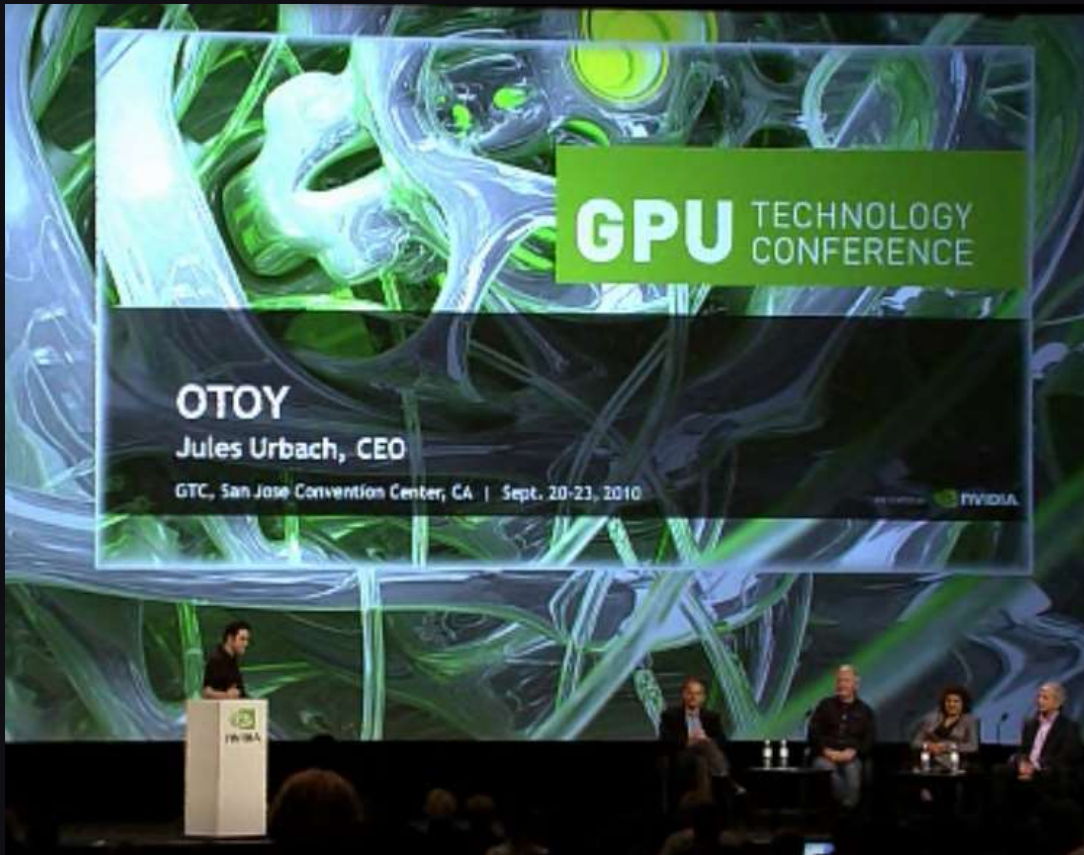


OTOY

THE FUTURE OF GPU RENDERING

Jules Urbach, CEO OTOY Inc. | GTC 2020

A DECADE OF GPU RENDERING: My first GTC 2010 talk...

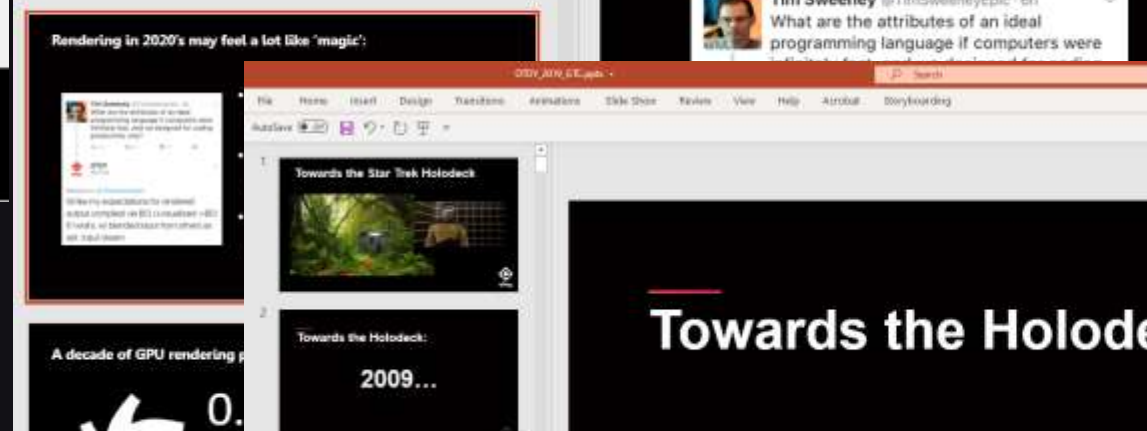
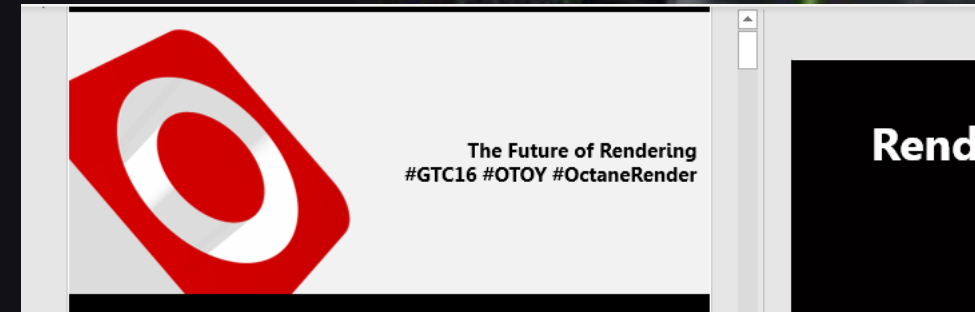


A DECADE OF GPU RENDERING: GTC 2013...

GTC GPU
TECHNOLOGY
CONFERENCE



A DECADE OF GPU RENDERING: GTC '14, '15, '16, '17, '18, '19...



OTOY's Mission:

- Practical digital holographic* content creation and publishing for everyone

*(Digital Hologram: 8D light field volume + depth + reflectance)



A decade of GPU rendering phases in ~2 year increments:



0..1..2..3..4..?

2010 ... 2012 ... 2014 ... 2016 ... 2018... 2020



A decade of GPU rendering phases in ~2 year increments:



0..1..2..3..4..?

2010 ... 2012 ... 2014 ... 2016 ... 2018... 2020

1.0 Images



A decade of GPU rendering phases in ~2 year increments:



0..1..2..3..4..?

2010 ... 2012 ... 2014 ... 2016 ... 2018... 2020

1.0 Images

2.0 Animations



A decade of GPU rendering phases in ~2 year increments:



0..1..2..3..4..?

2010 ... 2012 ... 2014 ... 2016 ... 2018... 2020

- 1.0 Images
- 2.0 Animations
- 3.0 Cinematic VFX



MARVEL STUDIOS PRESENTS



CAPTAIN MARVEL

ELASTIC

DCC ecosystem – 26+ plugins with ORBX I/O support:

- PhotoShop
- C4D
- Houdini
- AfterEffects / Nuke+
- MODO
- Blender / Poser +
- Autodesk Max / Maya / Revit +



3 AUTODESK®
3DS MAX™

Ae Adobe
After Effects

GRAPHISOFT
ARCHICAD

A AUTODESK®
AUTOCAD™

blender

CARRARA

CINEMA

DAZ 3D

Houdini

I AUTODESK®
INVENTOR™

LightWave

M AUTODESK®
MAYA™

MODO

NUKE

POSER

R AUTODESK®
REVIT™

Rhinoceros
modeling tools for designers

SketchUp

AUTODESK
SOFTIMAGE

unity

UNREAL
ENGINE

A decade of GPU rendering phases in ~2 year increments:



0..1..2..3..4..?

2010 ... 2012 ... 2014 ... 2016 ... 2018... 2020

- 1.0 Images
- 2.0 Animations
- 3.0 Cinematic VFX



A decade of GPU rendering phases in ~2 year increments:



0..1..2..3..4..?

2010 ... 2012 ... 2014 ... 2016 ... 2018... 2020

- 1.0 Images
- 2.0 Animations
- 3.0 Cinematic VFX
- 4.0 Real Time (+AI)



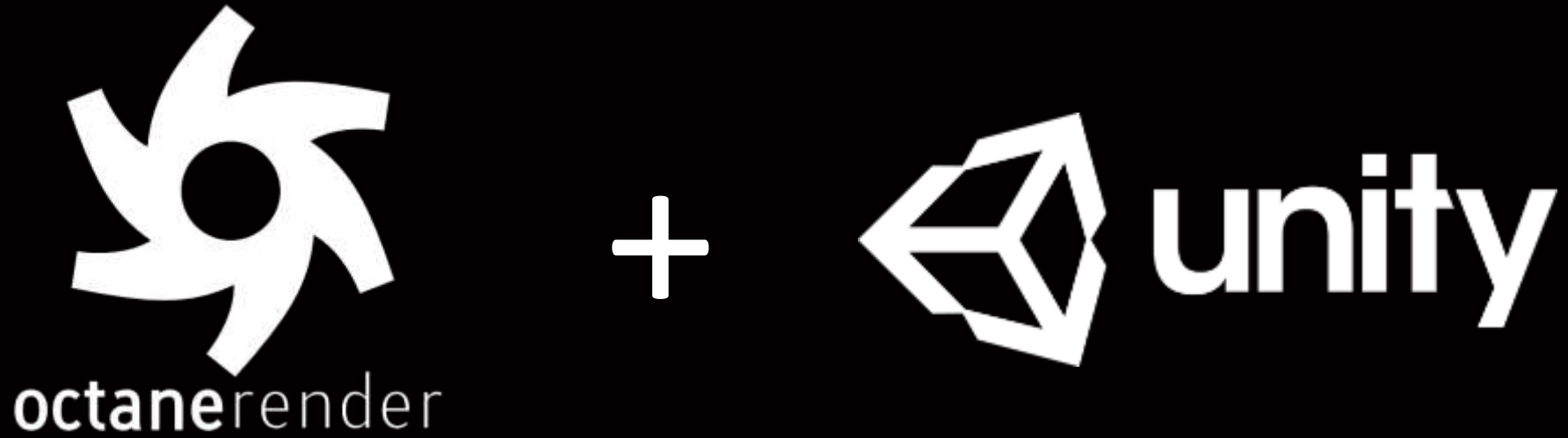
[Products](#)[Solutions](#)[Made with Unity](#)[Learn](#)[Community](#)[Get Unity](#)[Asset Store](#)[AD](#)[CloudMoolah](#)[Facebook](#)[Google](#)[Intel](#)[Microsoft](#)[Samsung](#)[Vuforia](#)[Xiaomi](#)[Clay](#)

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**Create hyperrealistic assets
using the cinematic power of
OctaneRender in Unity**

Render the future with Octane. What will you create?

Unity's first path-traced render engine enables a new generation of immersive games, VR, and AR. Hollywood-grade VFX are now available inside of the world's most popular game engine.



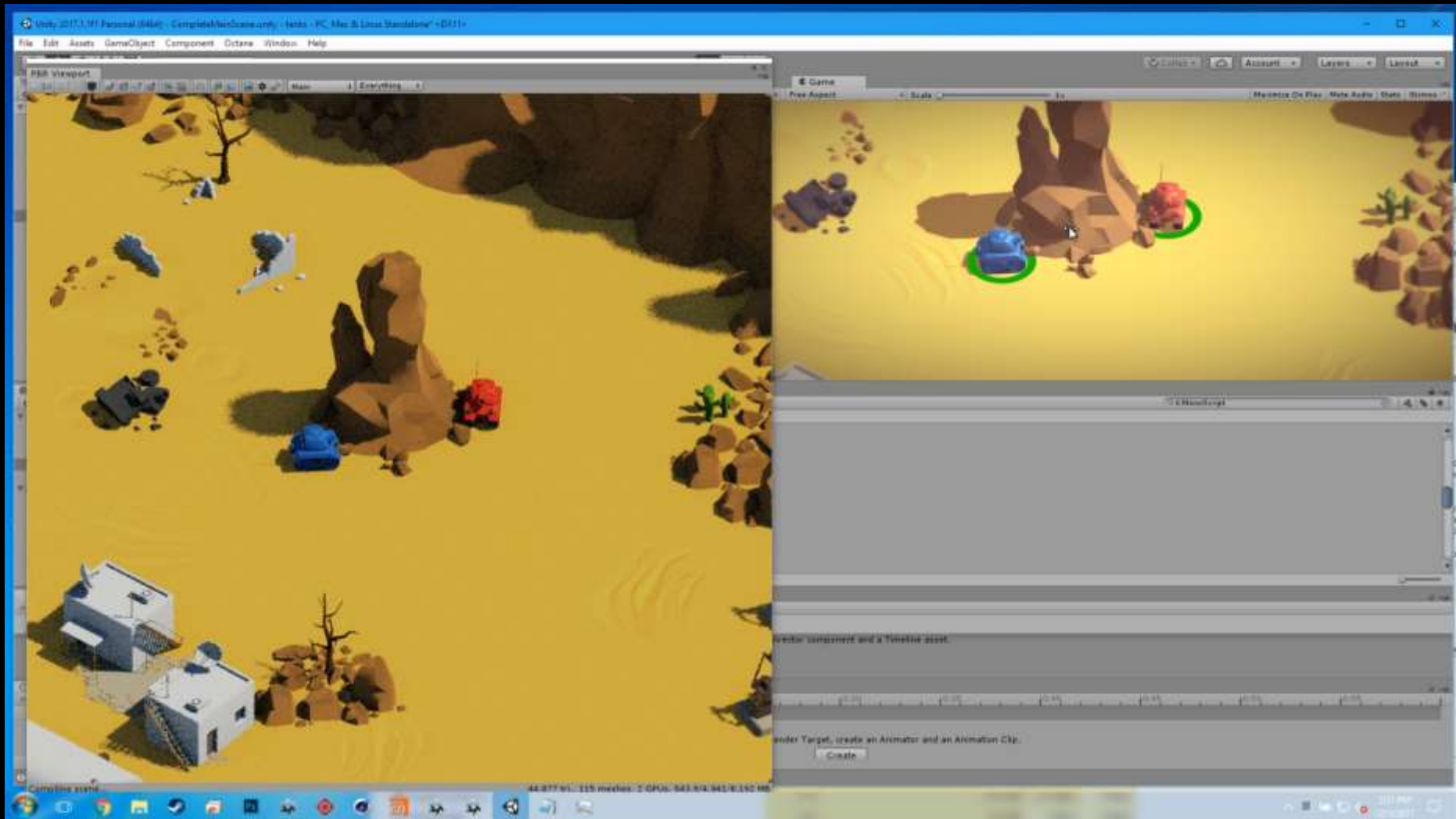
- Physically correct VFX GPU rendering in the free version of Unity
- Hollywood Grade VFX for millions of developers
- Full royalty free ORBX interchange for all Unity (and Blender, UE4) users



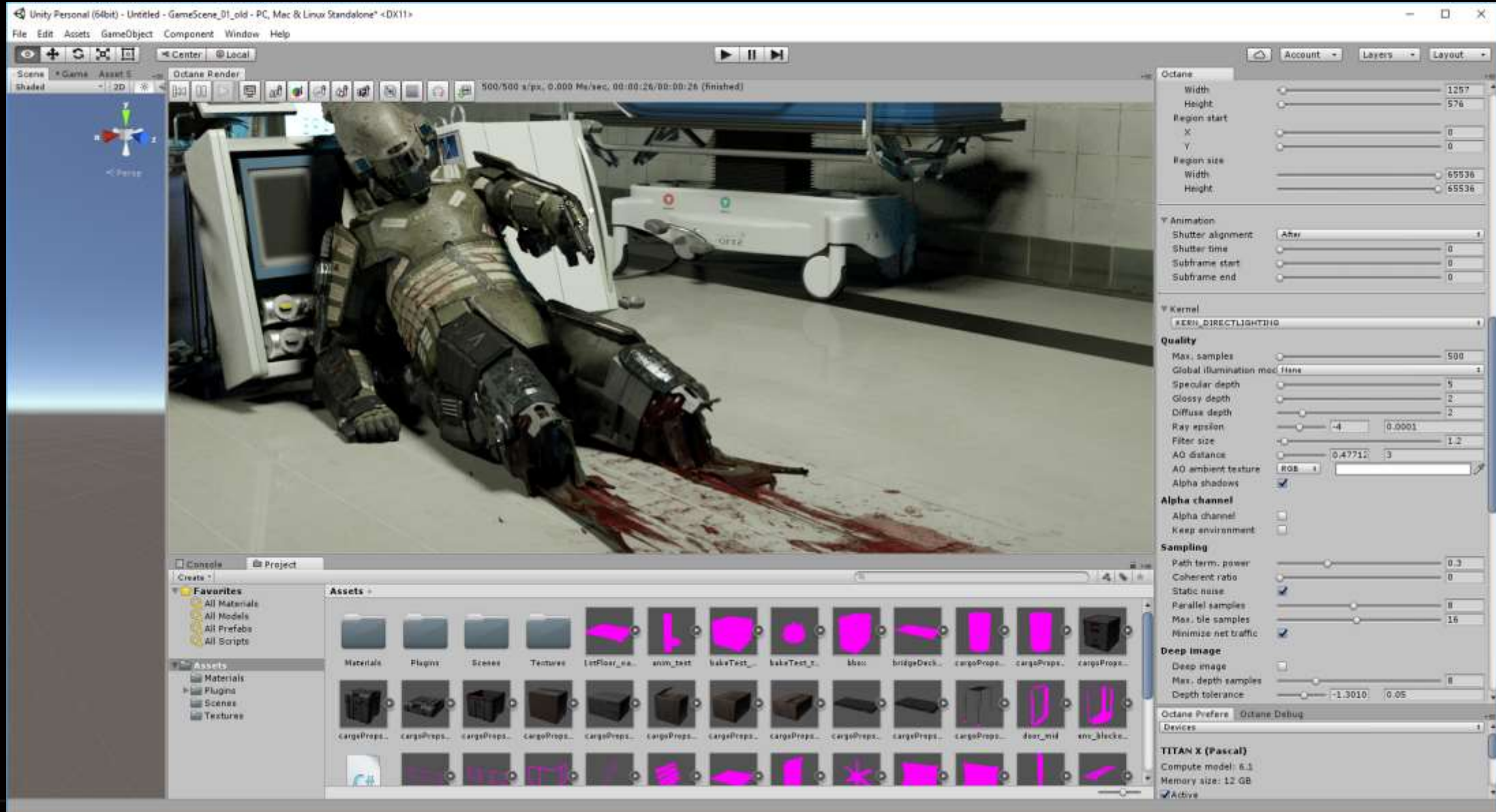


Brigade Game mode in Octane for Unity

- Game Mode - Octane / Brigade runtime:



3DS MAX -> ORBX -> Unity:



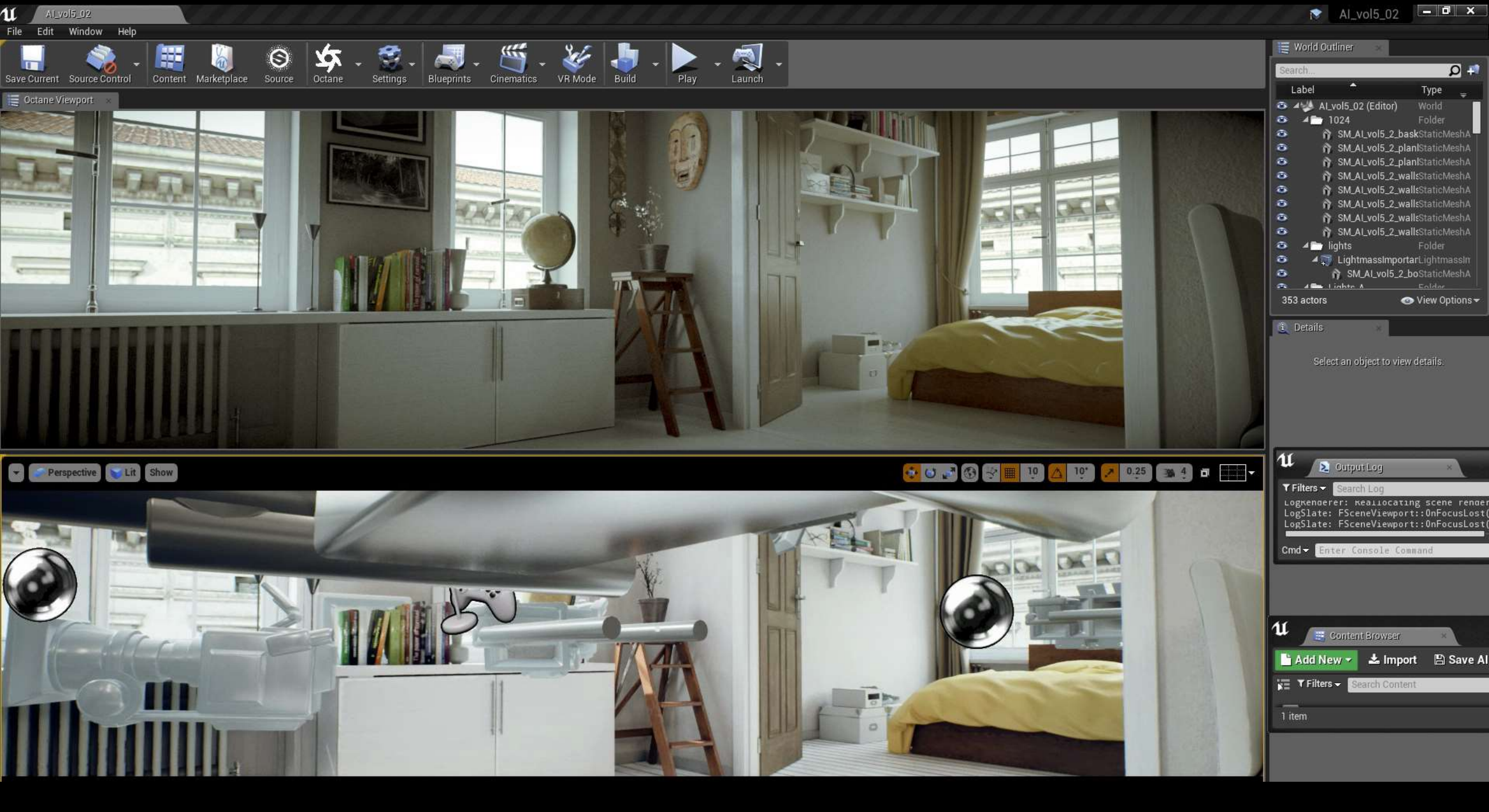


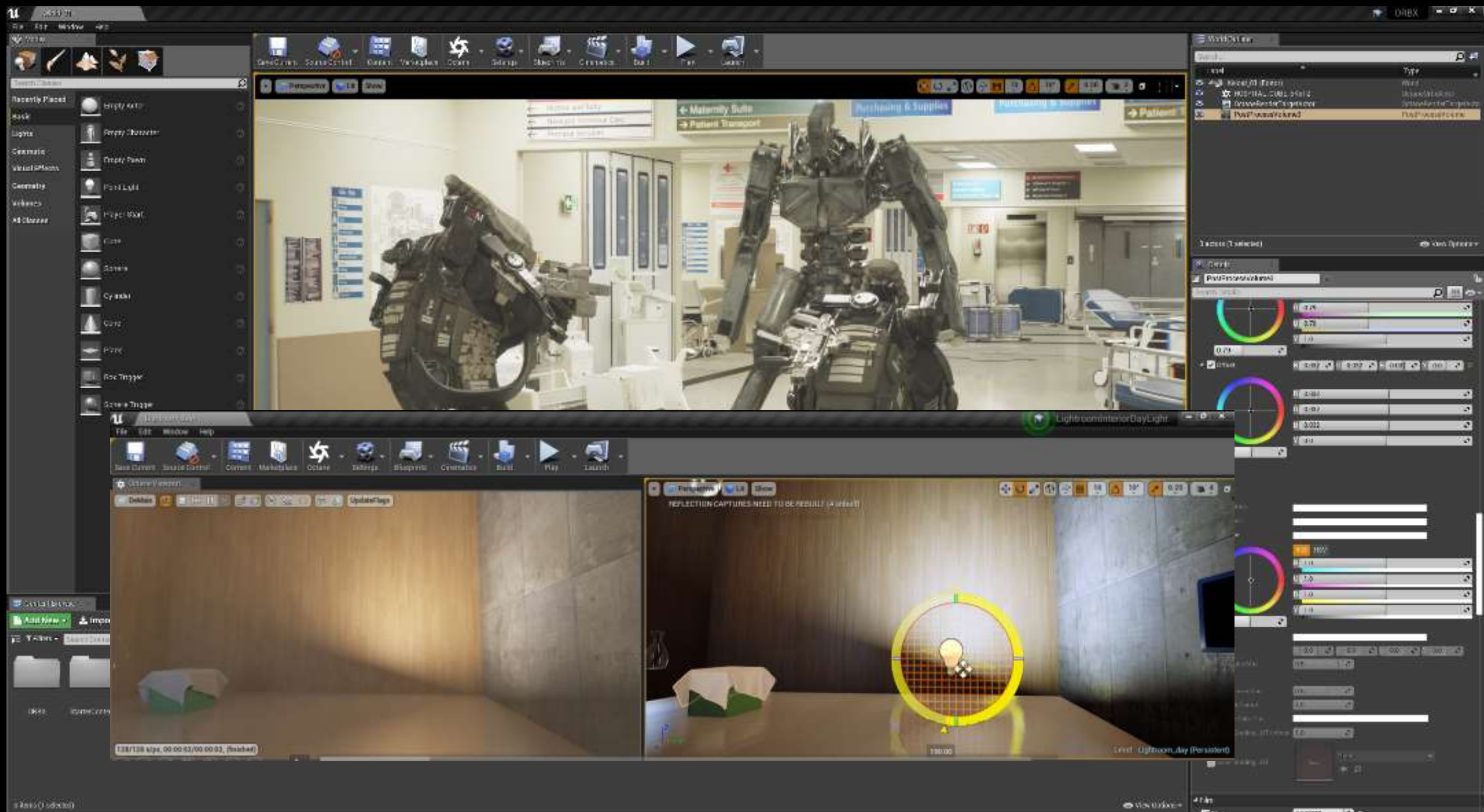


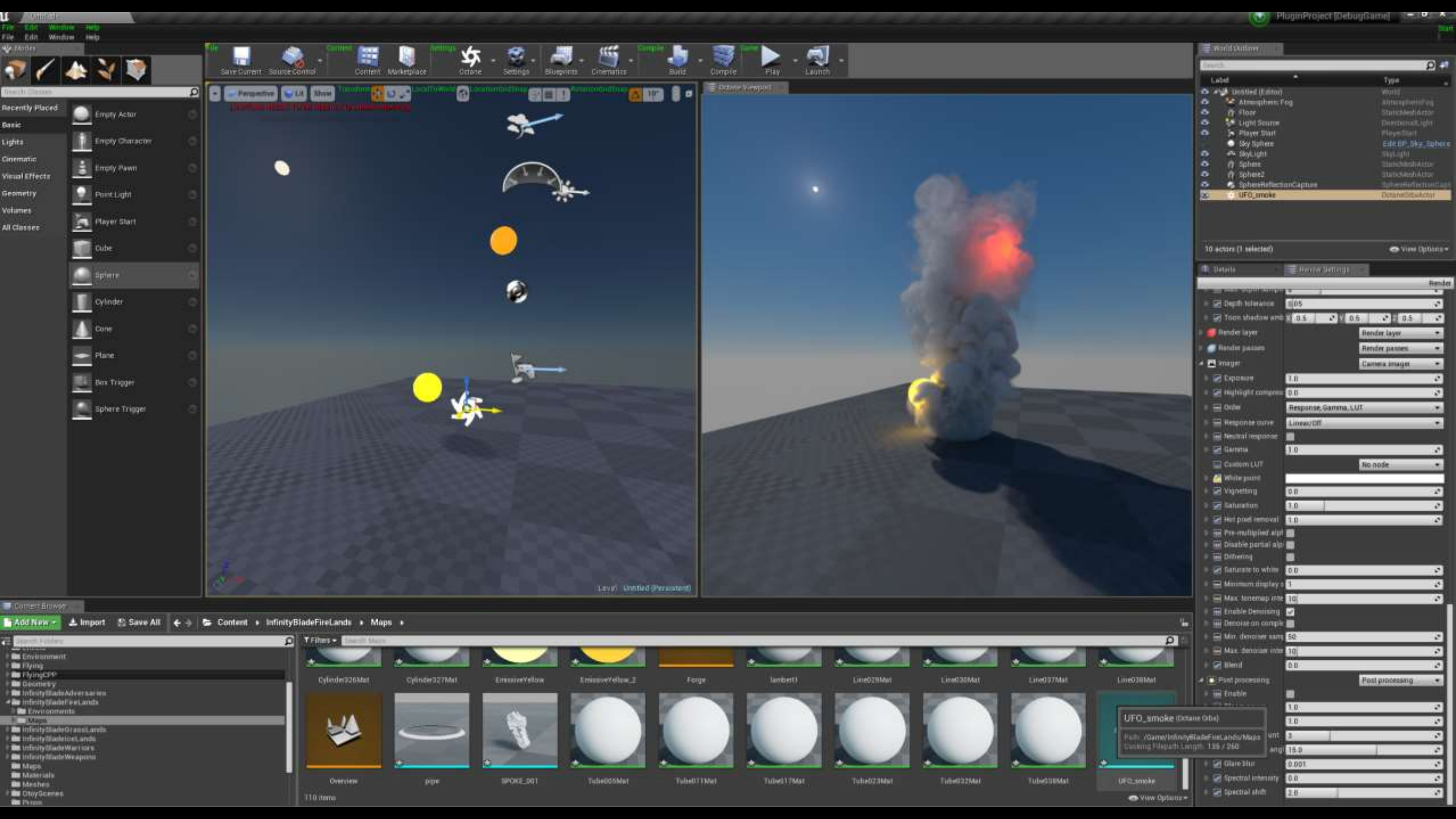
octanerender

Unreal Engine









A decade of GPU rendering phases in ~2 year increments:



0..1..2..3..4..X

2010 ... 2012 ... 2014 ... 2016 ... 2018... 2020

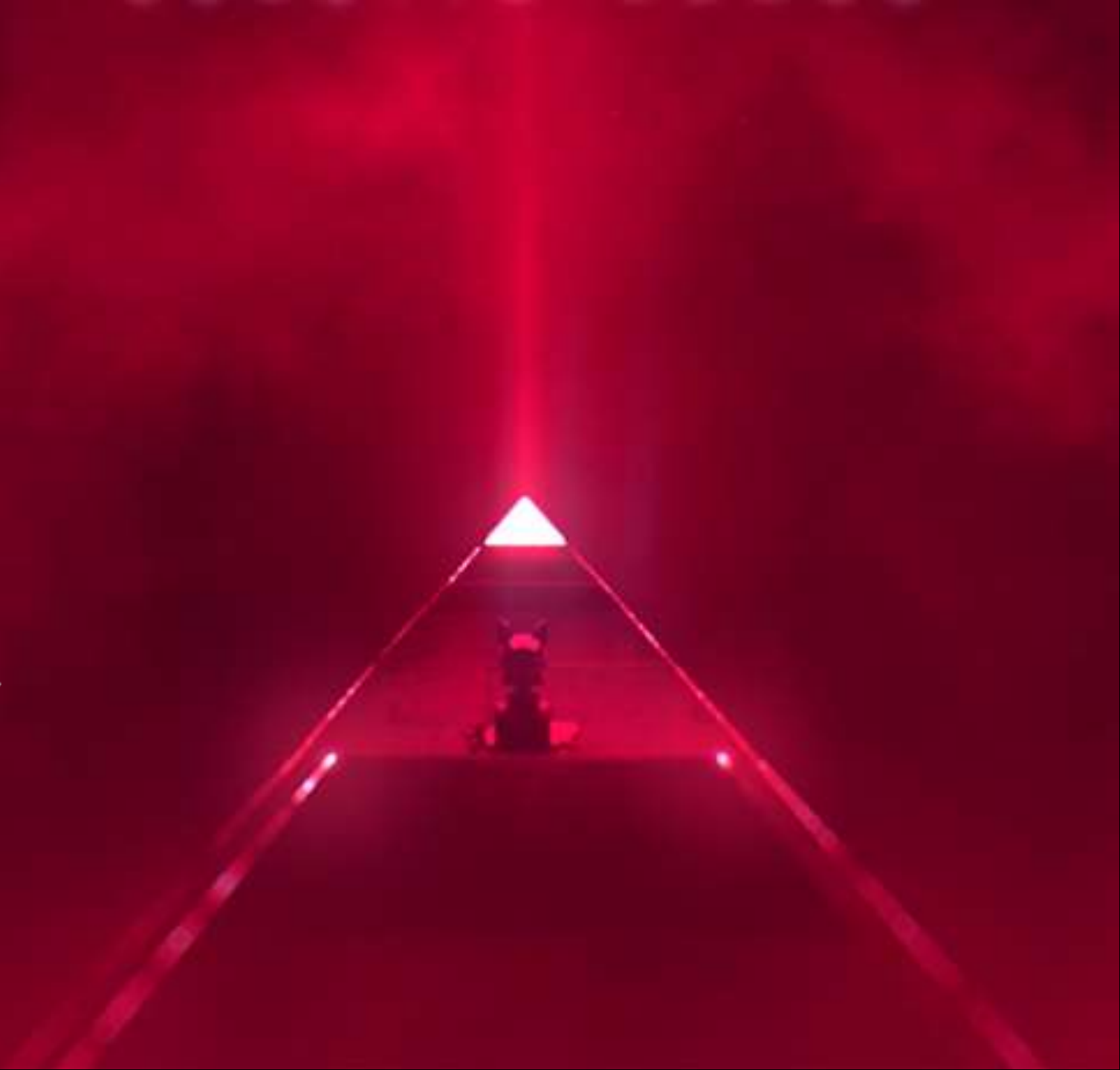
- 1.0 Images
- 2.0 Animations
- 3.0 Cinematic VFX
- 4.0 Real Time (+AI)
- 5.0 Holographic (+AI)





octanerender

2019 Recap





2019 Improvements:

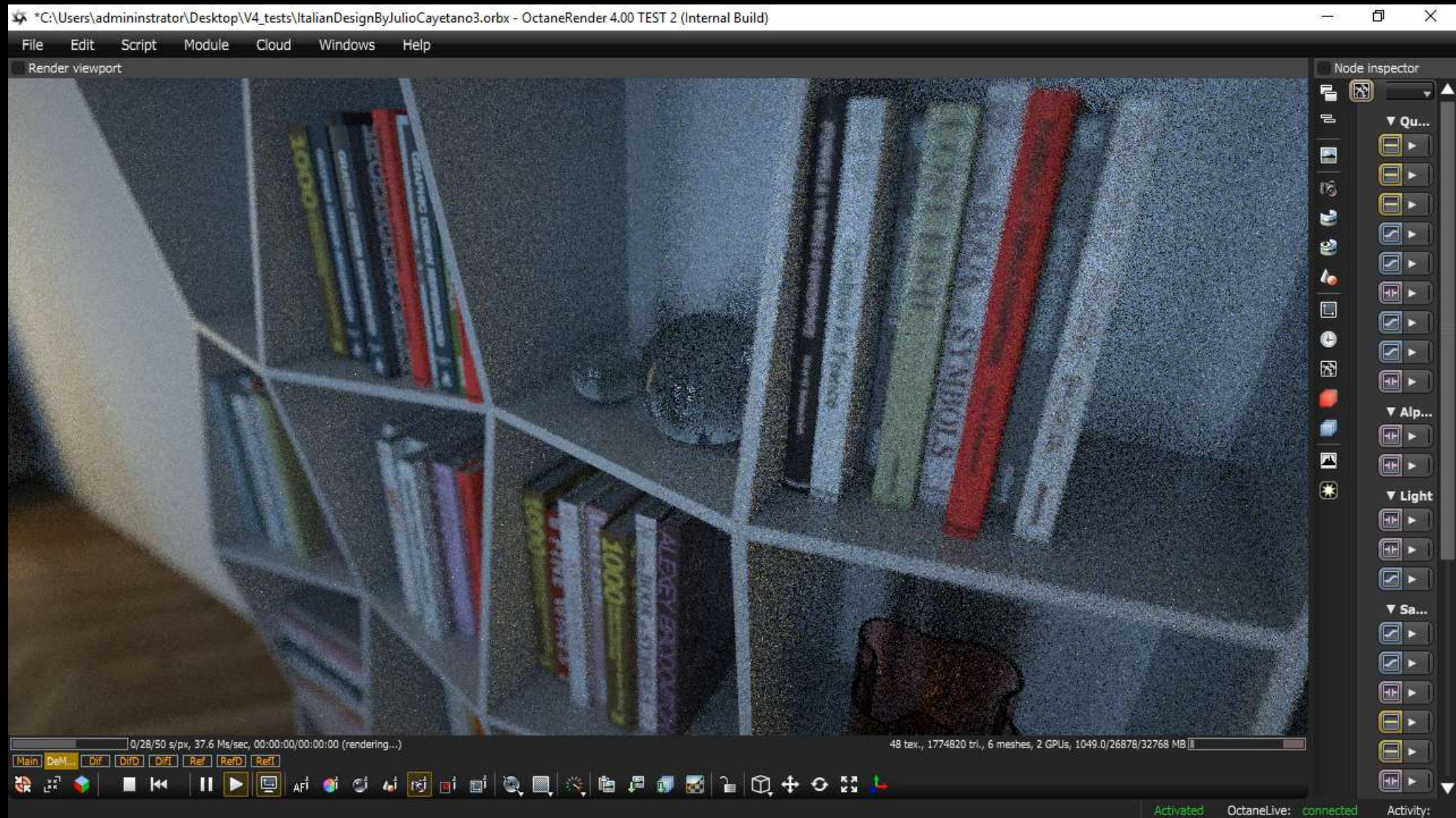
- Better AI Denoising + AI Light: Final renders in seconds
- Better Scene AI: Faster out of core Geometry (+NV Link)
- Vectron + Spectron - Procedural OSL lights/shapes/volumes





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AI Denoiser + AI Light – Real Time Viewport





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Fast Procedural Volumetric Lighting





