

# Image-Based Remapping of Material Appearance

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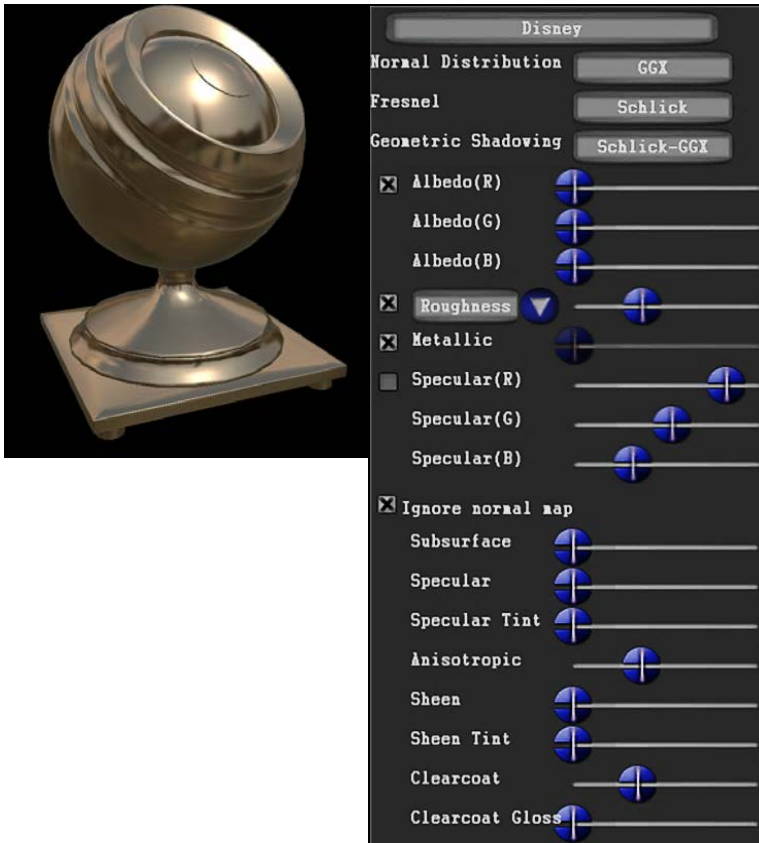
Computer  
Graphics  
Charles  
University

**DiSTRO**



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# Material authoring



[Retrieved from Unity forum]



