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A solid orange triangle pointing upwards, located in the bottom right corner of the slide.



## | VR Games & Experiences



PC



Gear VR



Gear VR &  
Cardboard



Console  
& PC



# “You Hear a Lot of People Say...”

The WHY behind the Dos and Don'ts of VR

**Best practices for VR, from seven devs working with the Oculus Rift**

The Dos and Don'ts of Virtual Reality Gaming

**Ten tips to help creatives get real with virtual reality**

10 things you need to know before developing for the Gear VR

**Design Tips For VR Games**

TEN DO'S AND DON'TS TO IMPROVE COMFORT IN VR

VR Best Practices, Eliminating Motion Sickness

Virtual reality needs tweaks

More women than men get motion sickness with Oculus Rift, a virtual reality headset.

**'Virtual nose' may reduce simulator sickness in video games**



Make more informed decisions...



“Don't put a helmet on  
the player!”

**“Don't accelerate the player!”**

“Don't scroll big blocks of text  
on screen!”

**“Don't move the camera  
without input!”**

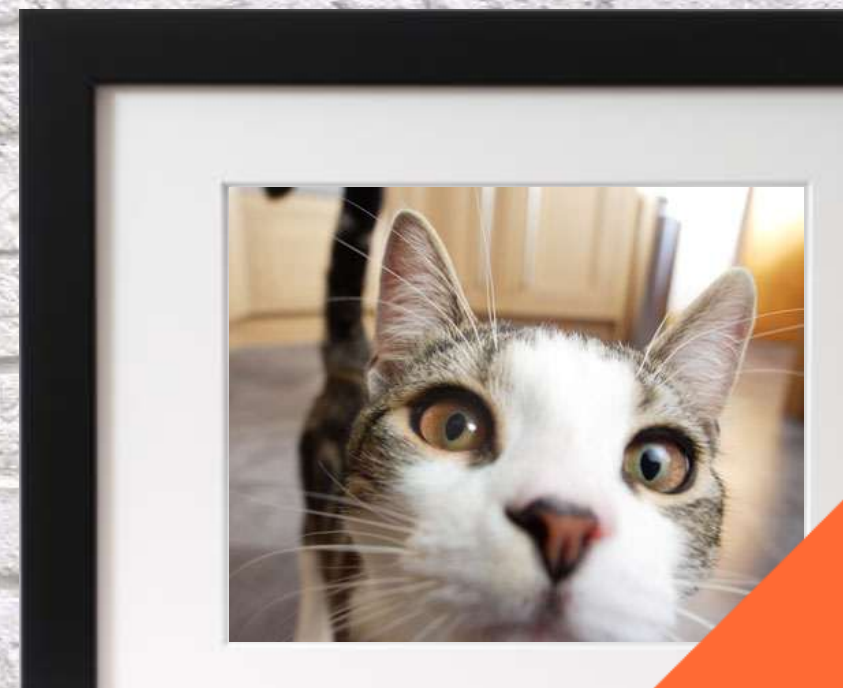






# Frame of Reference

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# Frame of Reference

Wrong Frame of Reference







# Frame of Reference

= Sickness!





# Frame of Reference

Natural Reaction











# On-Rails Movement

## Smash Hit



- Linear movement
- No acceleration

## VR Rollercoasters



- Acceleration
- Sudden, jerky rotation



# Framerate





60



A large, thick, orange number '2' is positioned on the left side of the slide, spanning most of the vertical height.

**“Make sure you  
use ASTC.”**

**“Enable texture  
compression!”**

**“Make sure you use  
ETC1.”**

A solid orange triangle is located in the bottom right corner of the slide.