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AI Volumetric Denoiser





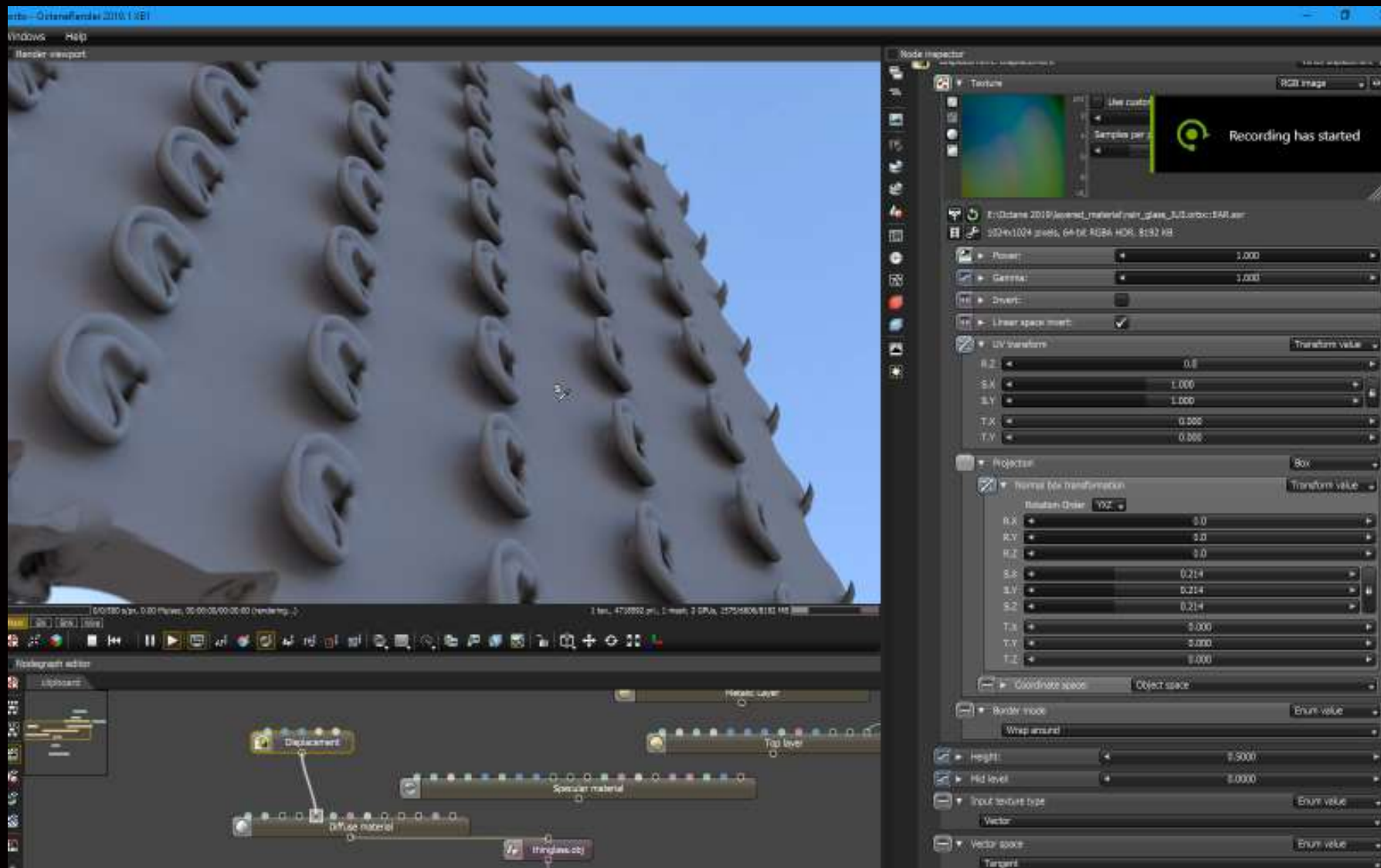
octanerender

Vectron + Spectron – Fast OSL Surfaces / Lights





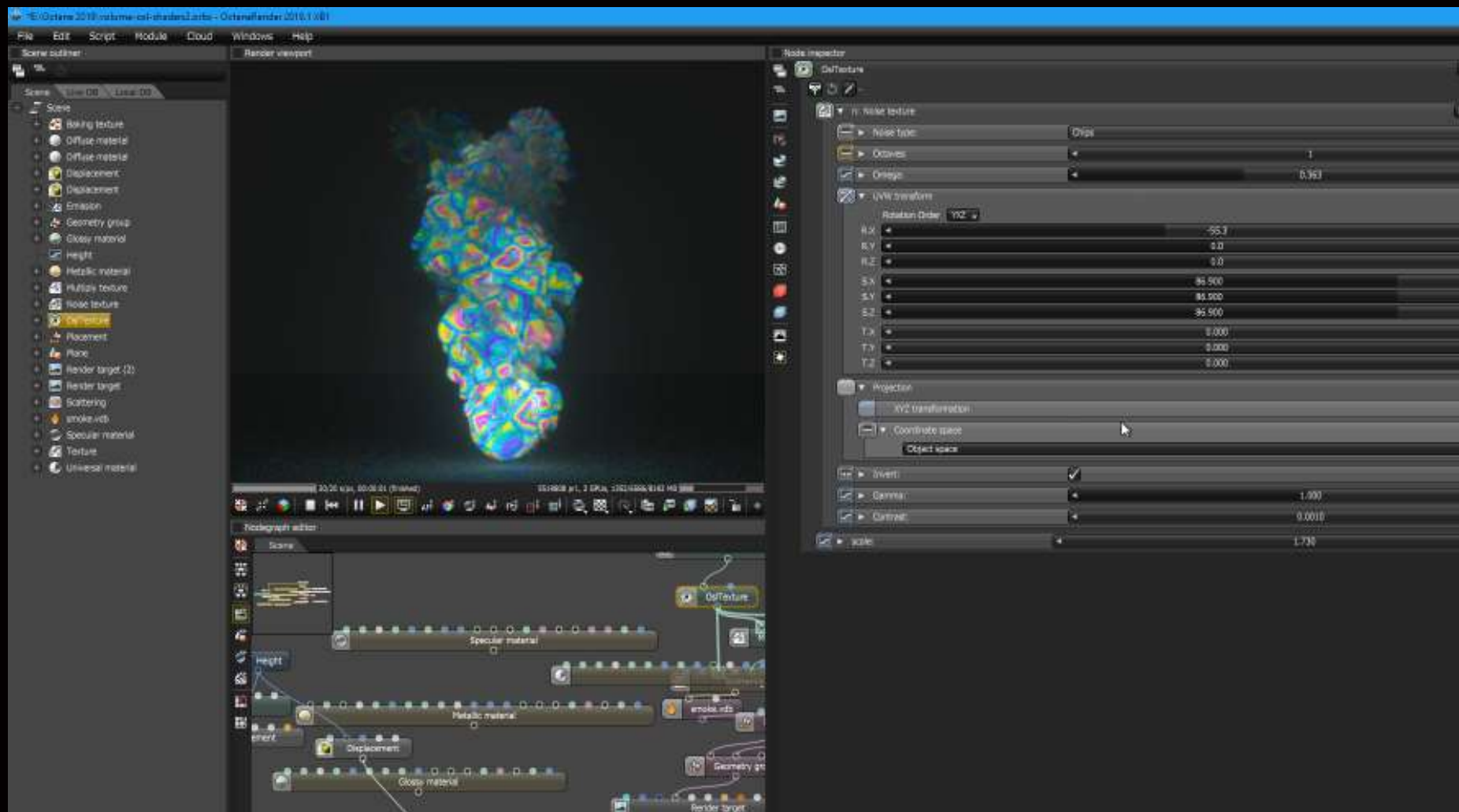
OSL & Vector Displacement:





OSL Volume Shaders

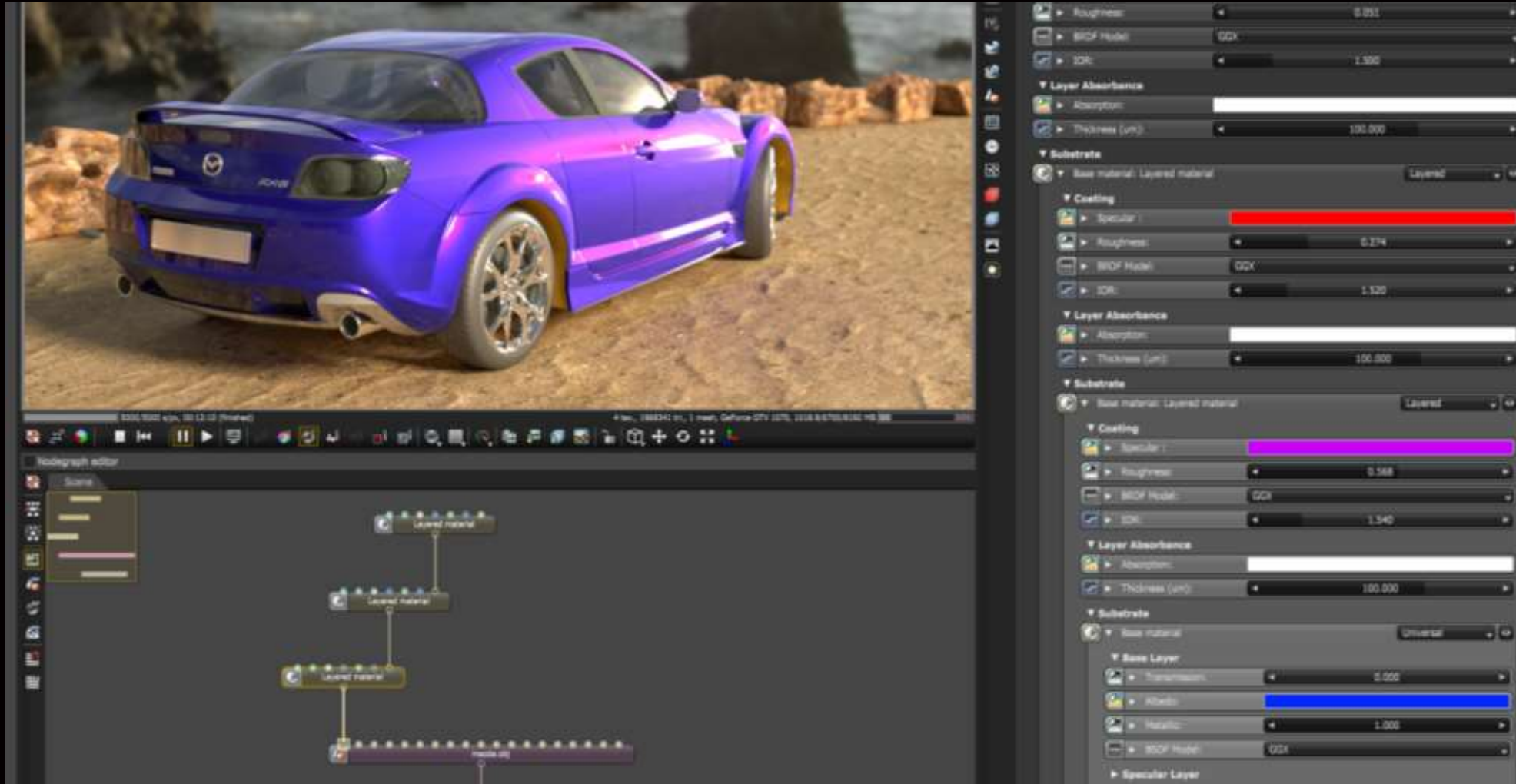
octanerender





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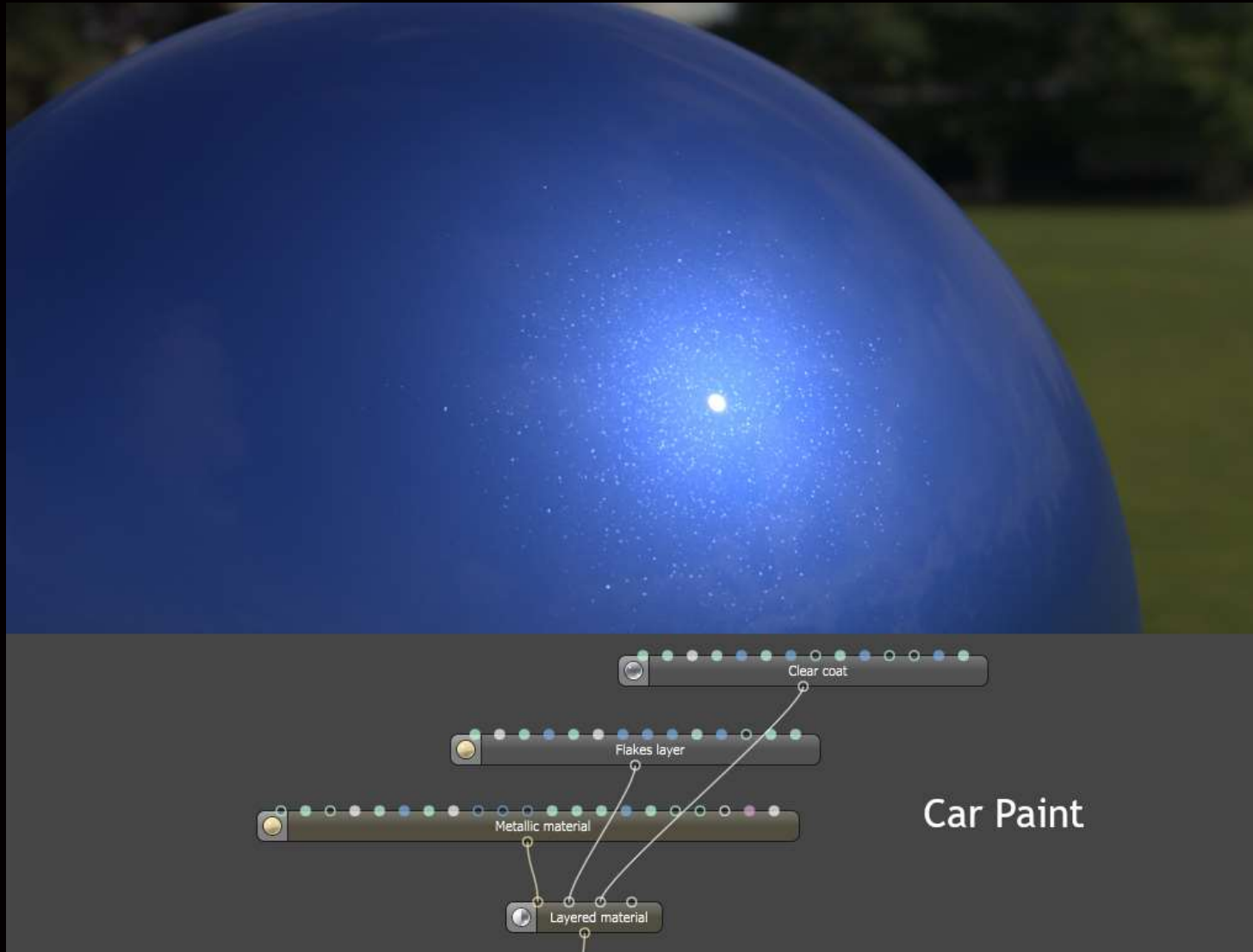
Complex Layered Material Substrates/Coats:





octanerender

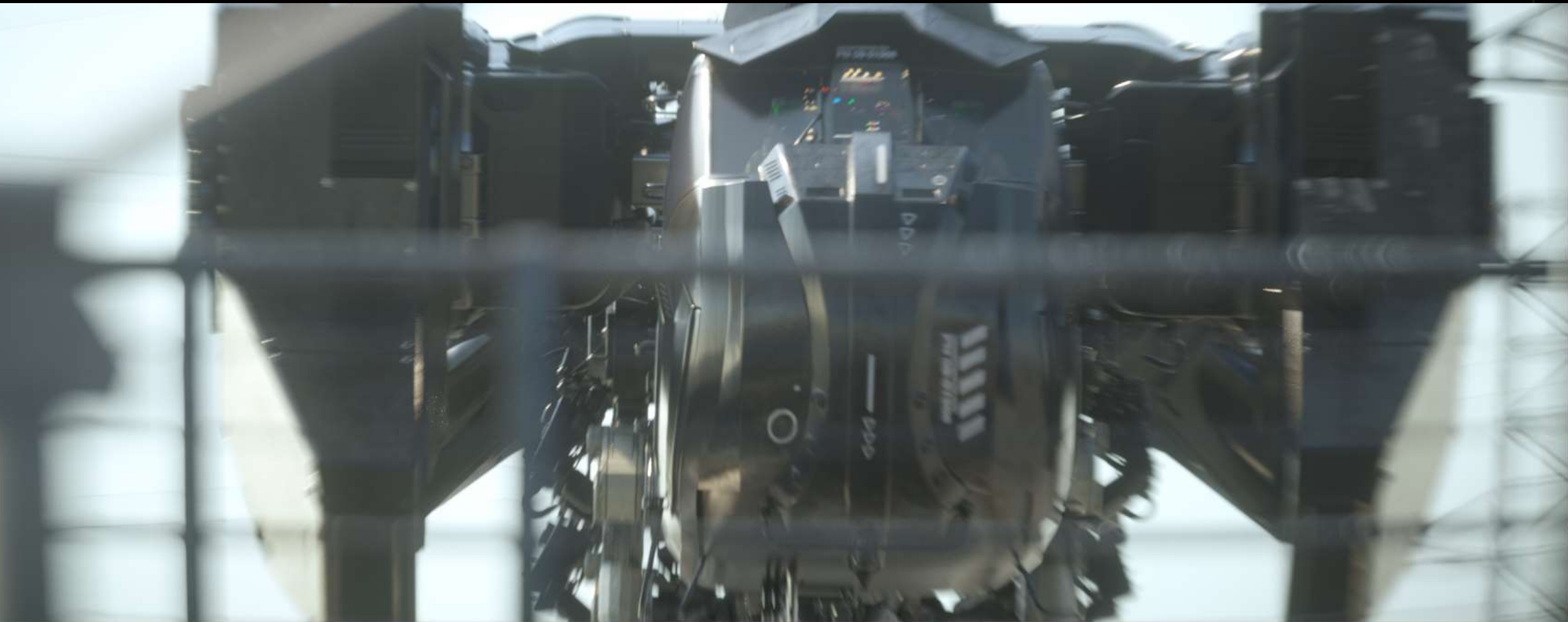
Material Layers – Artist friendly alt. to OSL closures:





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Universal Camera with OSL Distortion Maps:





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2020 | Roadmap



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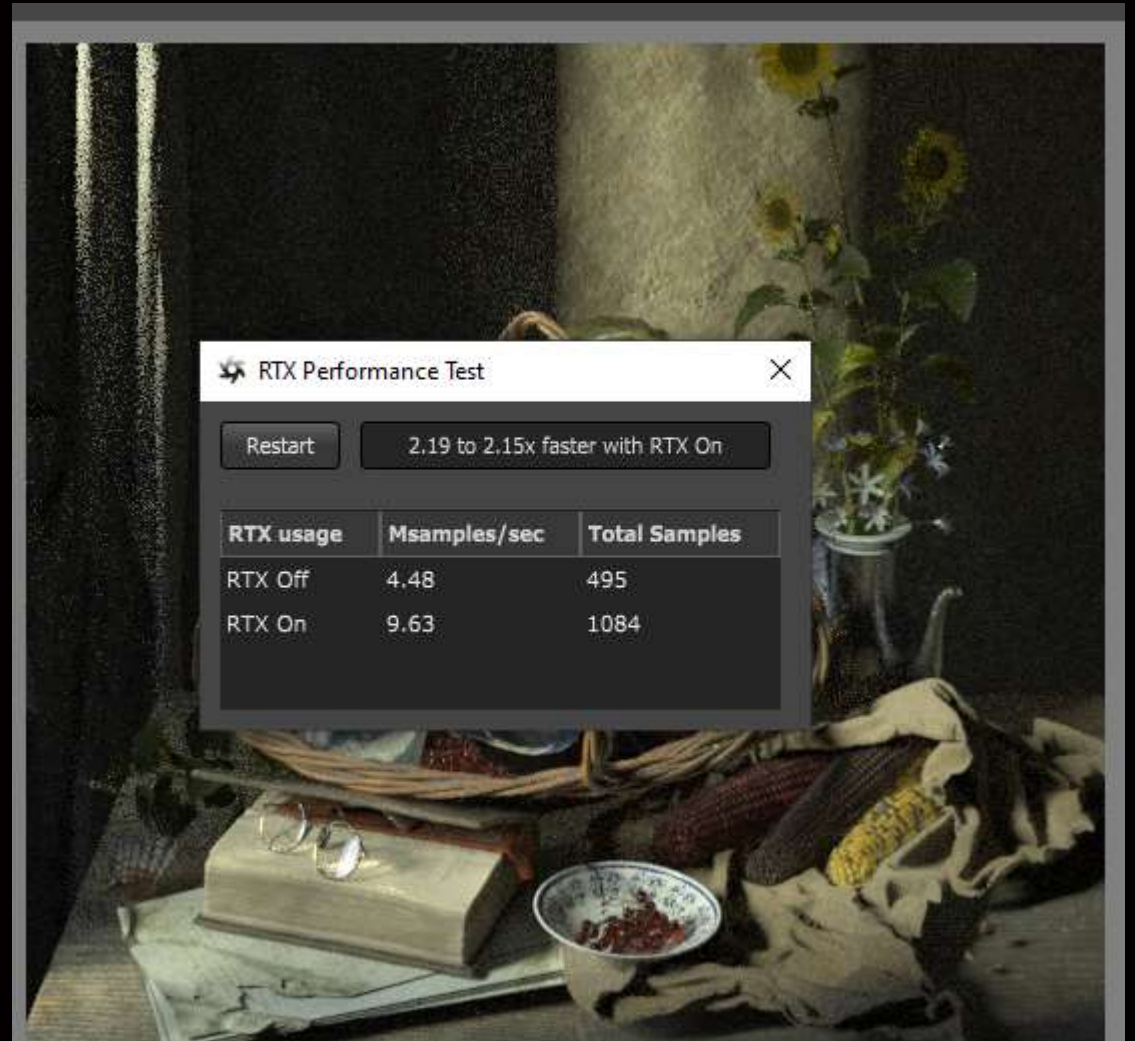
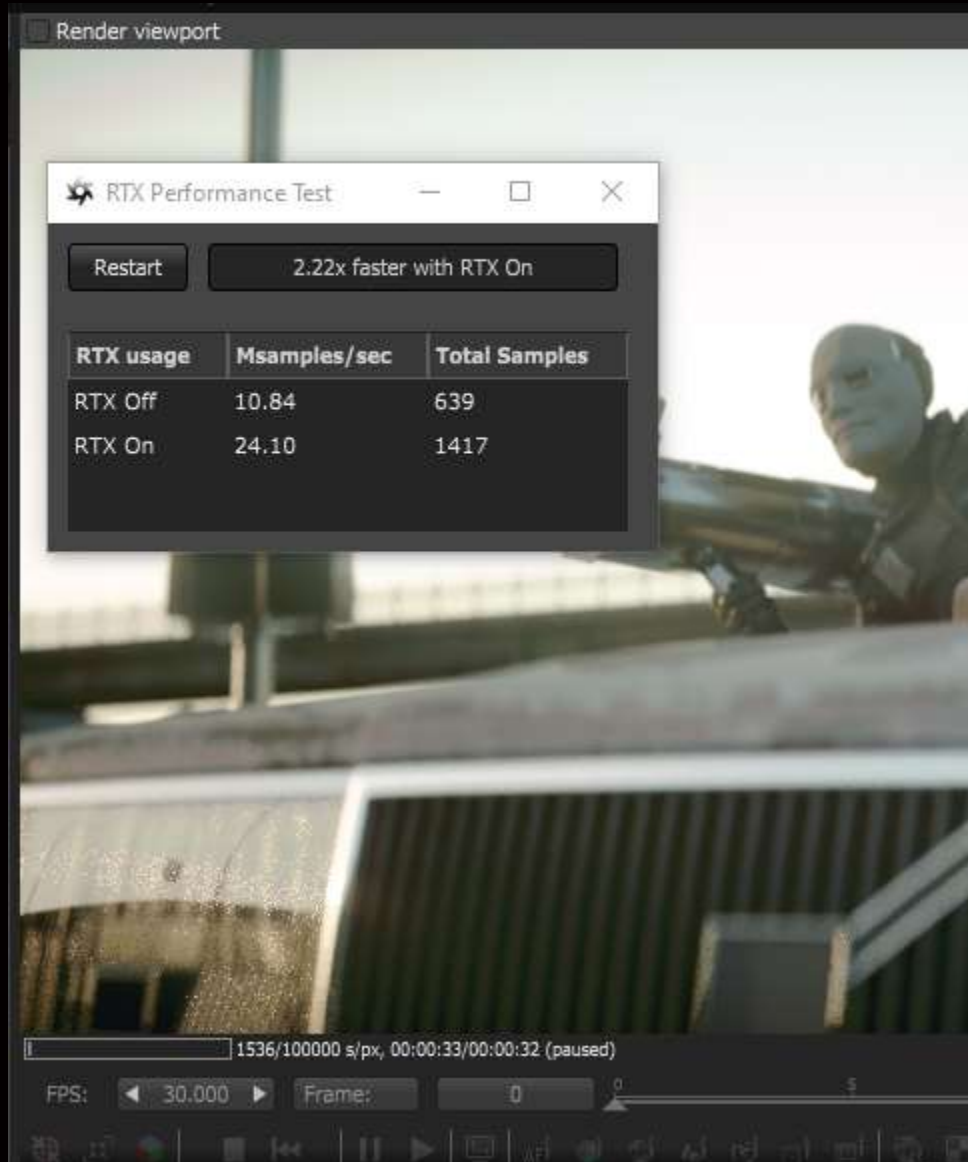
2020.1



Optix 7 – New RTX backend



RTX ON = 2-3x faster in real production scenes:





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RTX ON + Optix 7 = up to 15x faster in some scenes!

RTX Performance Test		
Restart 14.68x faster with RTX On		
RTX usage	Msamples/sec	Total Samples
RTX Off	4.12	28
RTX On	62.73	411

RTX Performance Test		
Restart 13.70x faster with RTX On		
RTX usage	Msamples/sec	Total Samples
RTX Off	4.20	30
RTX On	62.08	411



Scene and images from @nessgraphics



Why Optix 7?

- Vulkan RT + CUDA was best option last year (Optix 6 at the time was too slow)
- However - mixing CUDA and Vulkan was (and is) experimental
- We uncovered blocking issues - some at driver level beyond our control





Why Optix 7?

- Optix 7 API = better, lower level API than Optix 6
- Optix 7 RTX in Octane 2020.1 – fixes our Vulkan/CUDA interop issues + better NV Link support
- Optix 7 - faster, more stable & uses less memory than Vulkan RTX backend in 2019.2





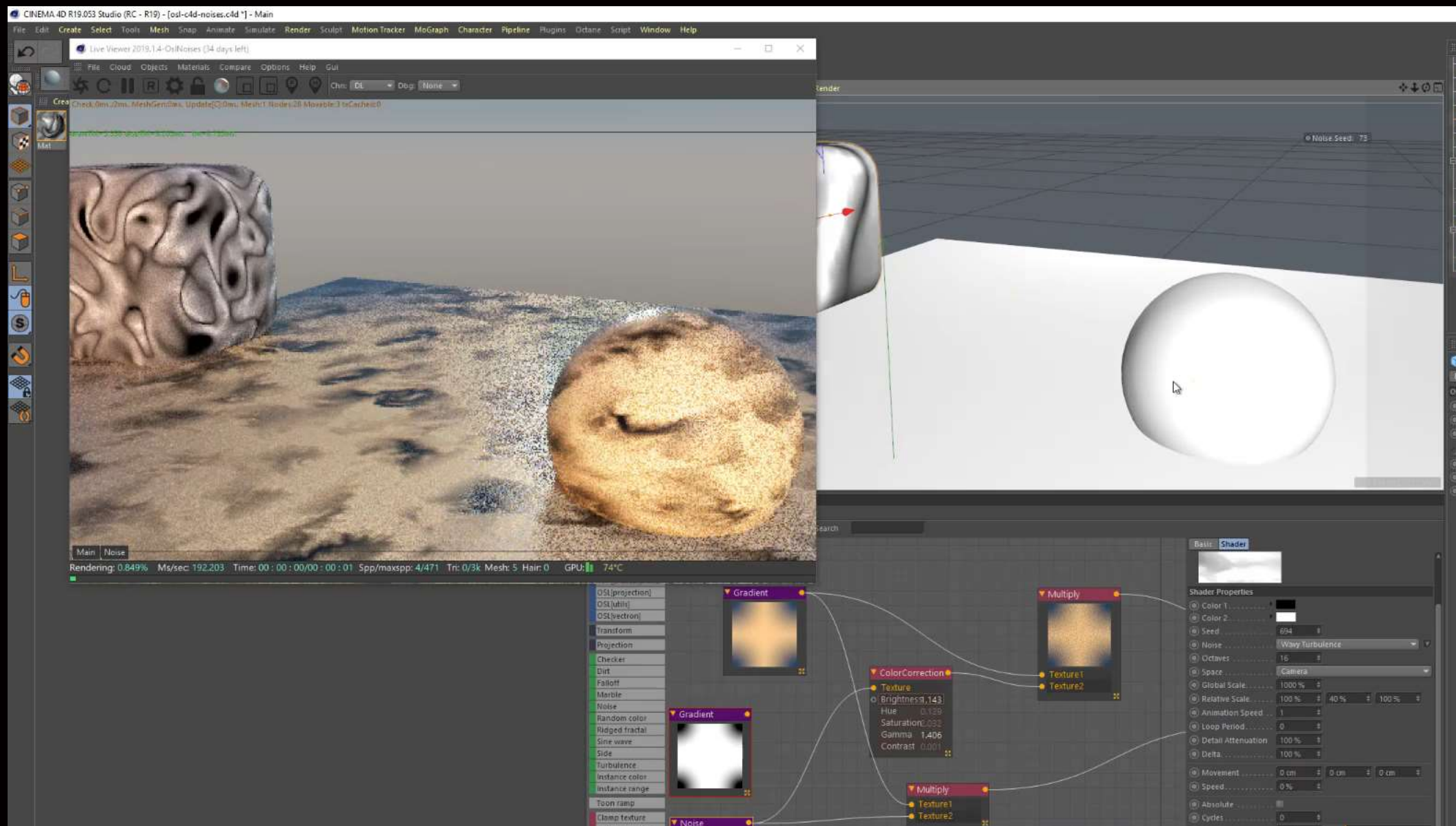
2020.1

New Features



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C4D Native GPU noises->OSL = No Texture Baking!





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C4D Native GPU noises - Volume Displacement:



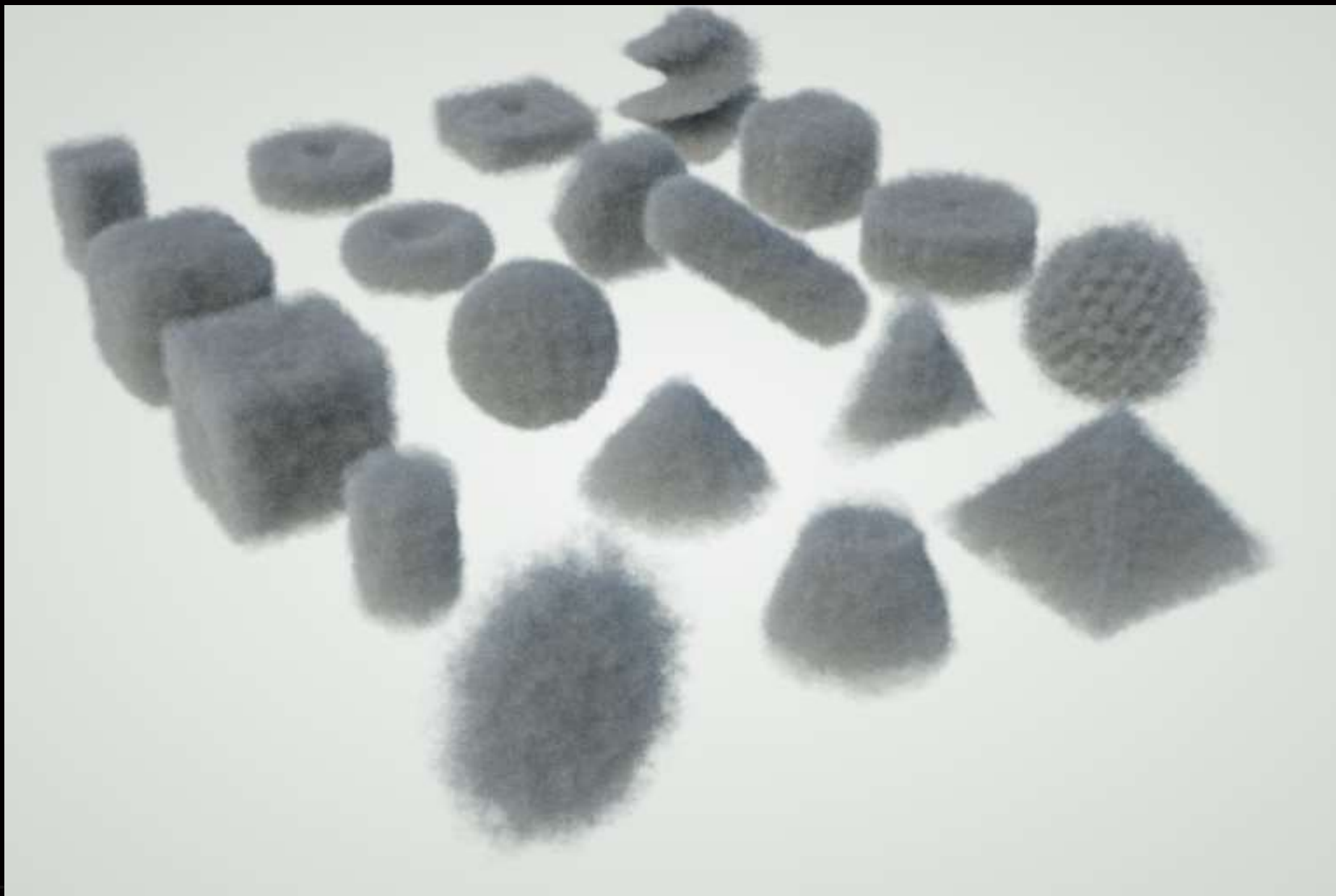


Vectron Volumes:





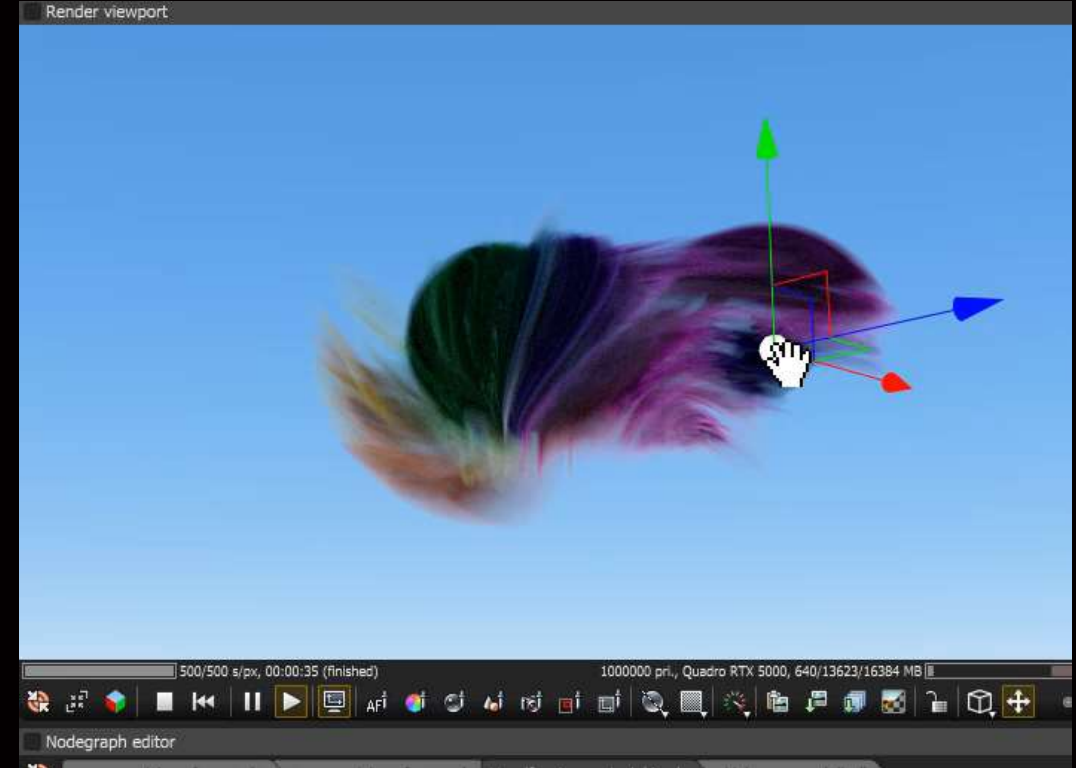
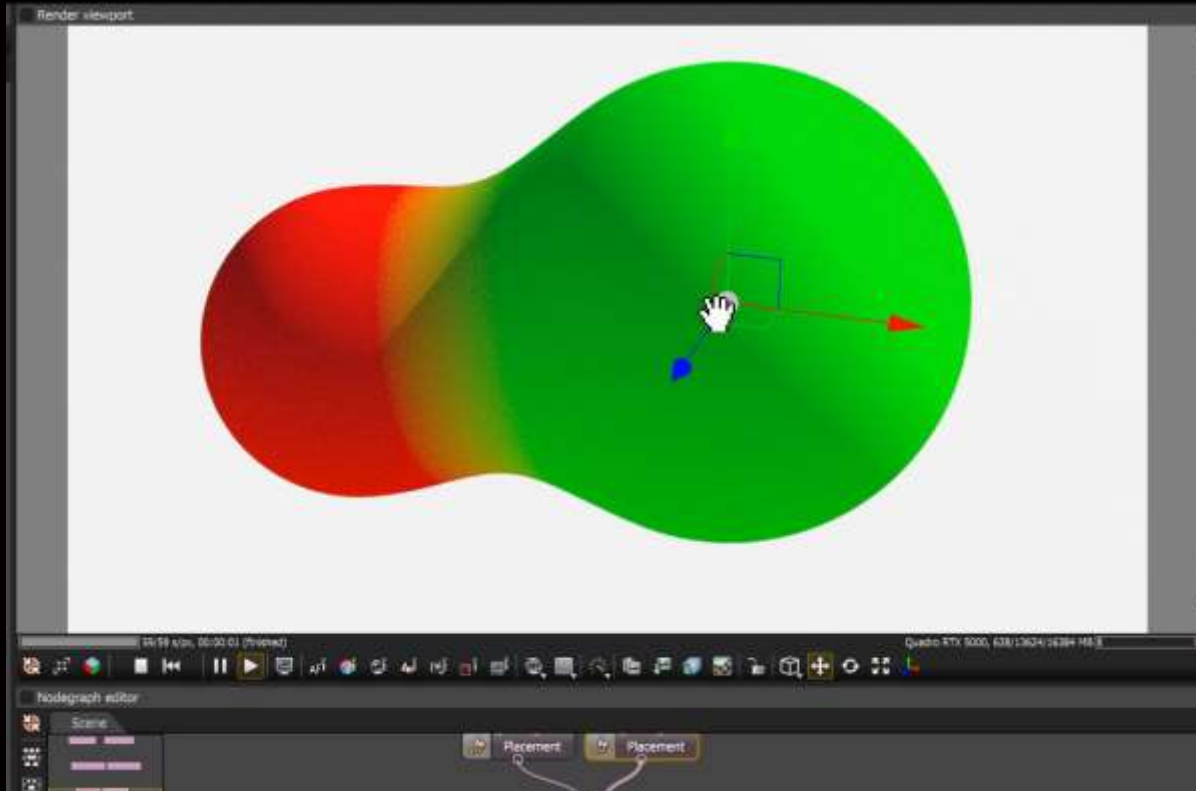
Vectron Volumes:





octane render

Vectron Mesh vs. Volume Operators:





octanerender

Vectron Volume Operators:





octanerender

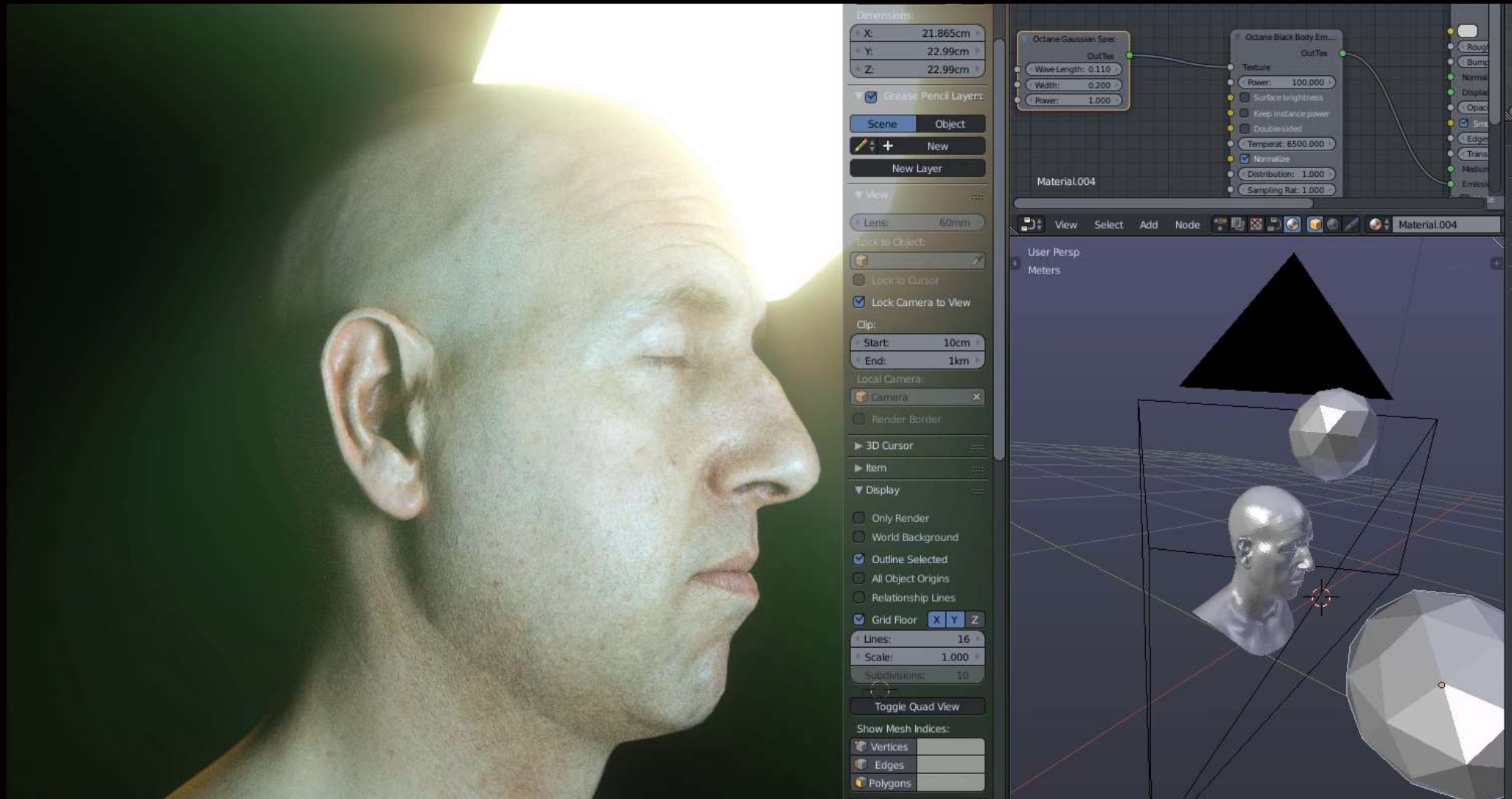
Fast Spectral Random Walk SSS / Skin:





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Fast Spectral Random Walk SSS / Skin:





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Fast Spectral Random Walk SSS / Skin:





octane render

Fast Spectral Universal Hair Material:





octane render

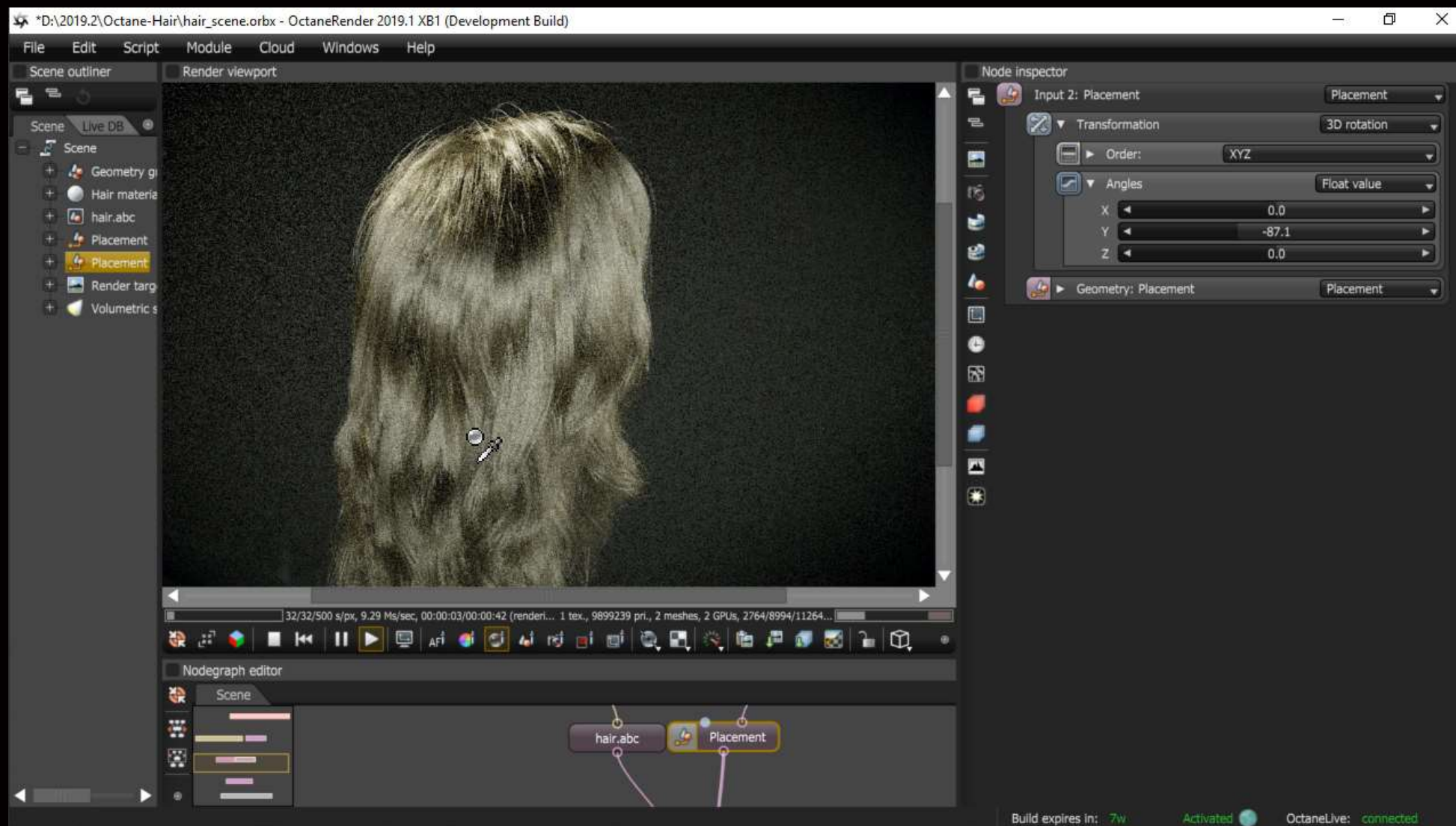
Fast Spectral Universal Hair Material:

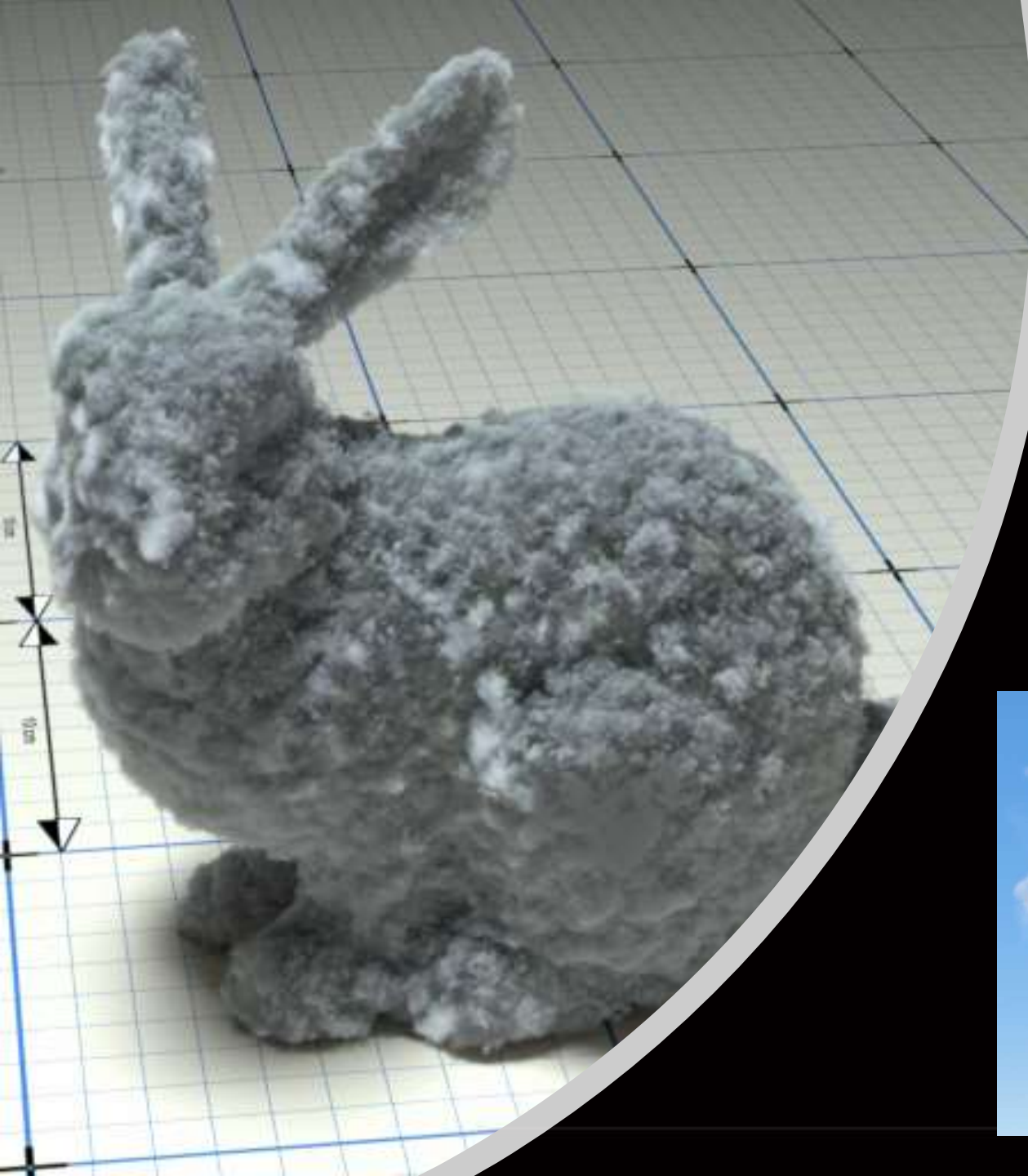




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Fast Spectral Universal Hair Material:



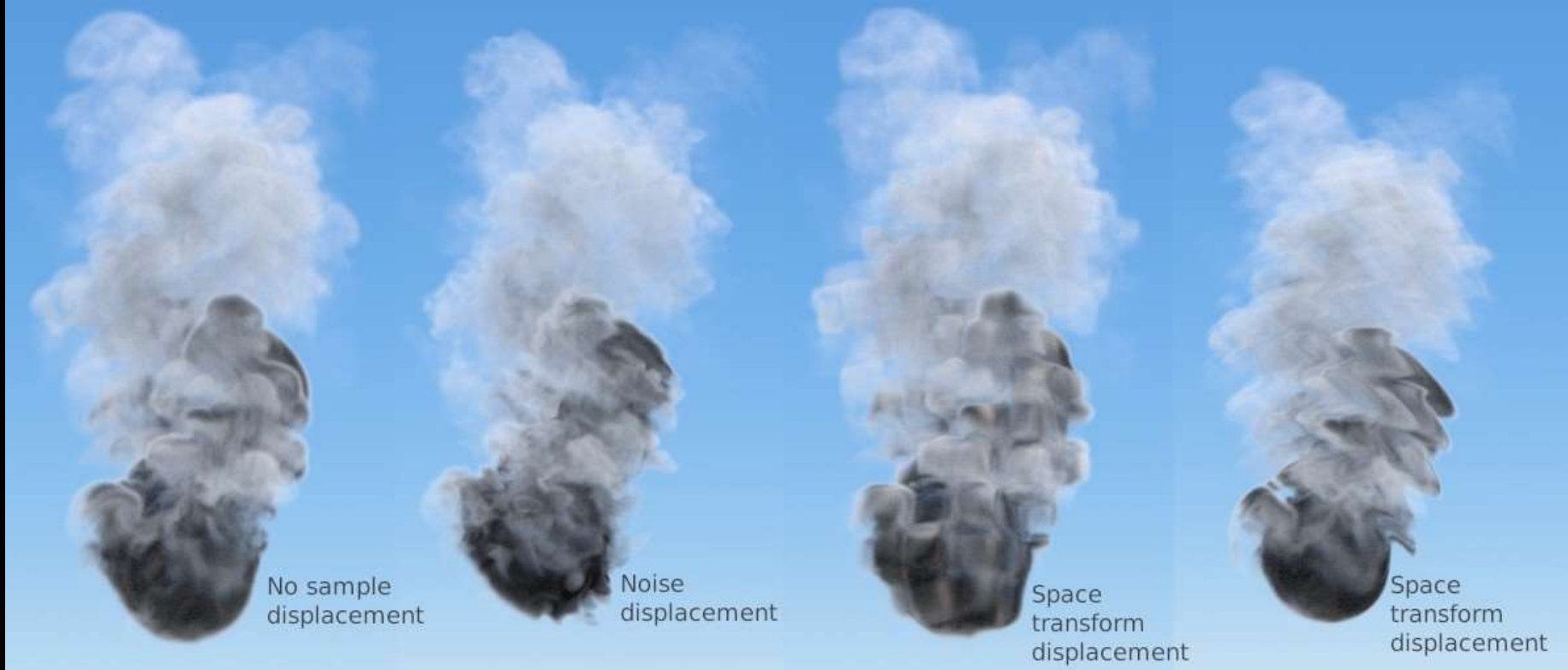


Volumetric Displacement





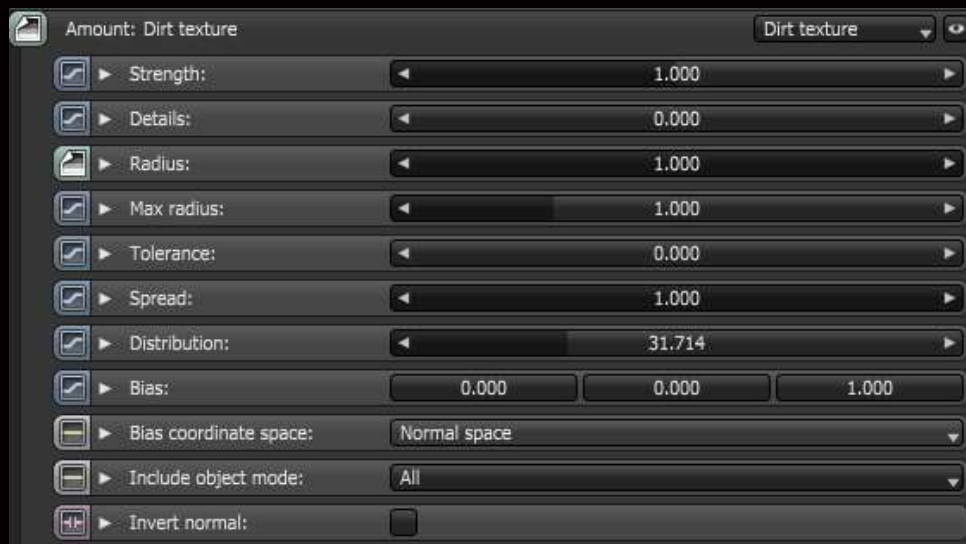
OSL Volume Sample Displacement:





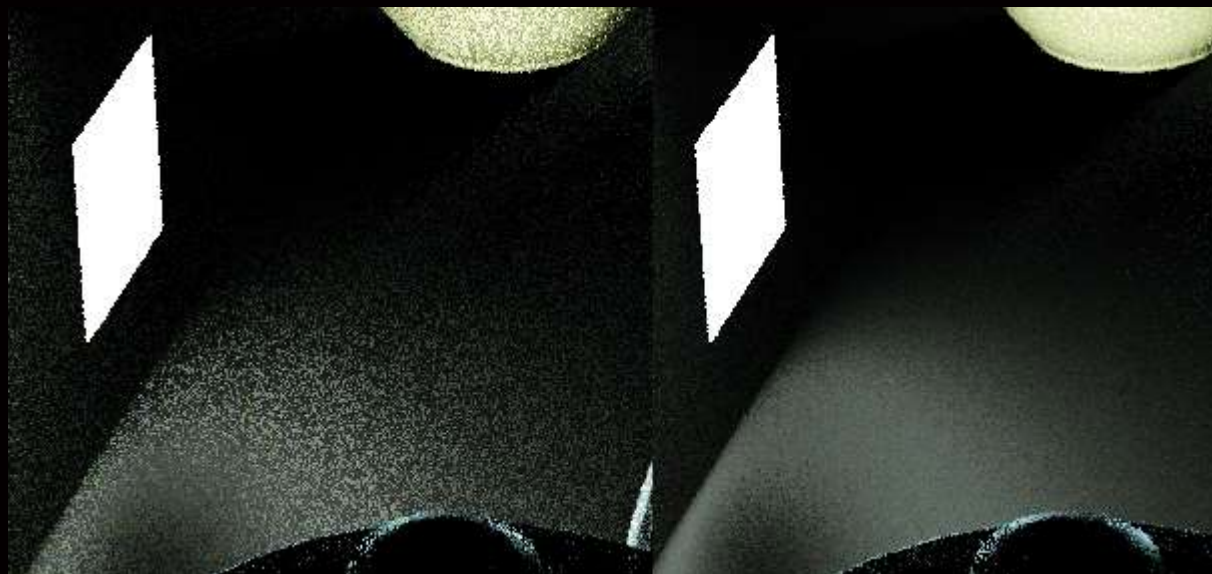
octane render

New Universal Dirt System:



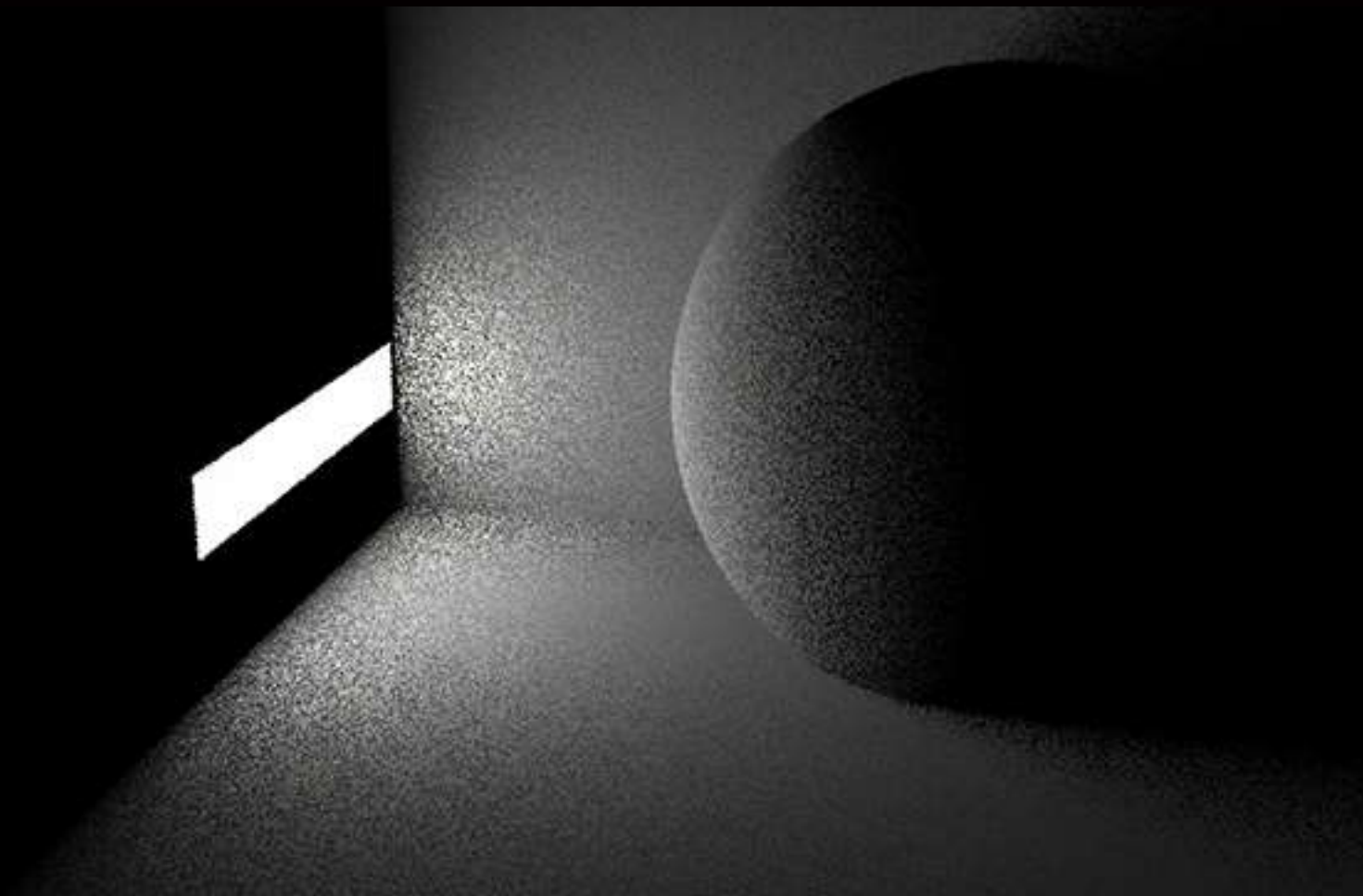


Spectron: Quad and Point Lights – 4x Faster!



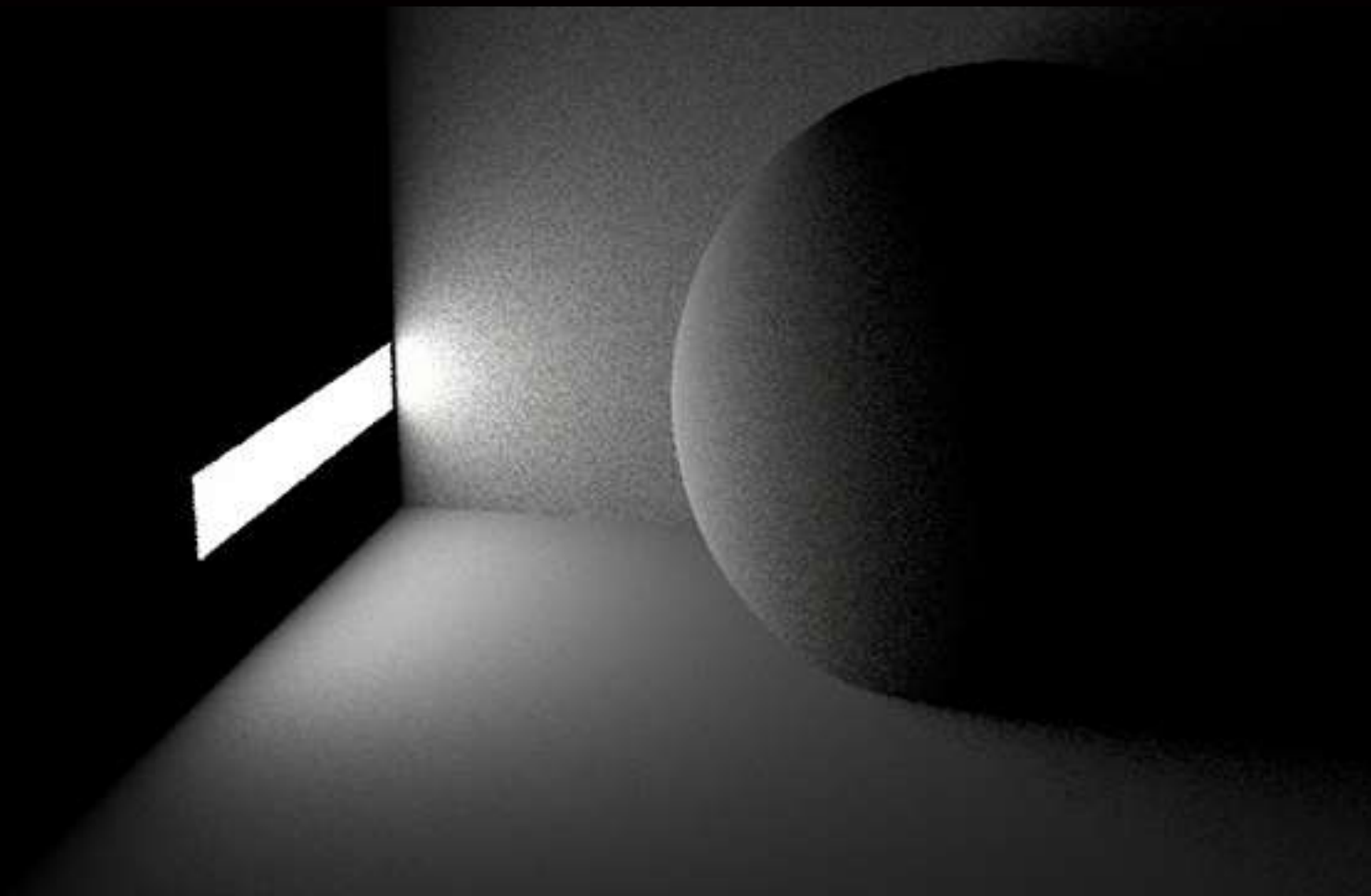


Spectron: Area Light (Mesh)



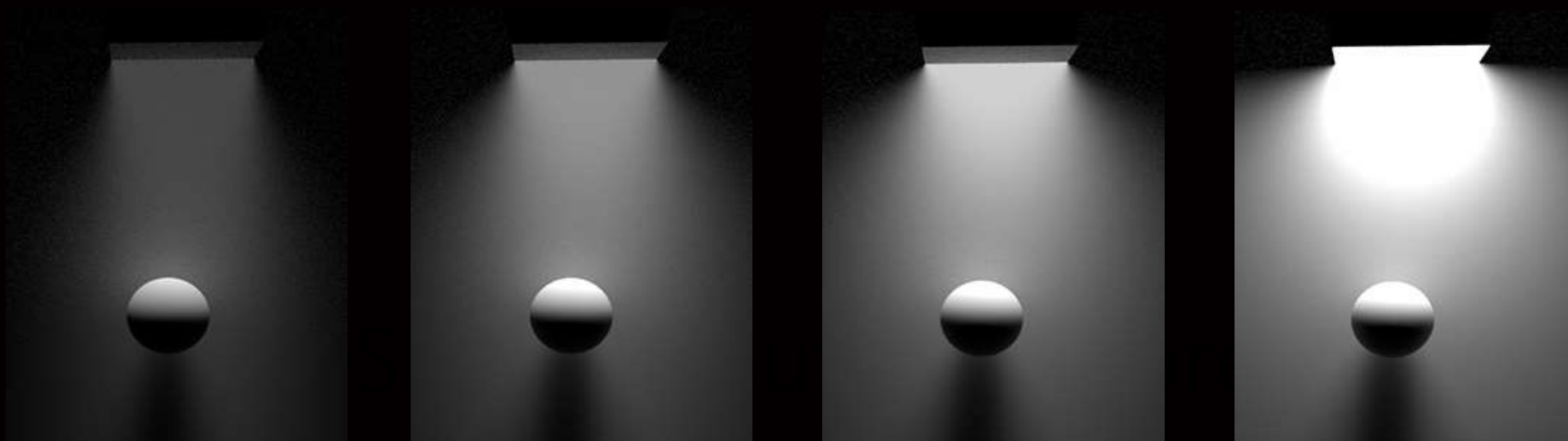


Spectron: Area Light (Quad) – 4x Faster!





Spectron: OSL Spotlight | Area Spread



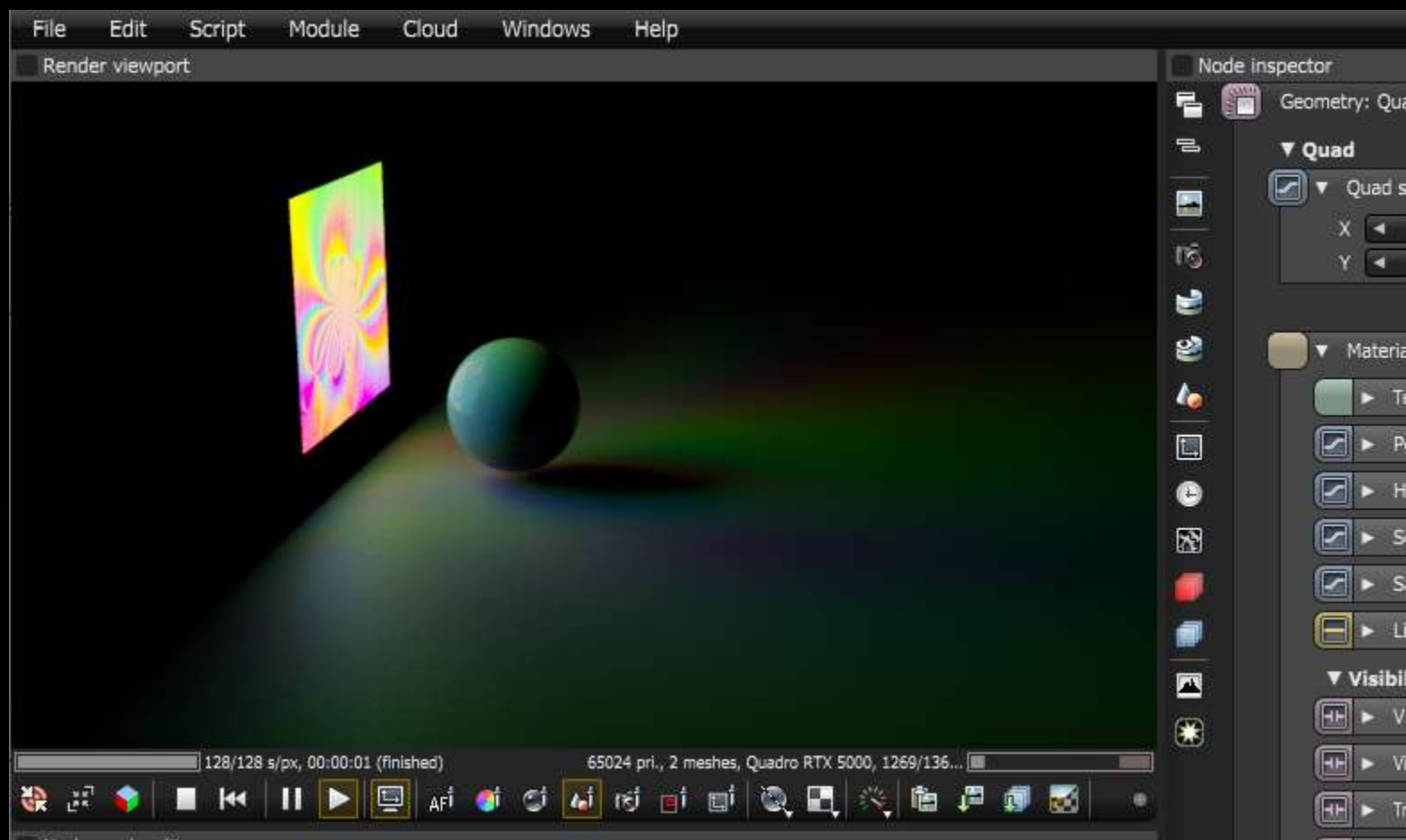


Spectron: OSL Spotlight | Area Spread



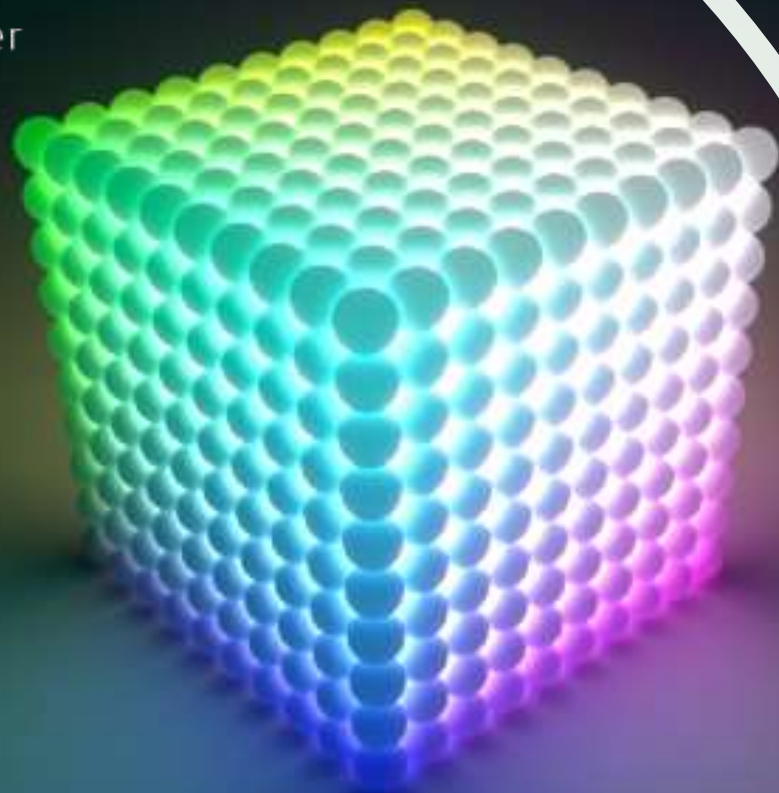


Spectron: OSL Spotlight | Gobo Filter

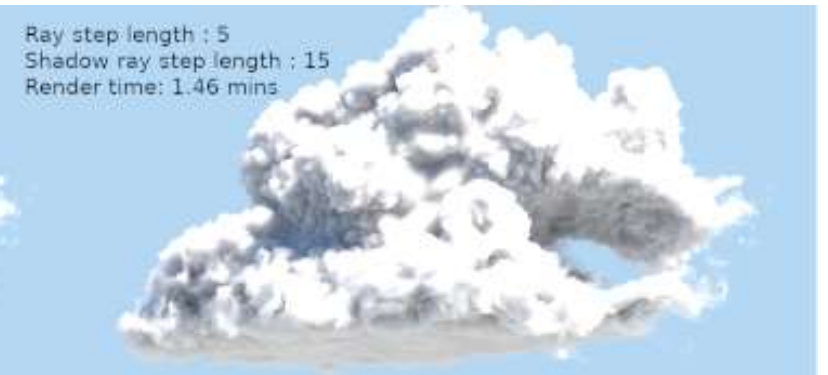
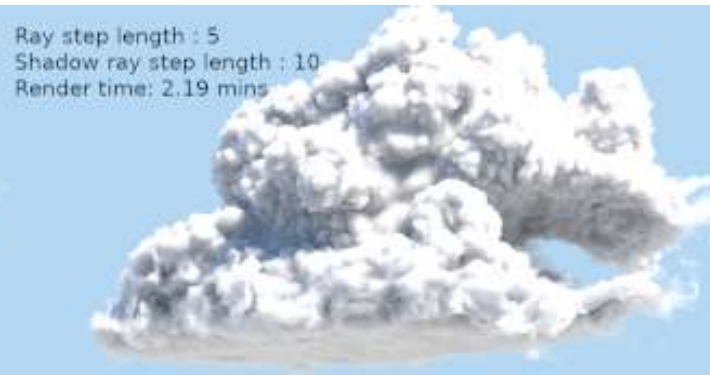
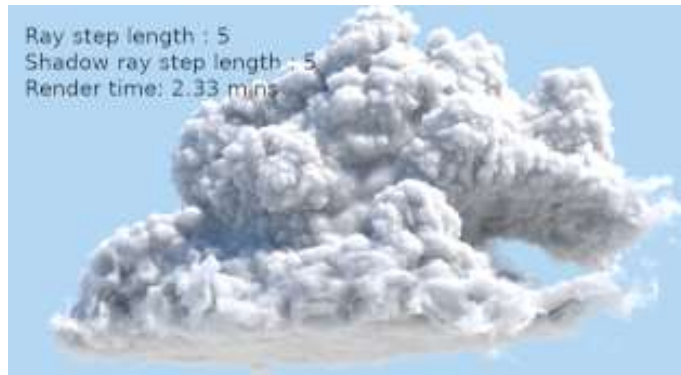




octane render



Native Curve and Point Primitive Attributes



Volume Shadow Step Length Improvements

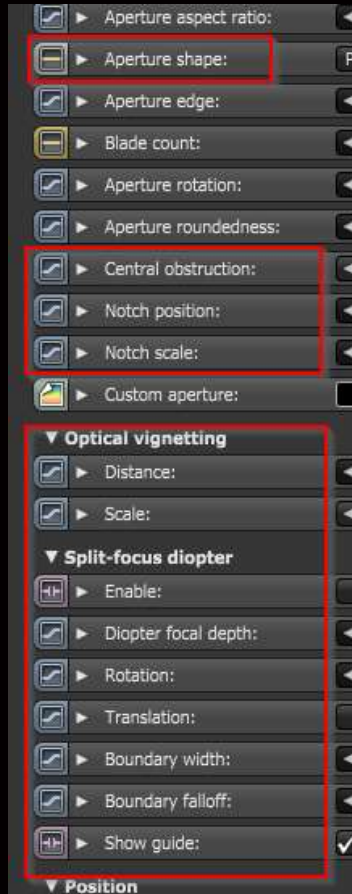


Universal Camera | Split-focus diopter:





Universal Camera | Even More Features:



- Split-focus diopter
- Optical vignetting
- Aperture texture and advanced DOF
- Aberration and distortion





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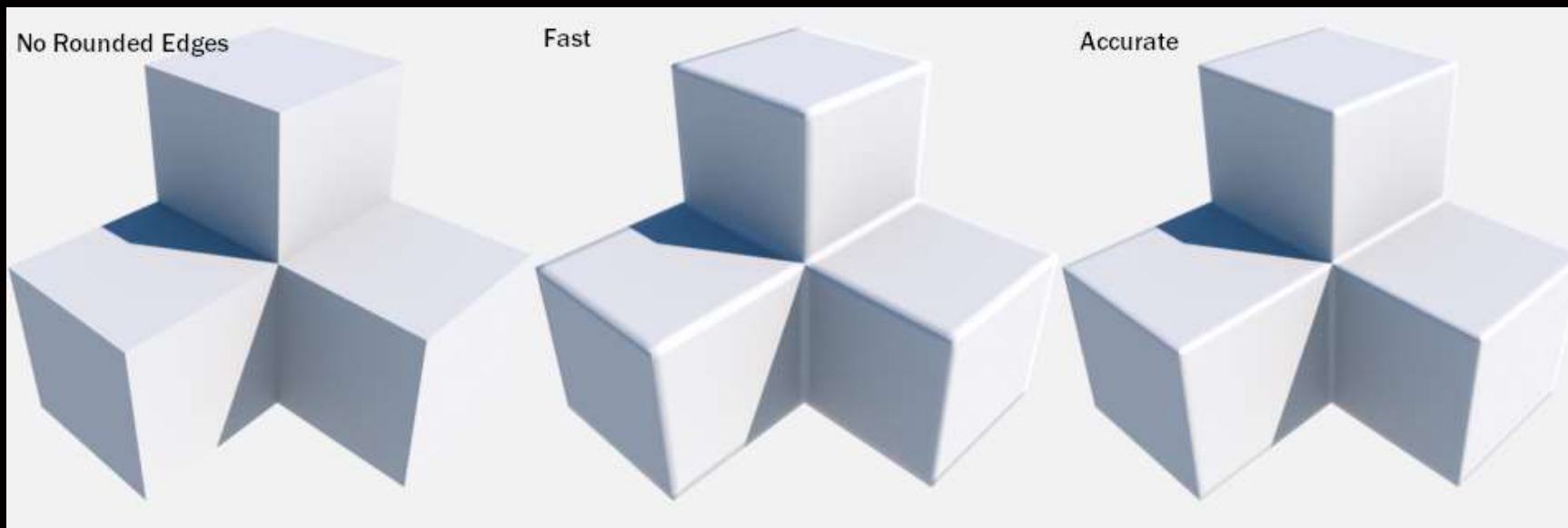
New Daylight System:





