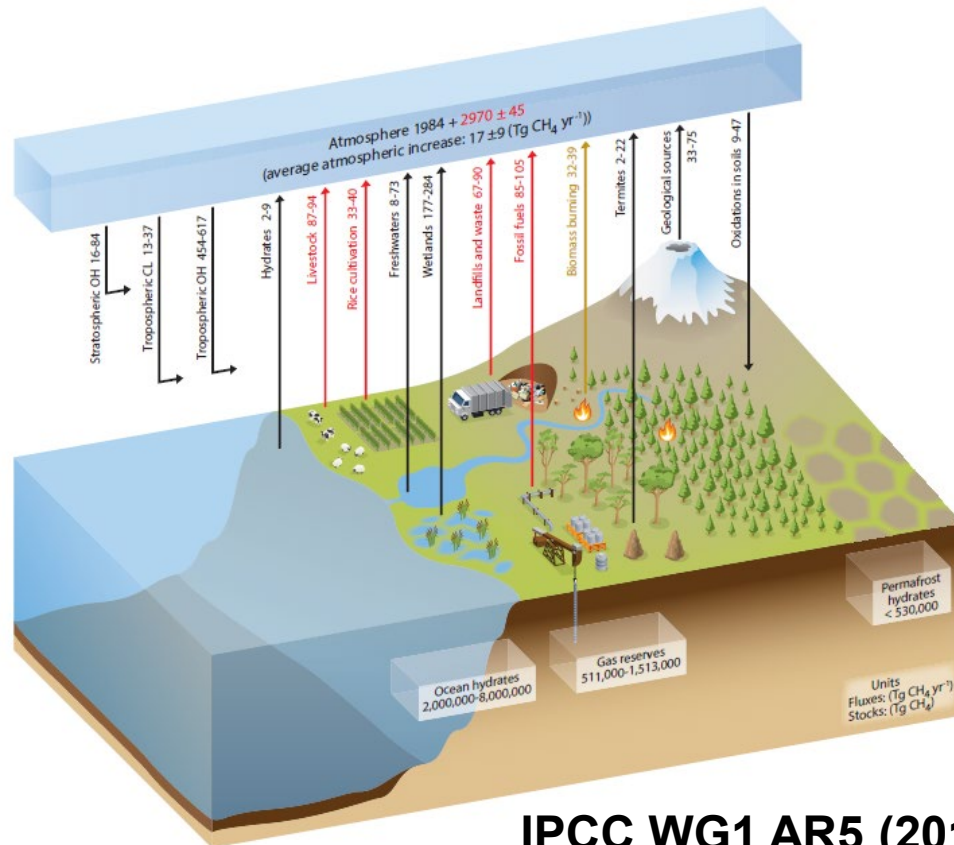


Normal Vision	Warning	Warning
Red Vision Missing		Warning

Warning sign test

# Tips for incorporating CVD considerations

- Use an additional visual label/cue



IPCC WG1 AR5 (2013)

Vary line thickness/use dashed lines

Vary font (bold, italics)

Use symbols ▲ ● ■ ◆



# Tips for incorporating CVD considerations

- Use a high contrast ratio
  - At least 4.5:1
- Contrast Checker (WebAIM)
  - Contrast ratio tool