# Bandwidth



200+GB/sec



10+GB/sec



Stats ASTC

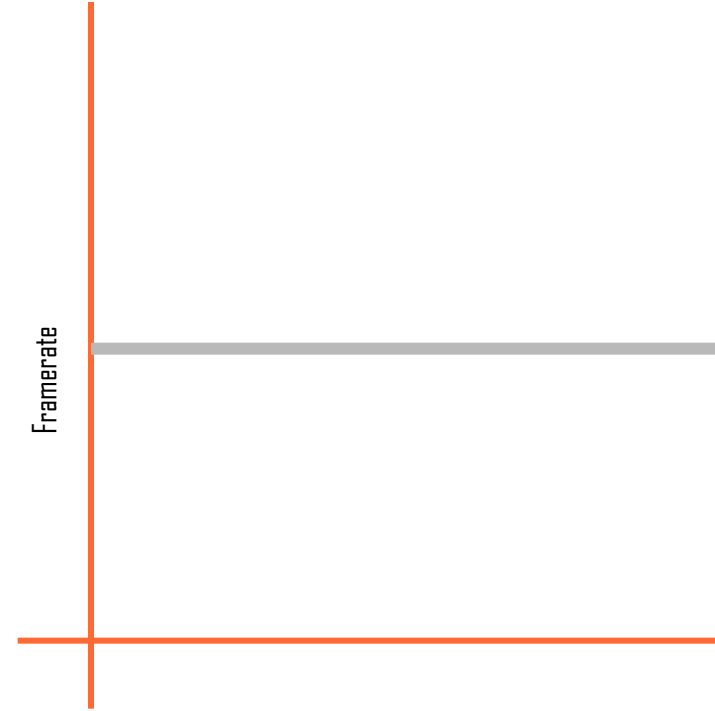
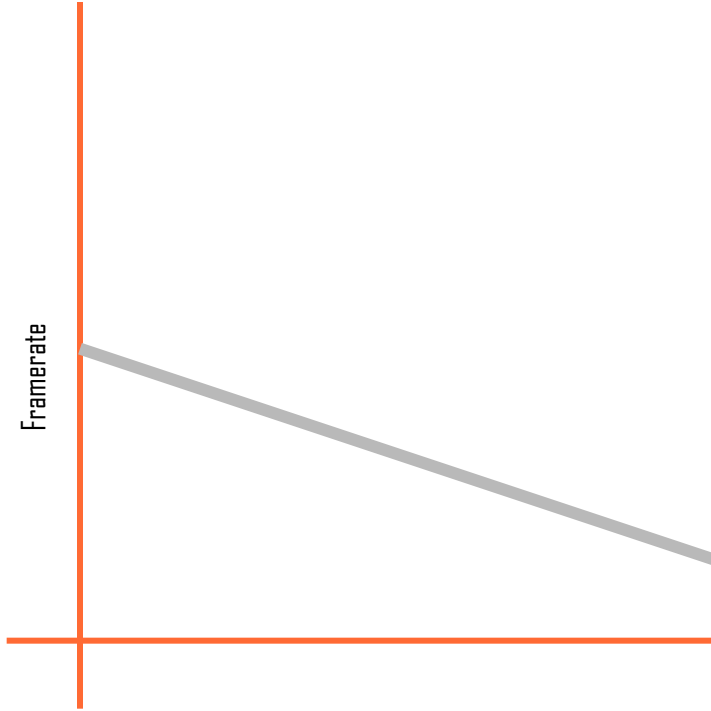
ETC 4bpp

ECT2 4bpp plus alpha

ASTC 0.8bpp to 8bpp  
**adaptive**



# Framerate







# Samsung Gear VR



=



Support one device



# Google Cardboard



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Support all devices!



# Mip-mapping



Just Turn it on!