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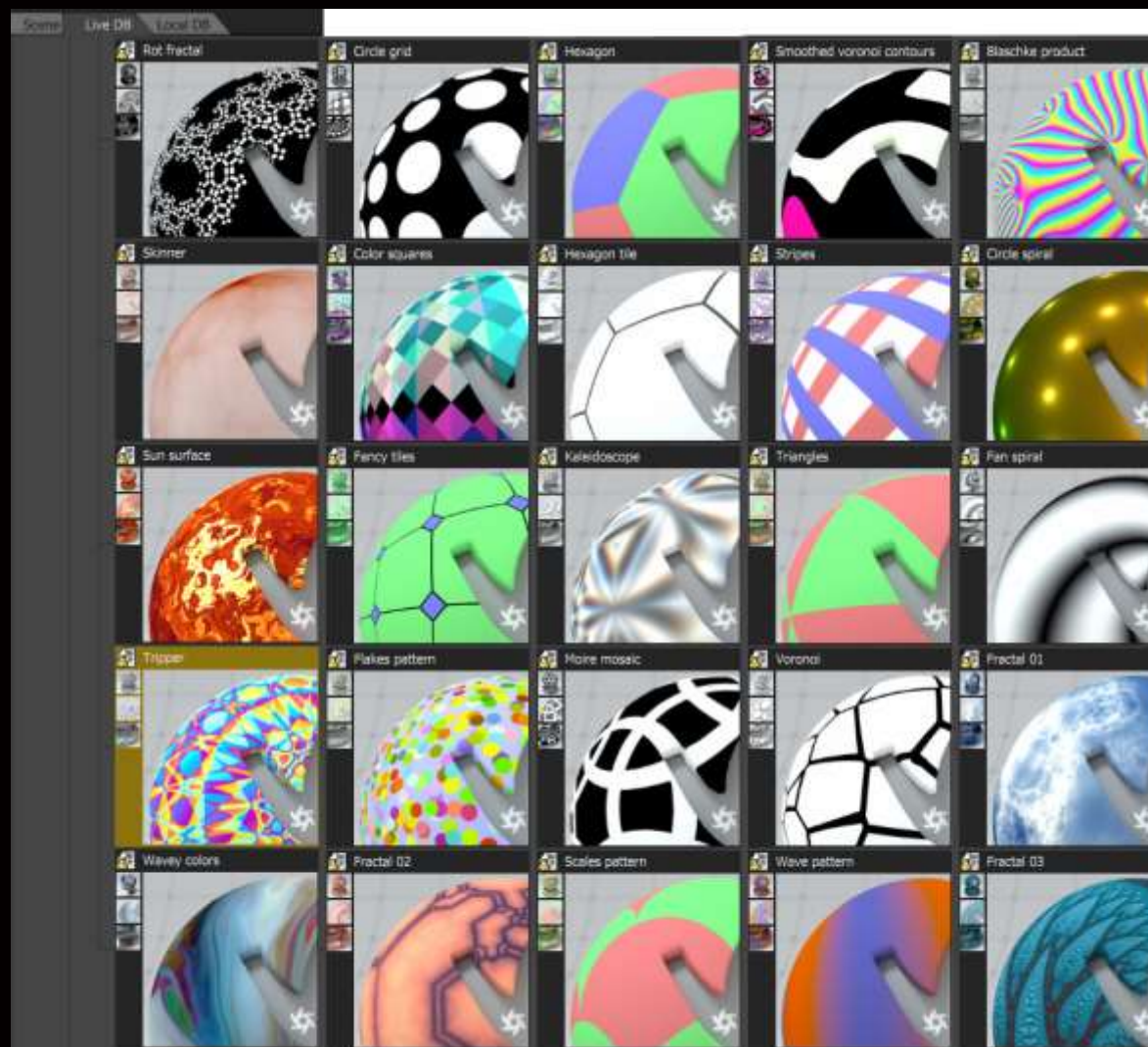
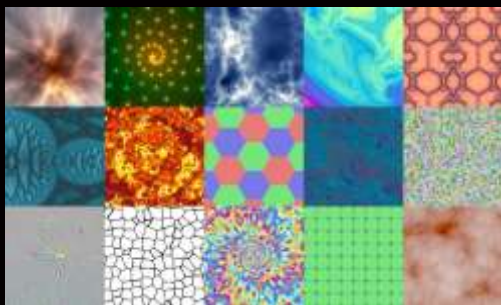
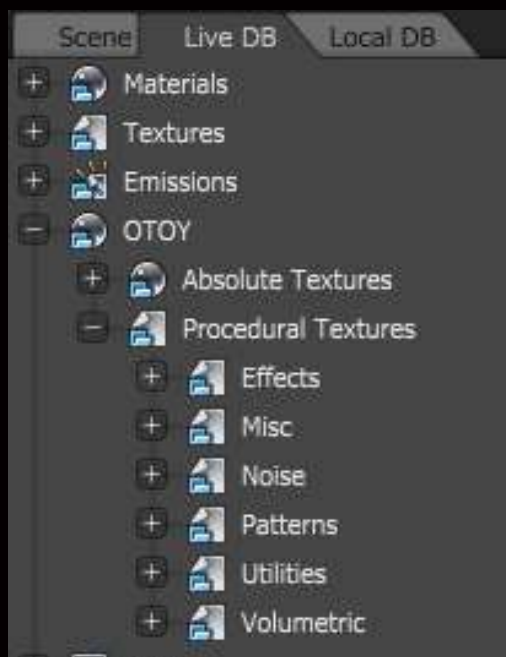
Improved Rounded Edges System:





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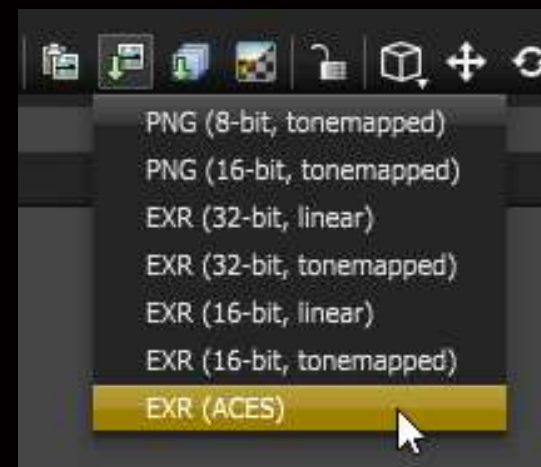
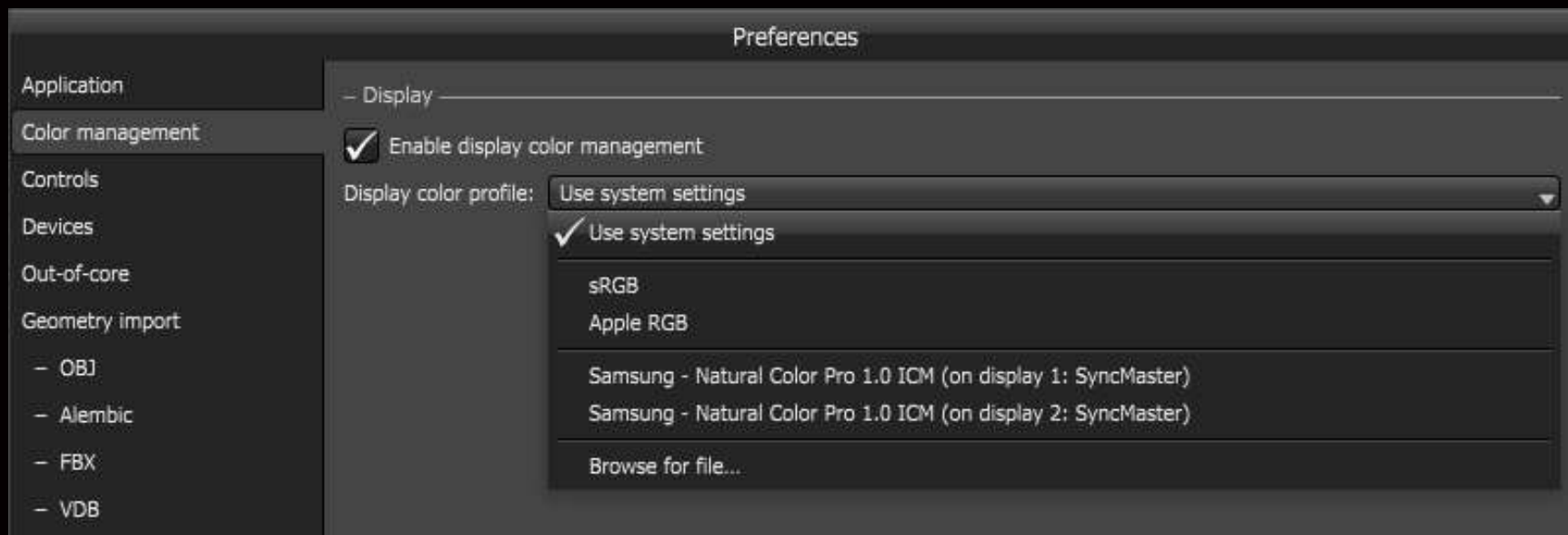
New Utility Nodes + LiveDB OSL Procedurals:





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ACES and Advanced Color Management:





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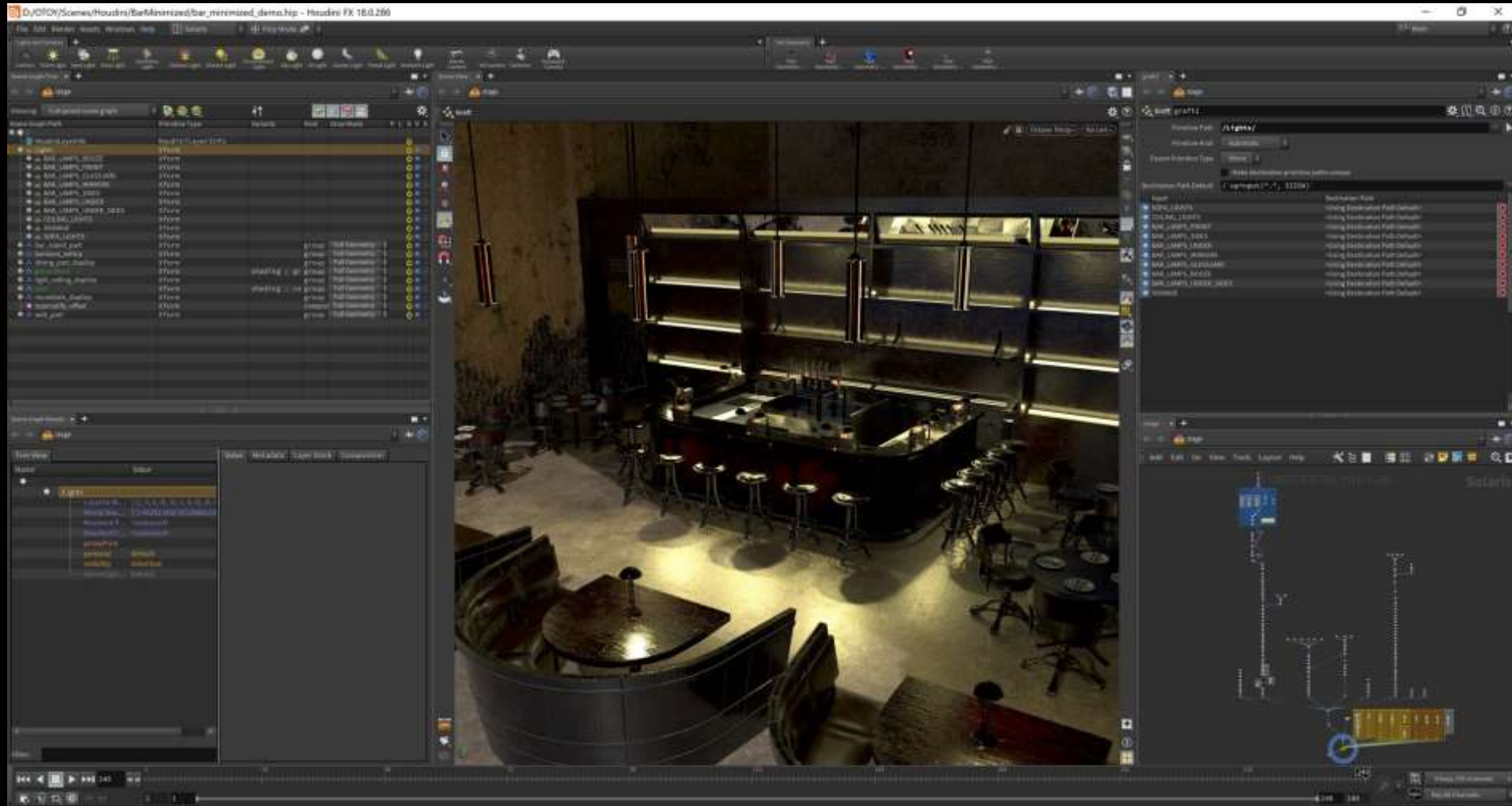
Hydra Render Delegate (Solaris / Houdini 18):





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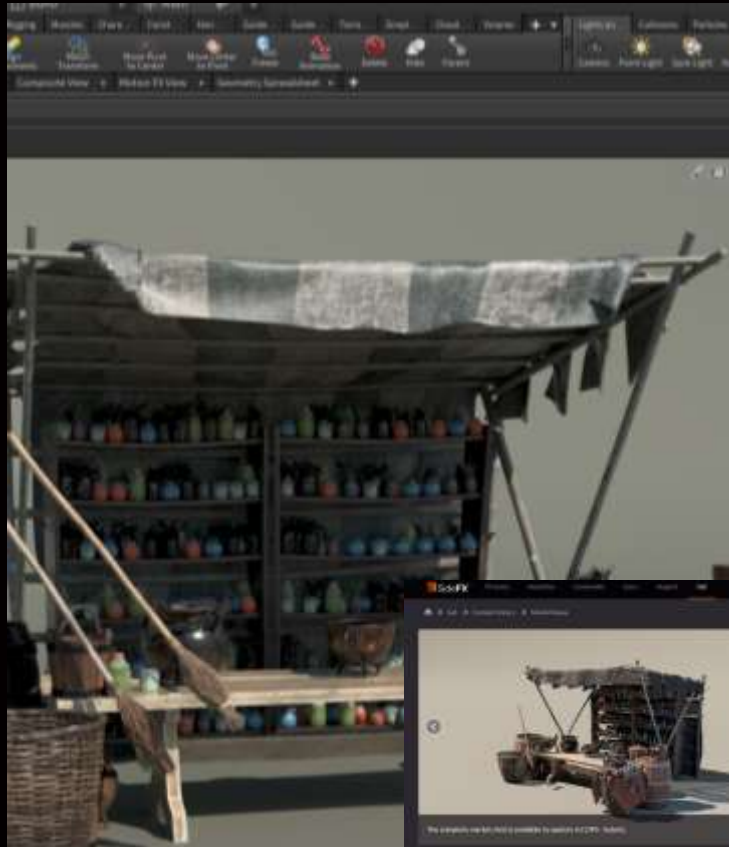
Hydra Render Delegate (Solaris / Houdini 18):





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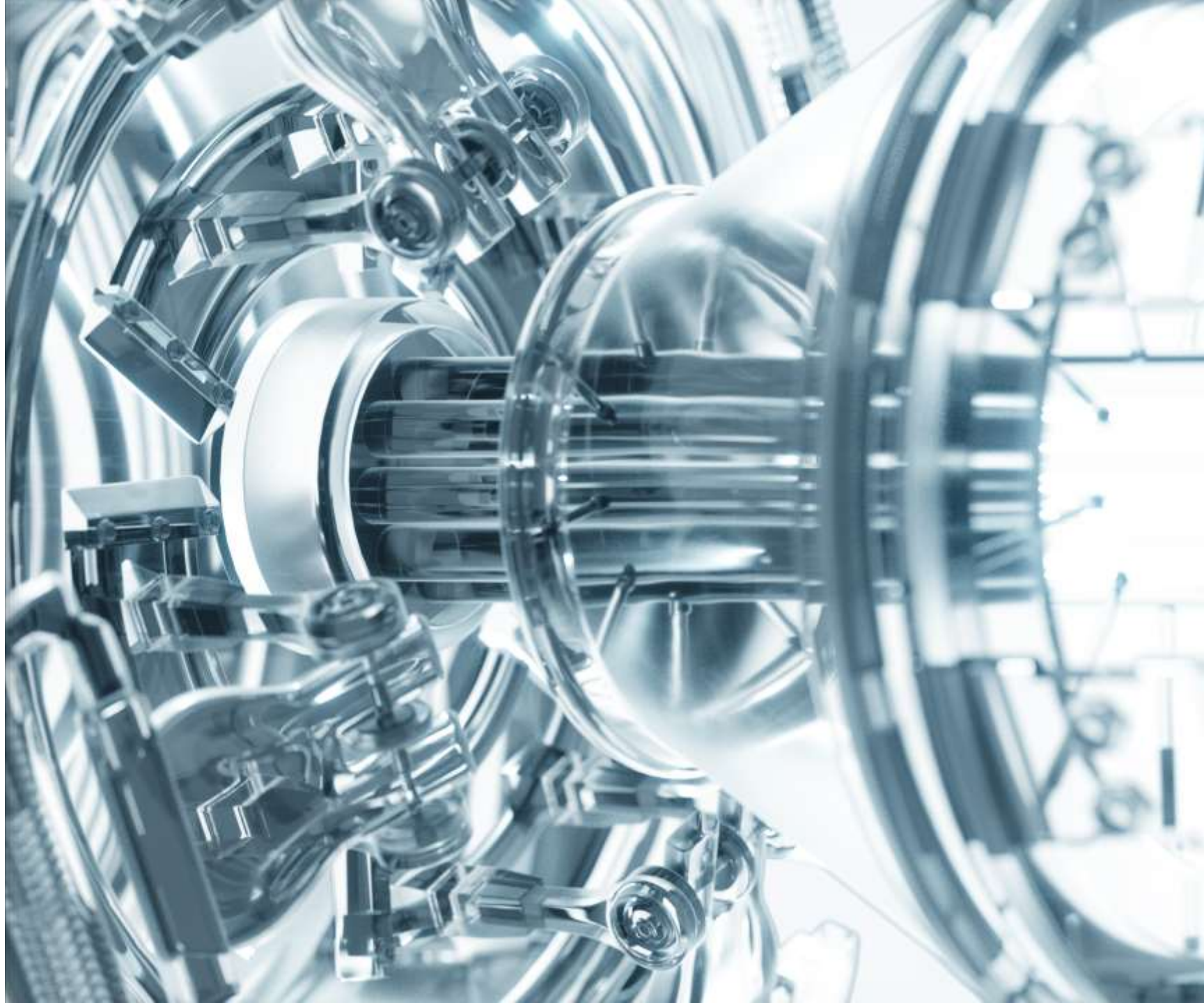
Hydra Render Delegate (Solaris / Houdini 18):



Introducing **RNDR**

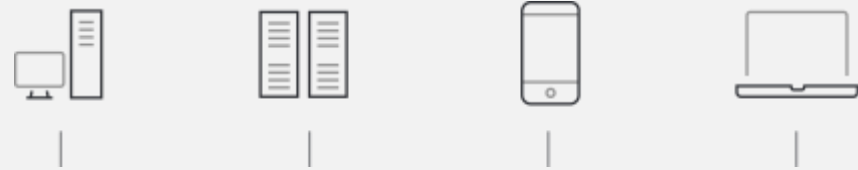
[Rendertoken.com](https://rendertoken.com)

Render Token: distributed GPU
rendering on the blockchain



THE OPPORTUNITY: THE MISSING GPU NETWORK

From smartphones to 8K televisions to the latest augmented reality devices, our visual world is evolving at breakneck speed.



GPUs are now a standard component on every phone and PC as the most efficient rendering hardware. Yet, single GPUs on devices, and even those in the cloud, are unable to individually handle the most intensive image processing demands.

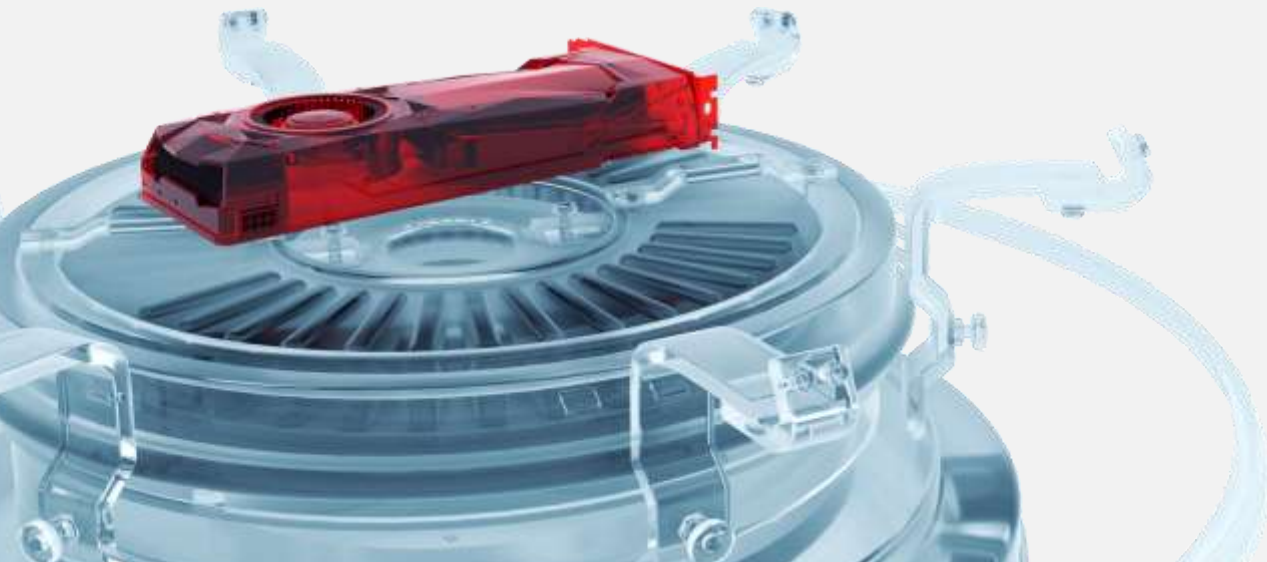
Authoring and publishing state-of-the-art graphics is an immense challenge that is growing each day.

WORLDWIDE - GPU PUBLIC CLOUD GAP

- ▲ 265 million GPUs in circulation**
- ▼ <50K GPUs for public cloud rendering

***Source:*

John Peddie Research, Market Watch, GPU Quarterly Market Report, 2nd Quarter, 2017





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RNDR – Phases 1 to 3

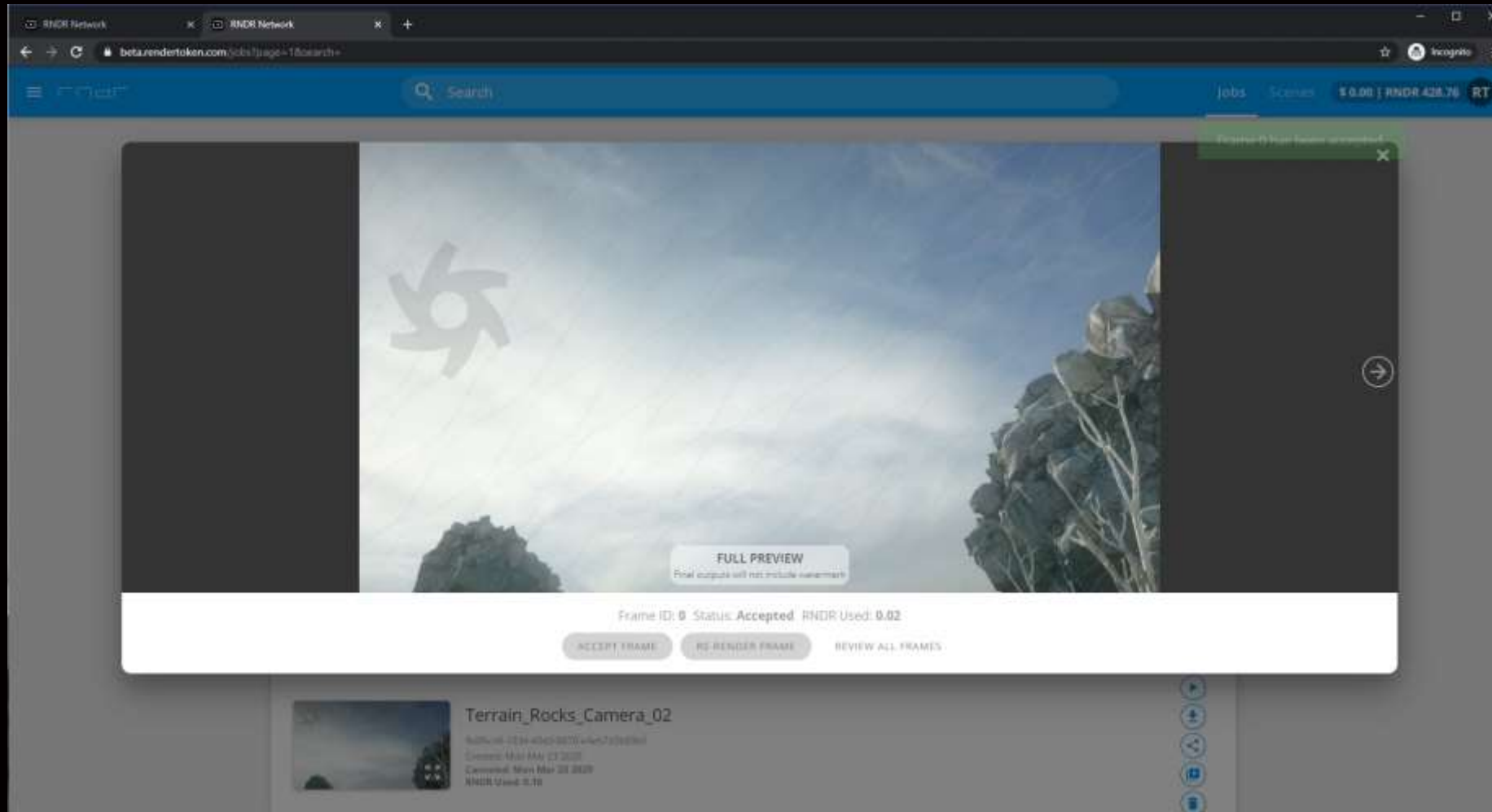
- ERC-20 RNDR tokens used to pay for cloud rendering jobs via MetaMask (same workflow as ORC)
- RNDR tokens pegged to same \$/OB hour of work done on AWS GPU instances = by ORC since 2015
- System tray applet runs decentralized RNDR jobs instead of public cloud





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RNDR – Beta





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RNDR – Beta



GPU Cloud Rendering Test on RenderToken.com

3840x1780 Pixels, 779 Frames, 5000spp, PathTracing

Rendered on 212 Distributed GPUs

Total Cost 2300 RNDR

Zepher





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RNDR – first commercial job!

Using RNDR, graphics pioneer John Knoll rendered a 4K imagery of the Apollo 15 lunar module for New York's Hayden Planetarium over a single weekend



“On RNDR, I was able to scale up a project from my local workstation to thousands of high-end NVIDIA GPUs, allowing me to meet an ambitious deadline without making compromises in final image quality,”

“Tapping unlimited capacity is a first for GPU cloud rendering, and I can see this becoming increasingly important as the industry transitions from 2K to ultra-high-resolution 4K, 8K, and immersive formats.”

John Knoll, Graphics Pioneer



More very exciting news to share...





Is coming to RNDR!



“We are really excited to be partnering with OTOY to bring Arnold onto the RNDR Network,”

“Demand for advanced rendering only continues to grow, putting pressure on artists and studios to produce more high-quality and complex content, faster than ever before. “

“By collaborating with OTOY, we hope to provide Arnold customers with the speed and scalability they need to meet demand and stay productive.”

- **Frederic Servant, Senior Software Development Manager for Arnold at Autodesk**

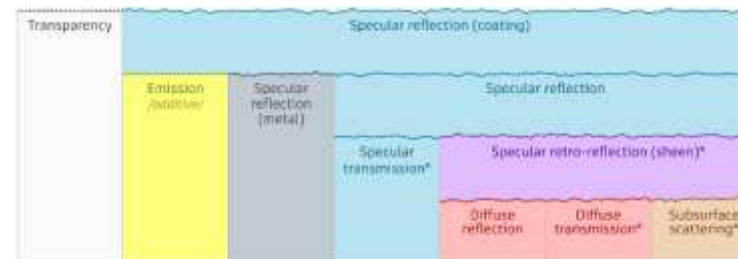


AUTODESK®
ARNOLD

OTOY and Autodesk are collaborating on making Standard Surface work between Octane and Arnold.

OTOY is making standard surface a core node in Octane.

This is a template for other renderers joining RNDR down the line...



We like Standard Surface

- Good balance:
 - More complete feature set
 - Not overcomplicated
 - Considers simplifications for preview purposes
- Well documented, well thought through
 - Crucial to adopt it partially, or evolve towards it
- First serious effort to make a collaborative BxDF UberShader
 - Included in the discussion top experts in the field



RNDR

Much more to share in the coming months!



RNDR

Next up – our public launch...



RNDR

RNDR is finally out of beta 😊



RNDR

RNDR is finally out of beta 😊

Public launch this month – open to all!





RNDR Launch

Finally out of beta - public launch this month:





RNDR Launch

Finally out of beta - public launch this month:

- RNDR Enterprise Tier – RNDR now fully replaces ORC





RNDR Launch

Finally out of beta - public launch this month:

- RNDR Enterprise Tier – RNDR now fully replaces ORC
- RNDR credits – simple way for artist to pay for jobs





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RNDR – RNDR Credits

During beta we saw friction for artists using crypto wallets for the first time on RNDR.

RNDR credits address this..





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RNDR – RNDR Credits

During beta we saw friction for artists using crypto wallets for the first time on RNDR.

RNDR credits address this..

- RNDR credits can be purchased through artists' existing OTOY / Octane account at launch
- Much simpler than crypto wallets for new users





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RNDR – RNDR Credits

During beta we saw friction for artists using crypto wallets for the first time on RNDR.

RNDR credits address this..

- 1 x RNDR credit = 1x RNDR token – (same OB/H)
- RNDR credits can be used on all RNDR tiers





RNDR – New RNDR Tiers

New Enterprise tier rolling out with current Public tier as we leave beta:

- Public Tier: fully decentralized (but untrusted) nodes
- Enterprise Tier: trusted nodes (TPN) designed to fully replace ORC jobs on public cloud





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RNDR – Public Tier

- Watermark/escrow system for proof of render
- Priority scaling / pricing
- RNDR tokens are directly accepted for jobs via MetaMask browser (full alt. to RNDR credits)





RNDR – Enterprise Tier

- TPN / MPA studio level security
- Highest end GPU systems – 8xV100 w/ 500 GB RAM
- Full replacement for ORC - with many new partners!





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RNDR – Enterprise Partners

+ ADD PNG OUTPUT

+ ADD EXR OUTPUT

3. Network Settings

Tier selection will influence price and render speed.

Tier ?

Tier 1: Trusted Partners

Frame Approval ?

RNDR gives artists the opportunity to review frames prior to acceptance and the power to request a re-render if the frame does not look correct. Due to the requirement for approval, job outputs cannot be downloaded until the entire job is completed and approved. Selecting "Pre-Approve" removes the approval flow from the process and allows all outputs to be downloaded as they are completed. If selected, a new job will need to be created to re-render any incorrect frames.

Powered by MPAA Compliant Partners AWS and Google Cloud



Select Frame Approval Method

- ☐ Manually Review Frames
- ☒ Pre-Approve Frames

4. Generate an Estimate

An estimate must be generated prior to job creation.
Estimates are not binding. Price will be determined based on actual render time.





RNDR – Phase 4

- All ORBX asset and author hash and GUIDs are decentralized for IP rights systems in phase 4
- Phase 4 will enable real time (low latency) streaming as RNDR work (essentially replacing x.io service today)





RNDR – Phase 4

- RNDR SDK will enable new extensions and services to be offered by anyone through the RNDR blockchain





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RNDR SDK



RNDR SDK: Overview

- RNDR SDK is a fully portable graphics, AI and compute framework
- Used for internal and external development of software apps & modules on the RNDR network
- All OTOY software and services, from Octane X onwards, are built using the RNDR SDK





RNDR SDK: Tools and Publishing System

Creators, artists and developers on can build and publish services on RNDR with the RNDR SDK

- 3rd parties can create and publish RNDR modules that extend any part of the ORBX node graph
- RNDR modules are published on the blockchain in ORBX packages (same as ORBX scenes for RNDR jobs)





RNDR SDK: Tools and Publishing System

Creators, artists and developers on can build and publish services on RNDR with the RNDR SDK

- RNDR modules are authored in GLSL and C++ - all inside Octane just like OSL/Script nodes
- RNDR Binary linking system can be used to securely publish commercial RNDR modules (just as we do for Octane)





RNDR SDK: More than just Rendering

RNDR modules can replace or add to any aspect of real time or offline pipelines expressed in the node graph:

- Beyond Brigade and Octane: Mix or swap 3rd party Hydra Render Delegates in real time viewports or offline jobs on the RNDR network
- New modelling, Scene graph, layout, compositing, physics, simulation and dynamics modules are in development





RNDR SDK: GPU cross compiler

RNDR has backends for CUDA, x86, Vulkan, D3D & Metal:

- Octane and other software can reach millions of new devices!





Octane X

10th Anniversary



Octane X

- Octane X – our 10th anniversary edition of Octane
- Octane coming to millions of new devices – i.e. Intel MacBooks and iPhones!





Octane X -> Metal

- 10 years of Octane code - rebuilt from scratch, line by line, in GLSL and MSL (RNDR SDK)
- Metal version – full feature | pixel parity w/ Octane 2020.2 and later...





Octane X

Headless Mode



Octane X

- Octane X Mac/iOS = host / master node
- Octane 2020.2 = GPU slave node
- CUDA slaves can use RTX, OOC, etc...
- Net render works over LAN or WAN
- HDR local tone mapping for WCG displays

Headless Mode (LAN)
Running over local Wi-Fi:





Octane X

- Octane X Mac/iOS = host / master node
- Octane 2020.2 = GPU slave node
- CUDA slaves can use RTX, OOC, etc...
- Net render works over LAN or WAN
- HDR local tone mapping for WCG displays

Headless Mode (WAN) Running on 4G Mobile Hotspot:





Octane X

Intel | MacBook



MacBook | Intel

- Octane X running on Intel chips in MacBooks!





MacBook | Intel

- Octane X running on Intel chips in MacBooks!



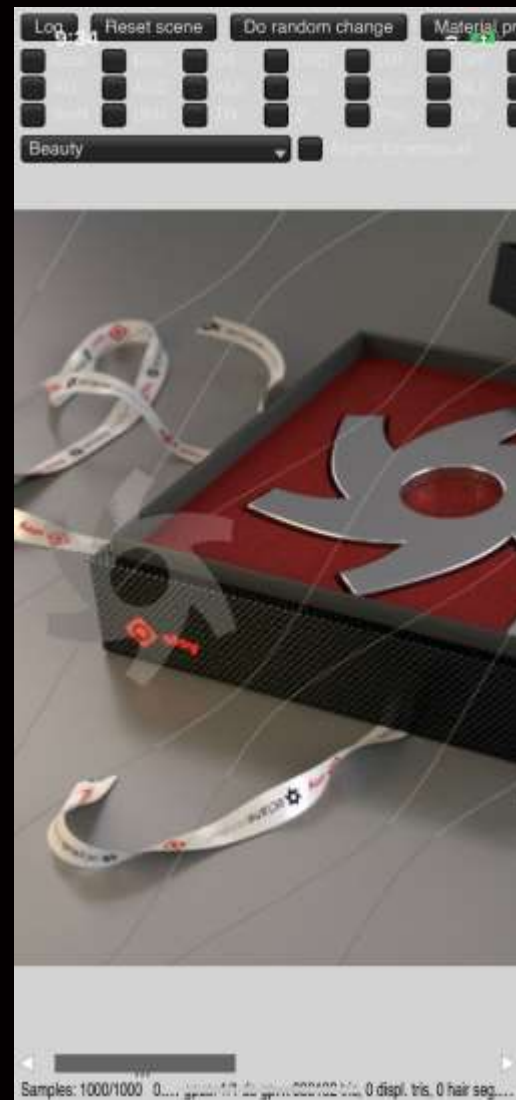


Octane X

iOS | iPhone 11 😊



Octane X | IOS – years of work – finally done!



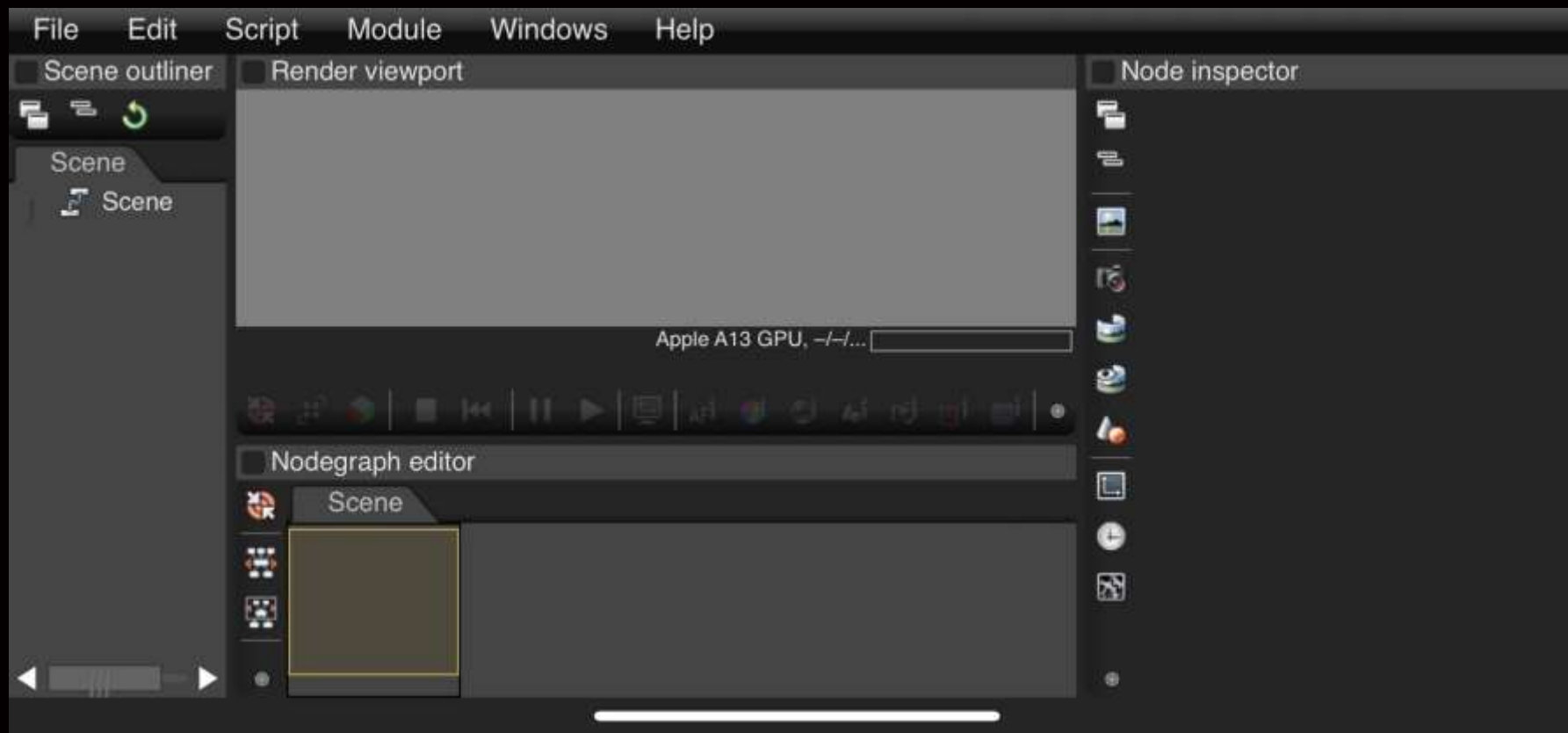


Octane X

Mobile UX

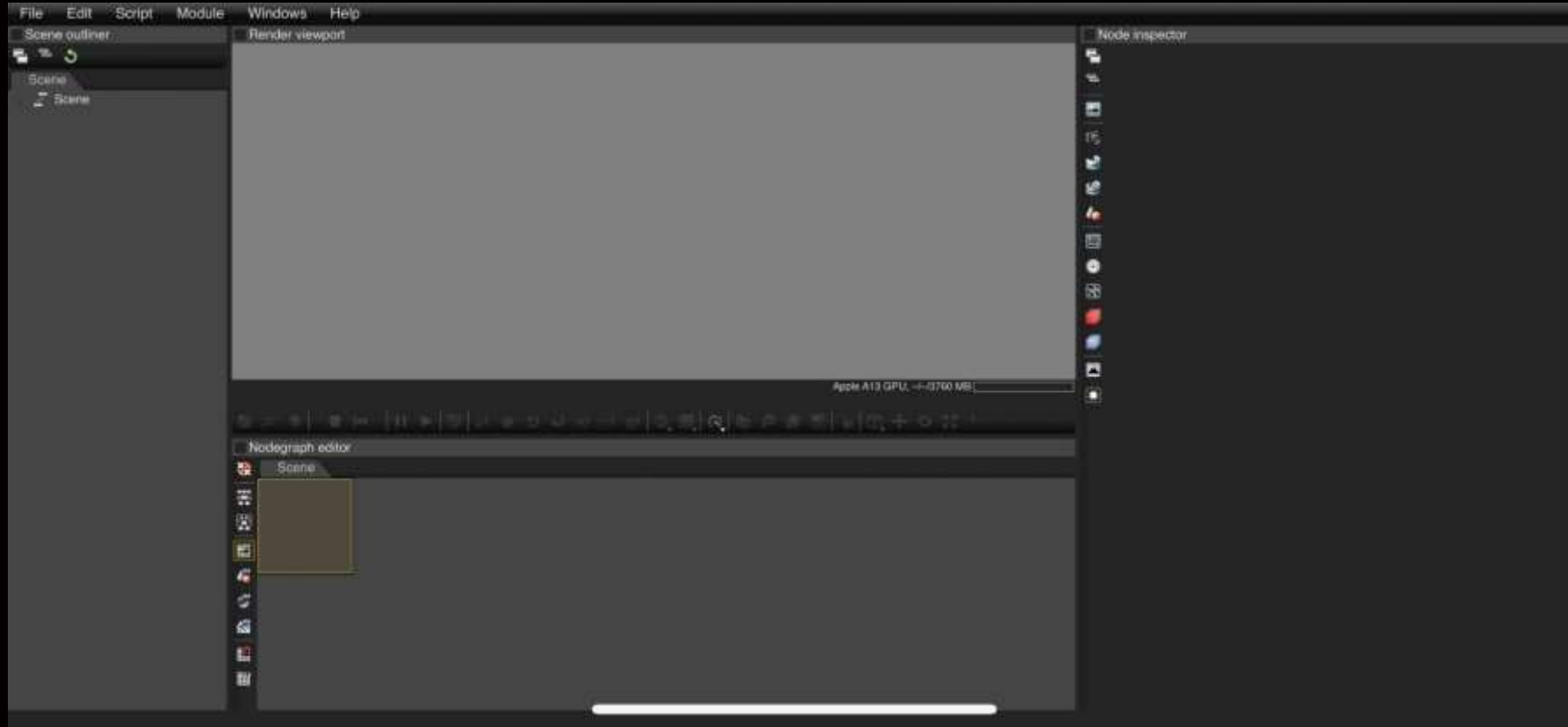


Octane X | IOS – Low DPI UI scaling (local iPhone/Touch Display)





Octane X | IOS – High DPI UI scaling (external TV/ UHD monitor)





Octane X

ORBX Files



Octane X | IOS – sync ORBX files from MacOS...



