

production notes in teal

troubleshooting notes in pink

doc links in blue

Houdini

Download Houdini at <https://www.sidefx.com/download/>.

Intro to Houdini Resources

- <http://deborahrfowler.com/HoudiniResources/HoudiniOverview.html>
 - Watch that video & follow along. Don't worry about the trigonometry part
 - The Principled Shader is a *Mantra* shader. Mantra is the default renderer for Houdini (analogous to Maya Software).
 - We are rendering with **Arnold**, not Mantra
 - Arnold and all its shaders & lights are not available to Houdini Apprentice (free) users. We can only use it on Monty computers and on the Renderfarm.
 - Instead of making a principledshader node in the *mat* context, we will be making an **Arnold Shading Network** node in the *shop* context.
 - Read more in [Creating a shader](#) below
 - Instead of clicking Render > Create Render Node > Mantra (PBR), we will be doing **Render > Create Render Node > Arnold** to create our *out* or *rop* node.
 - Read more in [Setting up a render](#) below
 - Follow other links on that page to learn more about Houdini
- Basics of Houdini, from SideFX: <http://www.sidefx.com/docs/houdini/basics/intro.html>
 - Navigating the viewport: <http://www.sidefx.com/docs/houdini/basics/view.html>
- <http://deborahrfowler.com/HoudiniResources/HOUDINI-RESOURCES.html>
- You can pretty much google any Houdini question you have & find an answer within like 2 seconds. The SideFX documentation is really great.
 - In the Parameter View, you can click on the little “?” icon in the top right corner to pull up the documentation for the node you're on

Operators

- obj node = *Object* node, also known as a *container*.
 - Found in the obj context, in the *Scene* level (in your node network)
 - Includes Geometry objects, lights, cameras, grooms, etc.
 - <http://www.sidefx.com/docs/houdini/nodes/obj/index.html>
- sop node = *Surface Operator* node, also can be a geometry node.
 - A Geometry Object contains a geometry (SOP) network inside.
 - Think of SOPs like Shape nodes in Maya, basically
 - If this is wrong, don't shoot me, Tim Steele said it
 - <http://www.sidefx.com/docs/houdini/nodes/sop/index.html>

- rop node = *Render Operator* node, also referred to as *out* node
 - Lives in the out context. Used for rendering stuff
 - <http://www.sidefx.com/docs/houdini/nodes/out/index.html>
- dop = Dynamics Operator
- shop = Shader Operator
 - We use the *shop* context for Arnold shaders
- vop = VEX Operator
 - VEX = Vector Expression Language, Houdini's native programming language
 - like C++ but with more Houdini-specific things
 - VOPs are a pictorial form of VEX. They involve all the stuff that VEX does, but in the form of nodes
 - Looks like the Hypershade in Maya

Importing an Alembic

1. File > Import > Alembic Scene
2. Select path to Alembic cache and accept
3. Export your alembic cache from Maya as Ogawa, not HDF5.
4. Remember to check boxes to **include UVs** when exporting from Maya
5. If your abc doesn't load in correctly when you open Houdini, exit Houdini and open it again
6. More about Alembics & importing them into Houdini at <http://www.sidefx.com/docs/houdini/io/alembic.html#import>

Arnold for Houdini

Creating a light

1. Obj context, scene level
2. Node view > hit Tab > type Arnold Light
3. Light tab > Light Type > choose which type of light you want
4. extra: Contribution tab > AOV Light Group. [Per-light AOVs on Arnold docs](#)
5. Rename your arnold_light node - indicate key, fill, rim, skydome, hair, quad etc. light in name
6. Make sure all texture paths are relative to \$HIP

Creating a shader

1. Shop context, shaders level
2. Node view > hit Tab > type Arnold Shader Network. Creates arnold_vopnet node
3. Double-click on arnold_vopnet node, enters VEX Builder with OUT_material
4. hit Tab > type Standard Surface [Standard Surface on Arnold docs](#)
5. Connect "surface" from OUT_material to "shader" from standard_surface node
6. Edit shader parameters on standard_surface node
7. Connect displacement map directly to "displacement" input on OUT_material (no need for intermediary displacement node, except with vector displacement maps)
8. Rename your arnold_vopnet node on the Shaders level - ex., treebark_mat

Importing a texture

1. Shop > arnold_vopnet > VEX Builder, editing your shader
2. Node view > hit Tab > type Image. creates image node
3. Connect "base_color" (or other desired input) from standard_surface node to rgba output on image node
4. Image node > texture tab > Filename > input texture file. [Image node on Arnold docs](#)
5. Edit texture placement in UV tab.
6. Avoid using extra texture maps when possible by using your color map as your roughness/bump/disp map, making minor adjustments via the color_correct or mix nodes. [Color Correct on Arnold docs](#) [Mix RGBA on Arnold docs](#)
7. Make sure all texture paths are relative to \$HIP

Creating a bump/normal map

1. Shop > arnold_vopnet > VEX Builder, editing your shader
2. Node view > hit Tab > type Bump 2D. creates bump2d node
3. Connect Geometry > Normal input from standard_surface to vector input on bump2d
4. Connect image rgba output to bump_map or normal input (depending on the type of map) on bump2d
5. Adjust bump height as needed [Bump mapping on Arnold docs](#)