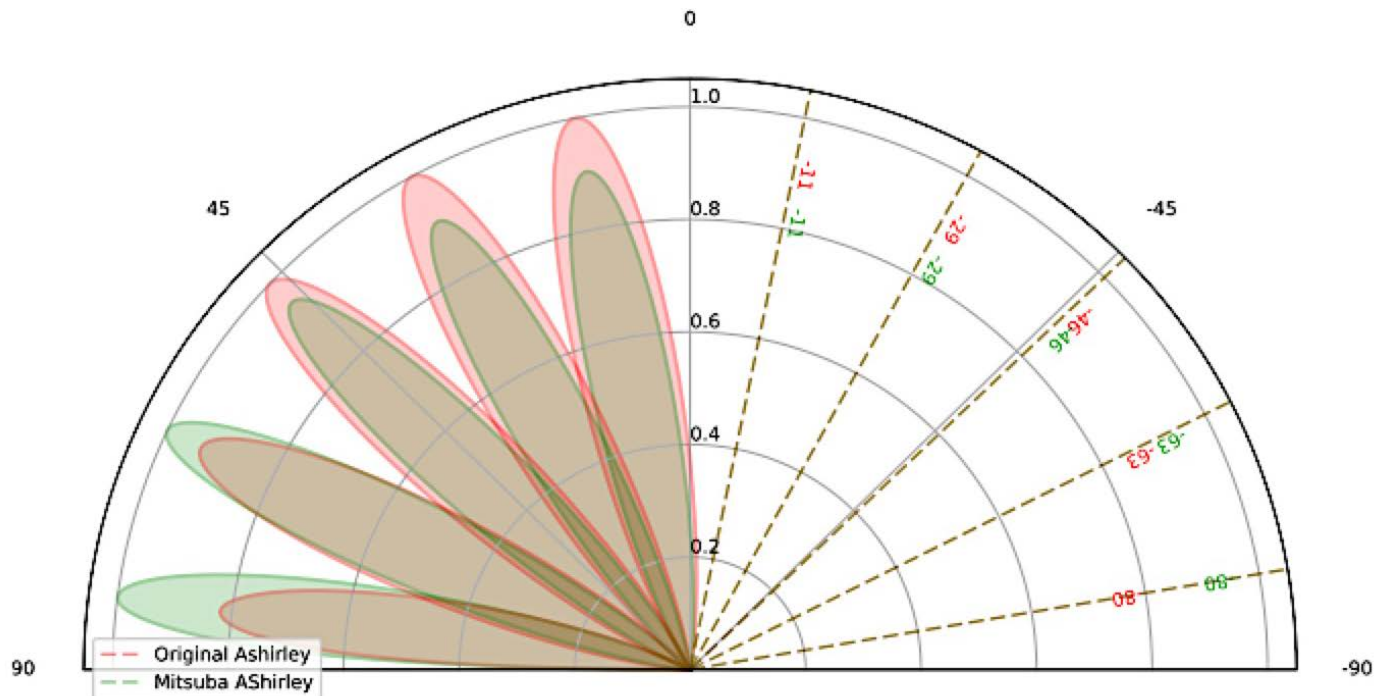
SUBSTANCE DESIGNER

Unity

allegorithmic

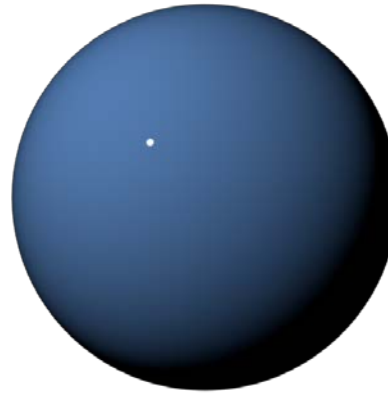
# Model incompatibility

1. Different BRDF models used by different softwares
1. No clear way to translate between models
3. We usually don't have access to the implementations
4. and they change between renderers

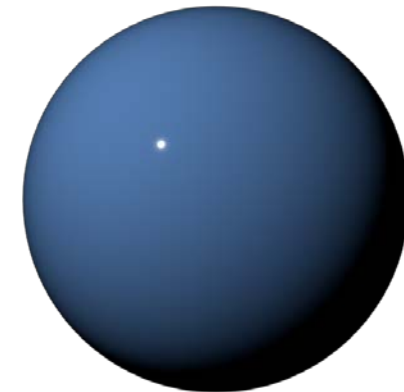


# BRDF remapping

Reference BRDF model



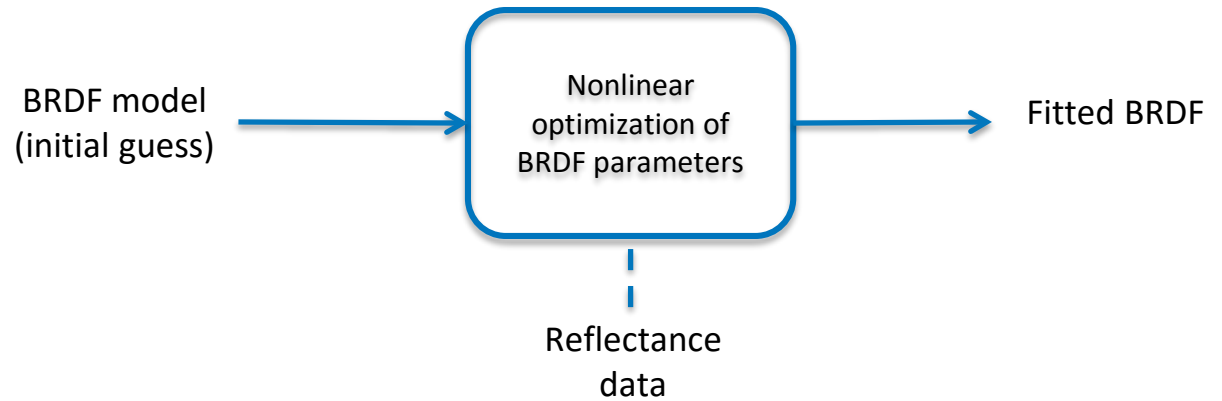
External BRDF model  
(initial condition)