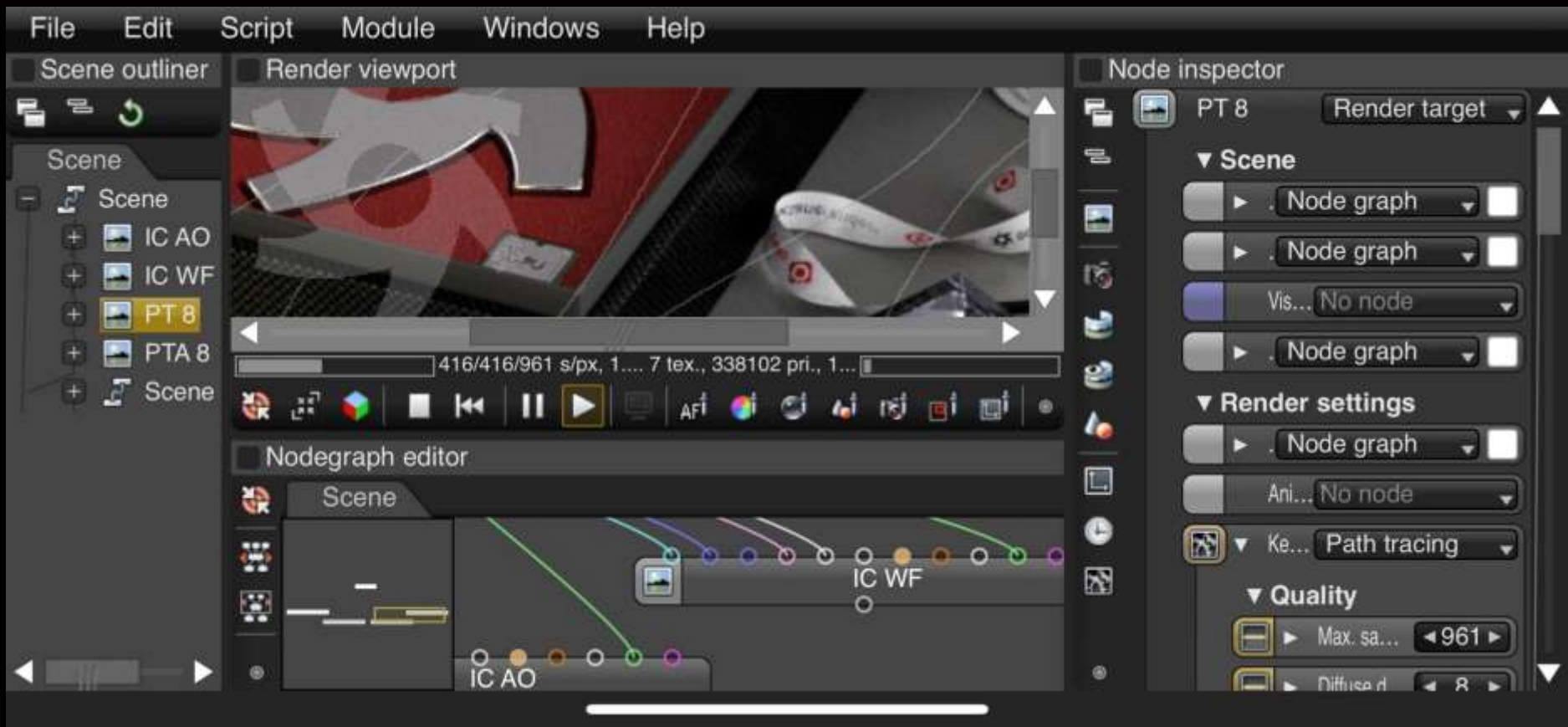


Octane X | IOS – or load ORBX files from iOS files app...





Octane X | IOS – then render! 100% identical to Octane on desktop!



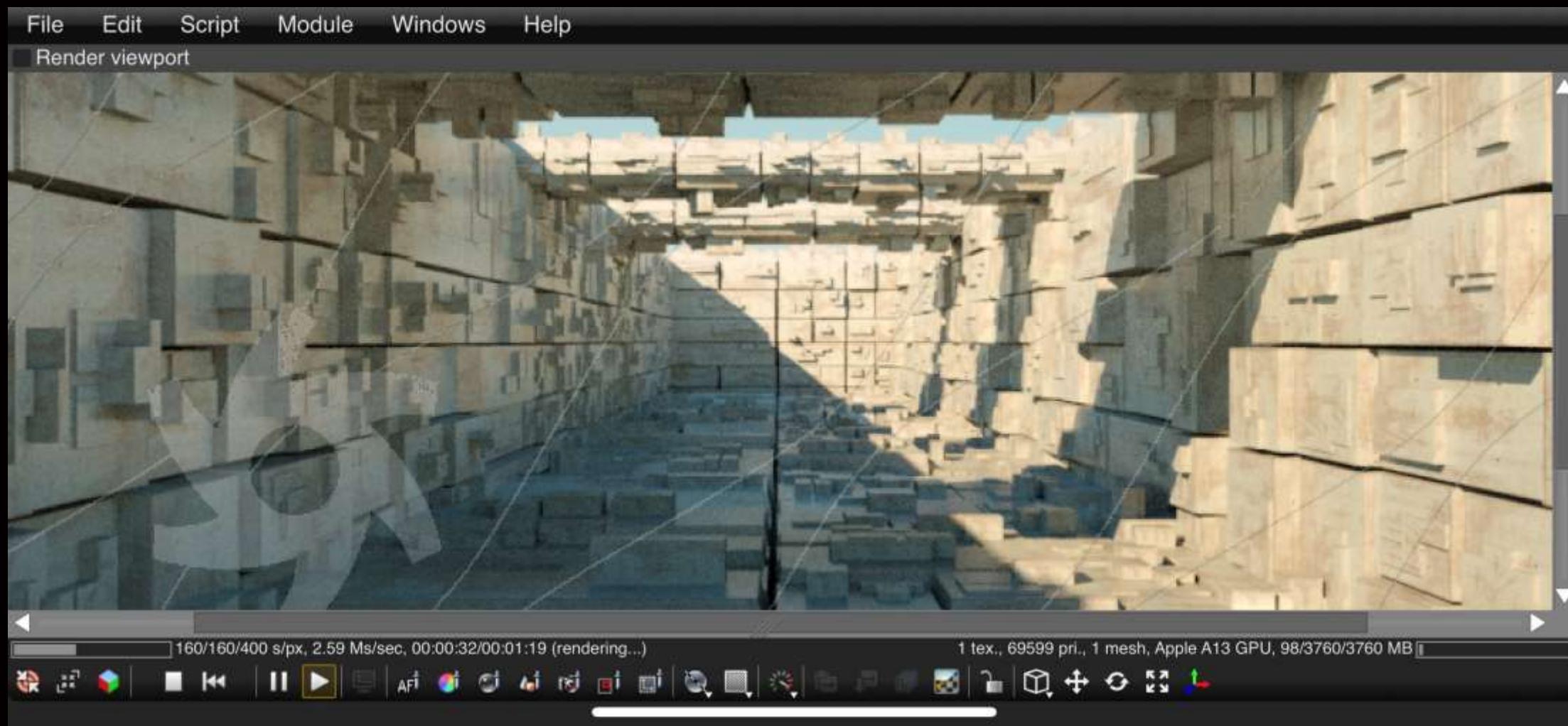


Octane X | IOS – then render! 100% identical to Octane on desktop!



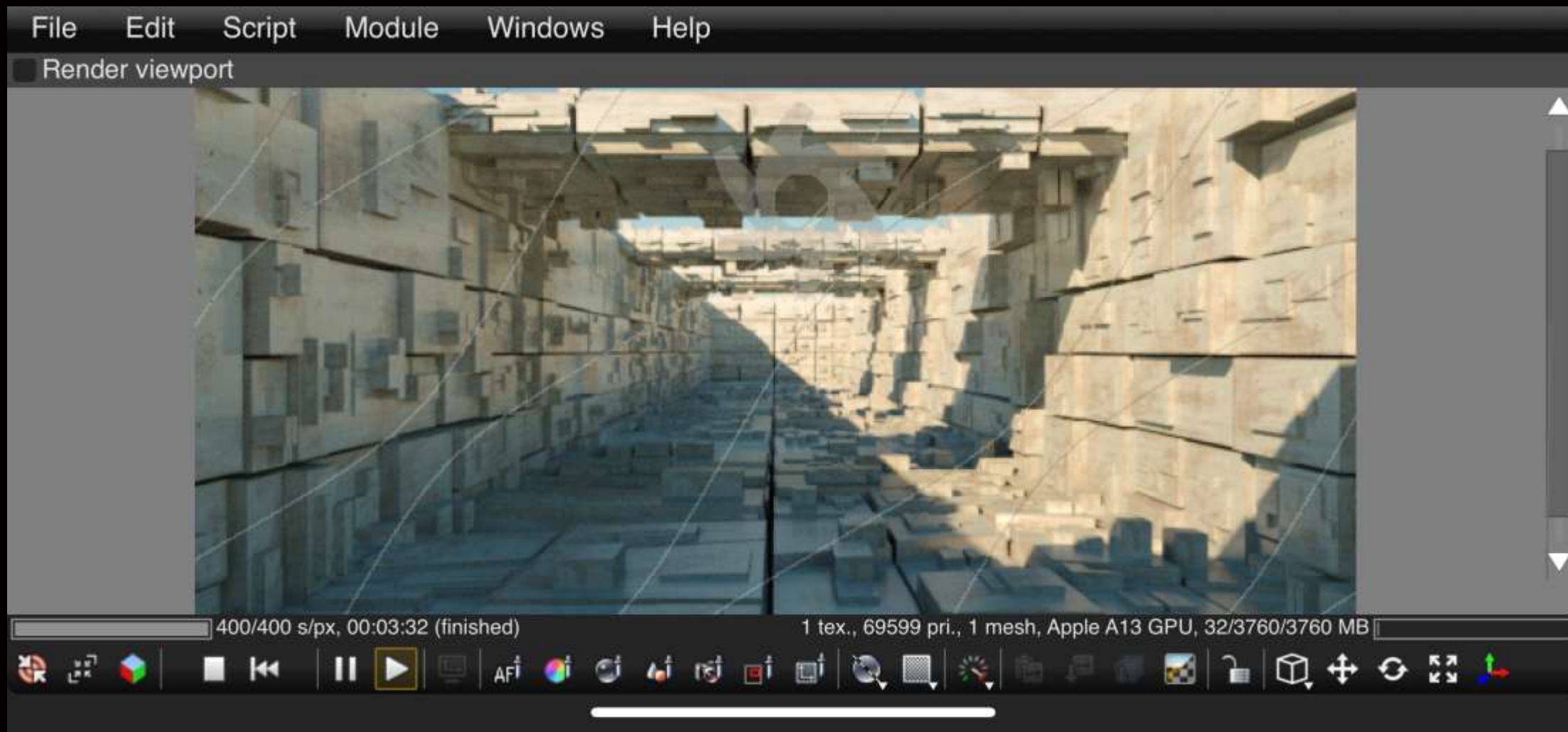


Octane X | IOS - ORBX renders identically to Octane 2020.2 desktop!



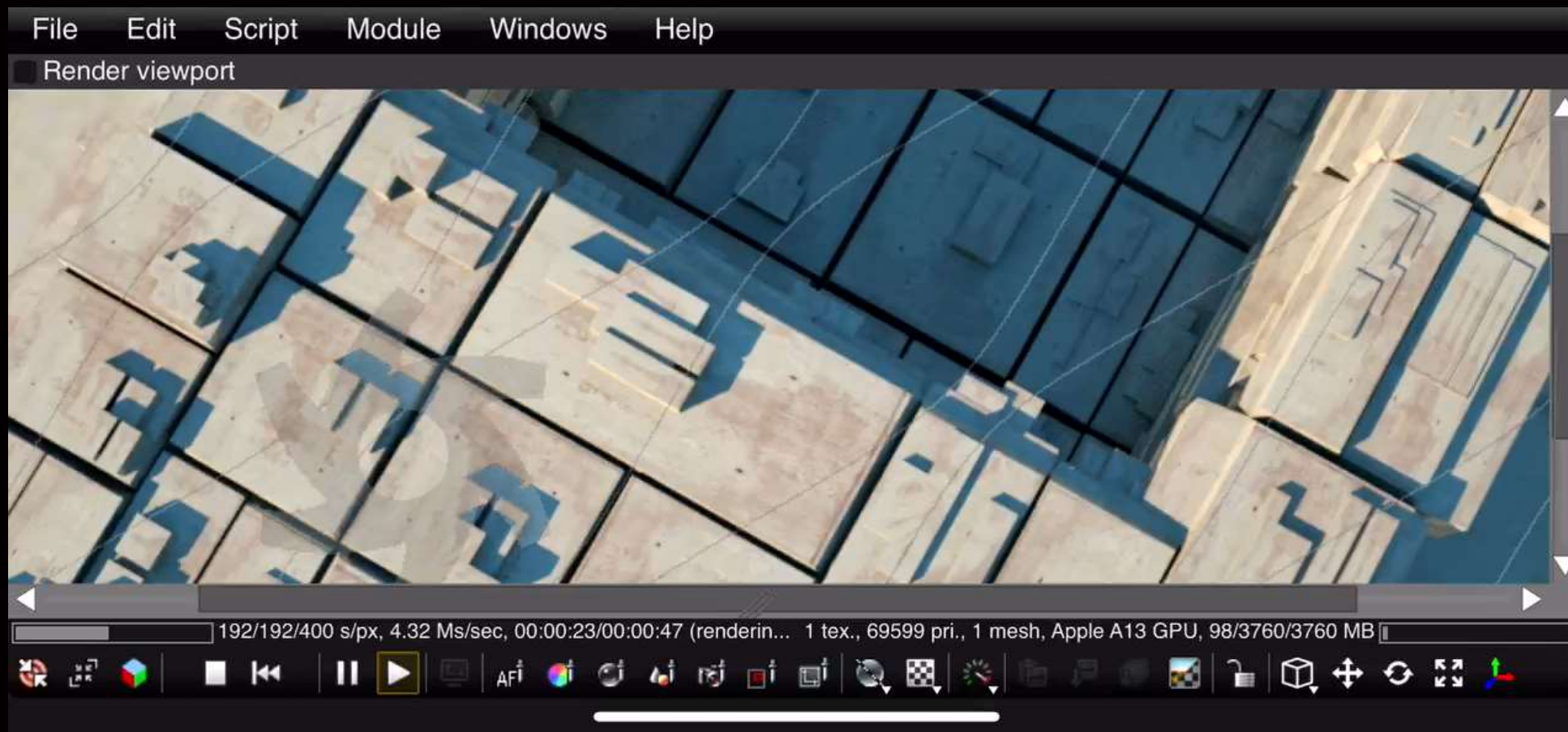


Octane X | IOS – Final frame iPhone 11 - ~speed of 13" MacBook Pro!





Octane X | IOS – Mobile standalone app... everything just works!!





Octane X | IOS – Path Tracing Kernel:
pixel parity with Octane 2020.2+ on desktop!



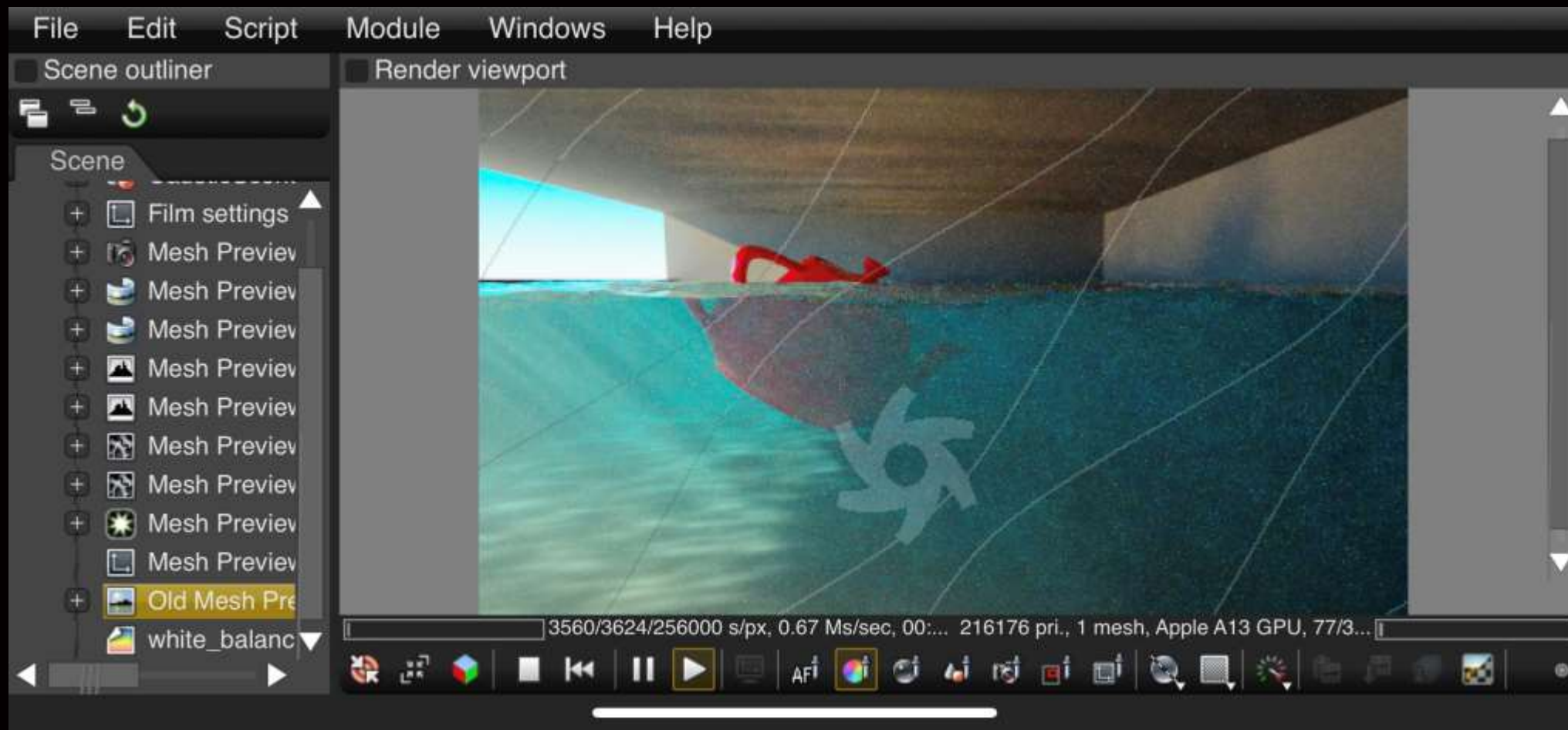


Octane X | IOS – Path Tracing Kernel: pixel parity with Octane 2020.2+ on desktop!





Octane X | IOS – PMC Kernel! 😊
pixel parity with Octane 2020.2+ on desktop!





Octane X | IOS – PMC, Random Walk SSS – pixel parity w/ Octane desktop!



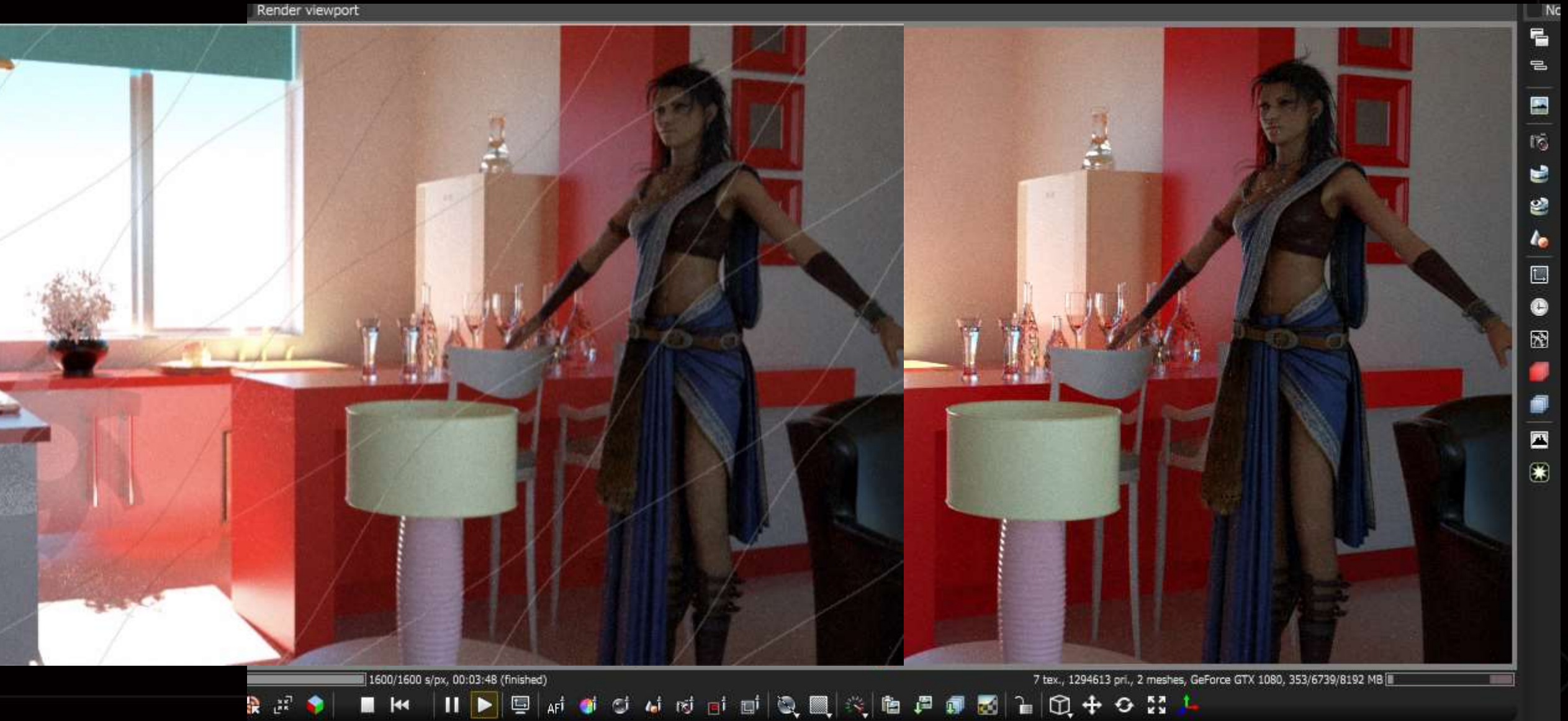


Octane X | IOS – PMC, Random Walk SSS – pixel parity w/ Octane desktop!



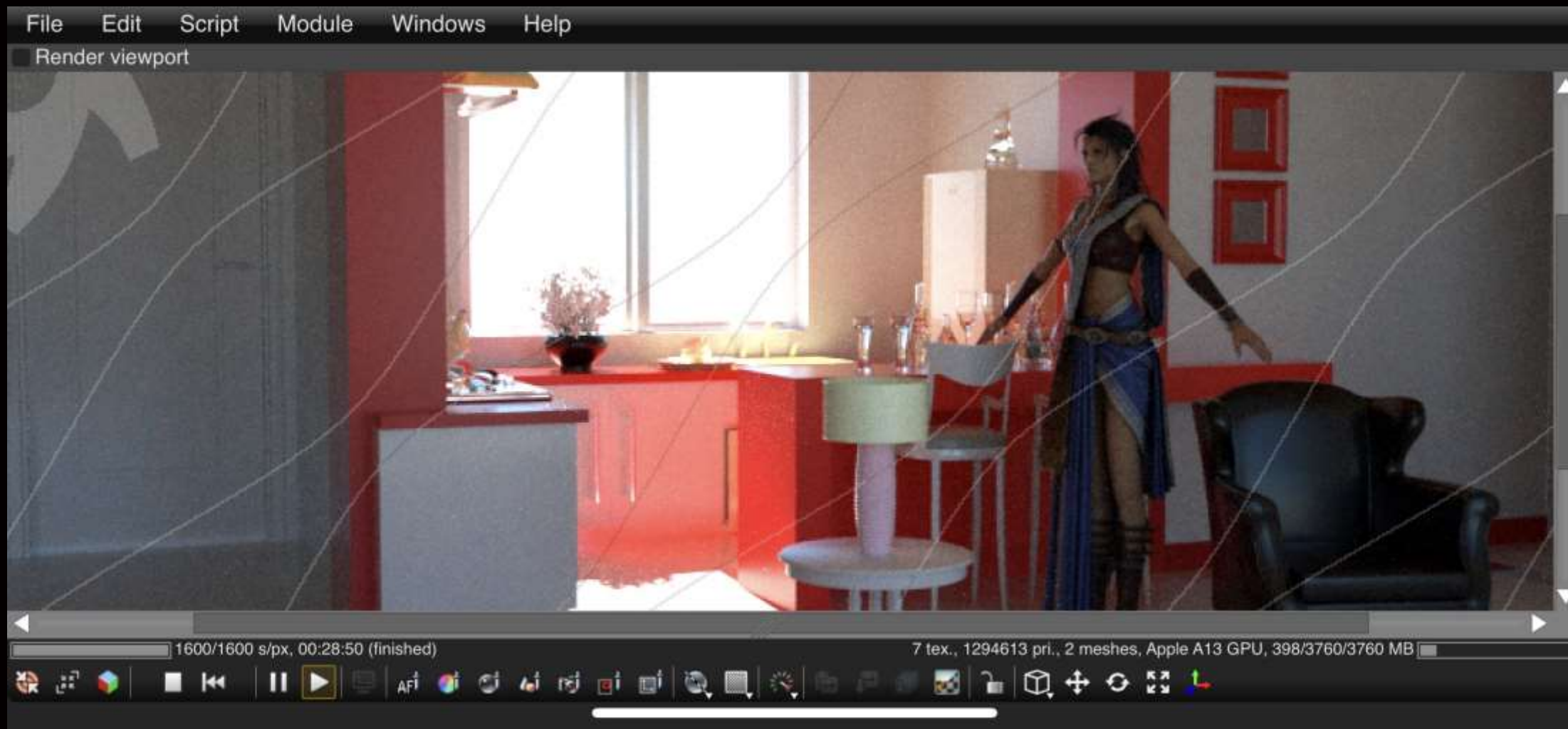
Octane X | PMC Kernel
iOS A13 iPhone (left)

Octane 2020 | PMC Kernel
WIn10 GTX 1080 (right)





Octane X | IOS – UHD final frame output – my iPhone is a render farm!



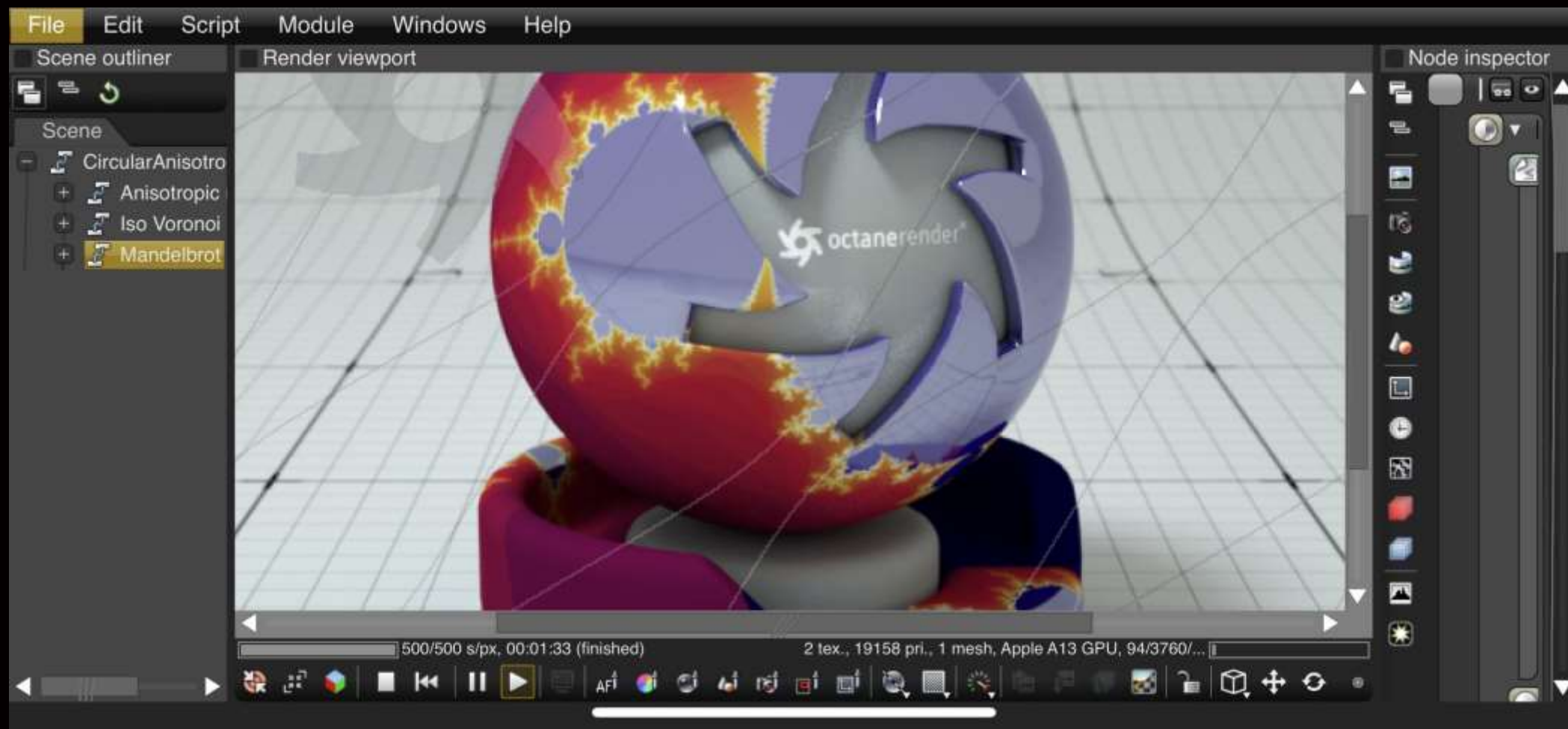


Octane X | IOS – OSL & Script Node Editor





Octane X | IOS – OSL shader compiler fully working on iOS!





Octane X | IOS – OSL shader compiler fully working on iOS!



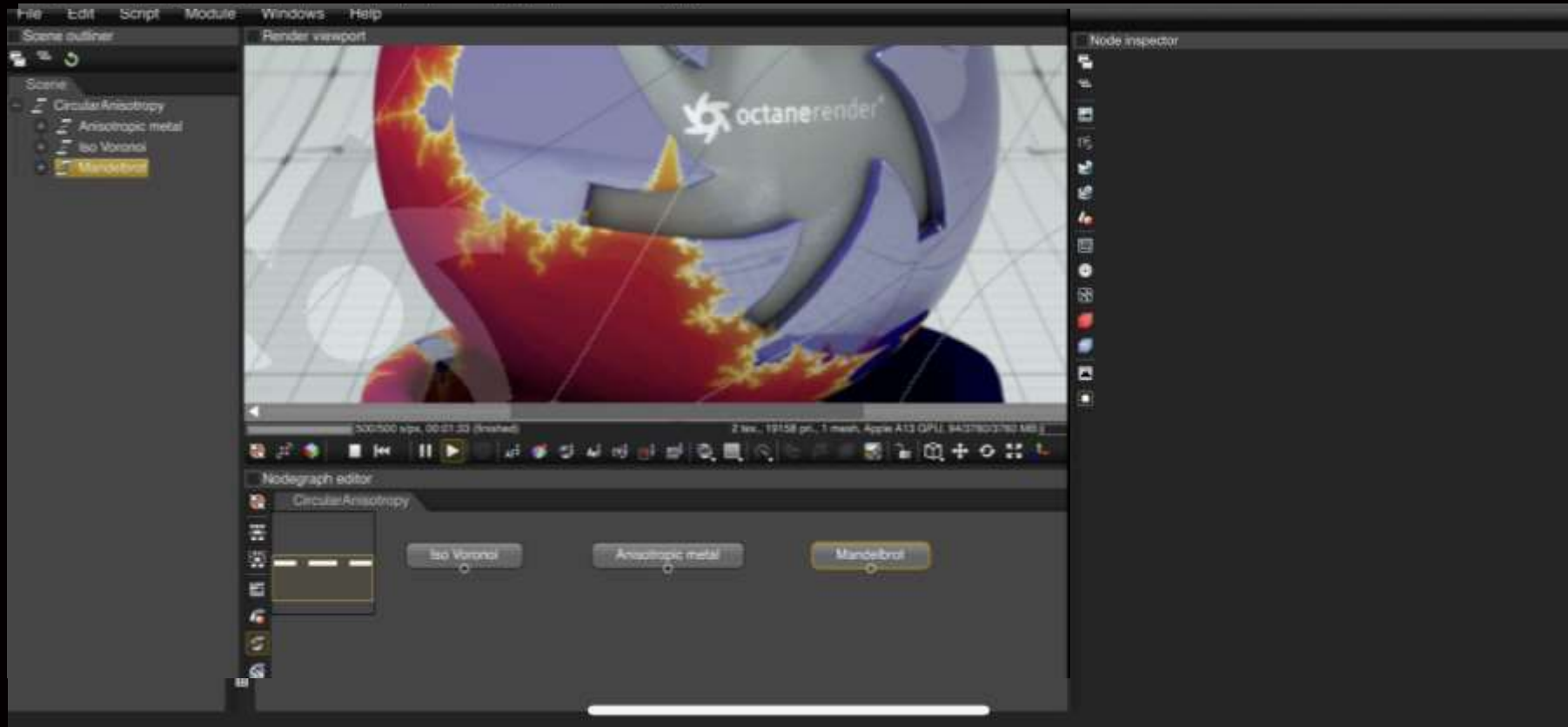


Octane X | IOS – Low DPI UI scaling (local iPhone/Touch Display)





Octane X | IOS – High DPI UI scaling (external TV/ UHD monitor)





Octane X | iOS

- Octane X for iPhone can also kick off cloud jobs to RNDR





Octane X | iOS

- Octane X for iPhone can also kick off cloud jobs to RNDR
- iPhone 11 running Octane X as render slave can double the rendering speed of MacBook :)





octanerender

Roadmap





2020 | Roadmap

- We have added a ton of features in the last 12 months.... 😊





2020 | Roadmap

- We have added a ton of features in the last 12 months.... 😊
- Major new updates underway for the coming year
– driven by user feedback





octanerender

2020.2





2020.2 | Roadmap

- Our next update is 2020.2 – ETA summer





2020.2 | Roadmap

- Our next update is 2020.2 – ETA summer
- Stability and performance will be the primary focus for this release...





2020.2 | Roadmap

- Also a priority – a major RTX overhaul...





2020.2 | Roadmap

- Also a priority – a major RTX overhaul...
- GOAL: No need for “RTX off” anymore!





2020.2

RTX | Always on!



RTX | 'Always on'

- "RTX on" will now support out of core memory – even faster than OOC with "RTX off"!





RTX | 'Always on'

- "RTX on" will now support out of core memory – even faster than OOC with "RTX off"!
- New RTX speed optimizations for splines, curves, dirt, round edges





RTX | 'Always on'

- "RTX on" will now support out of core memory – even faster than OOC with "RTX off"!
- New RTX speed optimizations for splines, curves, dirt, round edges
- Much lower memory footprint for RTX meshes





2020.2

Stability | Core



Stability | Core

- Multi-Process Mode (i.e. GPU render failures don't take down host DCC app)





Stability | Core

- Multi-Process Mode (i.e. GPU render failures don't take down host DCC app)
- Automated GPU Error Reporting System





Stability | Core

- Multi-Process Mode (i.e. GPU render failures don't take down host DCC app)
- Automated GPU Error Reporting System
- AI Denoiser: AVX2 (CPU SIMD) fallback support





Memory | Core

- Optimization and hardening of out of core
- Improve mixing of out of core and NV Link
- Auto-convert single channel RGBA image textures to greyscale image textures (less memory)





Volumes | Core

- Ignore volumes in the focus, target and material picker
- Make the random walk medium render to non-transparent if applied to volumes
- Fix invisible lights in volumes





2020.2

RNDR Network



RNDR Network

- Delta sync to RNDR in all DCC toolchains





RNDR Network

- Delta sync to RNDR in all DCC toolchains
- Improved ORBX export for C4D / H18 procedurals



What's next...

HANNAH



RNDR Modules

Plug-ins for all DCC integrations



sculptron™





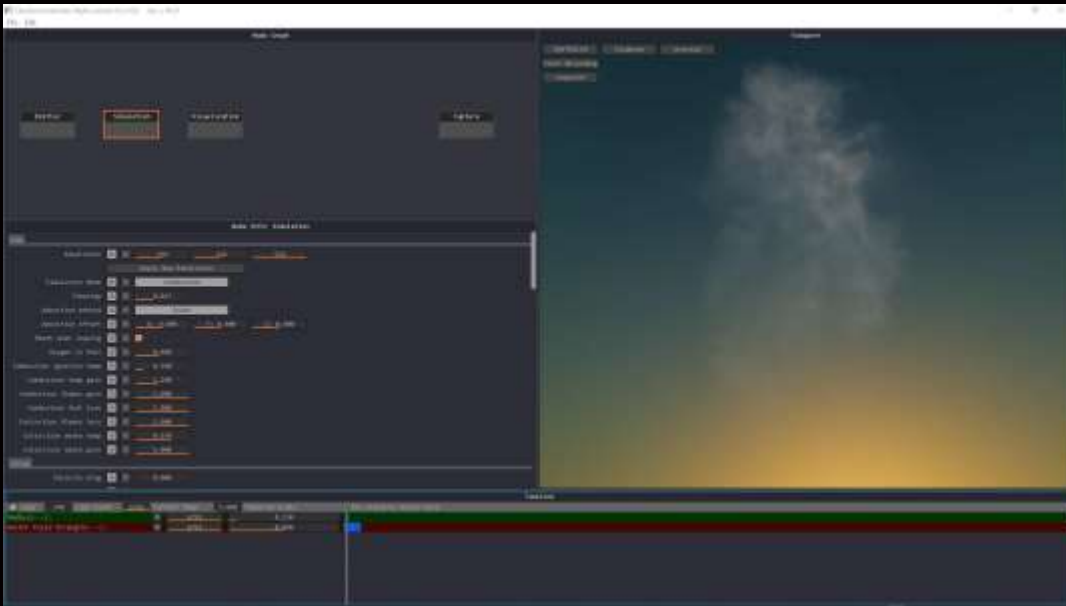
JangaFX

We are Joining forces!





