AV10255: Demystifying real-time material work flows for Stingray

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Class summary

With the introduction of Stingray 3D game engine, multitudes of new workflows are now possible. This class will explore and demystify the material workflows from 3ds Max software and Maya software to Stingray software. Simple materials are easy, but if you really want to capitalize on all Stingray has to offer you need to understand the basics of Shader FX and the new Stingray/PBR (physically based rendering). Much of this material will also be applicable in Unity and Unreal workflows.

Key learning objectives

At the end of this class, you will be able to:

- Deconstruct and understand the basic elements of PBR Shaders
- Learn how to assemble basic PBR shader networks
- Discover how and when to use various materials for different workflows
- Learn how to use appropriate methods for texture maps editing and generation

Tell me about you!

- Current Max users? How long? Other visualization software?
- Game engine users? Which ones?
- Material creation experience?

A little about me?

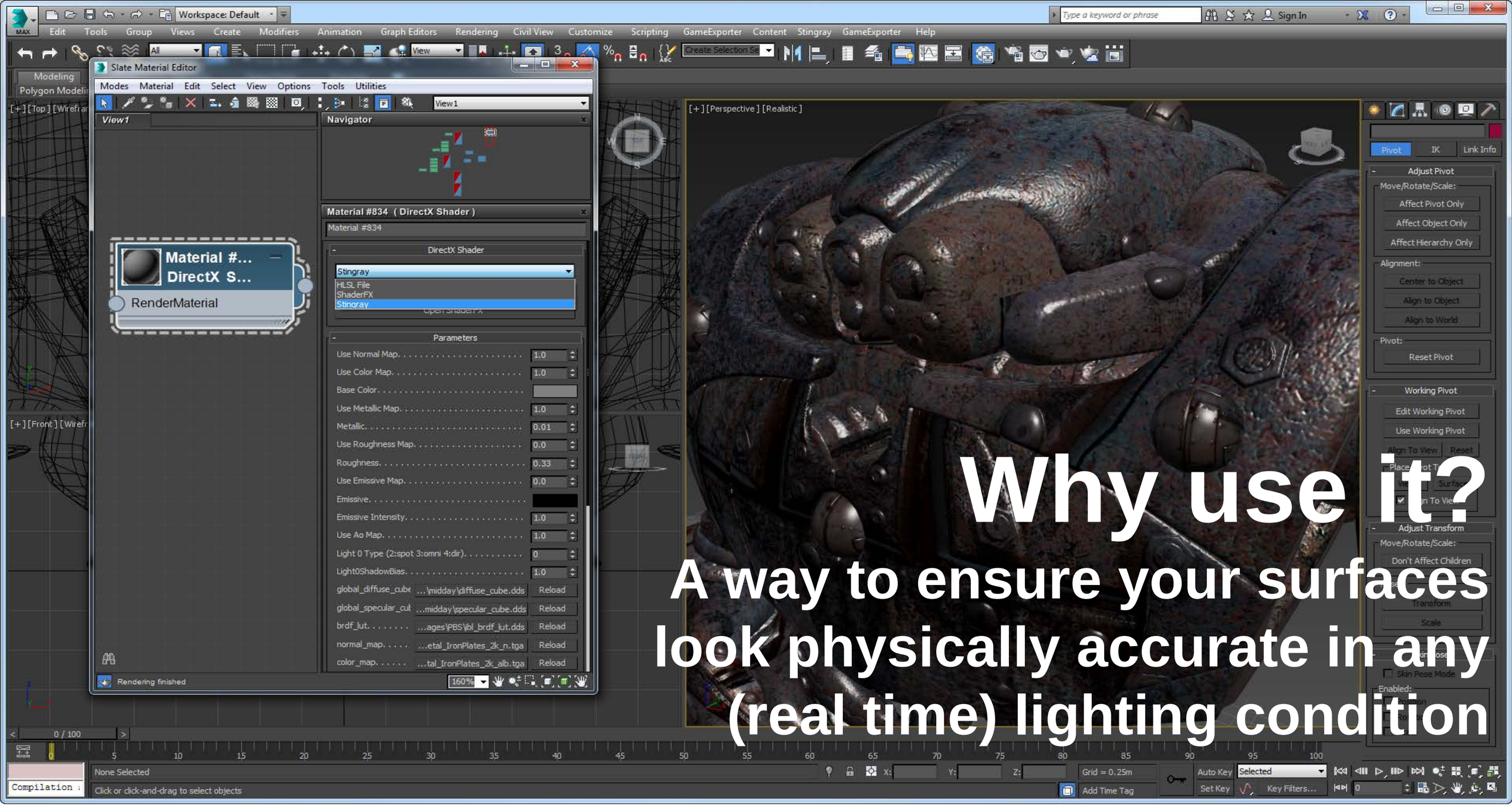
- Using Max since MaxR1 (DOS 2!)
- I’ve done a little bit of everything but mostly real time
  - Solid Generalist
  - Animation/don’t really like rigging
  - Modeling
- I love to learn…I don’t know it all!

Demystifying PBR - Lets get Started

What is it?

A method of rendering surfaces that is more physically accurate*


Stingray Editor (FC_Saltwork-AIA / Main_Scene_Saltwork_AIA)
File Edit Create Window Help
Sign In
Level Flow
Level Viewport
Perspective Full Rendering View
Real World Values
Courtesy of PLACE architects ltd
Explorer Create
Search
Level_Root
Entities
midday_shading_environment (Entity)
Units
360Building_FG (Unit)
Appartment (Unit)
Property Editor
midday_shading_environment
Search
+ Component
midday_shading_environment
Components
Global Lighting
Cascaded Shadow Mapping
Fog
Exposure
Ambient Occlusion
Screen-Space Reflections
Entity
Inherited Prefab
core/stingray_renderer/environments/midday/
Global Lighting
Skydome Map
core/stingray_renderer/environment
Skydome Intensity
5
Global Diffuse Map
core/stingray_renderer/environment
Global Specular Map
core/stingray_renderer/environment
Baked Diffuse Tint
1
Reflections Tint
1
Emissive Particle Intensity
1
Cascaded Shadow Mapping
Shadow Distance
100
Log/Linear Blend
0.4
Fog
Enabled
Asset Browser
Log Console
IMPORT
FC_Saltwork-AIA ▸ Content ▸ Meshes (28)
Search
FC_Saltwork-AIA
appkit
Content
Animations
Audio
Levels
Materials
Meshes
Scenes
Script
Textures
Buildings
Crowd
Foliage
Indoor Props
Outdoor Props
Street Props
M_Ardoise_01
M_ConcreteDalle_01
M_ConcreteSlab_01
M_ConcreteTileLeft_01
M_ConcreteTileRight_01
M_Default_01
M_EggshellConcrete_01
M_Glass_01
Asset Preview
No previewable asset selected
Full Rendering
Command
Editor Engine
[Perform] Select - midday_shading_environment


Slate Material Editor
Material #834 (DirectX Shader)
DirectX Shader
Stingray
HLSL File
ShaderFX
Stingray
Parameters
Material #...
DirectX S...
RenderMaterial
[+][Perspective][Realistic]
Why use it?
A way to ensure your surfaces look physically accurate in any (real time) lighting condition

OK good to know…

- PBR shader in 3ds Max, Maya, Maya LT , and Stingray
- All interchangeable
- Supported by FBX
- No programing or scripting required

What is a shader?