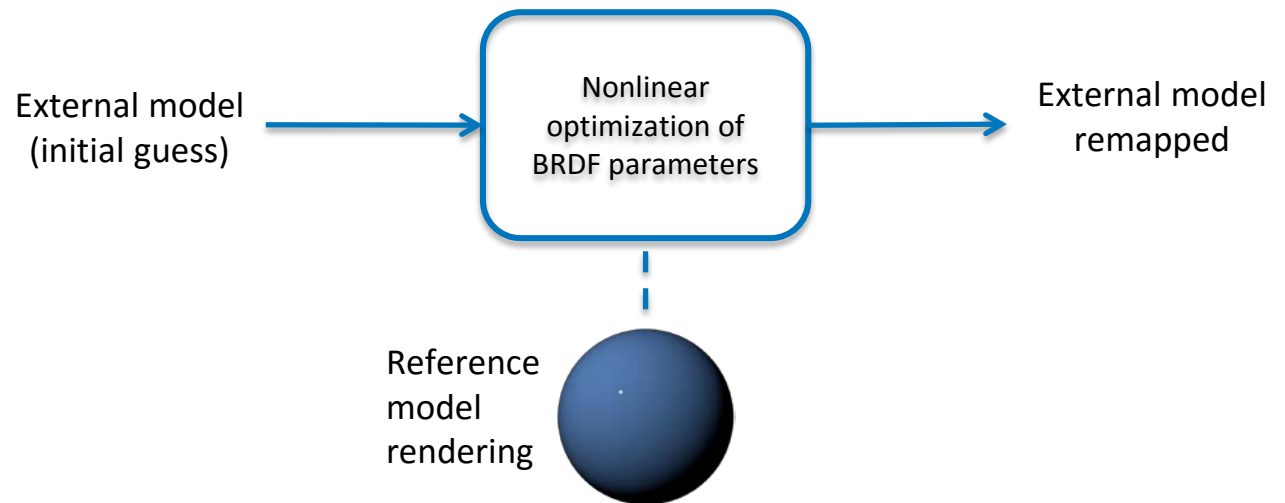
External BRDF model  
(after remapping)