EMBERGEN FX



- Standalone tool this summer for all Octane users!
- OTOY and JangaFX co-developing a full integration
- It will work inside of Octane and all DCC plug-ins!



EMBERGEN FX



EMBERGEN

JangaFX

Courtesy @romanbulygin





EMBERGEN

sculptron™





Feature Roadmap

Octane community is helping us rank this year's highest priority feature requests:

PRIORITY	FEATURES / IMPROVEMENTS
20	Stability (Octane running as independent process)
9	Scatter/Cloners should either be baked on ORBX or
9	Eevee-like "fake" Volumetrics
8	Scatter should follow animated geometry
8	Nested instances
6	ACES Support
6	Faster Volumetrics
6	Xp trails colors same as particle color
6	Splines as render instances
3	AOV Revamp
3	Trace Sets -Remove objects from reflections (make
3	Direct to RNDR upload from C4D plugin

All feature requests posted prior to the 4th of December 2019 have been removed, implemented.

Highest voted requests	
Recent	Most viewed
▲ +12 ▼ votes	0 requests
Adaptive subdivision requested Jan 4, 2019 in Rendering by Kaike (1,036 points)	
adaptive subdivision	
▲ +9 ▼ votes	0 requests
LightMix as in Corona Render requested Dec 4, 2019 in Imaging / Post-Processing by Kaike (1,260 points)	
light pass mix	
▲ +7 ▼ votes	0 requests
random colour by mesh requested Dec 5, 2019 in General by Hfiet (560 points)	
▲ +6 ▼ votes	0 requests
Geometry based displacement requested Dec 4, 2019 in Rendering by Kaike (1,287 points)	
displacement	

Vectron feature suggestion

03/25/2020

Scappin Matteo - Jesper Nybroe
[Machina-infinitum.com](https://machina-infinitum.com)

1. Vectron volumes in cinema 4d, currently the only option from the standalone.
2. Vectron volumes with proper medium scattering and with uv coordinate, gradient osl script, like the non-v

the perfect way of doing emission vectron volume w based on iteration number like in this example
<https://www.youtube.com/watch?v=E8n5chNZTww>





Fast Nested Dielectrics

Fully optimized - no speed hit 😊

Fluid/glass rendering is far simpler for scenes like this:



Octane scene and images by @silverwing





Curvature Node

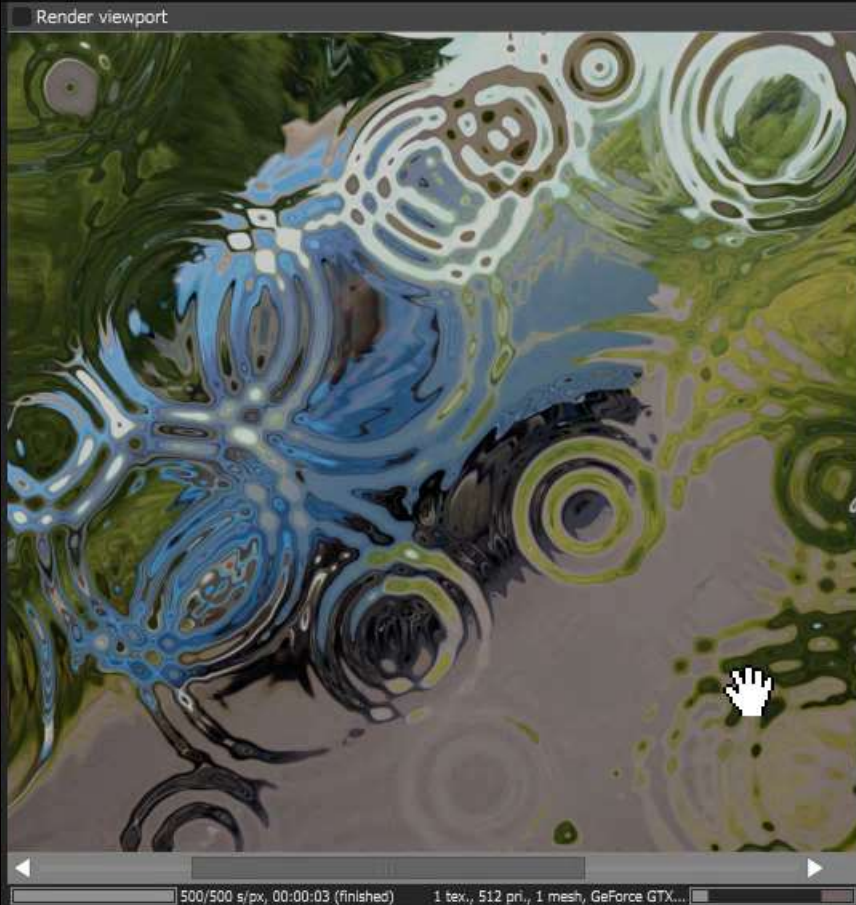




octanerender

UVW deformations from texture input

Render viewport



Node inspector

2D texture

cm ☐ Use custom object size 0.1000

Samples per pixel 64

File name

Texture: Base rain

Projection Mesh UV

UV set: 1

Parameters

Time:	-1.742
Rain speed:	0.600
Ring count:	3.000
Ripple speed:	4.000
Iteration count:	4
Strength:	0.300
Seed:	0
Scale:	1.000
Sharpness:	6.000

500/500 s/px, 00:00:03 (finished) 1 tex., 512 pri., 1 mesh, GeForce GTX...





octanerender

Chaos Texture Mapping | Tiling





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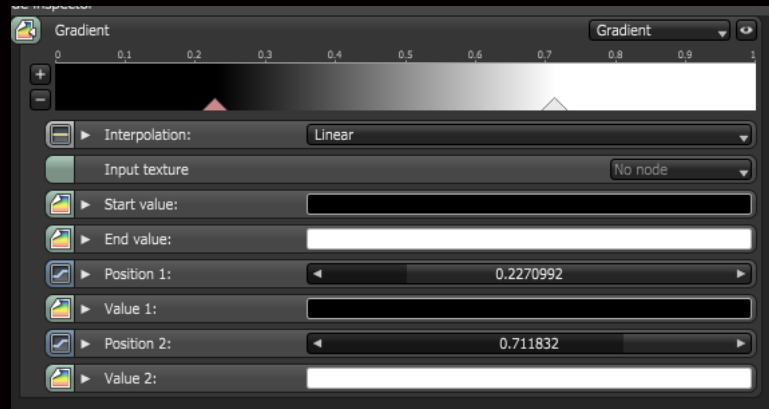
Chaos Texture Mapping | Tiling





New Gradient Tools

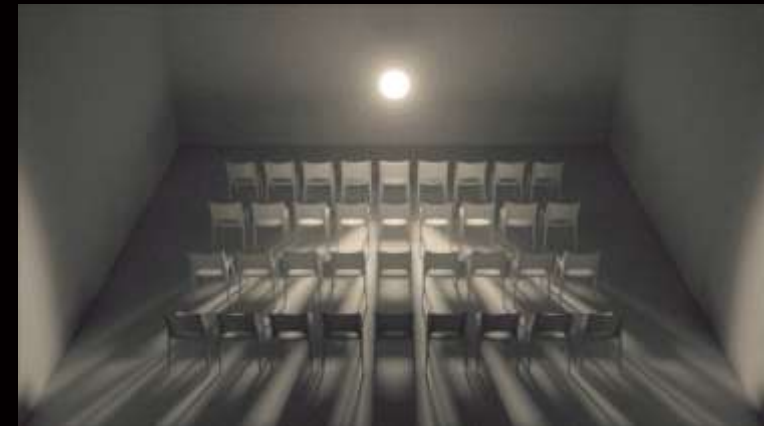
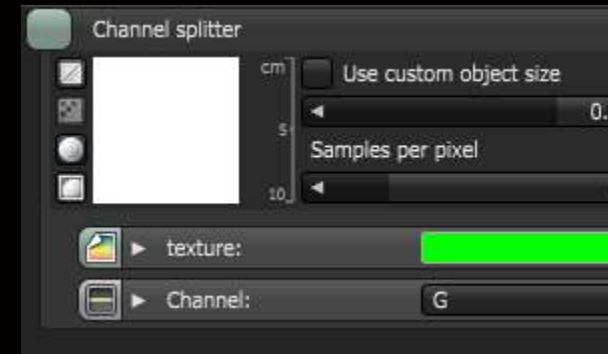
- Gradient generator node - creates a greyscale value from UVW position (e.g. "saw wave" or "sine wave")
- Gradient texture node - new static position inputs:





Native Utility Shaders

- RGB | HSV splitter / combiner
- RaySwitch nodes
- Math, Logic and State nodes





New Texture Features

- Mipmaps
- Parallax Occlusion Map





New Texture Features

- Rounded Edges Texture
- Random Color Texture - unique colors per object layers and instances





New BRDF Features

- GTR Microfacet BSDF - tail blurring factor for GGX
- Multi-scatter GGX – energy preserving BRDF

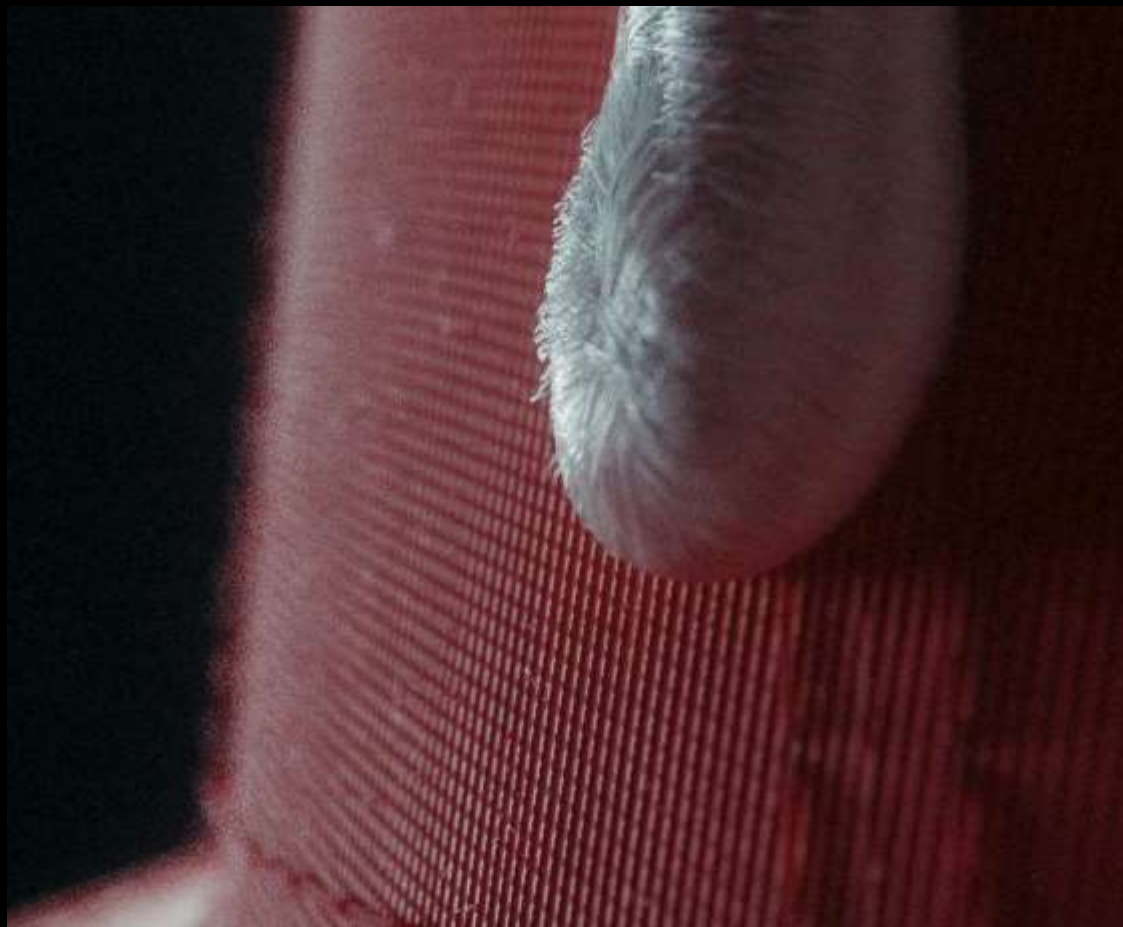




New Fabric Material

Spectral Fabric BRDF – micro-thread cloth and weaves

Improved fabric and cloth rendering in scenes like this one:



Post Processing



octane render

Fast Fog – both as Post Effect and Shader





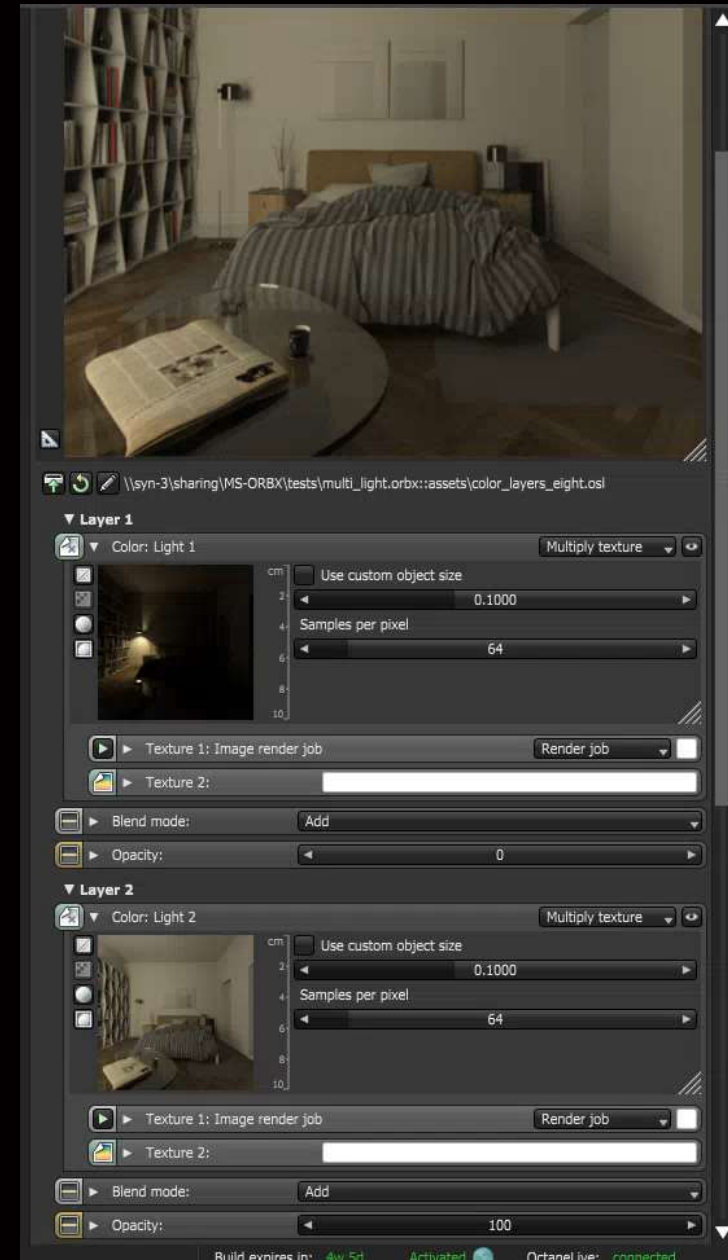
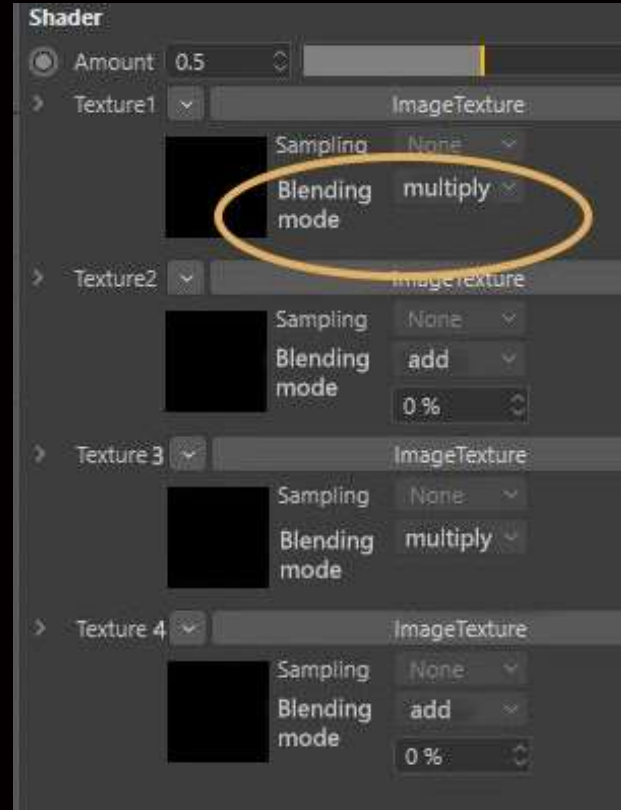
New Post Processing Stack

- Revamped Imager nodes (i.e. sharpening, contrast, gain, temperature based white balance, etc.)
- Compositor Node Graph – PS blending and processing render passes, multi-light with OSL, filters and shaders





Compositor Node Graph





AI Style Transfer Nodes

e.g. combine Octane + DeepDream – as in this video:



Octane scene and images by @shapiro500 and @moon_scooters





Major AOV Overhaul

- Custom AOV support via textures / shaders / LPE
- AOV driver nodes for explicit control of file format output perpass (e.g. DWAA, DWAB compression settings for EXR)



Rendering and Motion Sampling



New Camera Features

- Multi-Region Rendering
- Depth of Field - on/off toggle
- Lens FX – new physically based lens effects





Universal Camera: 'Lens FX'

New physically based lens effects in Universal Camera:

- Chromatic Aberration
- Lens Flares
- Optical Zoom Motion Blur





Motion Blur Improvements

- Motion blur for HDRI environments
- Volume instance motion blur
- Motion blur for texture displacement





New Time Node

- Linear transformation of the time of nested node graphs
- Time shifting of animated geometry / ORBX proxy
- Granular time warping in scene graph or imager



Geometry



New Geometry Features

- Adaptive subdivision for vertex displacement
- New Parametric Spline and Curve primitives
- New Geometry Boolean operators





Coordinate Mapping Updates

- Smooth Tangents - vertex tangent Interpolation for anisotropic materials (and better parallax occlusion)
- UVW packing - for compiled DCC primitives (instead of UV). This can be used by plugins to "pin" procedural textures to deformed textures





New Spectron Lights

- Spectron parallel light
- Spectron parametric spotlight
- Spectron disc and tube light primitives





New Spectron Lights

- Spectron Mesh Light (faster than emissive material)
- Spectron Portal light
- Spectron dome light (connectable to portals)





New Spectron Features

- Spectron OSL Filters: Light Decay | Blocker
- Spectron Light Manager
- Spectron Scatter (high performance particle shaders)





Spectron Scatter

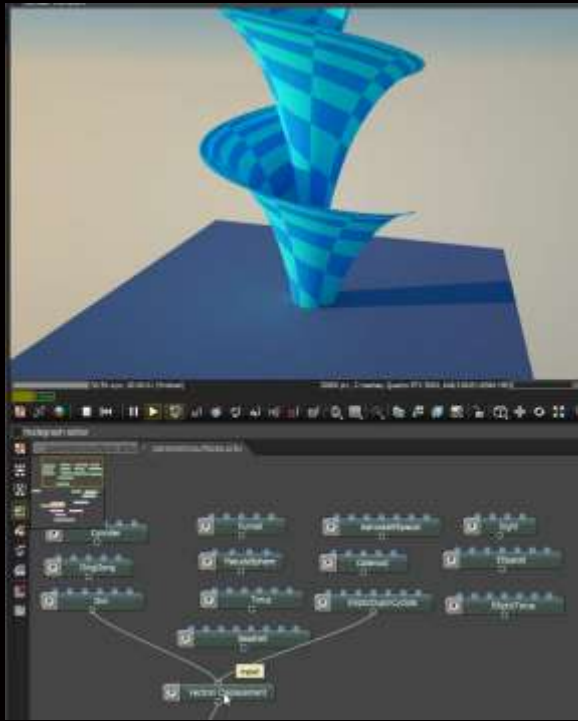
- Massive Procedural Particles – all OSL shaders/nodes
- GLSL reader (e.g. Touch Designer Vertex Shaders)
- Faster and lighter rendering vs. external sim / cache





Vectron Displacement

Combines best of Texture + Vertex Displacement



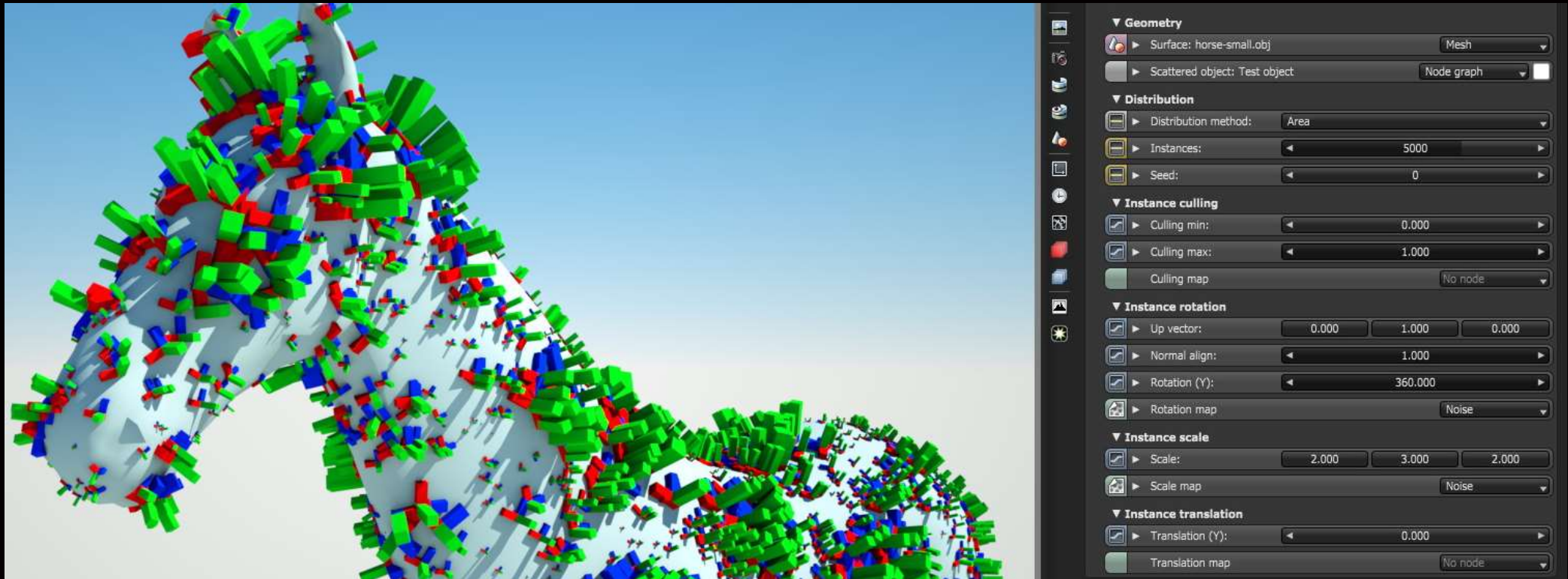
- Vectron / OSL mesh surface shaders
- Geometry is modified live at render time on GPU
- Millions of mesh instances / clones can each have unique dynamic procedural displacements – with zero memory used!





Vectron Scatter

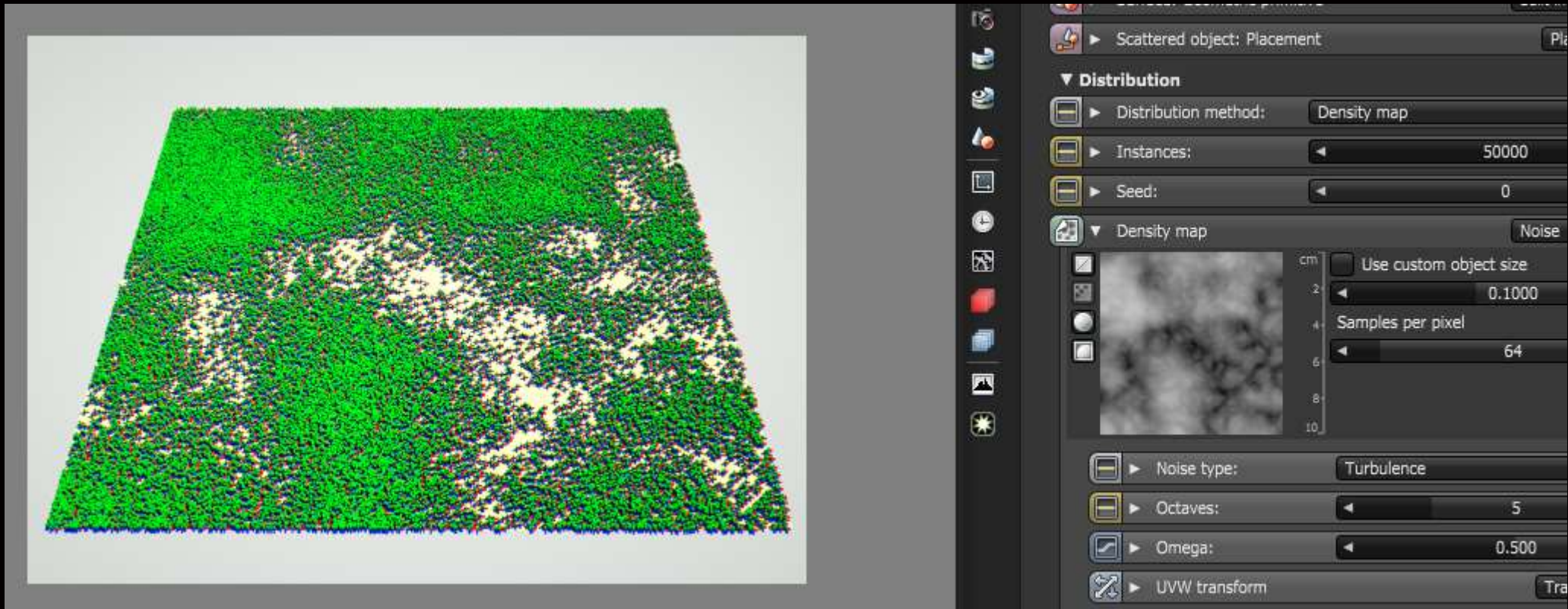
OctaneScatter (C4D) in core - baseline for new features





Vectron Scatter

OctaneScatter (C4D) in core - baseline for new features





Vectron Scatter Node

- Scattering on animated surfaces, volumes, vectron etc.
- Complex procedural GPU scattering at runtime





Vectron GeoScatter

- Combines Vectron Scatter + Vectron Displacement
- Mesh fitting on any surface –like VrayPattern





Vectron World Shaders

- Sparse volumes - not limited by voxel / VDB buffers
- Infinitely large procedural worlds





Material and Shading Roadmap

- OSL Trace Sets





Material and Shading Roadmap

- OSL Trace Sets
- OpenColorIO





Material and Shading Roadmap

- OSL Trace Sets
- OpenColorIO
- Material Layer Operators (i.e. OSL closures via nodes)





octane render

Fluorescence & Phosphorescence:



▼ Florescence Properties



► Wavelength shift 1:



► Wavelength shift 2:



► Wavelength shift 3:



► Wavelength shift 4:

▼ Florescence Properties

Wavelength shift 1:	1.000
Wavelength shift 2:	0.367
Wavelength shift 3:	0.258
Wavelength shift 4:	0.211

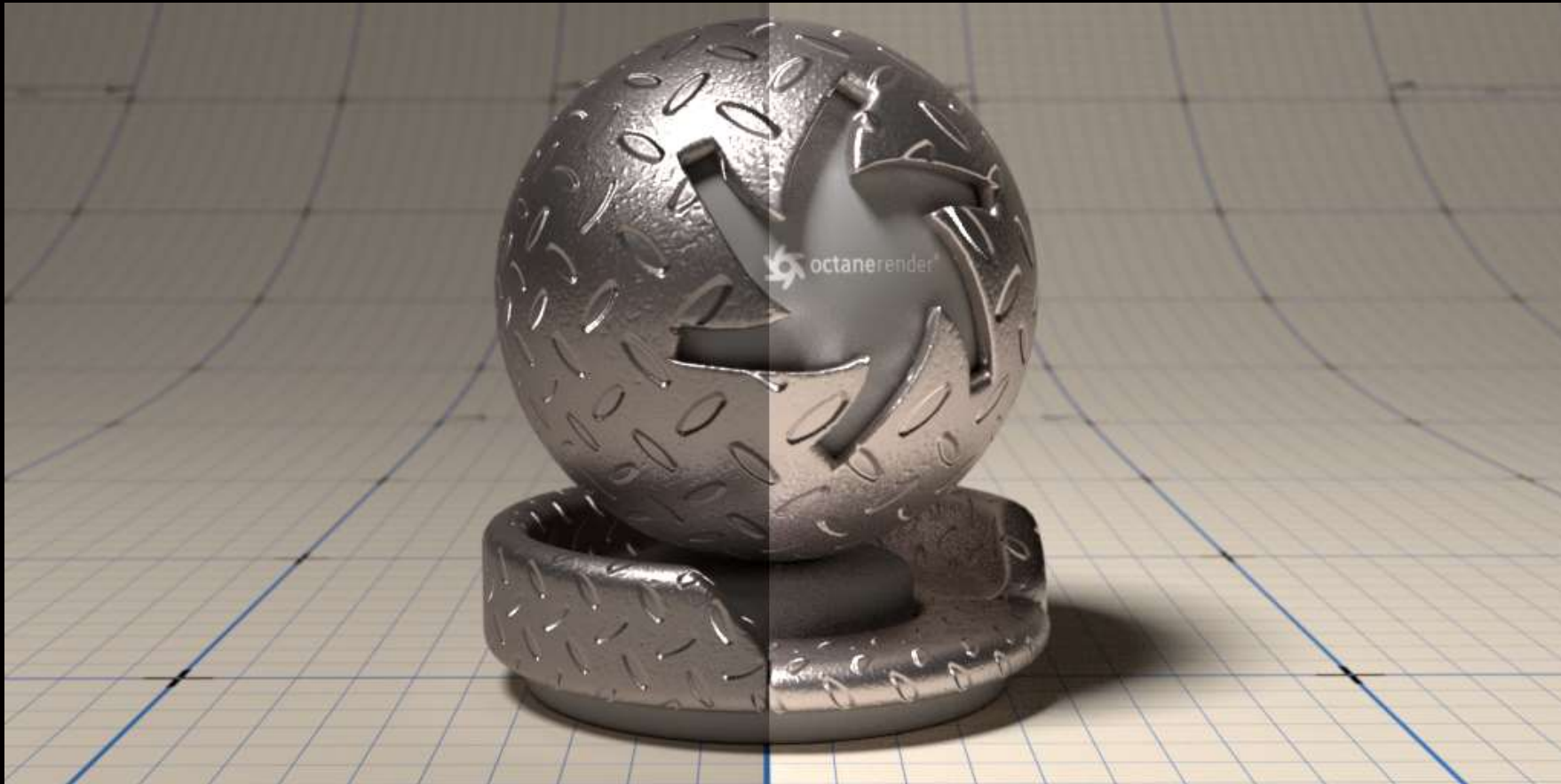




octane render

Polarized Lighting:

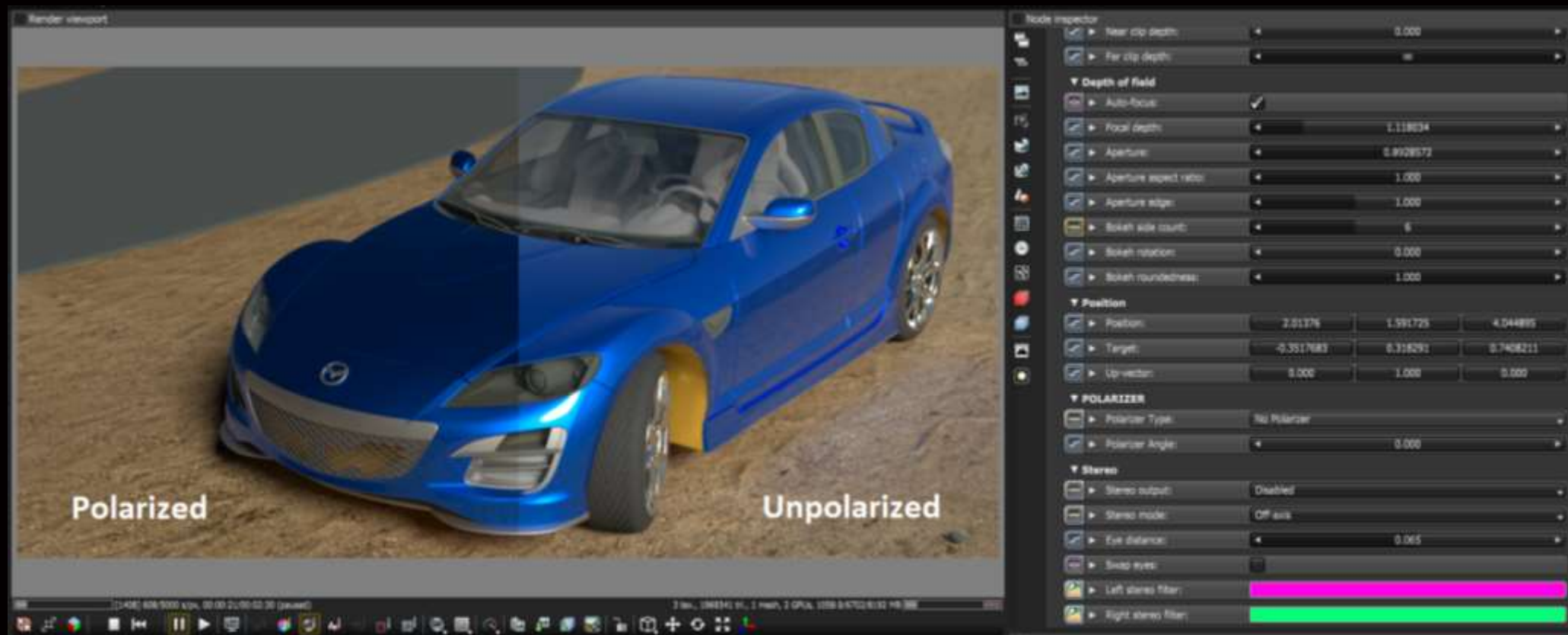






octanerender

Polarized Lighting:





octanerender

Native USD support in Octane and ORBX





3rd Party Format Roadmap

- Arnold Standard Surface / Volume as core node
- Material X (in USD at minimum)
- Hydra





octanerender

'Anime' Kernel – Raytraced Edges:



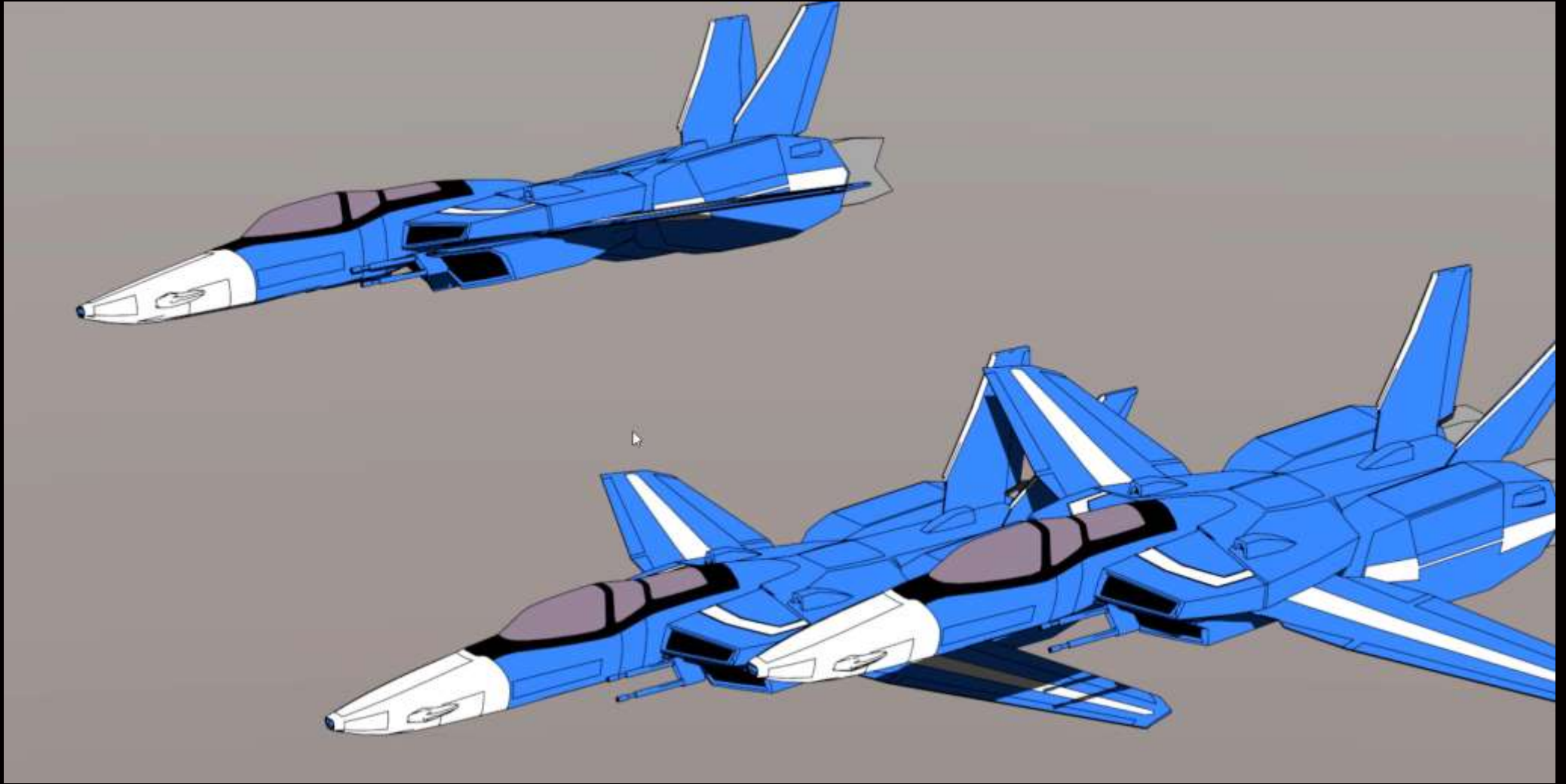


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'Anime' Kernel – Raytraced Edges:



'Anime' Kernel – Raytraced Edges:





octanerender

'Anime' Kernel – Raytraced Edges:





New Progressive Photon Mapping System





New 'PPM' Hybrid Kernel

Progressive Photon Mapping System (mixed with PT)

- Fast AND accurate caustics!
- Speed of GOBO caustics (left) - at PMC quality (right)





New 'PPM' Hybrid Kernel

GPU Photon Mapping and Diffuse Irradiance Cache

- Can be used for biased GI, volume and SSS options
- Light Cache can be used by Brigade GI on AR/mobile



Extending Octane...