- Code (Human and machine readable)
- Series of definitions and parameters
- Connection to to the rendering engine
- There are different “flavors”

What can you use it on?

SOURCE: http://plyczkowski.com/

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- **Metal**

What can you use it on?

SOURCE: http://plyczkowski.com/

- Metal
- **Plastic**

What can you use it on?

SOURCE: http://plyczkowski.com/

- Metal
- Plastic
- **Wood**

What can you use it on?

SOURCE: http://plyczkowski.com/

- Metal
- Plastic
- Wood
- **Fabrics**

What can you use it on?

SOURCE: http://plyczkowski.com/

- Metal
- Plastic
- Wood
- Fabrics
- **Skin**

What can you use it on?

SOURCE: http://plyczkowski.com/

- Metal
- Plastic
- Wood
- Fabrics
- Skin
- **Dielectric (rubber)**

Physics Primer
PBR is leveraging physics of light

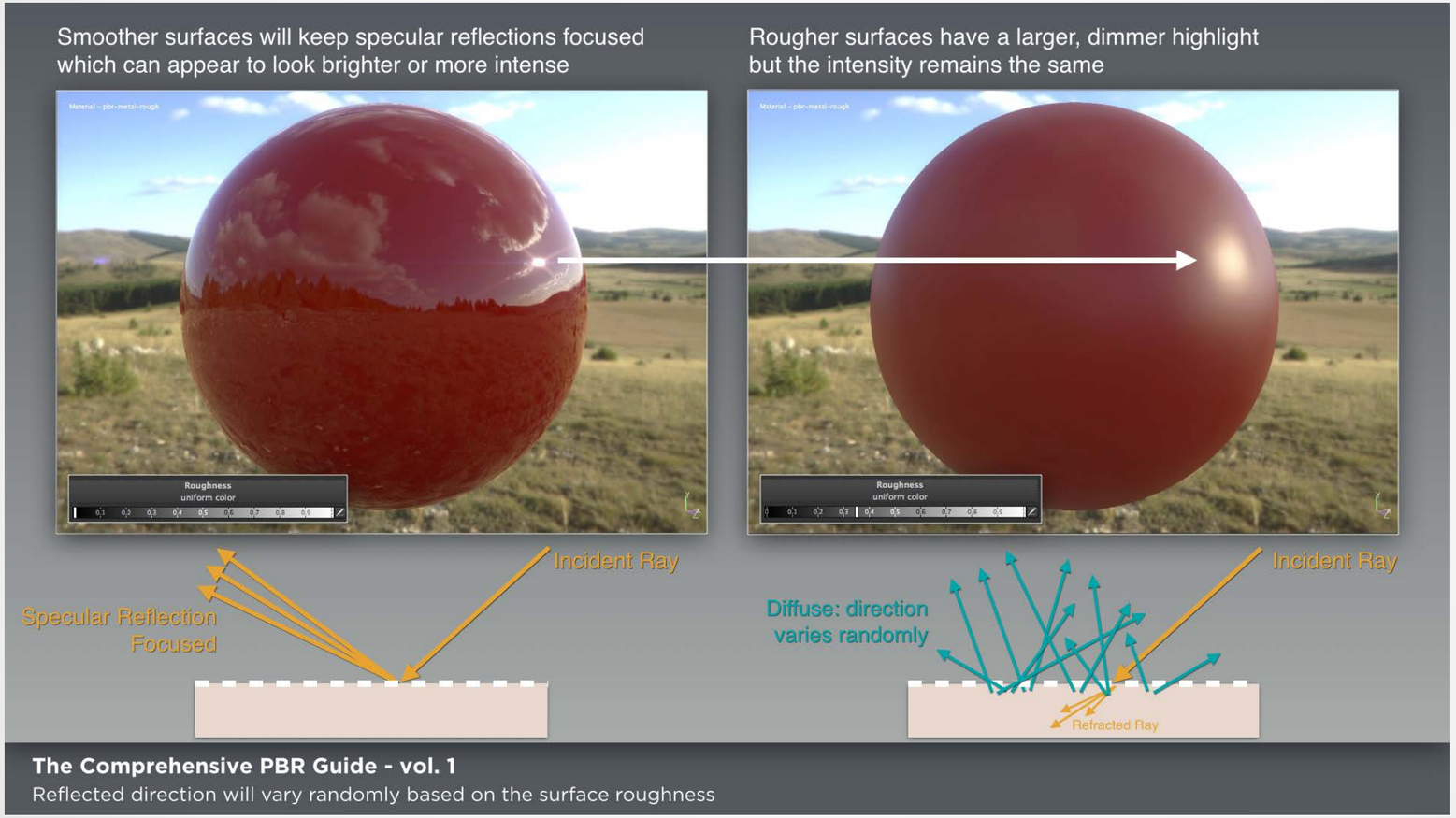
PBR is leveraging physics of light

- Diffusion (Albedo)
- Reflections
  - Fresnel
  - Microsurface
- Energy Conservation
- Ambient Occlusion

Ambient Occlusion

http://www.interstation3d.com/tutorials/making_slow_decay/slow_decay_take07.htm

Diffusion (Albedo)