Match Art to Technical Limitations



**“Push your UI out to between 3  
and 6 metres for comfort.”**

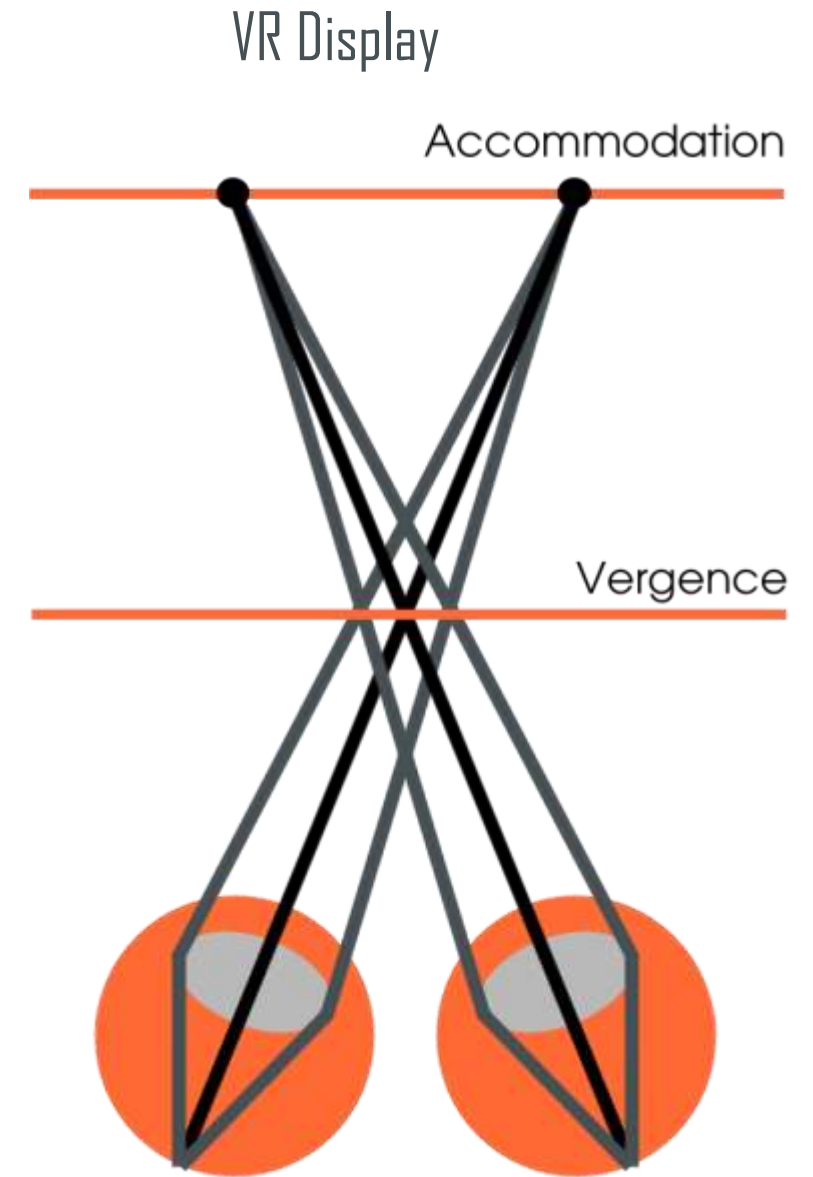
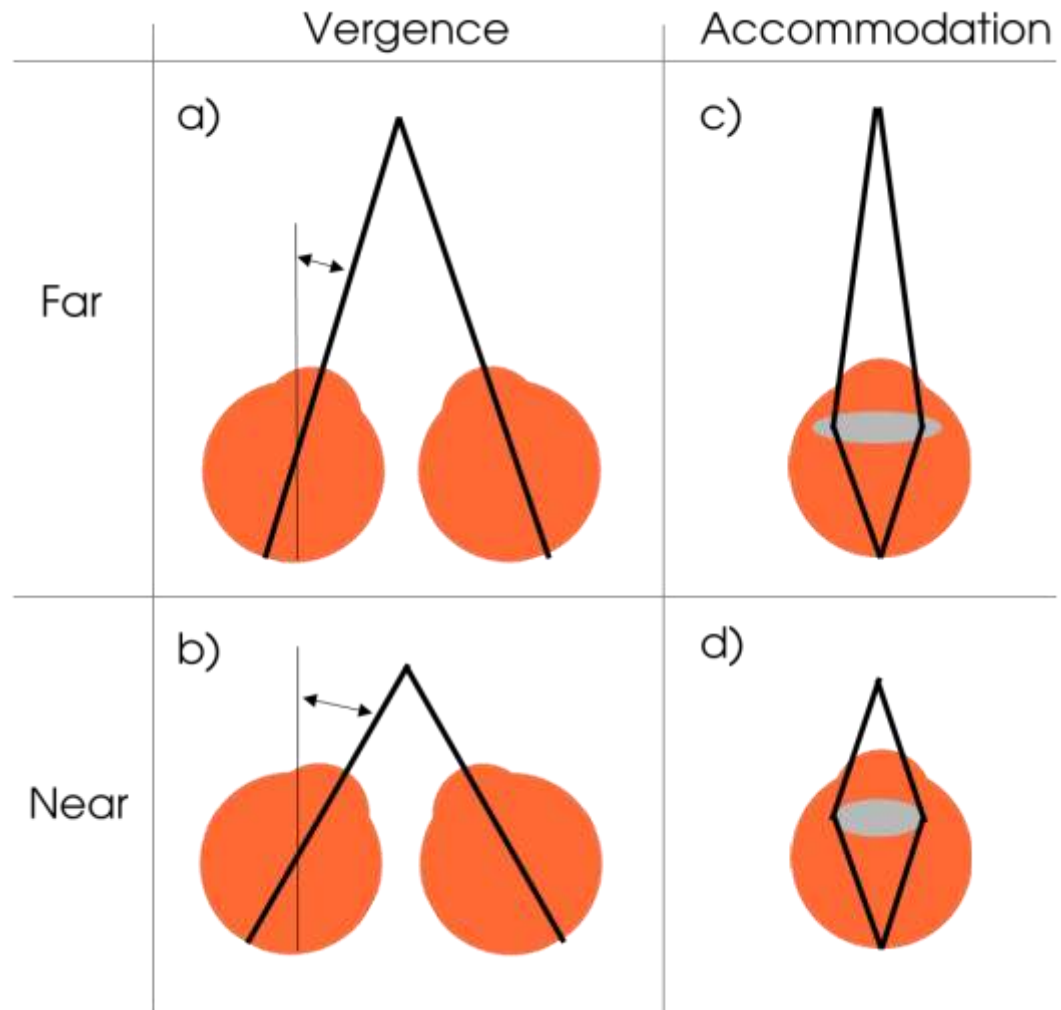
**“Keep text at about 3 metres!”**

**“Don't have your game less than a  
metre in front of the player.”**





# User Interface





# Close Ups

Close Ups Are Cool!





## Close Ups

but don't make people  
focus





“Let the player teleport around.”

“Don't use the analogue stick to look.”

**“Use a very fast movement to teleport.”**

“Use snap rotations, turning 45 or 90 degrees at a time.”