# BRDF remapping

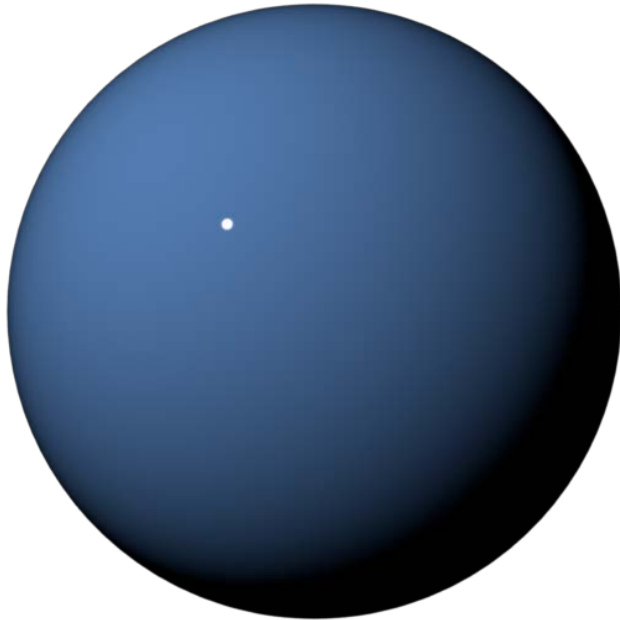
## BRDF fitting



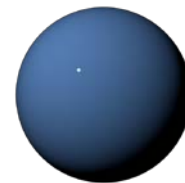
## BRDF remapping



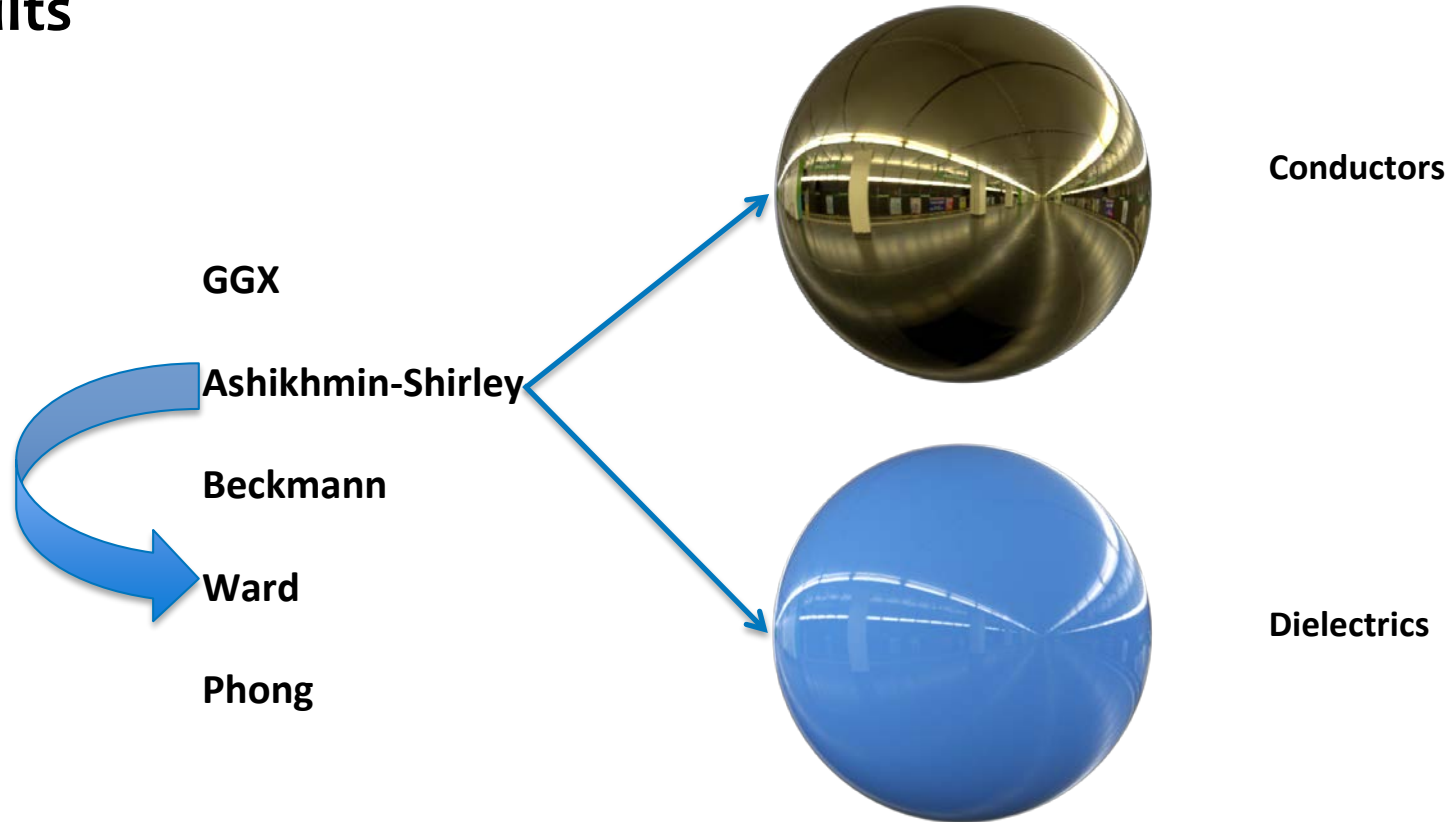
# Appearance comparison



- Spherical geometry
- Point light illumination
- $L_2$  metric for comparison
- Nonlinear optimization with TRF