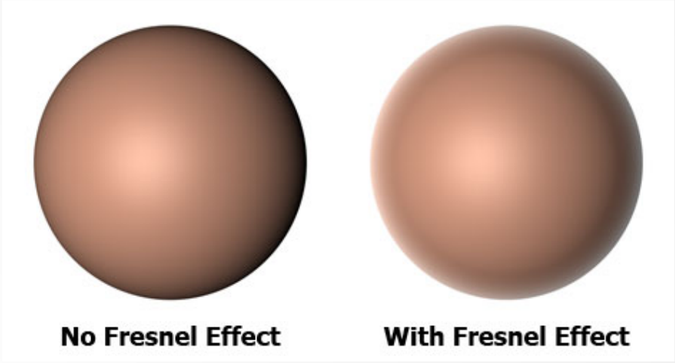


Source: The Comprehensive PBR Guide by Allegortihmic by Wes McDermott

Reflections

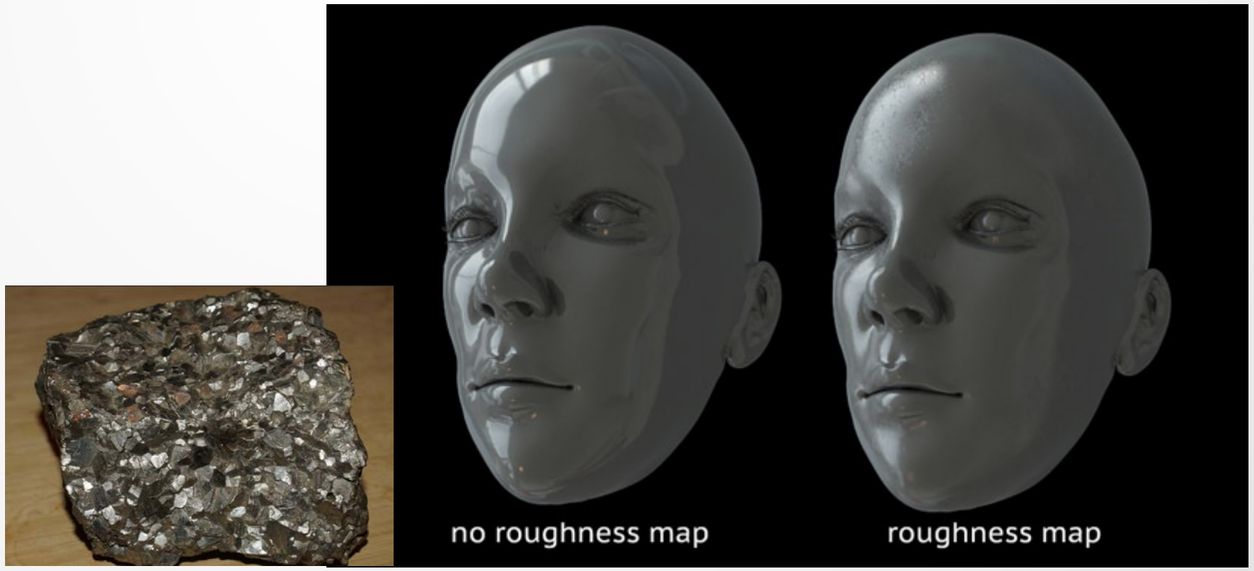
- Fresnel
  - What you see at glazing angles
  - Handled by the shader

http://wiki.thesimsresource.com/images/7/7f/FresnelEffect.jpg



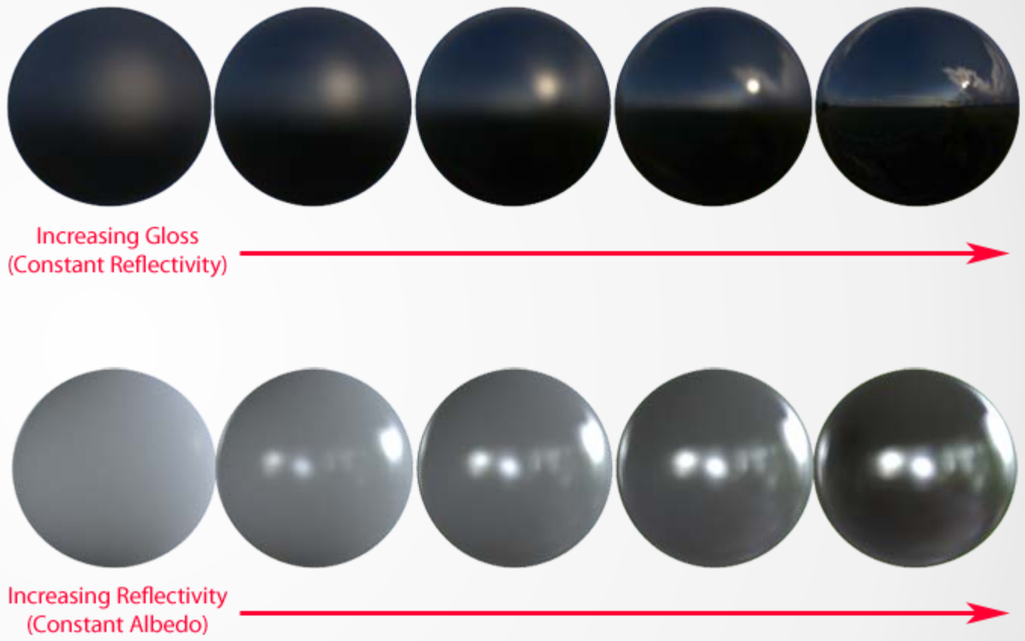
- Microsurface
  - Roughness map

http://www.cgchannel.com/2012/10/10-tips-for-lighting-and-look-development/



Energy Conservation

- Objects can’t reflect more energy than they receive.
- Important to know that this is occurring, but its enforced by the shader



http://www.marmoset.co/toolbag/learn/pbr-theory

Creating PBR Materials

What matters for you?

- 2 Methods of PBR Shader implementation
  - Metal/Roughness (Stingray uses this method)
  - Specular/Glossiness
- Which Method does your shader/engine utilize?
- Understanding what type of surface it is
  - Dielectric/Insulator?
  - Conductor/Metal?

Metal/Roughness? OR Specular/Glossiness?

- What's the difference?
  - How the diffuse and reflectivity are defined
    - In Spec method it uses 2+ maps
      - Diffuse
      - Specular/glossiness
    - In Metalness method
      - Albedo Map defines diffuse and reflectivity (luminosity)
      - Metalness Map defines insulator or metal qualities

Metal/Roughness? OR Specular/Glossiness?

- Pros
  - Less texture memory
  - Narrower usage types
- Cons
  - Material Artifacts possible
  - Less control over reflections
  - Large margin for error in Metalness Map values

- Pros
  - Diffusion and Ref. are 2 inputs
  - Reflected color separate from Diffuse
- Cons
  - Large margin for error (values)

NOTE: These are not interchangeable between each other

What about Texture Maps?

- Metal/roughness (in Stingray)
  - Albedo (Evolution of diffuse map)
  - Metalic (not required to be ‘PBR’ !)
  - Normal
  - Roughness (microsurface)
  - Ambient Occlusion
  - Emissive
- Specular
  - Diffuse or Albedo
  - Glossiness
  - Specular
  - Normal