## Visual Reaction Time

250ms

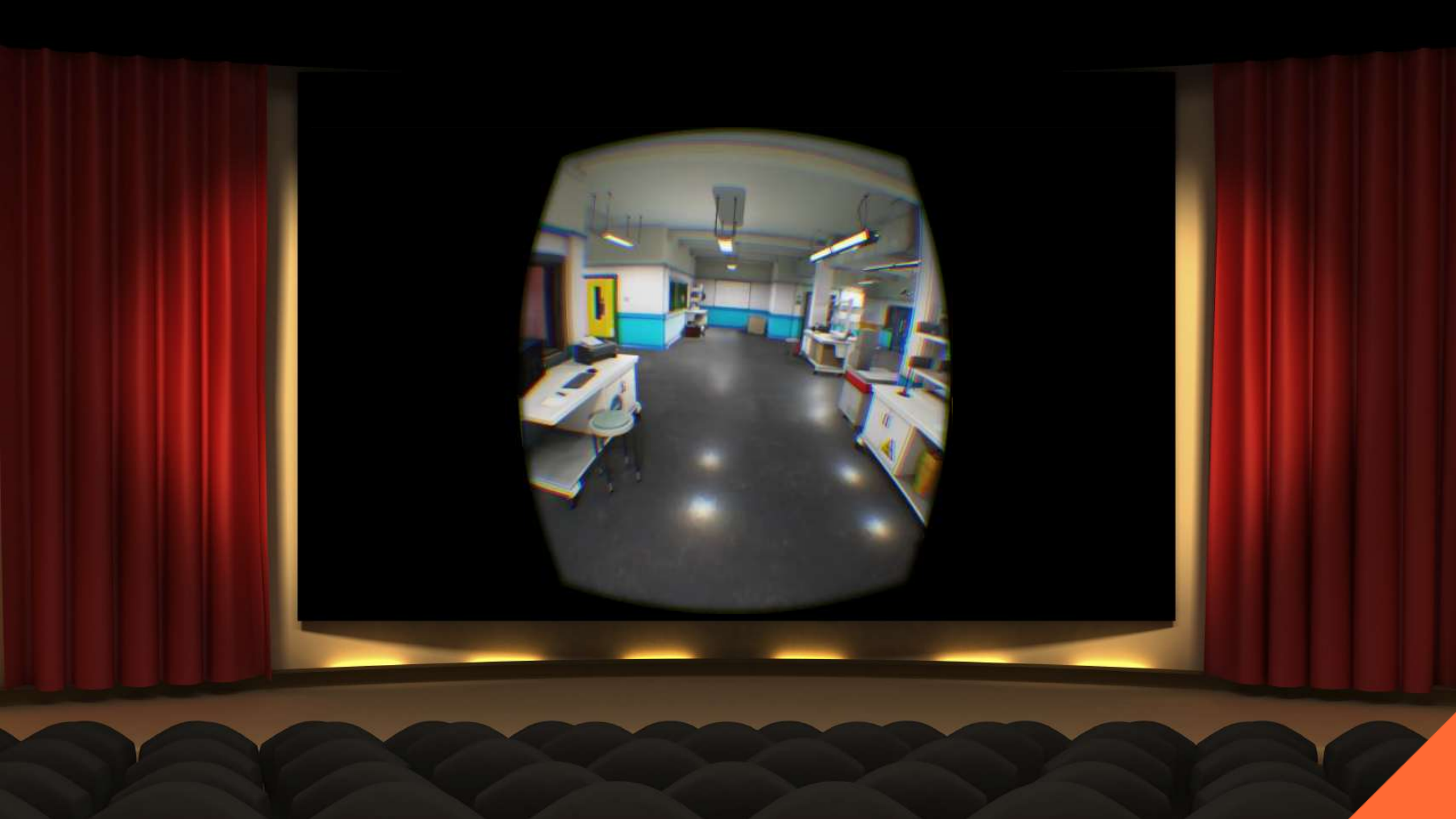
Reacting to visuals

100ms

Noticing visual motion

<100ms eliminates motion sickness





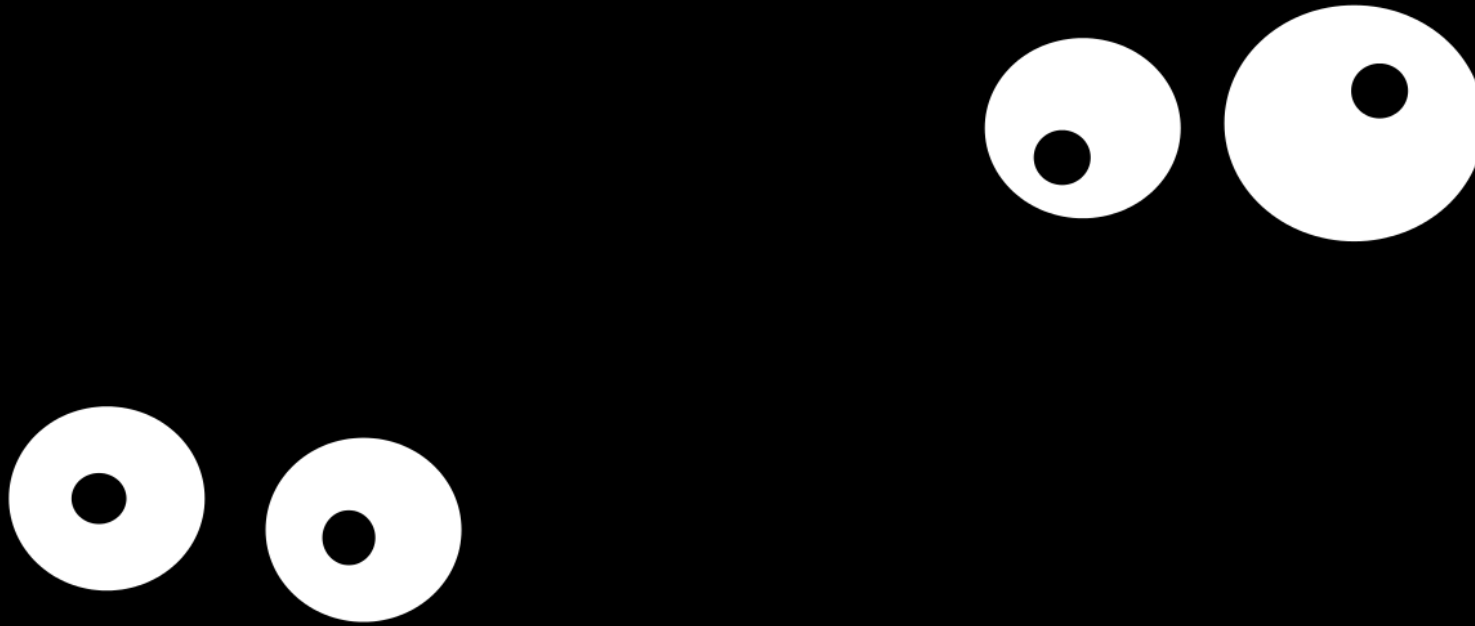


Teleport

Comfortable

BUT

Disorientating



Darkness = slower reaction times.





# Key Learnings



Trampolines



Pick-Ups





# Other Senses



0.25 sec