HANNAH





octanerender

RNDR Modules





RNDR Modules

- Physics
- Procedurals (Geometry/Volumes)
- rendering (via Hydra)





RNDR | Physics



- New Soft and Rigid Body physics nodes
- Bullet and PhysX backend modules (default)







RNDR | Physics



- New Soft and Rigid Body physics nodes
- Bullet and PhysX backend modules (default)
- 3rd party Physics modules can extend this..





RNDR | Physics

STØRM
THE SIMULATION TOOL

Octane scene and video by Wout Tengrootenhuyse – simulation using Storm Granular Solver





RNDR | Hydra

- All 20+ Octane DCC plug-ins – will be refactored as RNDR DCC plugins – to operate as Hydra as scene delegates
- RNDR DCC plug-ins can load any valid Hydra Render delegates supporting standard surface or ORBX: Octane, Brigade, Arnold and more!

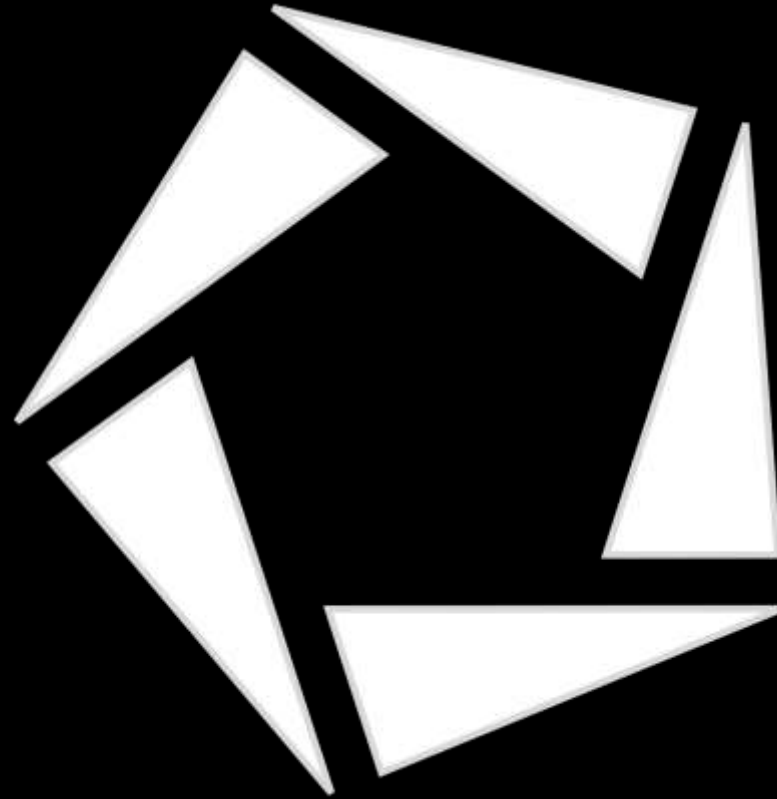




RNDR | Hydra

- All 20+ Octane DCC plug-ins – will be refactored as RNDR DCC plugins – to operate as Hydra as scene delegates





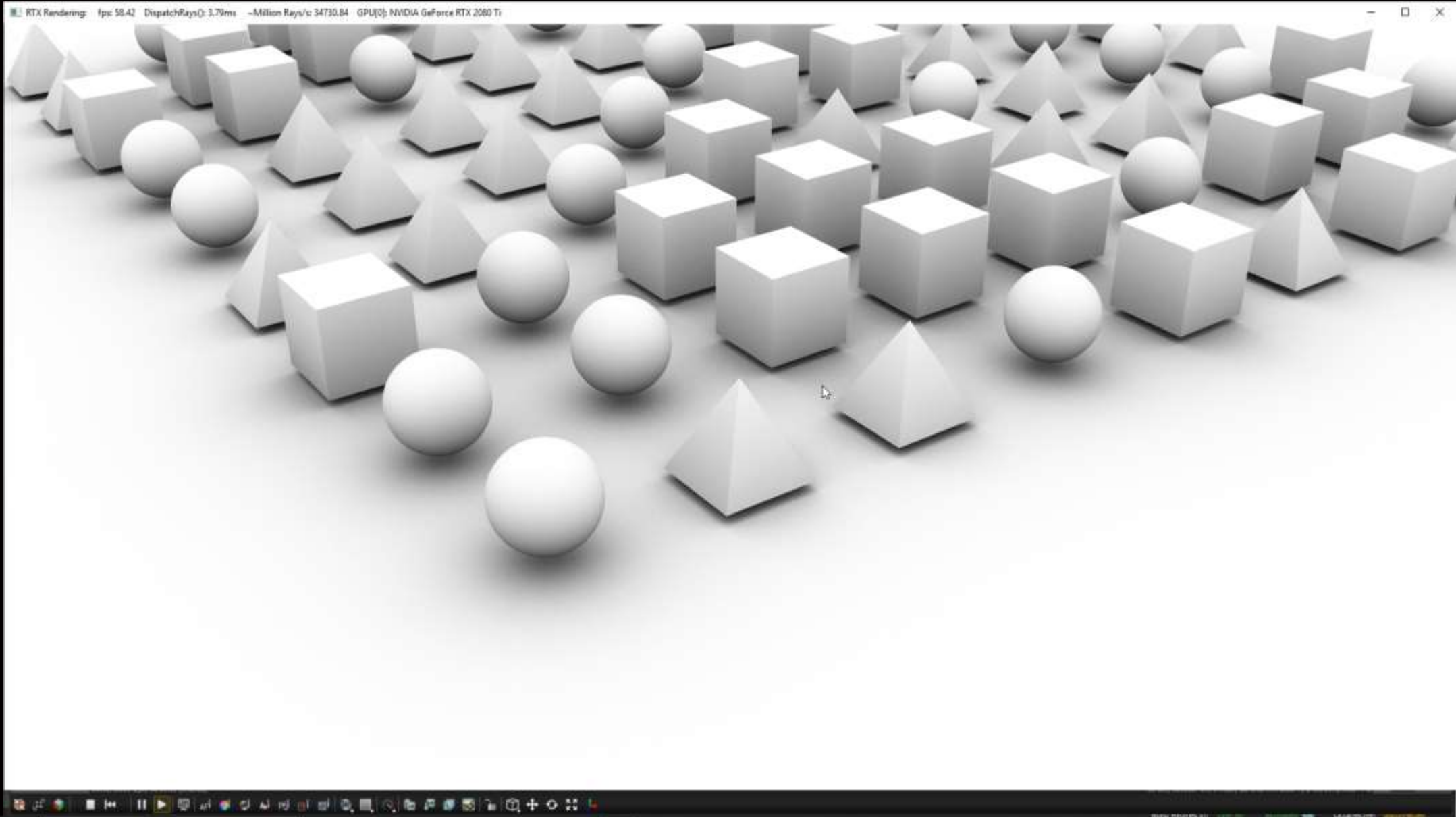
BRIGADE



BRIGADE

GPU POWERED
REAL TIME PATH TRACING

'Brigade' 2019 RTX Kernel – Noise Free 60 fps (AO):



Path Tracing Comparison: Single Frame (4 Spp)



Octane | Path Tracing
Offline (but near RT)



octane render

Brigade | Path Tracing
60 fps (full real time)



BRIGADE





BRIGADE | Instant Path Traced Volumes



Brigade RTX Path Tracing Kernel - 60 fps on a single RTX 2080





BRIGADE | Instant Path Traced Volumes



Brigade RTX Path Tracing Kernel - 60 fps on a single RTX 2080





BRIGADE | Path Tracing : 60 fps (1x RTX 2080)



Brigade RTX Path Tracing Kernel - 60 fps on a single RTX 2080





BRIGADE | Path Traced Caustics



Brigade RTX Path Tracing Kernel - 60 fps on a single RTX 2080





BRIGADE | Path Traced Volume Caustics!



Brigade RTX Path Tracing Kernel - 60 fps on a single RTX 2080





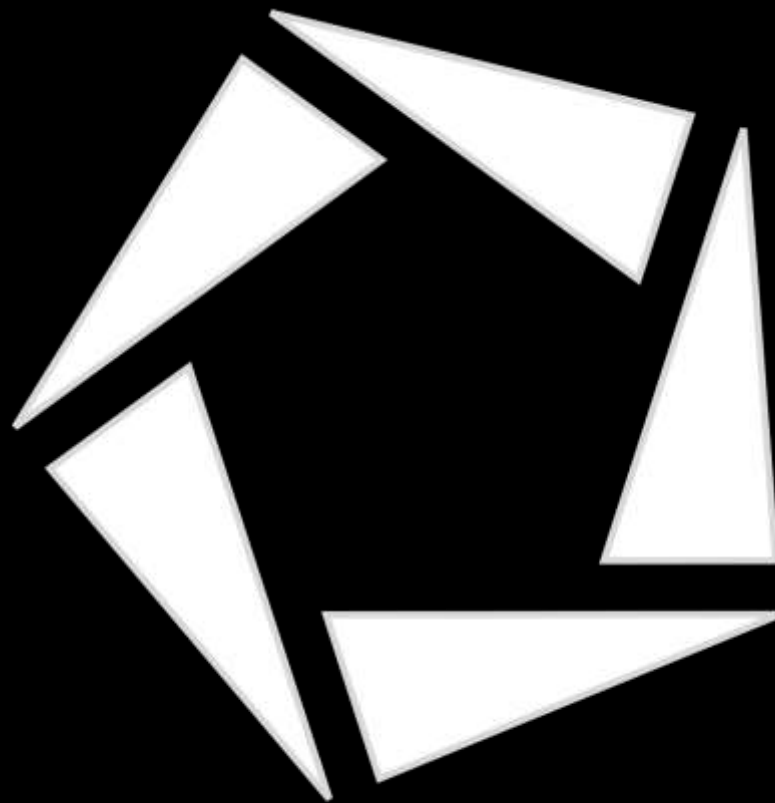
BRIGADE | Path Tracing : 60 fps (1x RTX 2080)



Instant Path Traced DOF (WIP)

Brigade RTX Path Tracing Kernel - 60 fps on a single RTX 2080





BRIGADE | Light Cache

Octane DL Kernel (Left) vs. Brigade LC+DL Kernel (Right)



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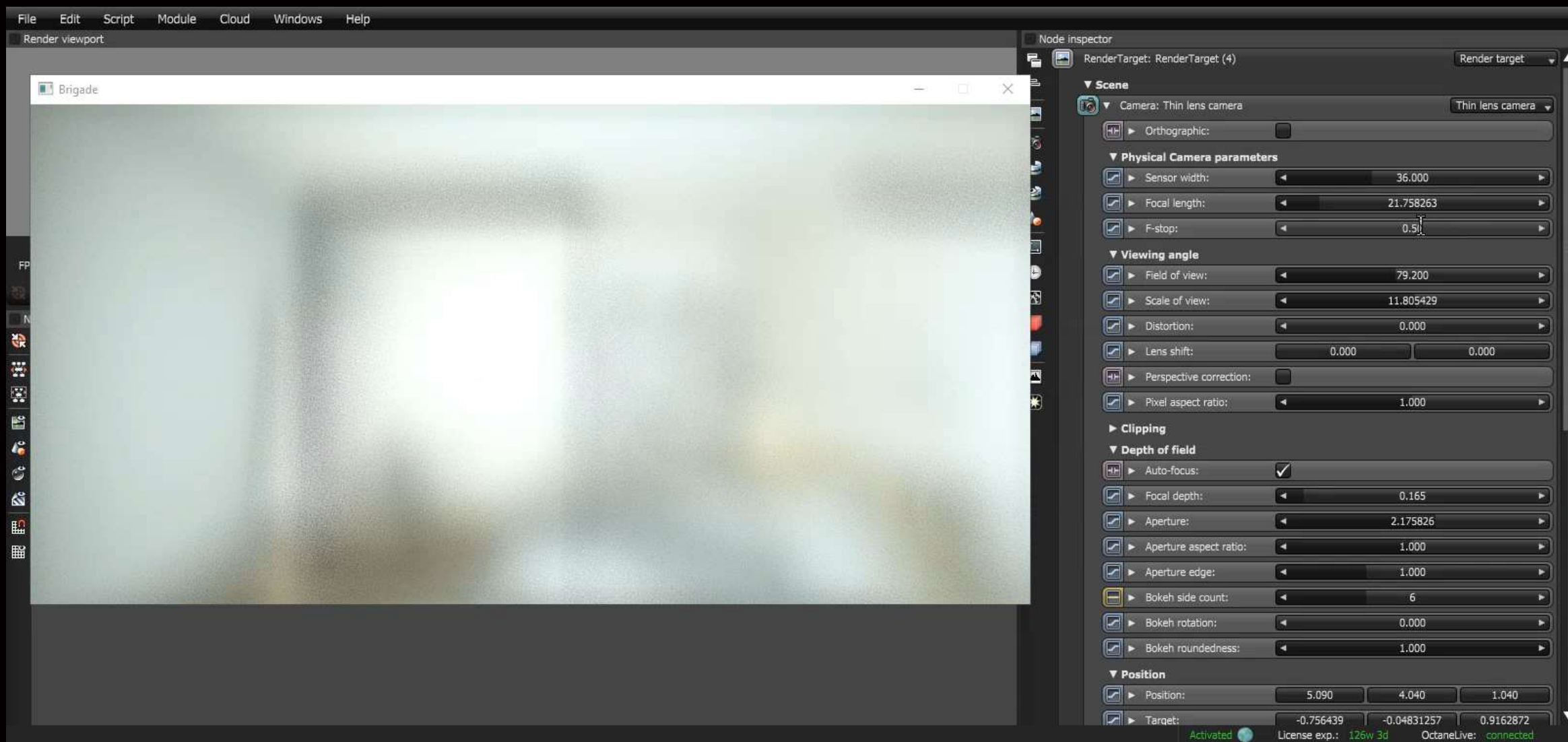
BRIGADE





BRIGADE

Irradiance Cache from Octane PPM





octanerender

Octane X on iOS (AR Kit – Brigade | Irradiance Cache)





octanerender

Octane X on iOS (AR Kit – Brigade | Irradiance Cache)





octane

Octane on iOS (AR Kit)





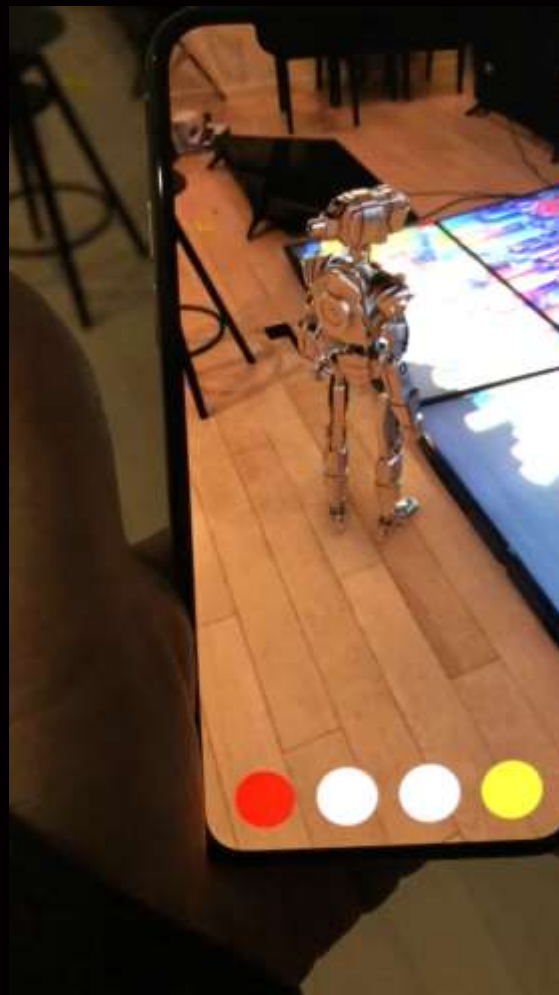
RNDR SDK XR Test





octanerender

RNDR: Octane X/AR Kit in action:





2 SOUTH
Birthing Centre
Maternal and Baby
Neonatal Intensive Care
Prenatal Services

Neonatal Intensive Care
Delivery Suite
Maternity Suite
Patient Transport

Acute Medical
Specialist Services
Resuscitation & Surgery

Acute Medical
Specialist Services
Resuscitation & Surgery

Acute Medical
Specialist Services
Resuscitation & Surgery

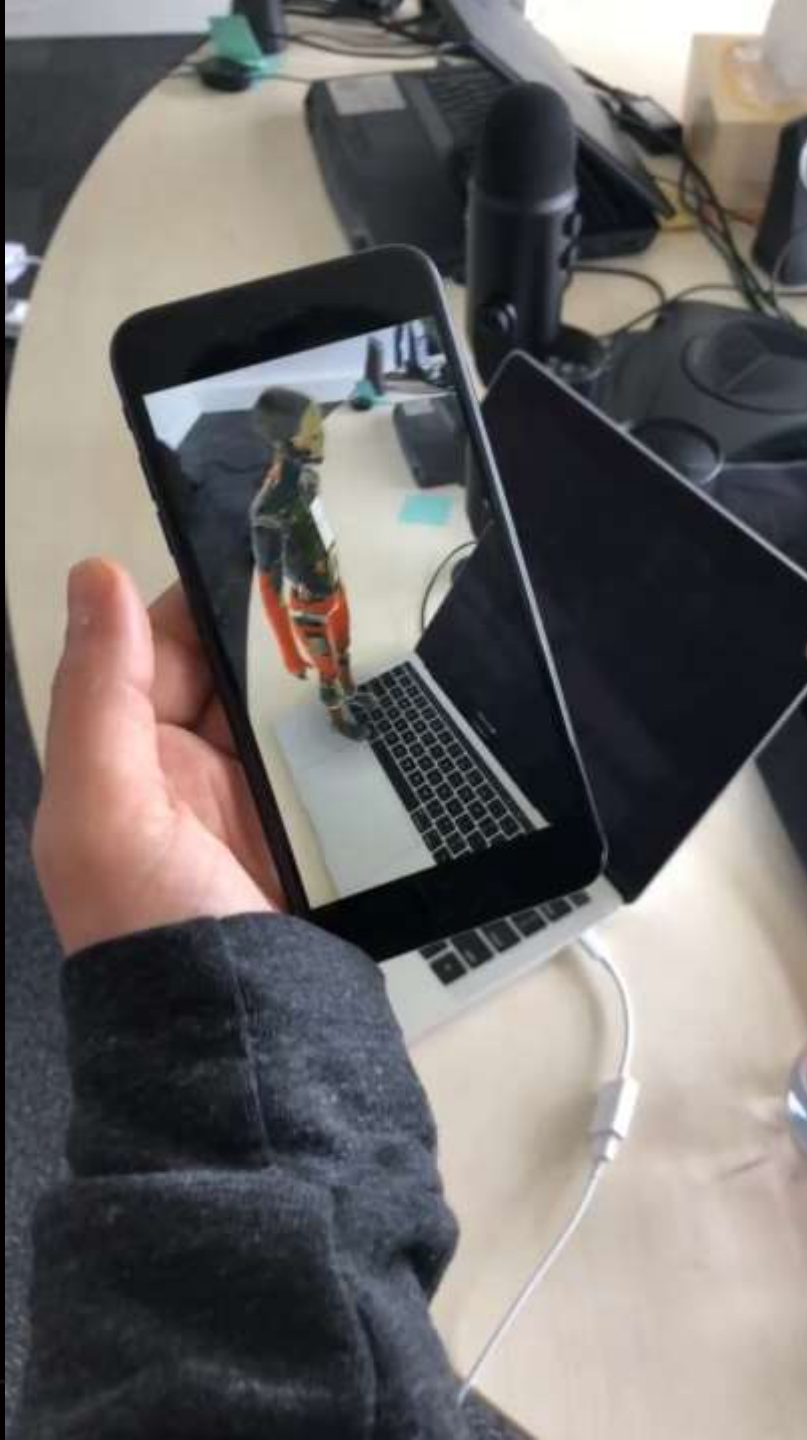
EMERGENCY
CONTACT NUMBERS

011	Acute Medical Services
012	Acute Medical Services
013	Acute Medical Services
014	Acute Medical Services
015	Acute Medical Services
016	Acute Medical Services
017	Acute Medical Services
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098	Acute Medical Services
099	Acute Medical Services
100	Acute Medical Services



RNDR: Octane X/AR Kit in action:





1:45

Tweet

**Derren Brown** 
@DerrenBrown

WE ARE ALL GOING TO DIE. RT
[@GustavoVela71](#): Robot



0:12

9.7M views · From ...

4:49 PM · 8/18/18 · [Tweetlogix](#)

14.2K Retweets 35.2K Likes

Tweet your reply



1:44

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Say Hi to our new office pet 🙌🐉

#motiongraphics #3d #animation
#3danimation #octane #octanerender
#c4d #mograp #tracking #skyrim
#elderscrolls #dragon

🎬 By @LekTrix



2:29 AM · Aug 23, 2018 · Twitter Web Client

26 Retweets 92 Likes

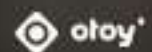


sculptronTM



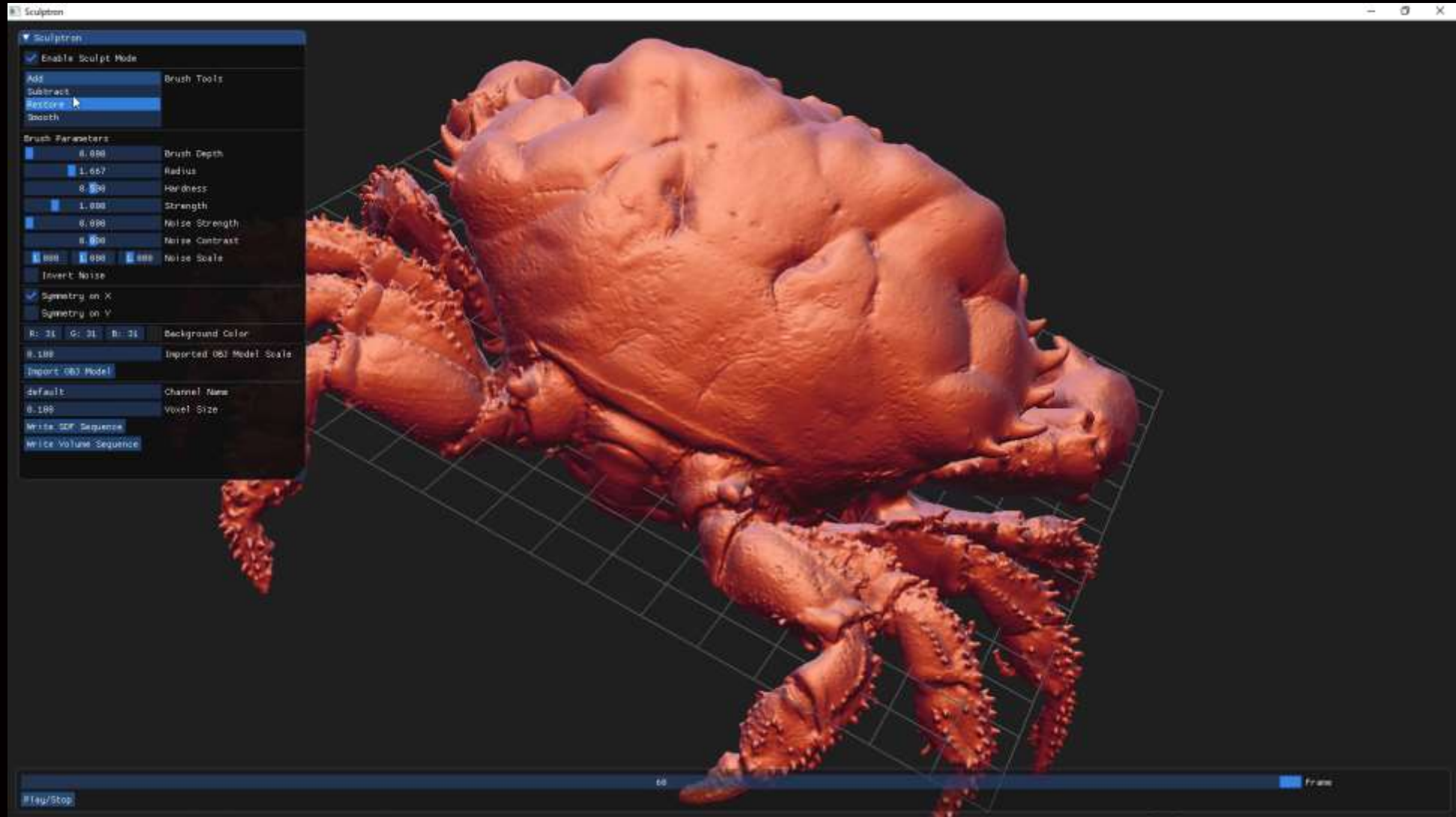


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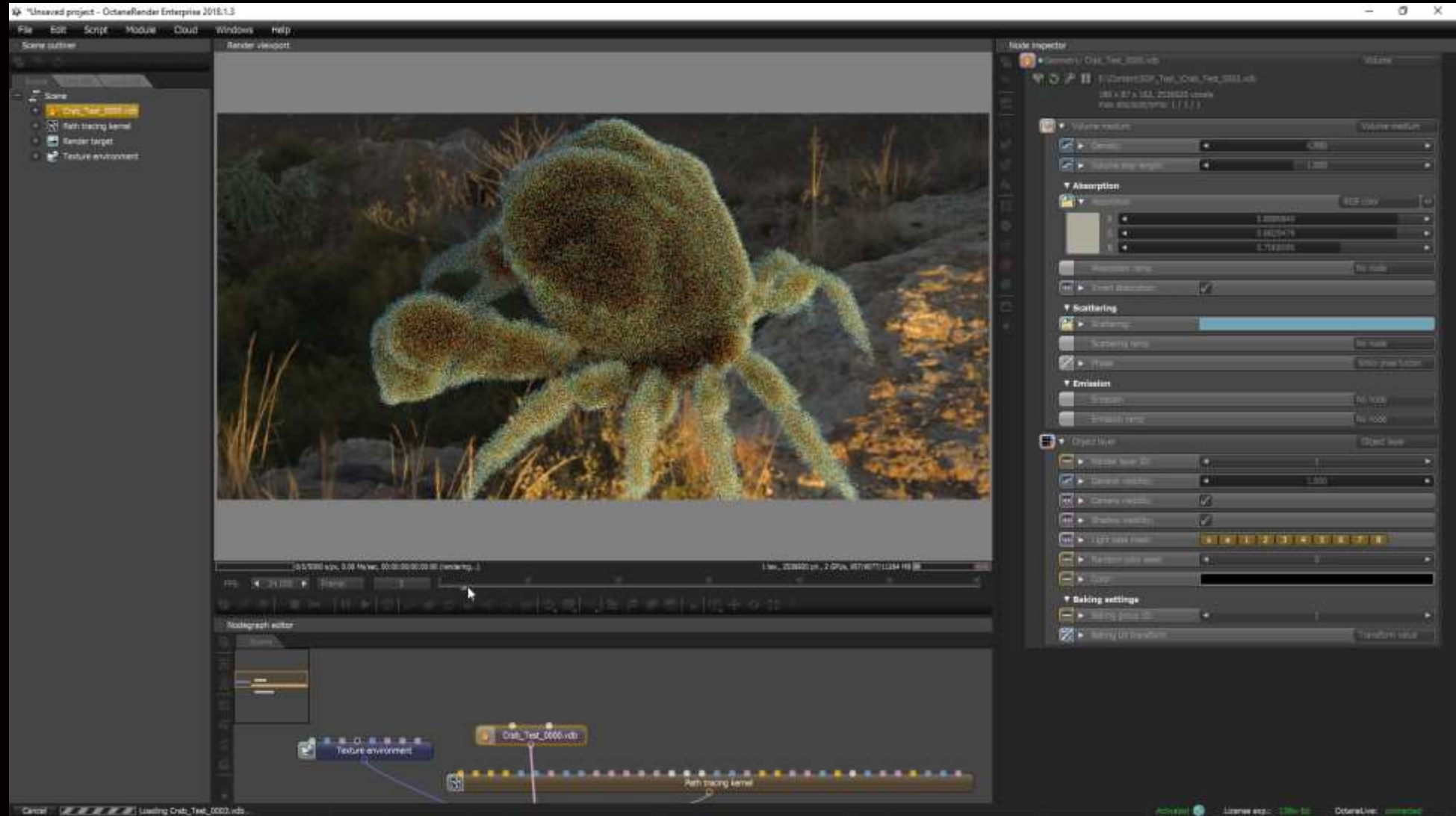


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"Alien Bust" by Lino Grandi.

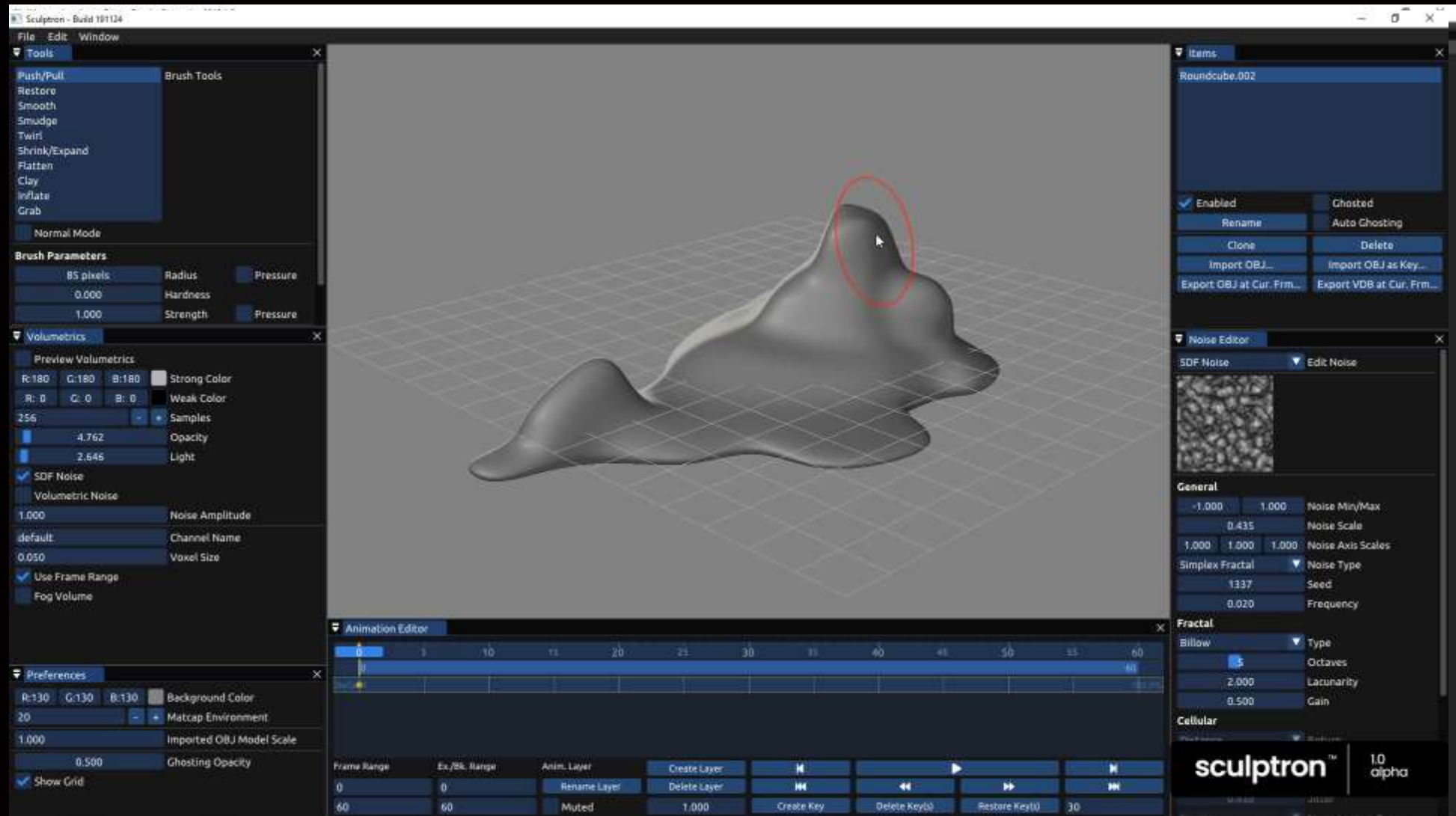
sculptron™ | Vectron/Spectron Temporal Brush Tool



sculptron™ | Vectron/Spectron Temporal Brush Tool



sculptron™ | Volume/VDB Temporal Brush Tool



sculptronTM | Alpha 2

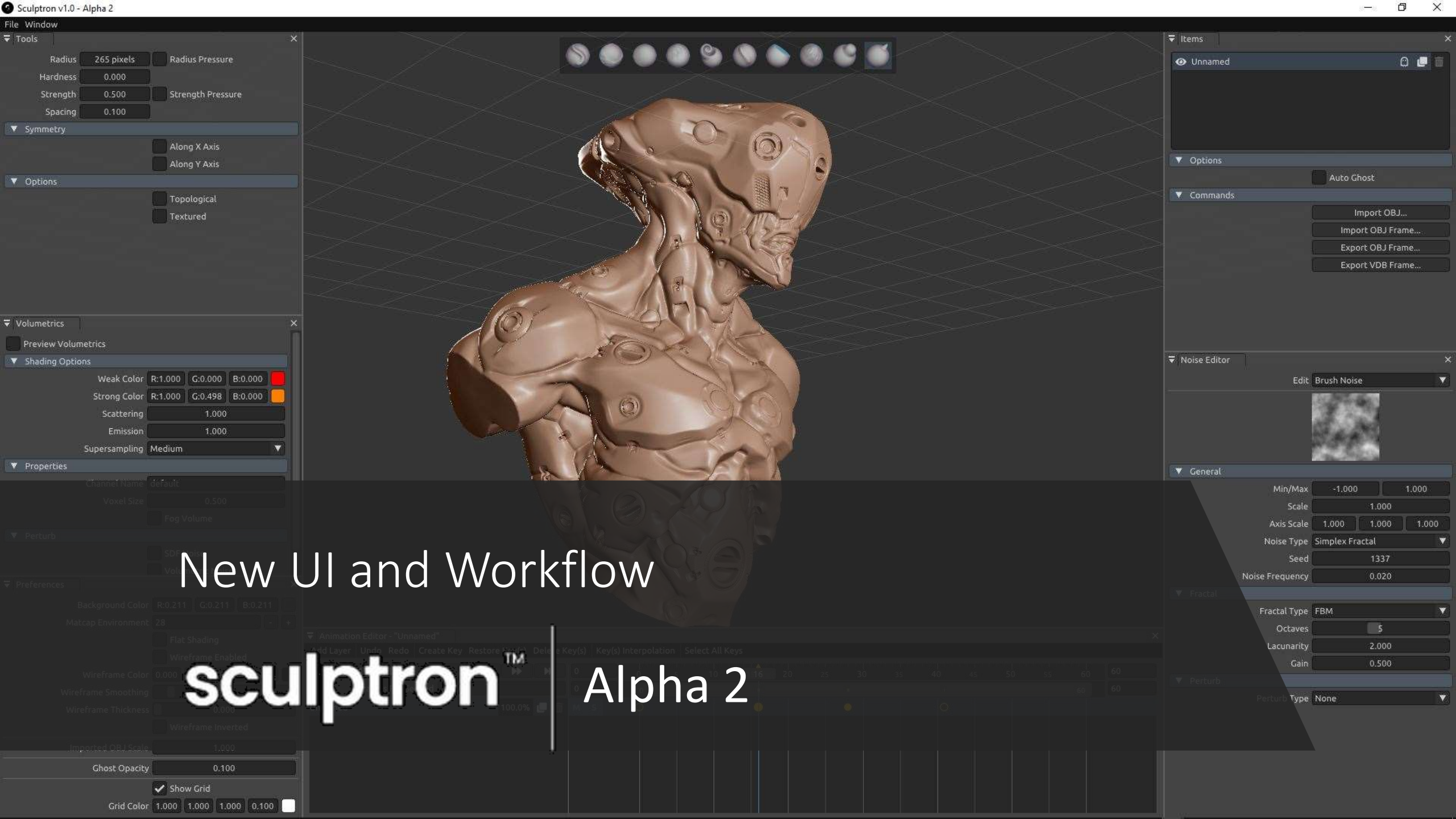


New Timeline & Keyframe System

sculptronTM

Alpha 2





Radius 265 pixels Radius Pressure
Hardness 0.000
Strength 0.500 Strength Pressure
Spacing 0.100

Along X Axis
Along Y Axis

Topological
Textured

Weak Color R:1.000 G:0.000 B:0.000
Strong Color R:1.000 G:0.498 B:0.000
Scattering 1.000
Emission 1.000
Supersampling Medium

Channel Name default
Voxel Size 0.500
Fog Volume

Background Color R:0.211 G:0.211 B:0.211
Matcap Environment 28

Flat Shading
Wireframe Enabled
Wireframe Color 0.000
Wireframe Smoothing 0.000
Wireframe Thickness 0.000
Wireframe Inverted
Imported OBJ/Scale 1.000

Ghost Opacity 0.100

Show Grid

Grid Color 1.000 1.000 1.000 0.100



Unnamed

Auto Ghost

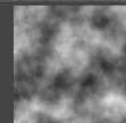
Import OBJ...

Import OBJ Frame...

Export OBJ Frame...

Export VDB Frame...