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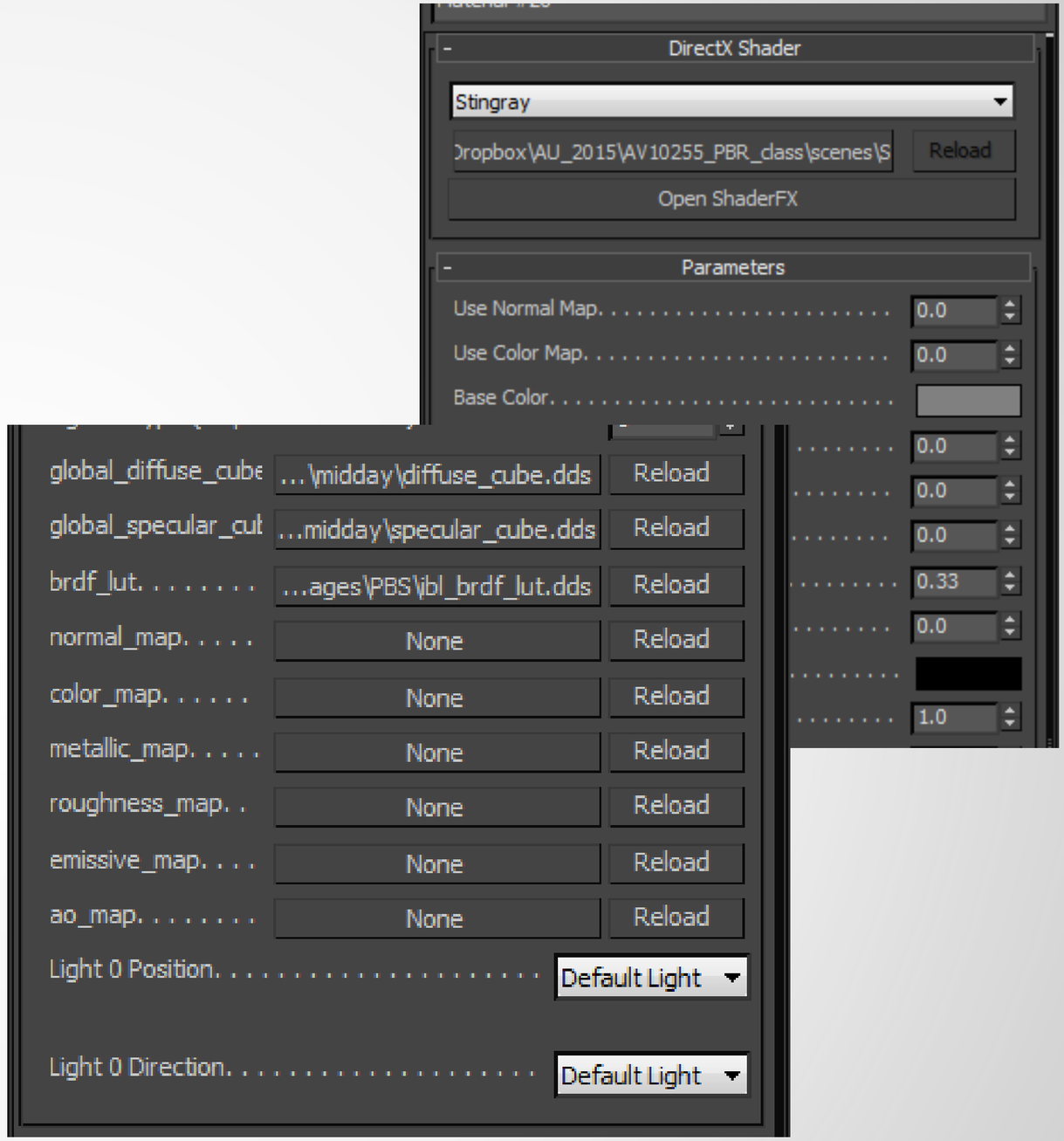
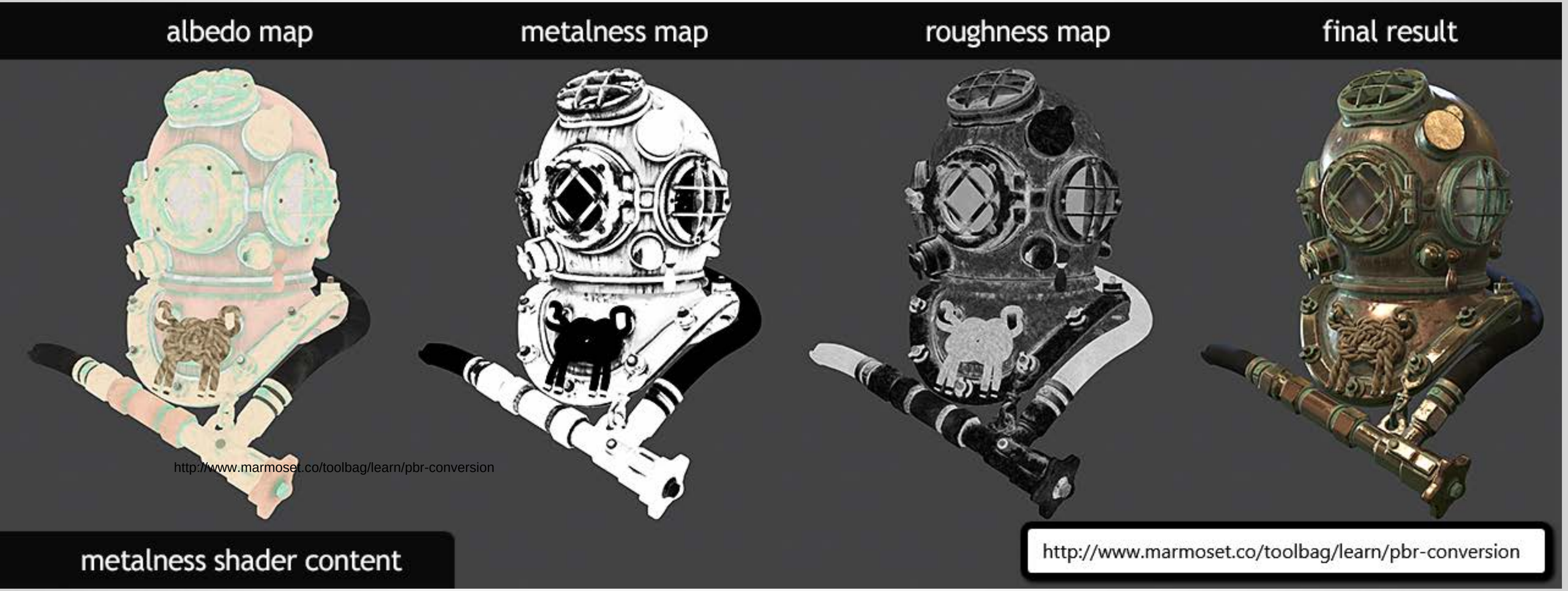