0.17 sec



0.15 sec



**“Audio is important.”**

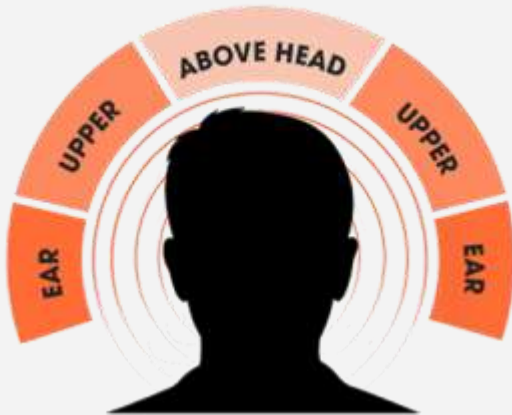
**“3D Audio is a great  
way to add immersion.”**

**“Sounds give away locations and help promote  
attention.”**



# Audio Channels

Binaural / 3D



Stereo



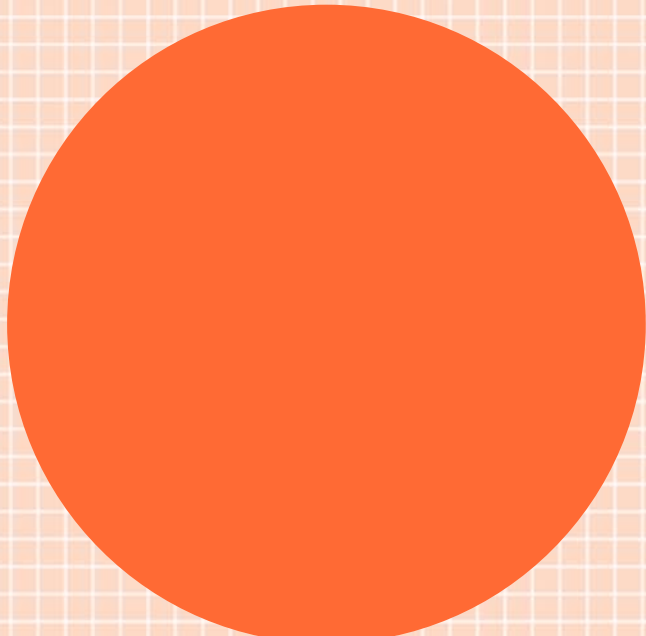
Ambient



Binaural – not always the best solution...