Setting up a render

1. Out context, “Outputs” level
2. Node view > hit Tab > make an Arnold node [Rop on Arnold docs](#)
3. Parameter view > Main tab. Select desired Camera
4. Properties tab contains most of the Arnold “render settings” from Maya & more
5. extra: Check “Override Camera Resolution” and specify a Resolution Scale to temporarily render at a lower res to test/speed up workflow.
6. Scene View > switch to Render View. Set desired Camera and hit Render
7. Though there is a “recycle” icon in the IPR window to automatically refresh the render, you may need to force refresh by hitting the Render button again (esp if making changes to geometry or major tweaks to shaders/lights).
8. It’s best practice to turn the Auto-Refresh button off. If you don’t, hit the red X button after the IPR render is done or else it will render repeatedly forever
9. If the render is upside down, hit H to reset the view

Instancing Workflow for Wander Set Dressing

1. We are using an **instancing workflow** using the **Instance** object with the **Arnold Procedural** (.ass, Arnold Stand-ins) instead of the copy sop, because **Arnold currently does not support packed primitives**.
 - a. What are packed primitives in Houdini?
<http://www.sidefx.com/docs/houdini/model/packed>
 - b. What is instancing? <http://www.sidefx.com/docs/houdini/copy/instancing.html>
 - c. Instance object <http://www.sidefx.com/docs/houdini/nodes/obj/instance.html>
 - d. Point attributes <http://www.sidefx.com/docs/houdini/copy/instanceattrs.html>
2. Documentation about the Instance object in Houdini, the Arnold Procedural (.ass files)
 - a. <https://docs.arnoldrenderer.com/display/A5AFHUG/Instancing>
 - i. Very useful tutorial for setting up instancing with .ass procedurals
 - b. <https://docs.arnoldrenderer.com/display/A5AFHUG/Archive> Archives in rop node
 - c. <https://docs.arnoldrenderer.com/display/A5AFHUG/Procedurals>
 - d. <https://docs.arnoldrenderer.com/display/A5AFHUG/Properties+Overrides>

Troubleshooting

HtoA

- HtoA currently does not support **packed primitives**
 - If you're importing geometry into your scene and not seeing it in the render, try unpacking it with the unpack sop.
 - We are using an **instancing** workflow using the **Instance** object with the **Arnold Procedural** (.ass, Arnold Stand-ins) instead of the copy sop. Documentation to come.
- Arnold occasionally throws an error when rendering a **skydome** with an **HDRI**, with a log error about the image file **tiling**.
 - Check Auto-Tile in the Arnold rop node (in the Textures tab)
- Arnold parameters on the object level node sometimes don't work if you're **object-merging** that object into another object
 - i.e., catclark subdiv iterations, displacement parameters, etc.

Houdini

- **Displacement** may not update reliably in the IPR window
 - Check your render in the MPlay window.
 - Menu bar, Render > Preview in MPlay > rop node.
- Sometimes **MPlay** refuses to render the correct rop node, even when you specify with the "Preview in MPlay" button.
 - Try changing the rop selected in the IPR window and try Preview in MPlay again.

Relevant Documentation

SideFX

- Packed primitives – <http://www.sidefx.com/docs/houdini/model/packed>
- Copy stamp – <http://www.sidefx.com/docs/houdini/nodes/sop/copy.html>
- Removing Mantra noise – <http://www.sidefx.com/docs/houdini/render/noise.html>
- Mantra ray limits – http://www.sidefx.com/docs/houdini/render/limits_tab.html

Arnold

- Fur/hair
 - Rendering fur workflow – <https://docs.arnoldrenderer.com/display/A5AFHUG/Rendering+Fur+Workflow>
 - Hair shape – <https://docs.arnoldrenderer.com/pages/viewpage.action?pagelId=38830213>
 - Standard Hair – <https://docs.arnoldrenderer.com/display/A5AFHUG/Standard+Hair>
- Set Dressing
 - Procedurals (.ass/stand-ins) – <https://docs.arnoldrenderer.com/display/A5AFHUG/Procedurals>
 - Instancing – <https://docs.arnoldrenderer.com/display/A5AFHUG/Instancing>
 - <http://www.sidefx.com/docs/houdini/nodes/obj/instance.html>
 - <http://www.sidefx.com/docs/houdini/copy/index.html>
 - <http://www.sidefx.com/docs/houdini/copy/instanceattrs.html>
 - <http://www.sidefx.com/docs/houdini/copy/instancing.html>
 - <http://www.sidefx.com/docs/houdini/copy/varying.html>
- Texturing
 - maketx – <https://docs.arnoldrenderer.com/display/A5AFHUG/Maketx>
 - UV Transform – <https://docs.arnoldrenderer.com/display/A5AFHUG/UV+Transform>
- Rendering
 - ROP node – <https://docs.arnoldrenderer.com/display/A5AFHUG/Render+Output>
 - Sampling – <https://docs.arnoldrenderer.com/display/A5AFHUG/Sampling>
 - Noise – <https://docs.arnoldrenderer.com/display/A5AFHUG/Removing+Noise>
 - Removing Noise workflow – <https://docs.arnoldrenderer.com/display/A5AFHUG/Removing+Noise+Workflow>
 - AOVS & noise – <https://docs.arnoldrenderer.com/display/A5AFHUG/Using+AOVs+to+Identify+Noise>
 - Ray Depth – <https://docs.arnoldrenderer.com/display/A5AFHUG/Ray+Depth>
 - Textures – <https://docs.arnoldrenderer.com/pages/viewpage.action?pagelId=38830468>
 - fix skydome tiling issue & maketx issues here