The Metalness workflow in Action



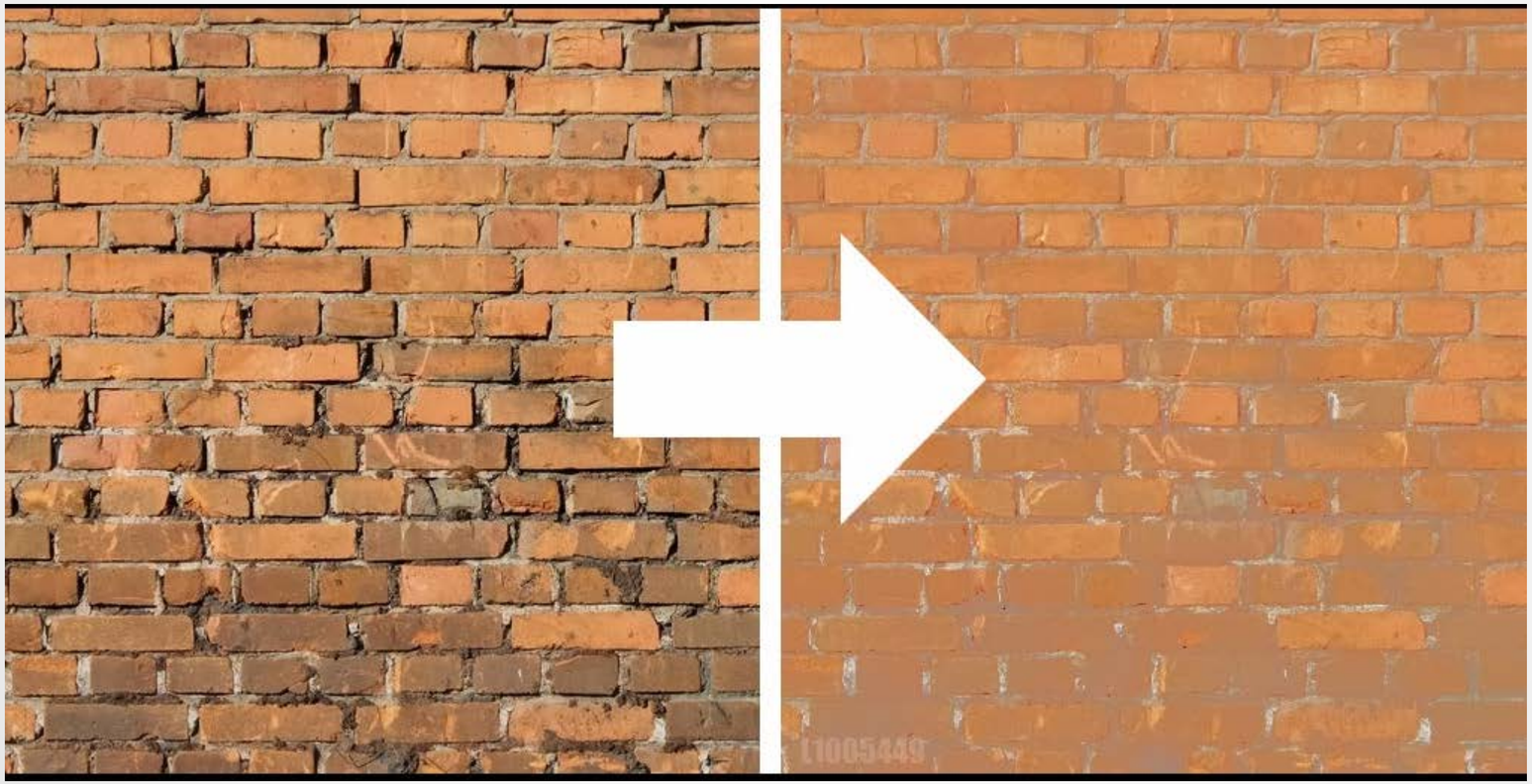
What the heck is an Albedo Map?

- Diffuse (old school)
  - May contain Color, Occlusion, Specular

- Albedo (PBR)
  - Only color information
  - Other maps do all the work

What the heck is an Albedo Map?

- Diffuse (old school)
- Albedo (PBR)



https://facepunch.com/showthread.php?t=1454089&page=4

Tools for creating PBR Materials and Maps

Stingray Material Teaser

Software Tools for PBR

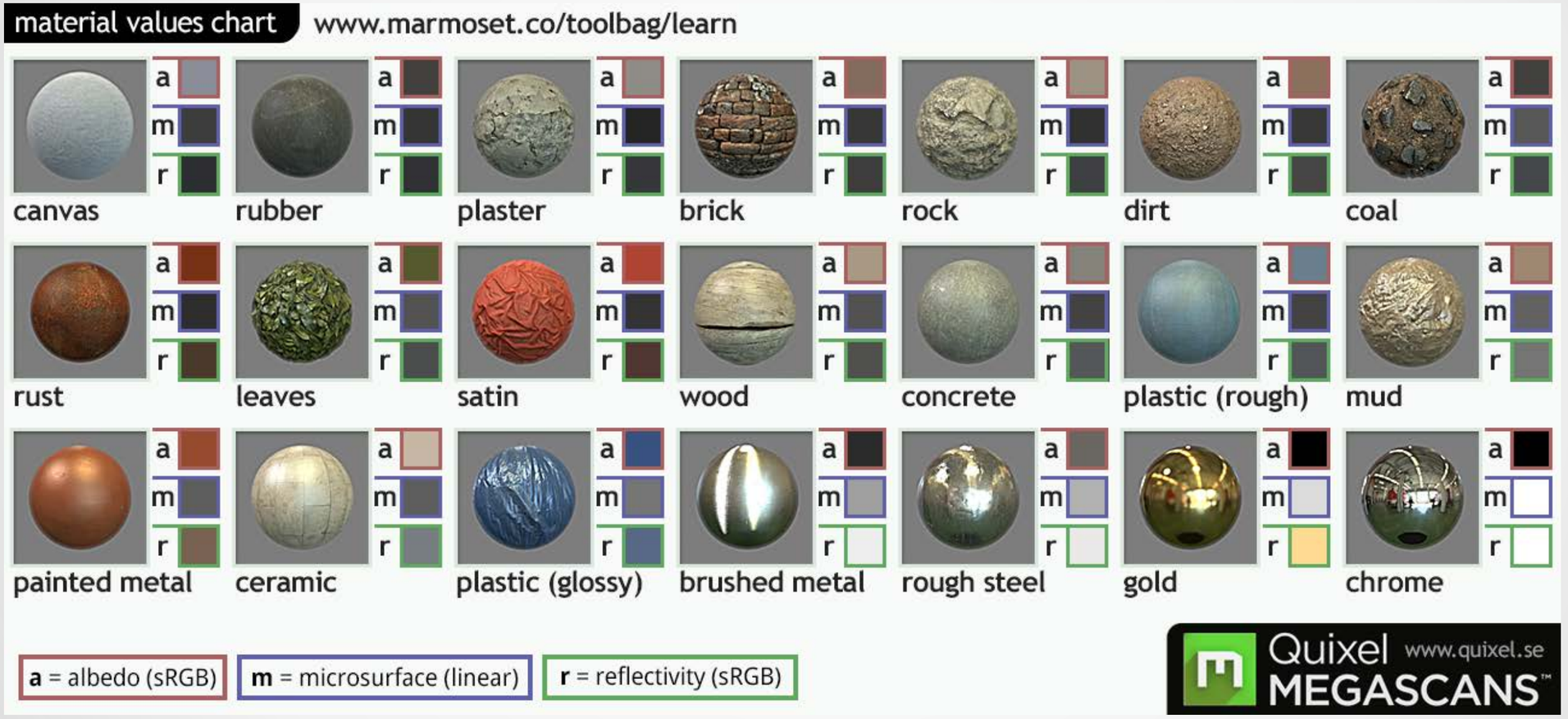
- Photoshop
- CrazyBump
- Allegorithmic – Bitmap to Material (B2M)
- Reference Charts