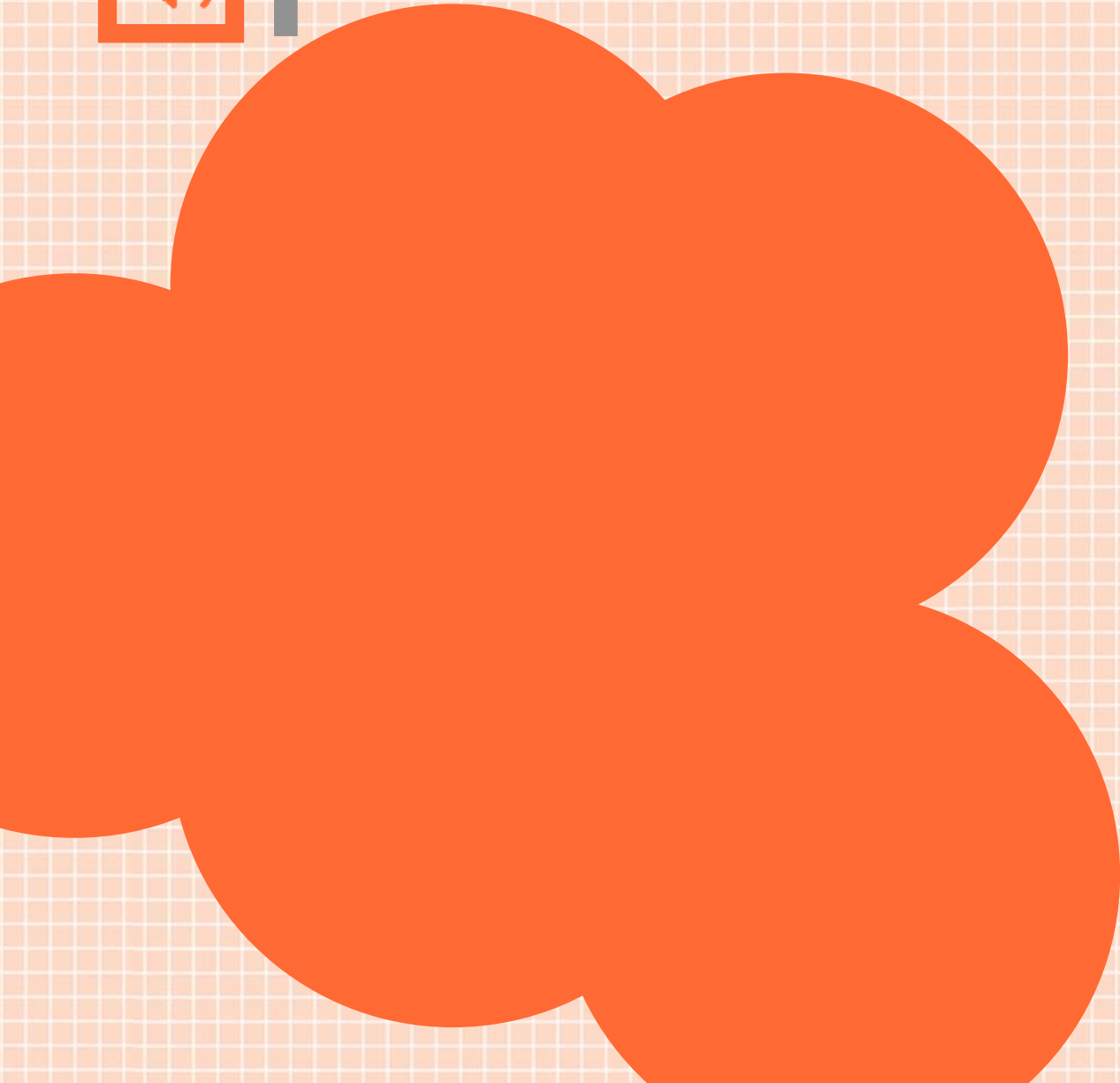
## Good Binaural







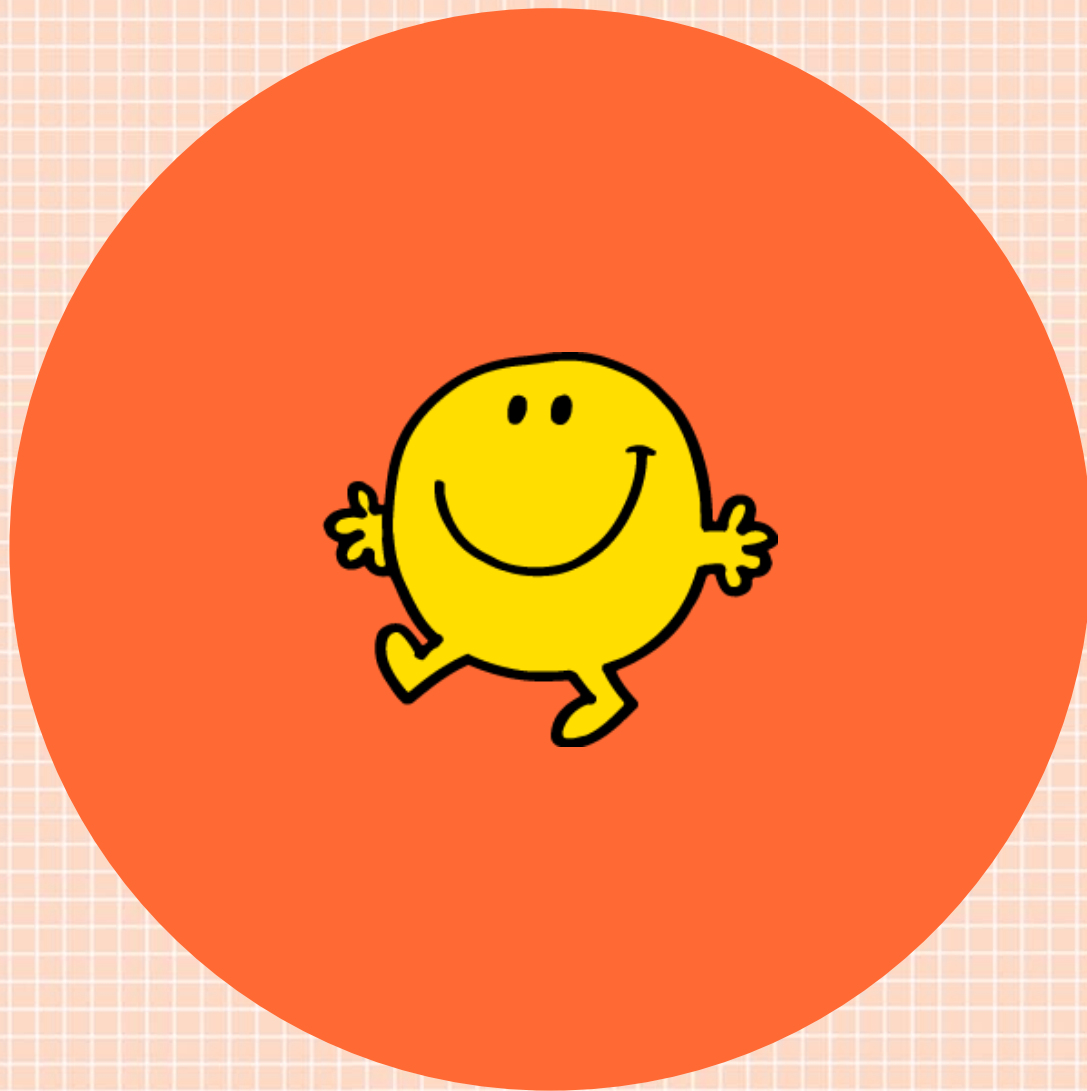
# Bad Binaural







## Ambient





Binaural audio is  
expensive





“50 draw calls per eye.”

**“Keep it around 100 draw calls total, with maybe 20 of those being dynamic.”**

“Not much more than around 50,000 polygons using 50,000 vertices.”

**“Keep your draw calls low!”**





# Draw Calls!









## Unity Tips

- Keep dynamic meshes < 300 simple vertices so they can dynamically batch.
- Use very few skinned meshes.
- Use texture atlases where possible, so you can use shared materials
- Stick to a small number of materials so more meshes can be batched.
- Avoid real-time shadowing - objects that use real-time shadowing can't be batched.



ARM MALI™






# Merge your meshes

## Be aware of the camera





“Don't show the body of the player.”

**“Don't show arms, just up to the first joint.”**

“Use bigger hands, not small accurate ones, or use big gloves.”