Edit Brush Noise



Min/Max -1.000 1.000
Scale 1.000
Axis Scale 1.000 1.000 1.000
Noise Type Simplex Fractal
Seed 1337
Noise Frequency 0.020

Fractal Type FBM
Octaves 5
Lacunarity 2.000
Gain 0.500

Perturb Type None

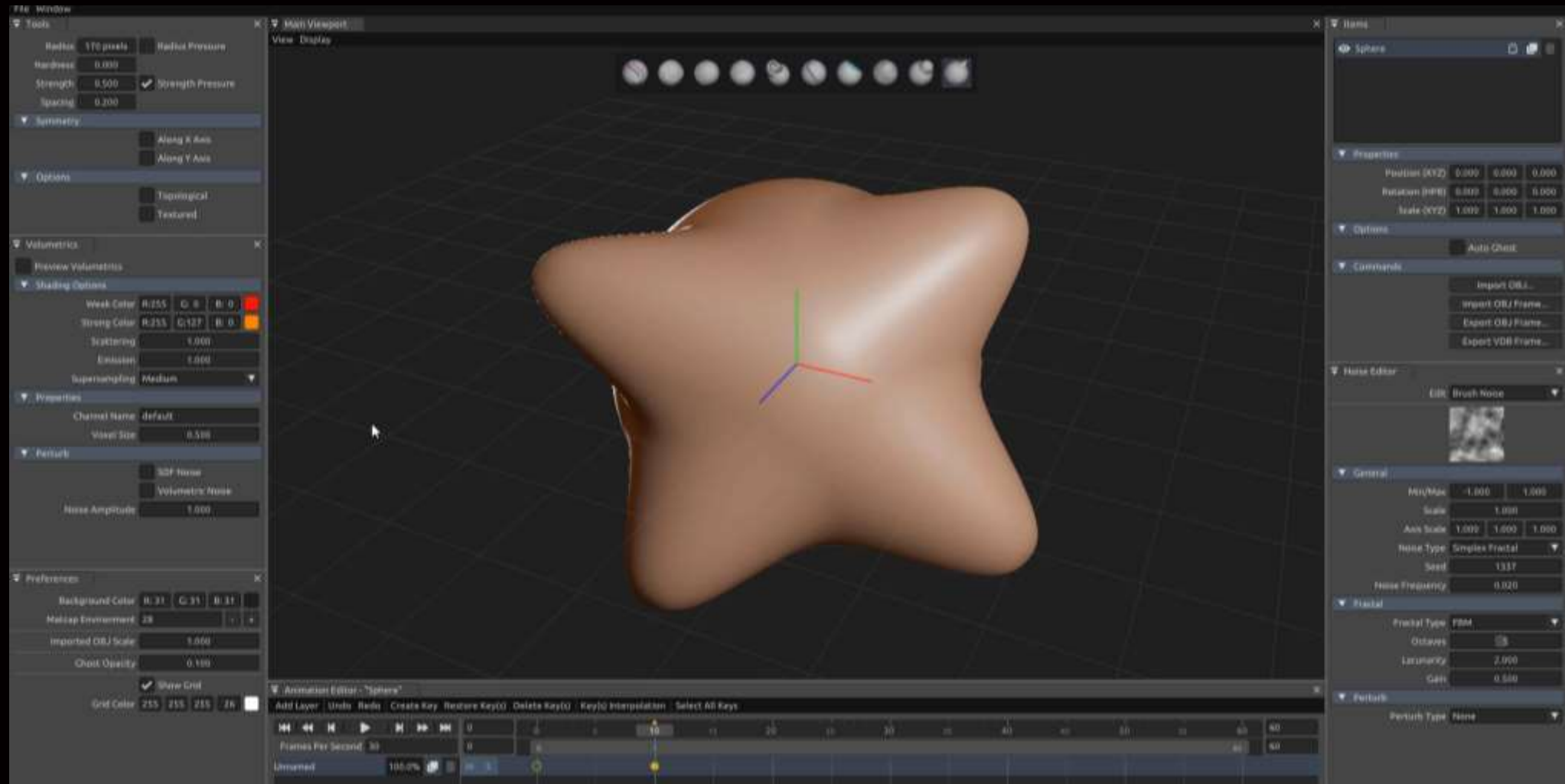
New UI and Workflow

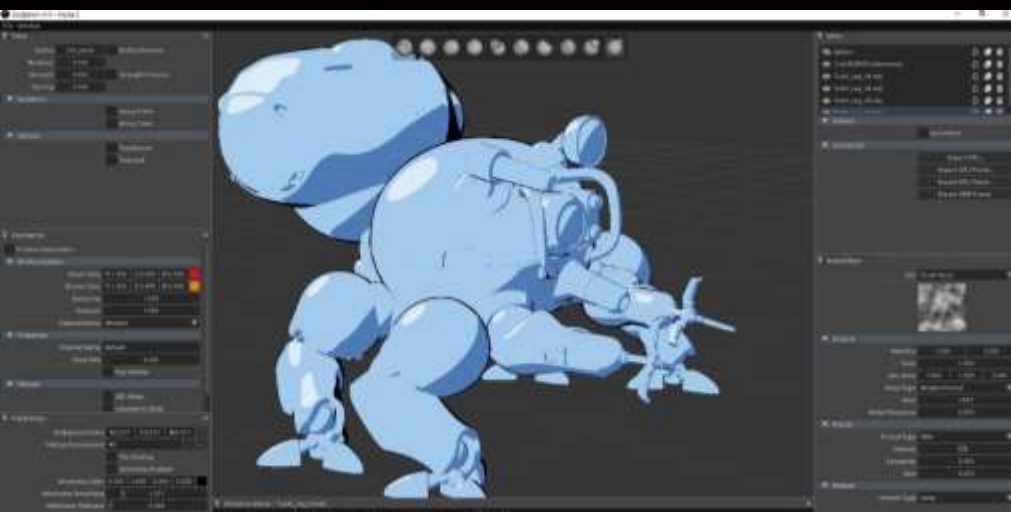
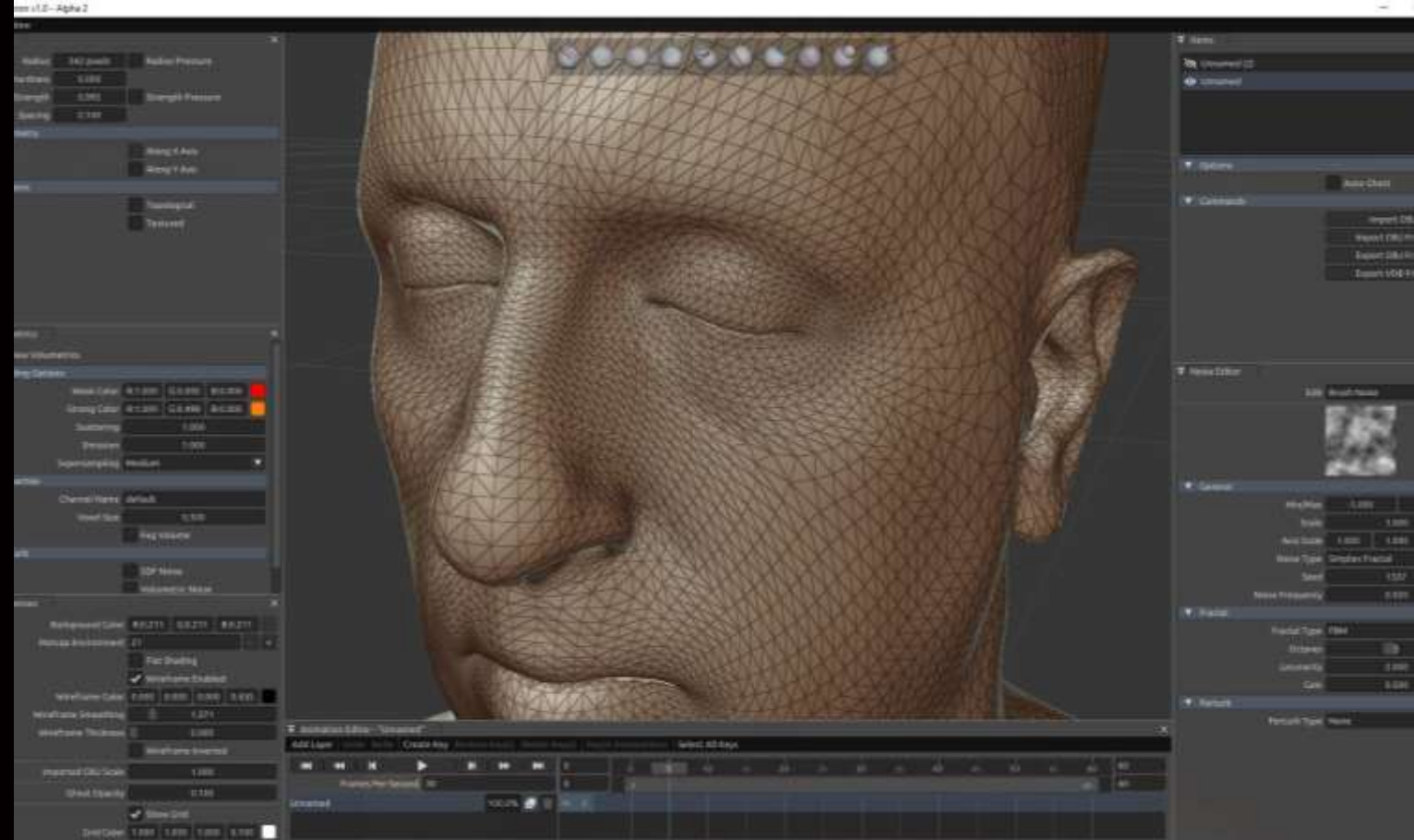
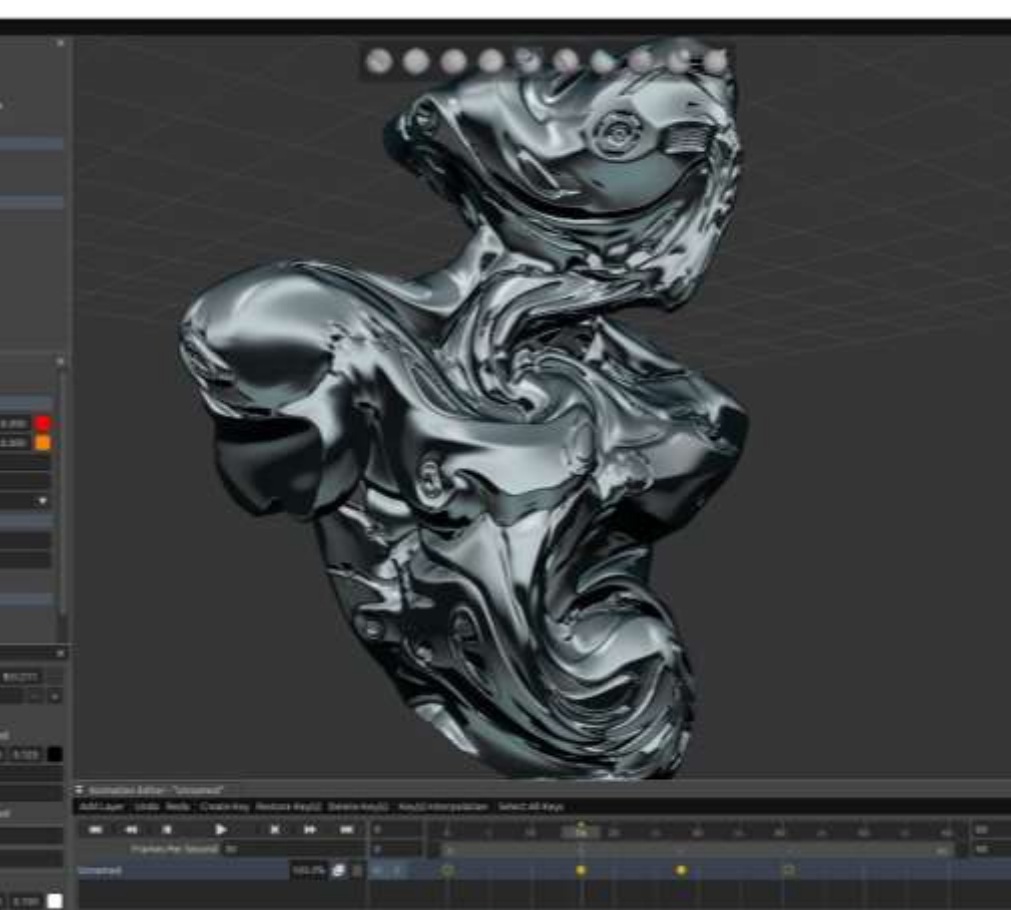
sculptron™

Alpha 2

sculpttron™

Alpha 2 – over 10x faster!





New Viewport Modes

sculptron™ | Alpha 2



Sculptron v1.0 - Alpha 2

File Window

Tools

Radius 242 pixels Radius Pressure

Hardness 0.000

Strength 0.995 Strength Pressure

Spacing 0.100

Symmetry

Along X Axis

Along Y Axis

Options

Topological

Textured

Volumetrics

Preview Volumetrics

Shading Options

Weak Color R:1.000 G:0.000 B:0.000

Strong Color R:1.000 G:0.498 B:0.000

Scattering 1.000

Emission 1.000

Supersampling Medium

Properties

Channel Name default

Voxel Size 0.500

Fog Volume

Perturb

SDF Noise

Volumetric Noise

Preferences

Background Color R:0.211 G:0.211 B:0.211

Matcap Environment 49

Flat Shading

Wireframe Enabled

Wireframe Color 0.000 0.000 0.000 0.435

Wireframe Smoothing 1.371

Wireframe Thickness 0.000

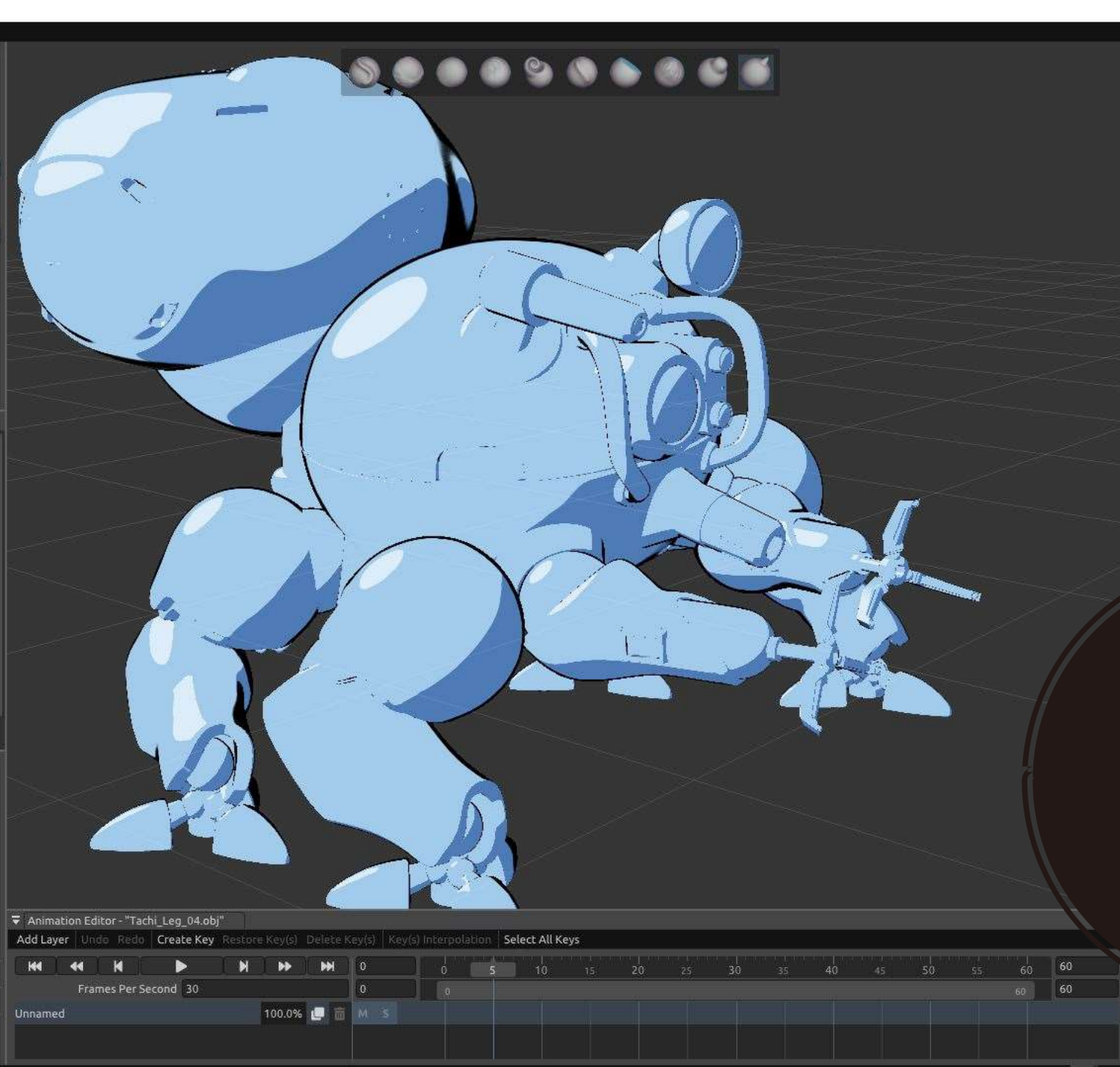
Wireframe Inverted

Imported OBJ Scale 1.000

Ghost Opacity 0.100

Show Grid

Grid Color 1.000 1.000 1.000 0.100



Items

Sphere

TachiBODYSculptron.obj

Tachi_Leg_01.obj

Tachi_Leg_02.obj

Tachi_Leg_03.obj

Tachi_Leg_04.obj

Options

Auto Ghost

Commands

Import OBJ...

Import OBJ Frame...

Export OBJ Frame...

Export VDB Frame...

Noise Editor

Edit Brush Noise

1.000

1.000

60

60

Unnamed

100.0%

M S

Toon
MatCap

Sculptron v1.0 - Alpha 2

File Window

Tools

Radius 242 pixels Radius Pressure

Hardness 0.000

Strength 0.995 Strength Pressure

Spacing 0.100

Symmetry

Along X Axis

Along Y Axis

Options

Topological

Textured

Volumetrics

Preview Volumetrics

Shading Options

Weak Color R:1.000 G:0.000 B:0.000

Strong Color R:1.000 G:0.498 B:0.000

Scattering 1.000

Emission 1.000

Supersampling Medium

Properties

Channel Name default

Voxel Size 0.500

Fog Volume

Perturb

SDF Noise

Volumetric Noise

Preferences

Background Color R:0.211 G:0.211 B:0.211

Matcap Environment 21

Flat Shading

Wireframe Enabled

Wireframe Color 0.000 0.000 0.000 0.435

Wireframe Smoothing 1.371

Wireframe Thickness 0.000

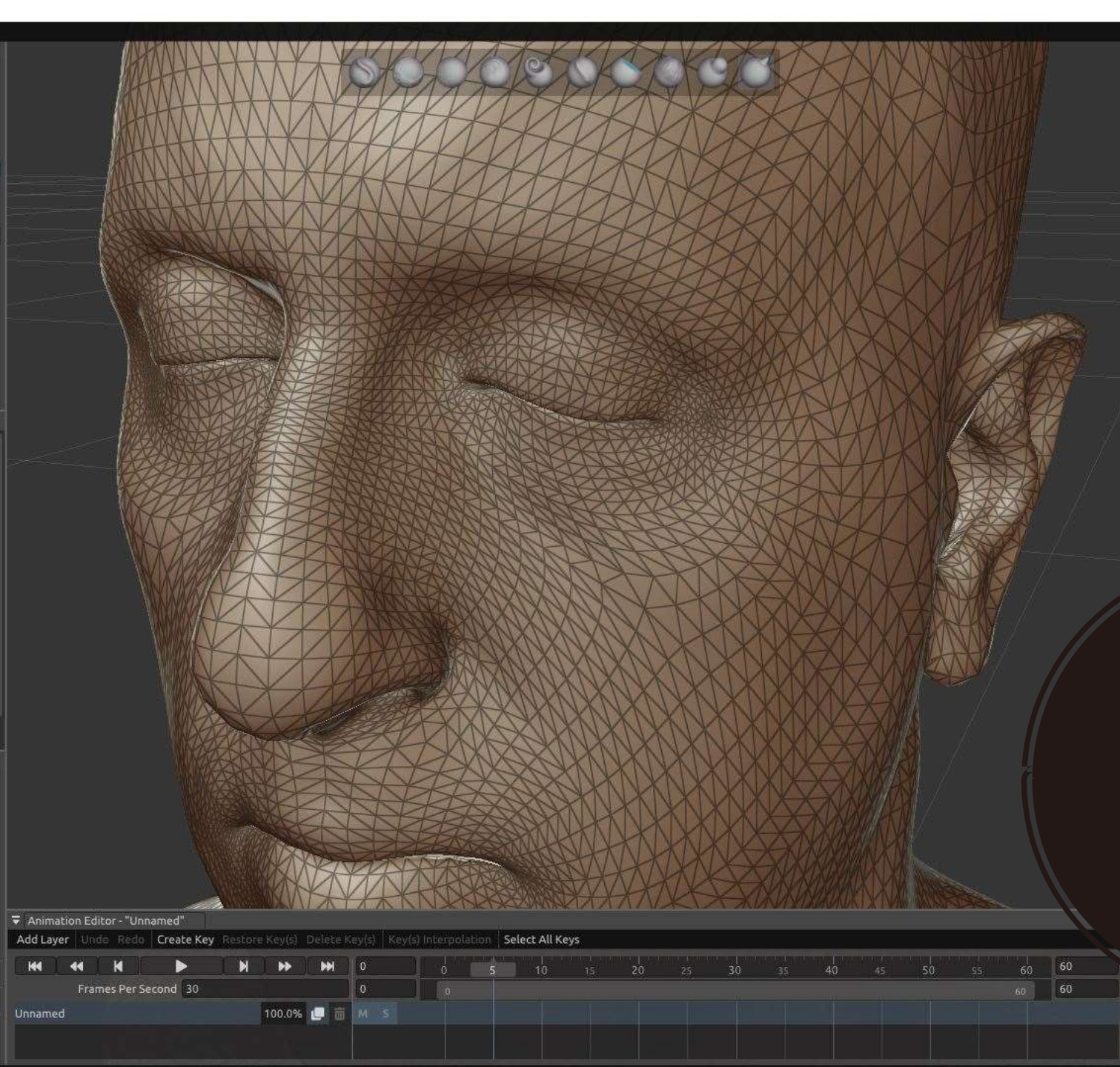
Wireframe Inverted

Imported OBJ Scale 1.000

Ghost Opacity 0.100

Show Grid

Grid Color 1.000 1.000 1.000 0.100



Items

Unnamed (2)

Unnamed

Options

Auto Ghost

Commands

Import OBJ...

Import OBJ Frame...

Export OBJ Frame...

Export VDB Frame...

Noise Editor

Edit Brush Noise

1.000

1.000

60

60

Frames Per Second 30

100.0%

M S

Wireframe
Overlay
Mode

sculptron™ | What's Next...



Long Term Goals

- Full USD Scene Editor: instancing, bones, animations
- GPU mesh modifier stack: user editable geo-shaders
- Simple layout, sculpting, painting for iPad / AR
- Forces and fields authoring





Feature Roadmap

- Topological Grab
- Wrinkle Tool
- Animated Deformers + Falloffs
- Heat Maps
- Compress/Stress calculation
- Weight Map Painting
- Volume Channels Painting
- Dynamic Meshes Sculpting
- Polygon Masking
- Alpha Brushes
- Presets for Procedural Textures
- Expansion of Brushes
- Displacement Map Live Brush
- Bone Deformation Editor
- Local Space Deformations
- Keys: Stepped, Bezier, Hermite
- Graph Editor
- Orthogonal Views
- Statistics (Number of Polygons)
- 3D Perspective Reference
- OpenSubdivision in IPR
- Alembic Import/ Export with Camera support
- Item Transformations (Position/Rotation/Scale)
- Support for mesh sequences with different topology
- Multiple meshes VDB export
- Full USD scene editing
- Octane/Brigade module
- Scatter paint and particle tools
- Cloud, terrain and foliage scatter tools
- Octane X – Apple Pencil / AR



Towards the Star Trek Holodeck...



ORBX Holographic Video



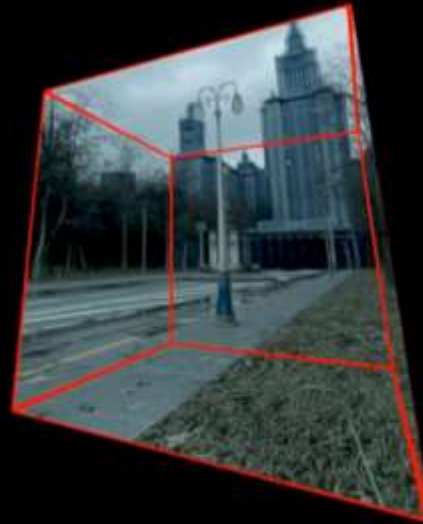
ORBX Light Field 'Surface': Holographic Portals & Viewports



ORBX LF 'Volume': Holographic Spatial Rendering in 6DOF



ORBX LF 'Video': Holographic navigable XYZT World-Line



Towards the Holodeck:

2020's

The Star Trek Holodeck (1987)



OTOY Partners With Light Field Lab On Holodeck Display Tech



AR/VR

Light Field Lab and Otoy team up to make Star Trek's Holodeck a reality

DEAN TAKAHASHI @DEANTAK OCTOBER 22, 2018 8:00 AM



Above: A lifelike hologram is about to permanently traumatize this kid. This is a future concept visualization.

Holographic display maker [Light Field Lab](#) and graphics software firm [Otoy](#) have teamed up to turn the *Star Trek* Holodeck into a reality.

The Holodeck, which *Star Trek* movies and shows depict as a perfect virtual reality space where people can live out their fantasies, is one of the long-sought dreams of the technological world.

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MOST READ



2020's

- Holographic Display Panels from Light Field Lab produce full color touchable 'holograms'

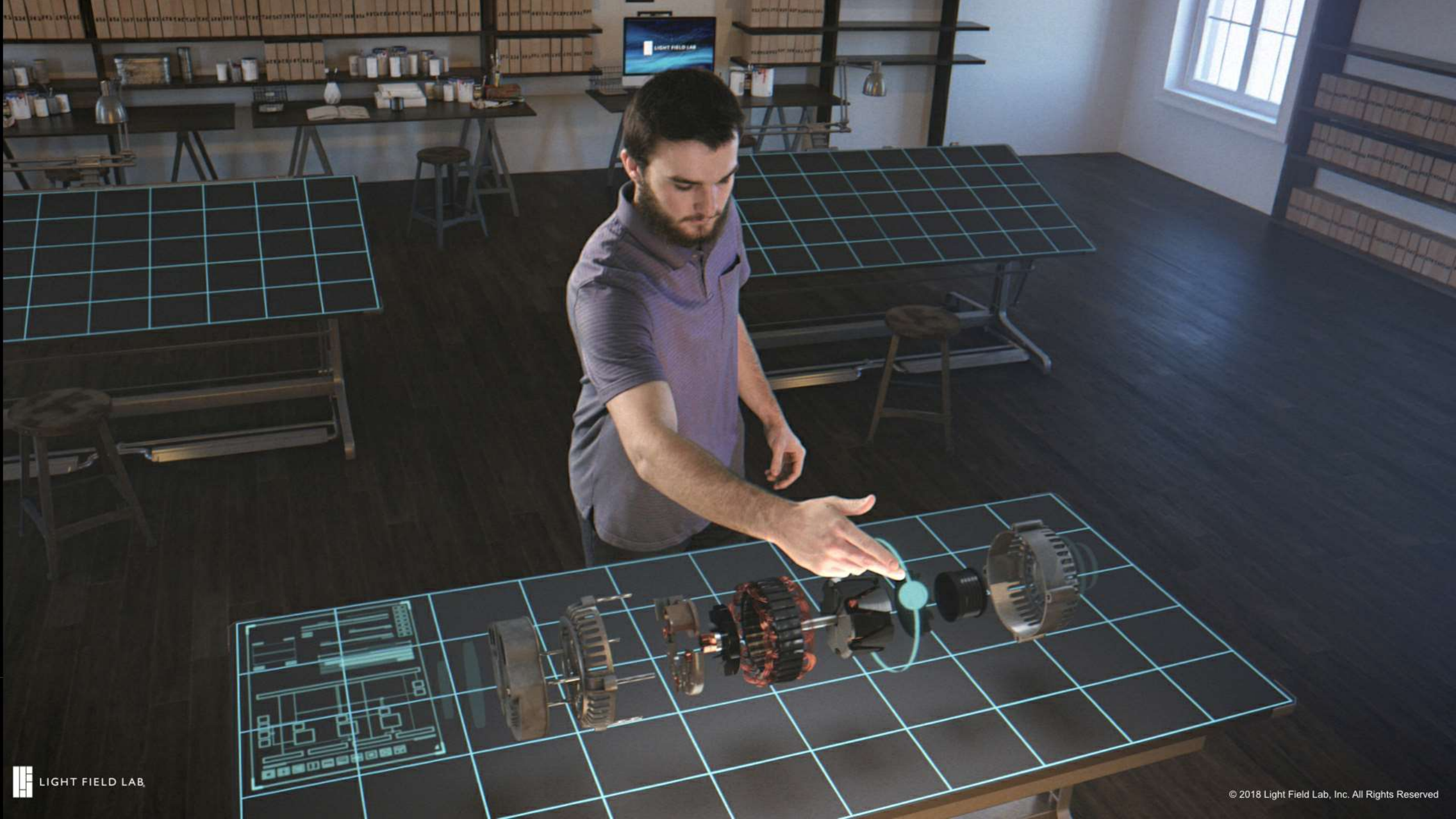
2020's

- Holographic Display Panels from Light Field Lab produce full color touchable 'holograms'
- 2 foot tile panels can be configured to any size (like Samsung Wall shown at CES)

2020's

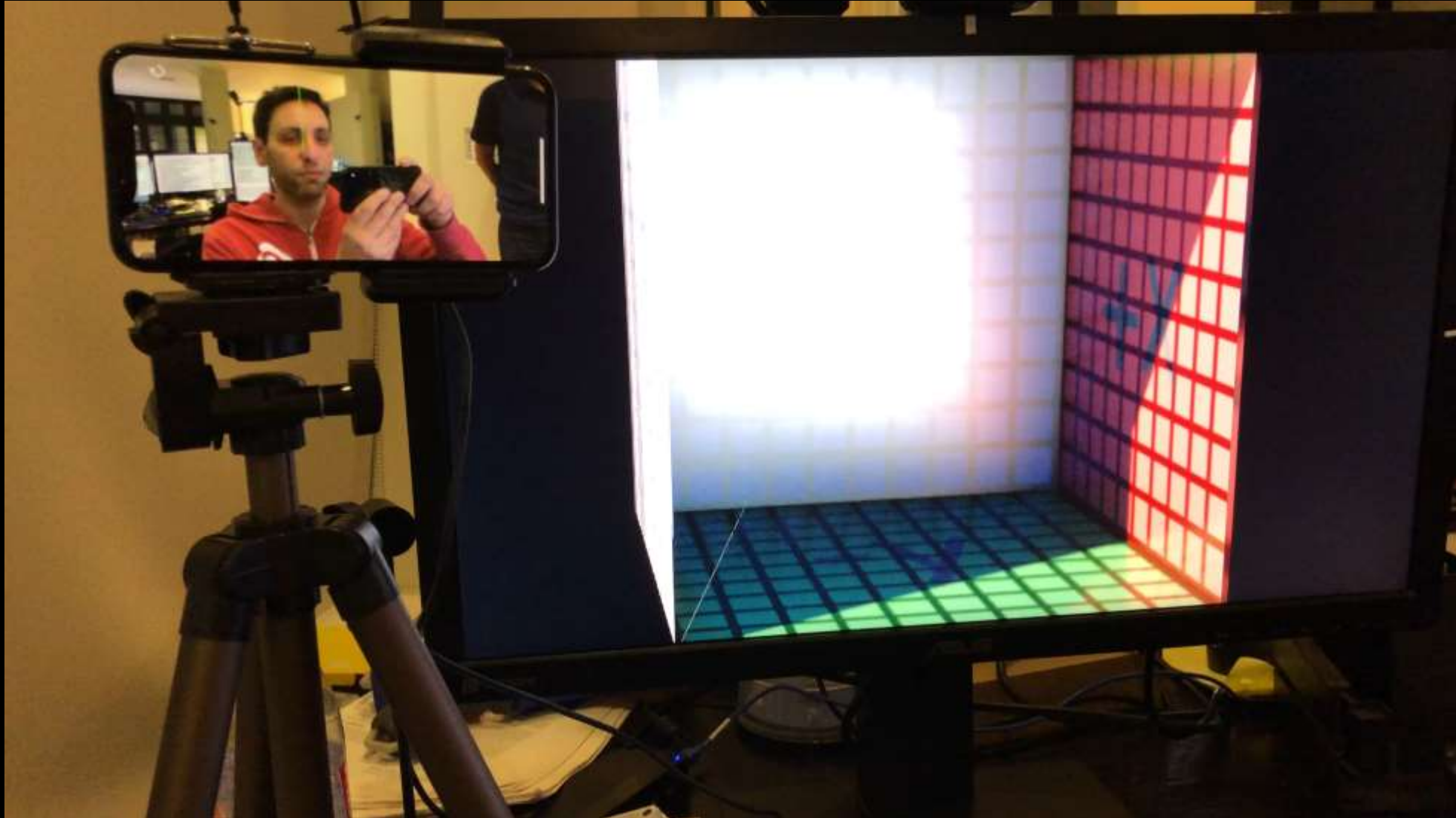
- Holographic Display Panels from Light Field Lab produce full color touchable 'holograms'
- 2 foot tile panels can be configured to any size (like Samsung Wall shown at CES)
- First adopters: parks, concerts, conference rooms, billboards, desks and workstations







RNDR SDK XR Light Field Test



RNDR SDK XR Light Field Test





octanerender

LFL Holographic Display Simulator





octane render

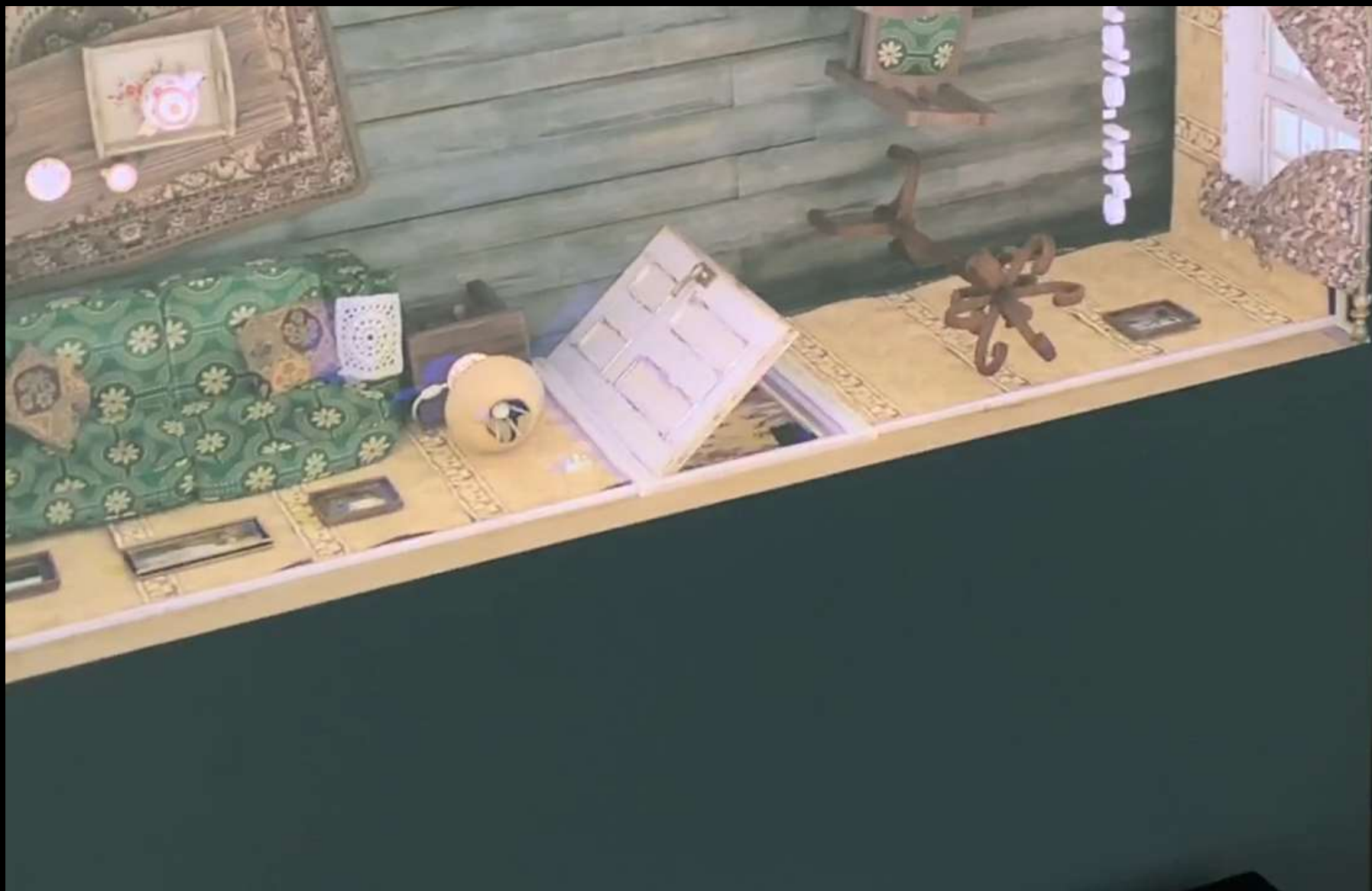
LFL Holographic Display Simulator





octanerender

LFL Holographic Display Simulator





LIGHT FIELD LAB

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Towards the Holodeck:

2030's

2030's

- Holographic Display Panels become commodity - all screens are holographic

2030's

- Holographic Display Panels become commodity - all screens are holographic
- Windows in vehicles and homes are replaced with holographic panels – anyone can have a park avenue view for example, or see 'through' a car or plane as if it were made of glass

2030's

- Holographic Display Panels become commodity - all screens are holographic
- Windows in vehicles and homes are replaced with holographic panels – anyone can have a park avenue view for example, or see 'through' a car or plane as if it were made of glass
- Room sized holodeck may be built into homes (or converted)

Towards the Holodeck:

2040's

2040's and Beyond...

- Holographic surfaces are cheap - applied like wallpaper – telepresence for billions

2040's and Beyond...

- Holographic surfaces are cheap - applied like wallpaper – telepresence for billions
- Holographic clothing and wearables

2040's and Beyond...


- Holographic surfaces are cheap - applied like wallpaper – telepresence for billions
- Holographic clothing and wearables
- Buildings have entire surfaces covered in holographic panels - making them invisible or have them look like anything we want

Why we need a truly open Metaverse...

Medium Sign up

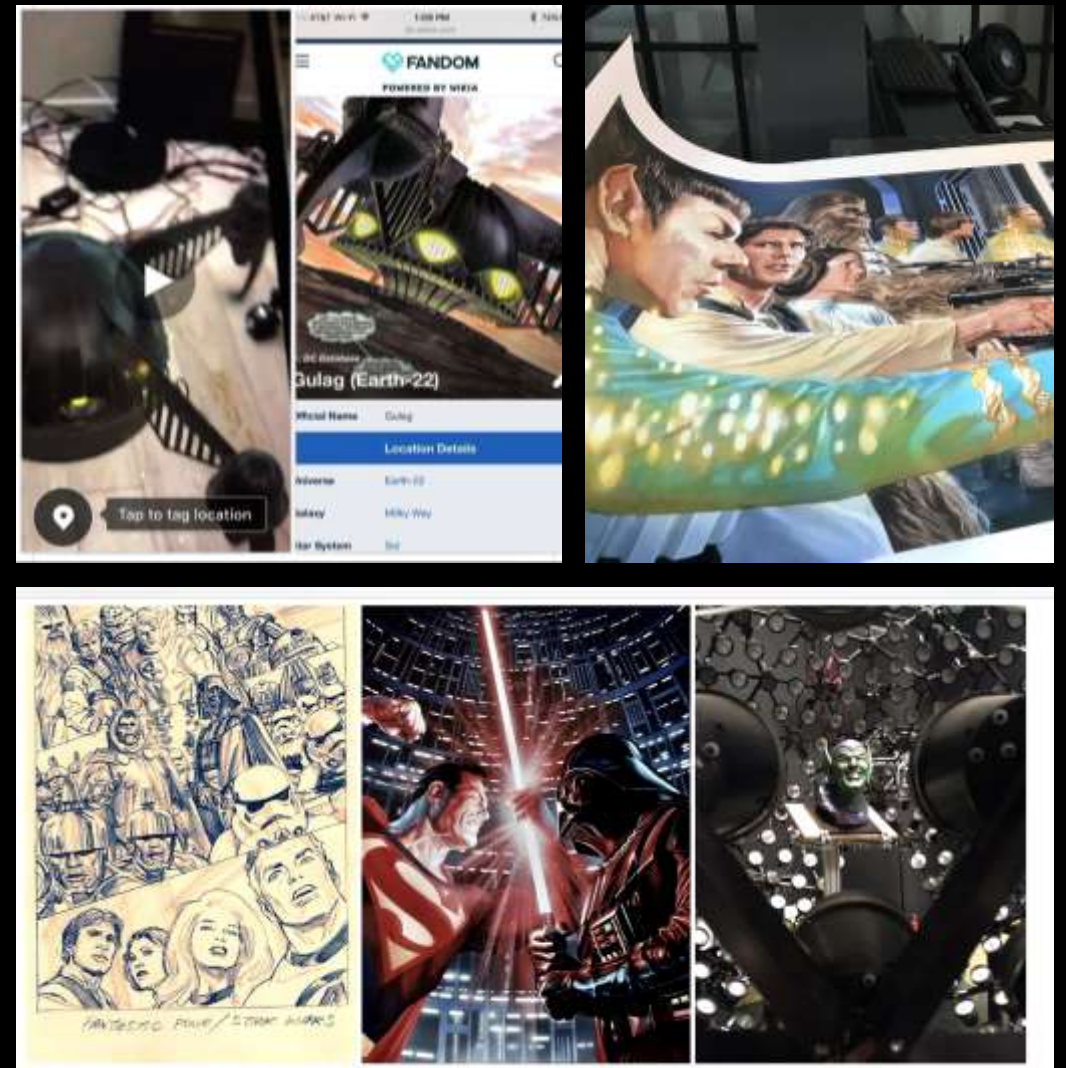
Jules Urbach Follow
Sep 28 · 5 min read

What is the Metaverse, really?



From Alex Ross' Gallery in the Metaverse

This summer, Octane user '24601' (not his actual account ID, but close enough!) was giving me feedback on the site and the Maya plug-in, and we got to talking about ORC (which was about to launch to a wider audience the following month).







otoy



THE FUTURE OF GPU RENDERING

JULES URBACH - CEO OTOY INC.

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GTC 2020

Jules Urbach, CEO

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