- Allegorithimic – Painter
- Quixel
- Marmoset Toolbag

Creating from scratch: before we begin…

- Thank goodness for smart people that like to share!
- Reference Charts!
- 32-bit… they must stay that way…

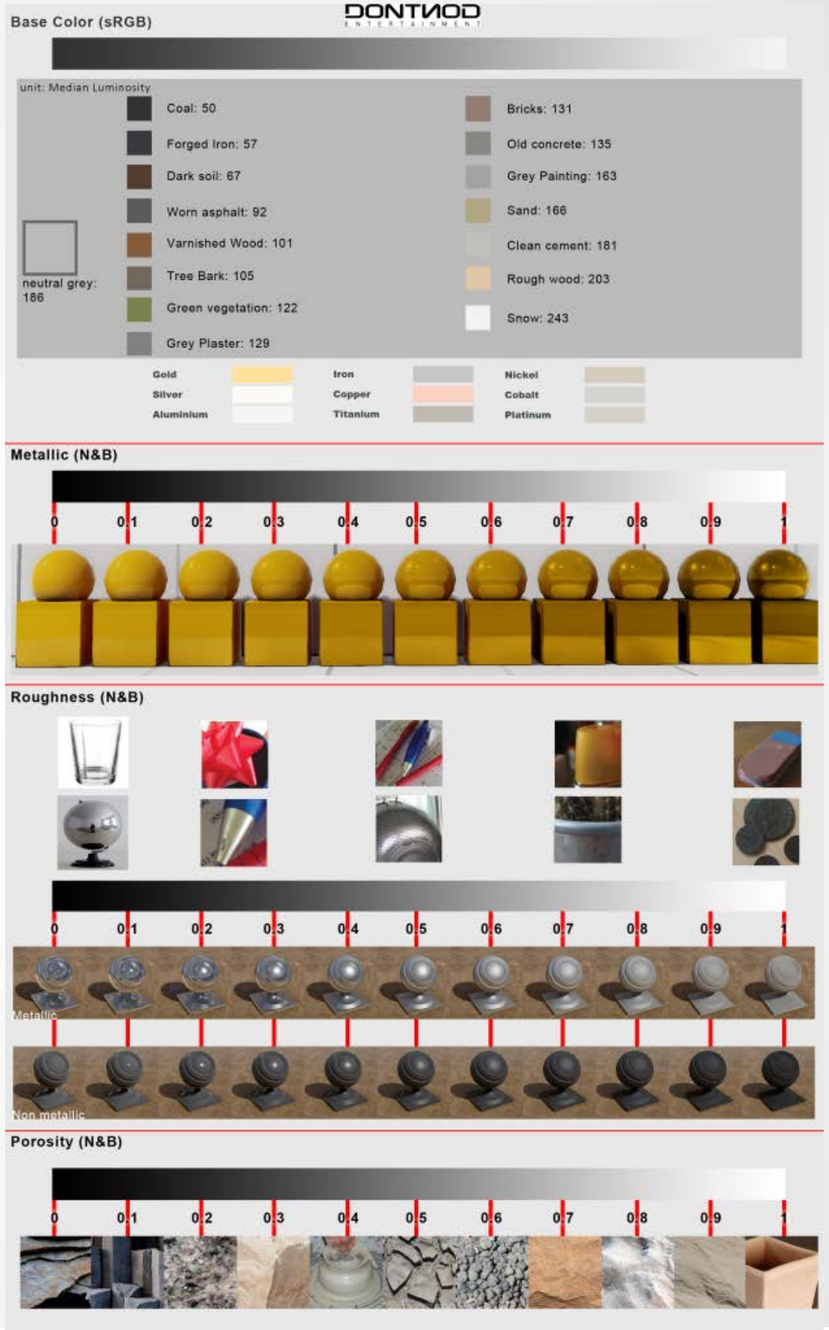
Marmoset Material Values



http://www.marmoset.co/toolbag/learn/pbr-theory

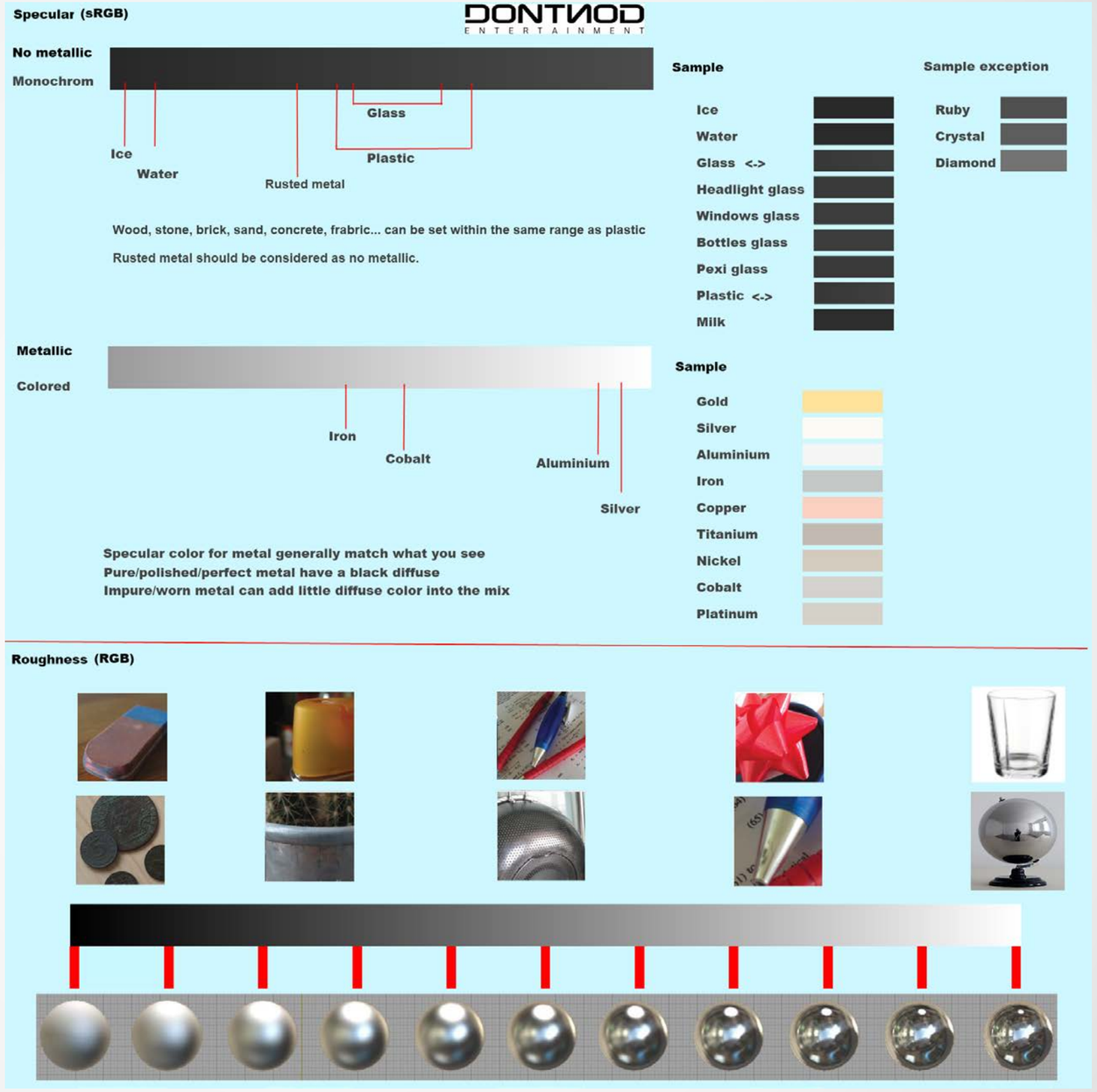
“Don’t Nod” 1

- Metalness reference



“Don’t Nod” 2

- Specular reference
- Still useful