**“Don't be afraid to have the hand model vanish when interacting with objects.”**





# Disconnect





Hand is the Racket

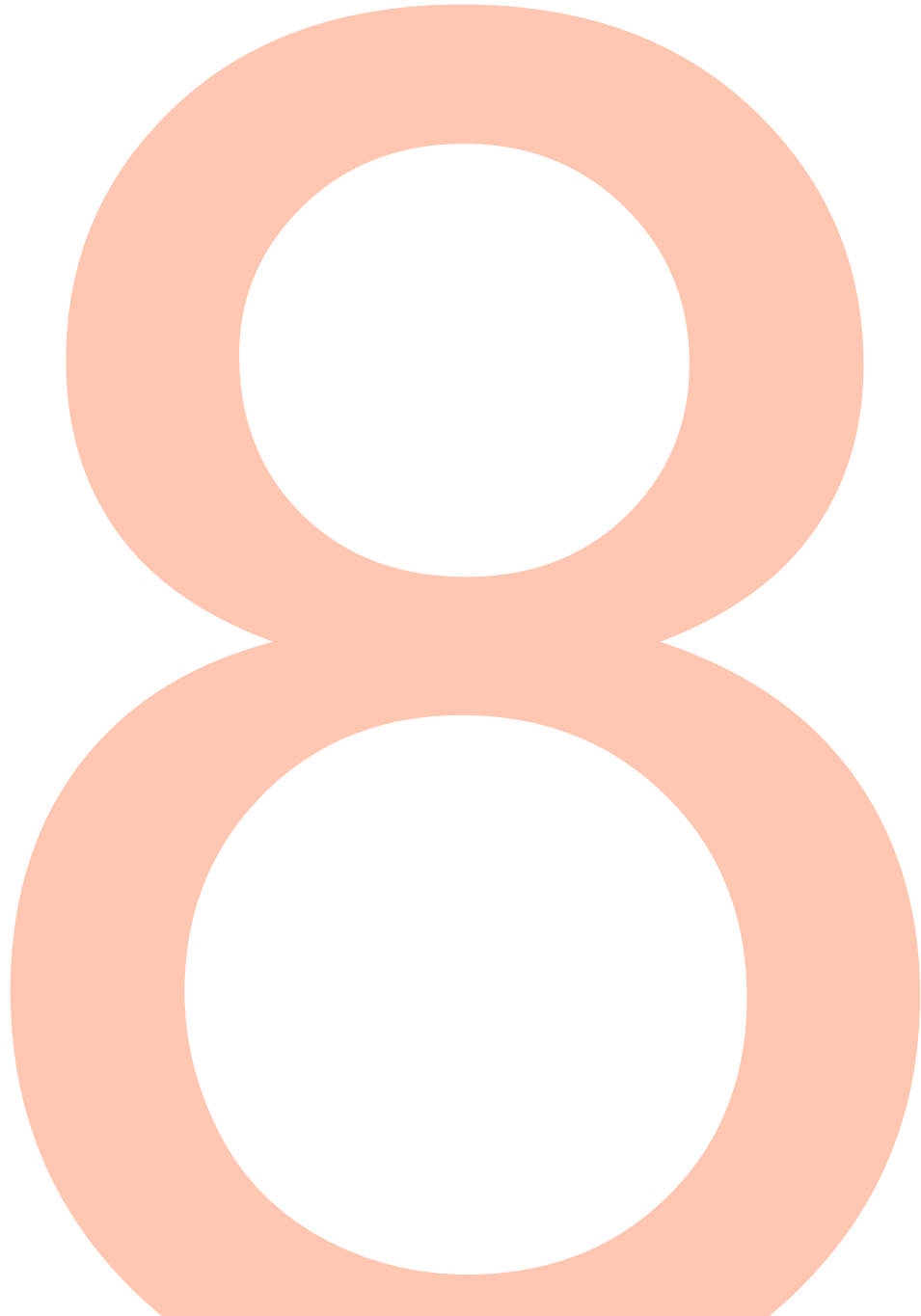


A low-angle shot of two human hands, palms up, reaching towards the center of the frame. The hands are positioned on the left and right sides, with fingers slightly spread. The skin is a warm, light brown tone. The background is a clear, bright blue sky. The text "Your Hands?" is centered between the hands in a white, sans-serif font.

Your Hands?



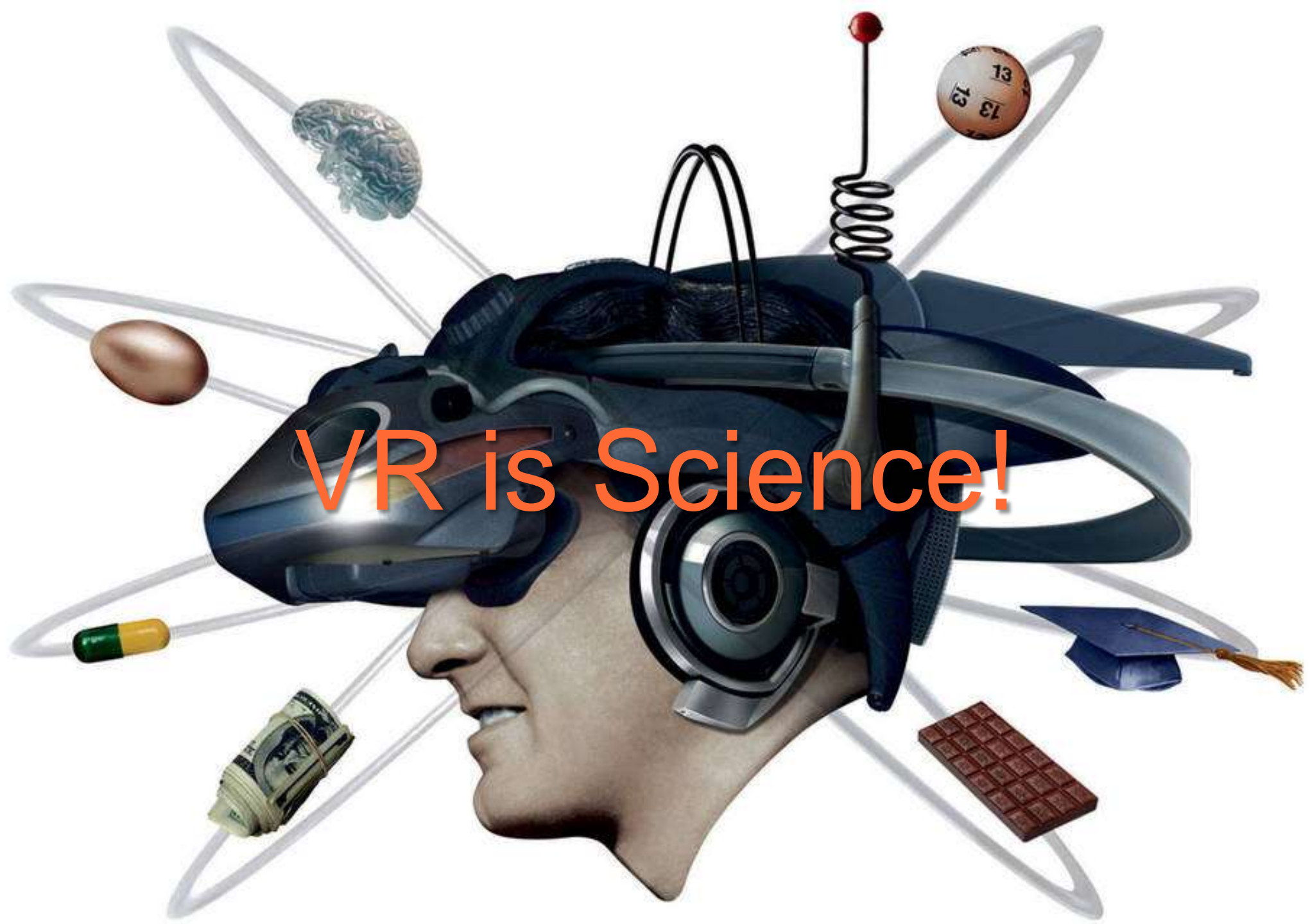




**“Just follow these  
rules for VR.”**

**“A study shows that ...”**

**“It's common  
knowledge that ...”**



VR is Science!



Ask Why!

Slide unintentionally left  
**BLANK**



# Experiment!







## Summary

Let's start to be scientists about this, work together, and build a better understanding of all the elements of VR.!

Any | questions?