Contrast ratio 1.1:1

Contrast ratio 2:1

Contrast ratio 5.5:1

Contrast ratio 10:1

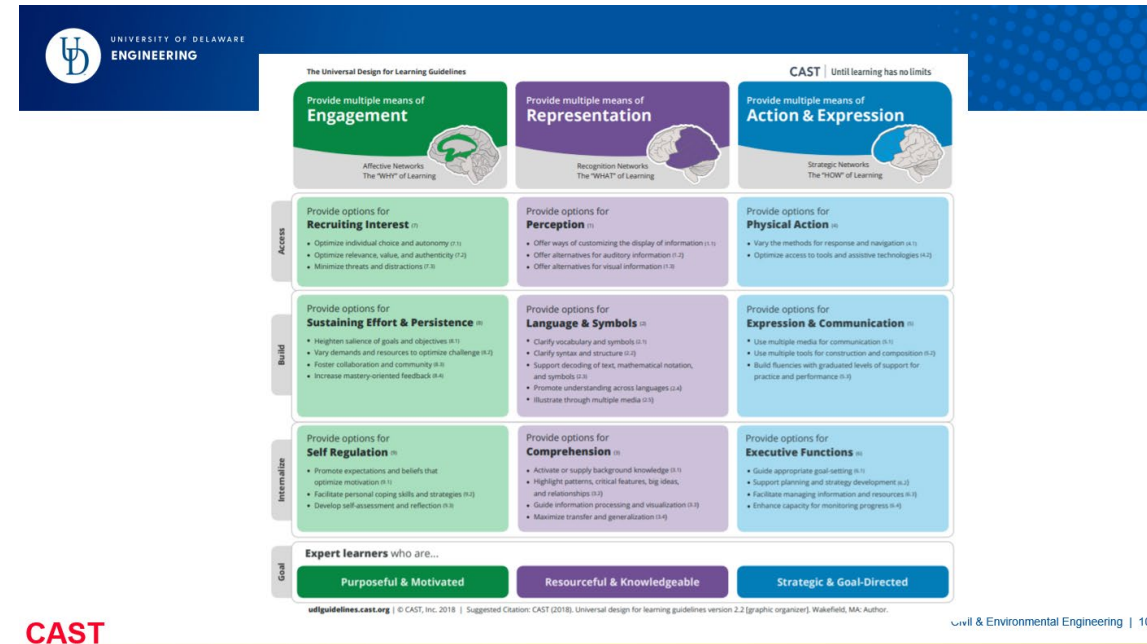
Contrast ratio 21:1





# Tips for incorporating CVD considerations

- Apply Universal Design for Learning tools
  - Provide multiple ways to access material
  - Refer to March 2022 presentation





# Test visuals using a tool/app

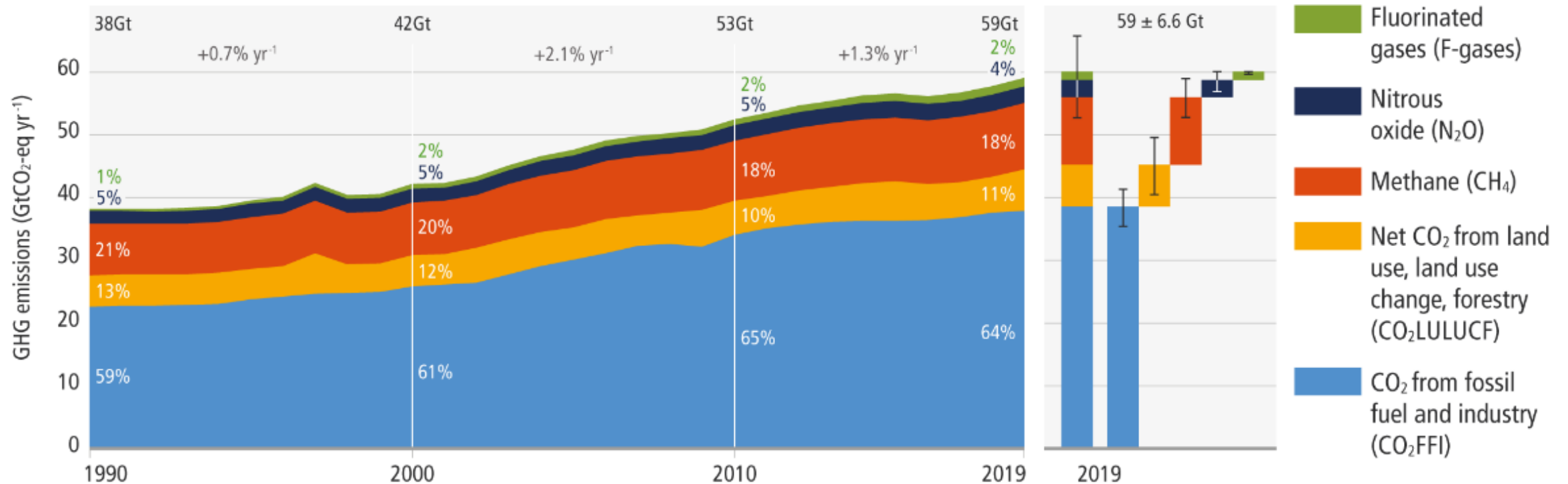
- Pilestone color blindness simulator
  - Upload graphics to view with different CVDs
- Color Oracle
  - Applies a full-screen color filter
- Vision Sim app
- Color Blind Pal app
  - Paper on its use in chemistry education



# Testing Color Blind Pal app: IPCC AR6 WG3 SPM Figure 1a

Global net anthropogenic emissions have continued to rise across all major groups of greenhouse gases.

a. Global net anthropogenic GHG emissions 1990–2019 <sup>(5)</sup>





**NIH:** [types of color blindness](#)

**NHS:** [colour vision deficiency](#)

**Penn State Accessibility:** [color deficient vision](#)

**Northwestern:** [Seeing differently: designing for students with colorblindness and low vision](#)

**Meeks et al:** [Universal Design: Supporting Students with Color Vision Deficiency \(CVD\) in Medical Education](#)