Starting with end in mind: 3dsMax

- Jump to 3dsmax
- Where is the Stingray Shader?
- Deconstruct a PBR Material
- Lets make a PBR from scratch

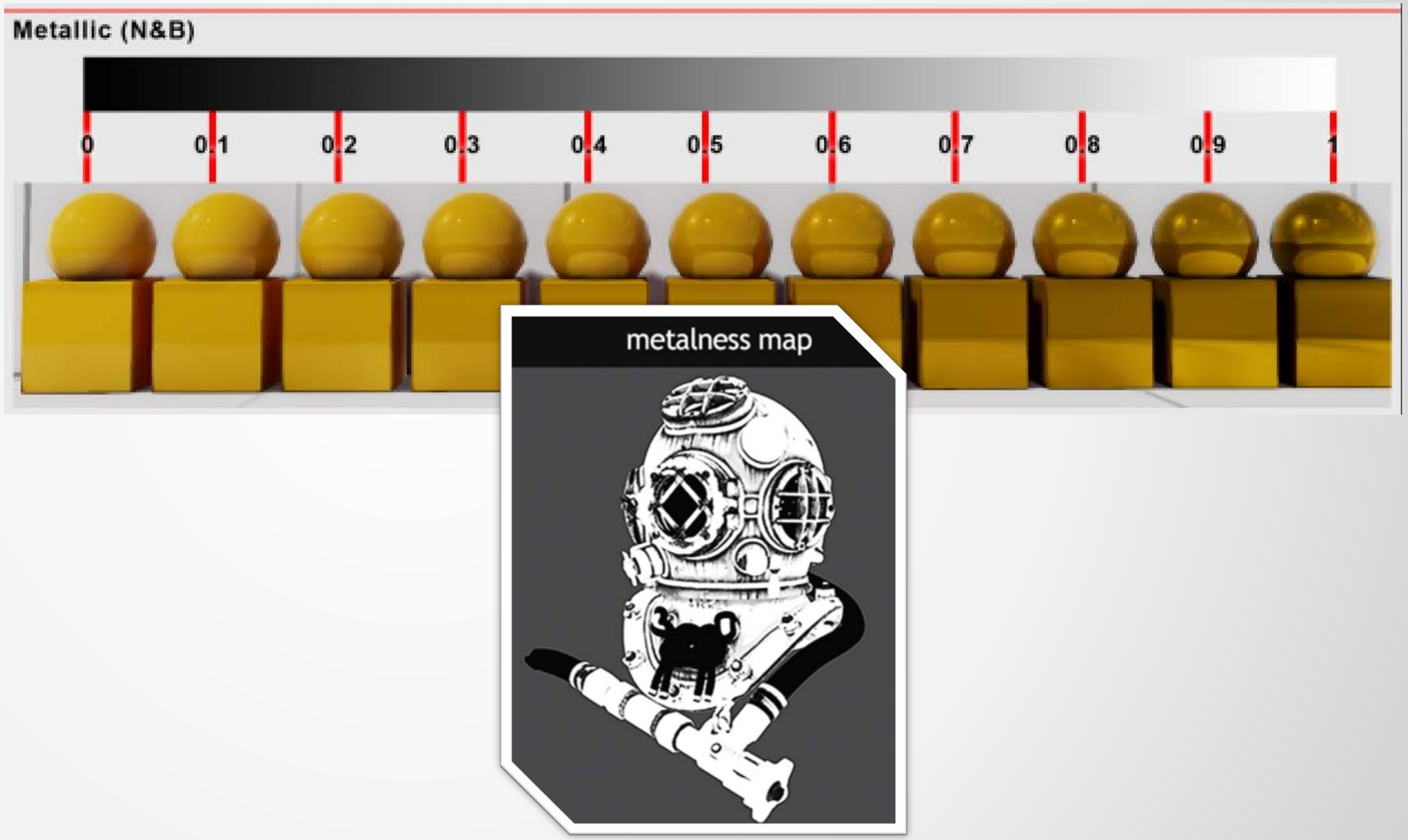
Creating Textures – Creating the Albedo

- Convert Diffuse to Albedo
- Set luminosity – IMPORTANT – but can be flexible
- Use a color swatch with a specific luminosity
- See various reference charts

- Base Color not the same as Albedo (example dielectric or non-conductor)

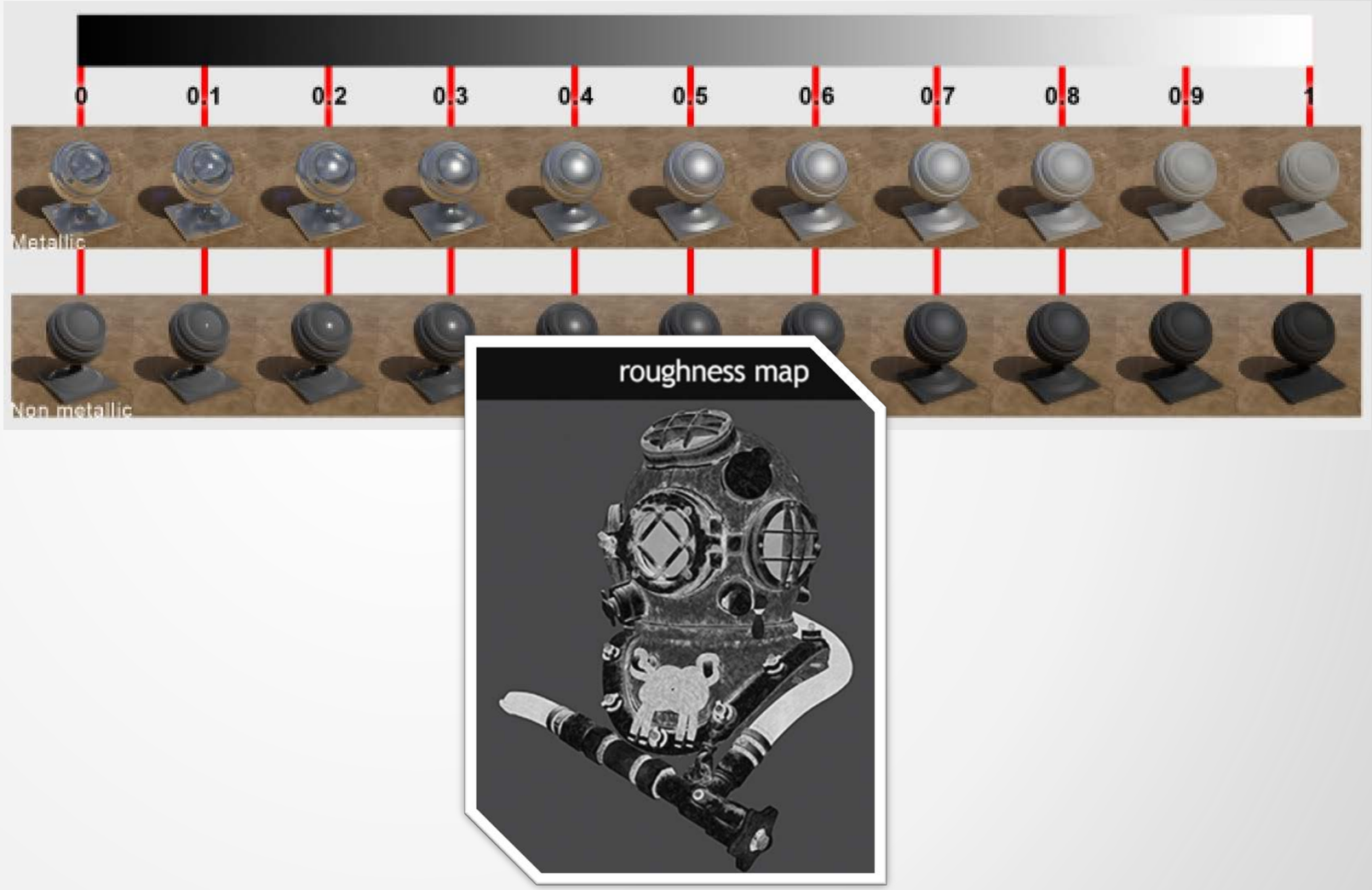
Creating Textures – Creating the Metalness Map

- Get the “metalness” value from a reference chart
- Create a swatch to be very specific



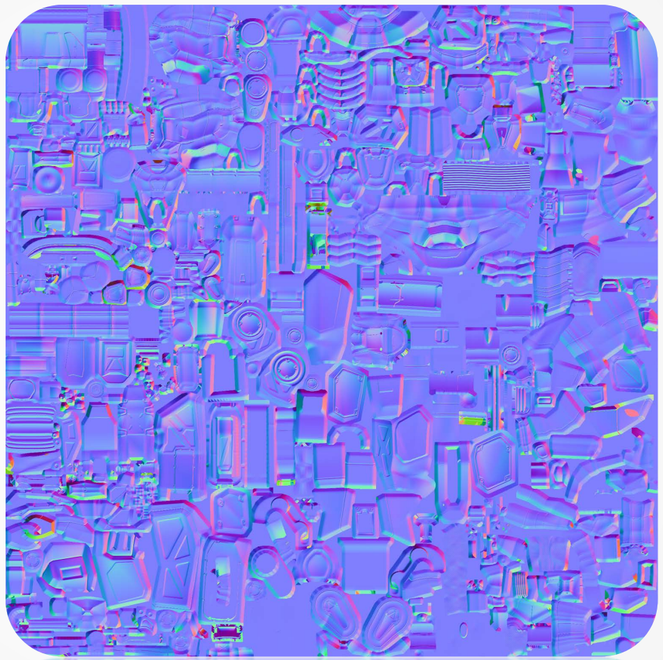
Creating Textures – Creating the Roughness Map

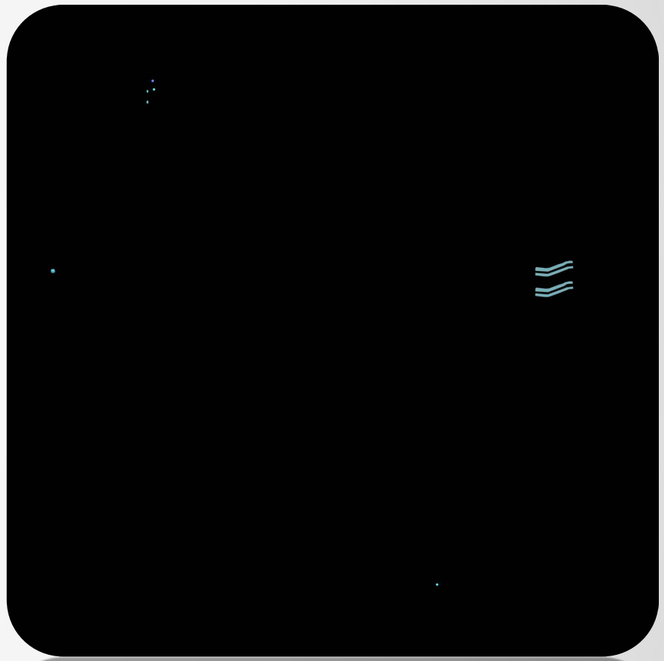
- Get the Roughness value from reference chart
- Use a sample as basis for creating your texture map.



Creating Textures – Creating the Other maps

- Normal – Same as you're used to
- AO – Same…
- Emissive – Same…





Shooting Source Textures

- Mac Beth Chart
- Polarized Lens
- Color Calibration tool
  - ColorTarget2
  - https://colortarget.wordpress.com/

Thank you!

AUTODESK®

@chrismmurray

\3dsmaxtrainer

”Pinning the Stack”

Sources and Thanks

- Sources for images noted on specific slides
- Special thanks to Zak Inks, Clemson University, “PBR Pipeline for Unity 5.0”
- Special thanks to Allegorithmic, Wes McDermott
- Special thanks to “Don’t Nod” games
- Special thanks to Marmoset