# Results



# Results: conductors

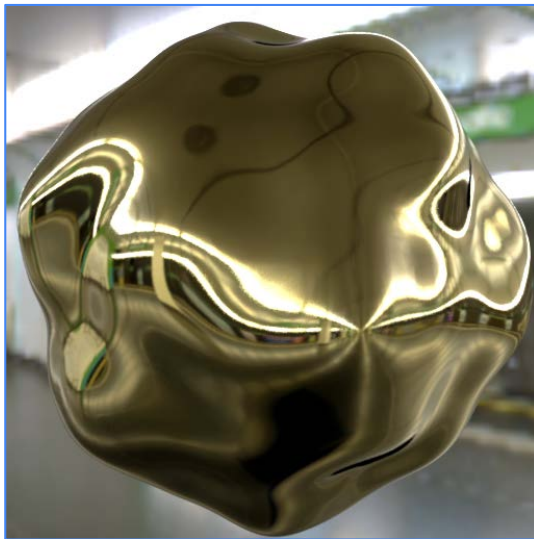
## Ashikhmin-Shirley

- RGB Reflectivity
- Roughness

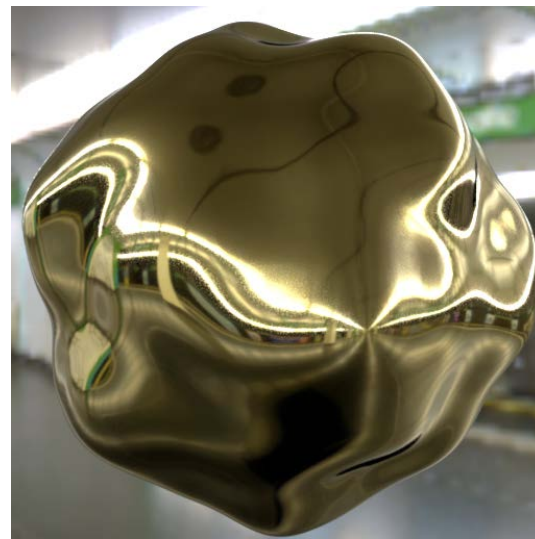


## Ward

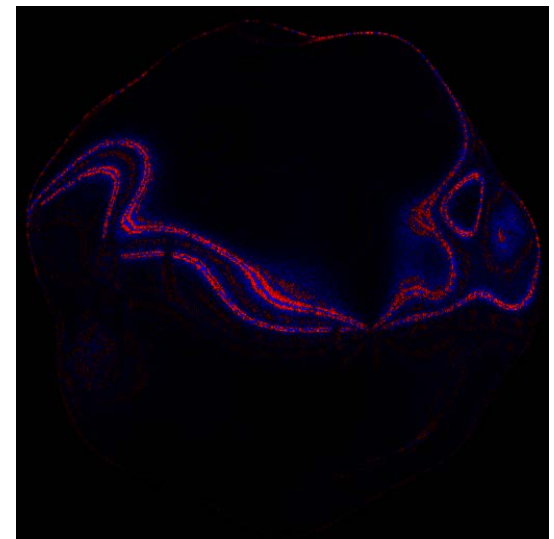
- RGB Specular reflectance
- Roughness



Reference Ashikhmin-Shirley BRDF



External Remapped GGX BRDF



Error



# Results: remapping of conductors

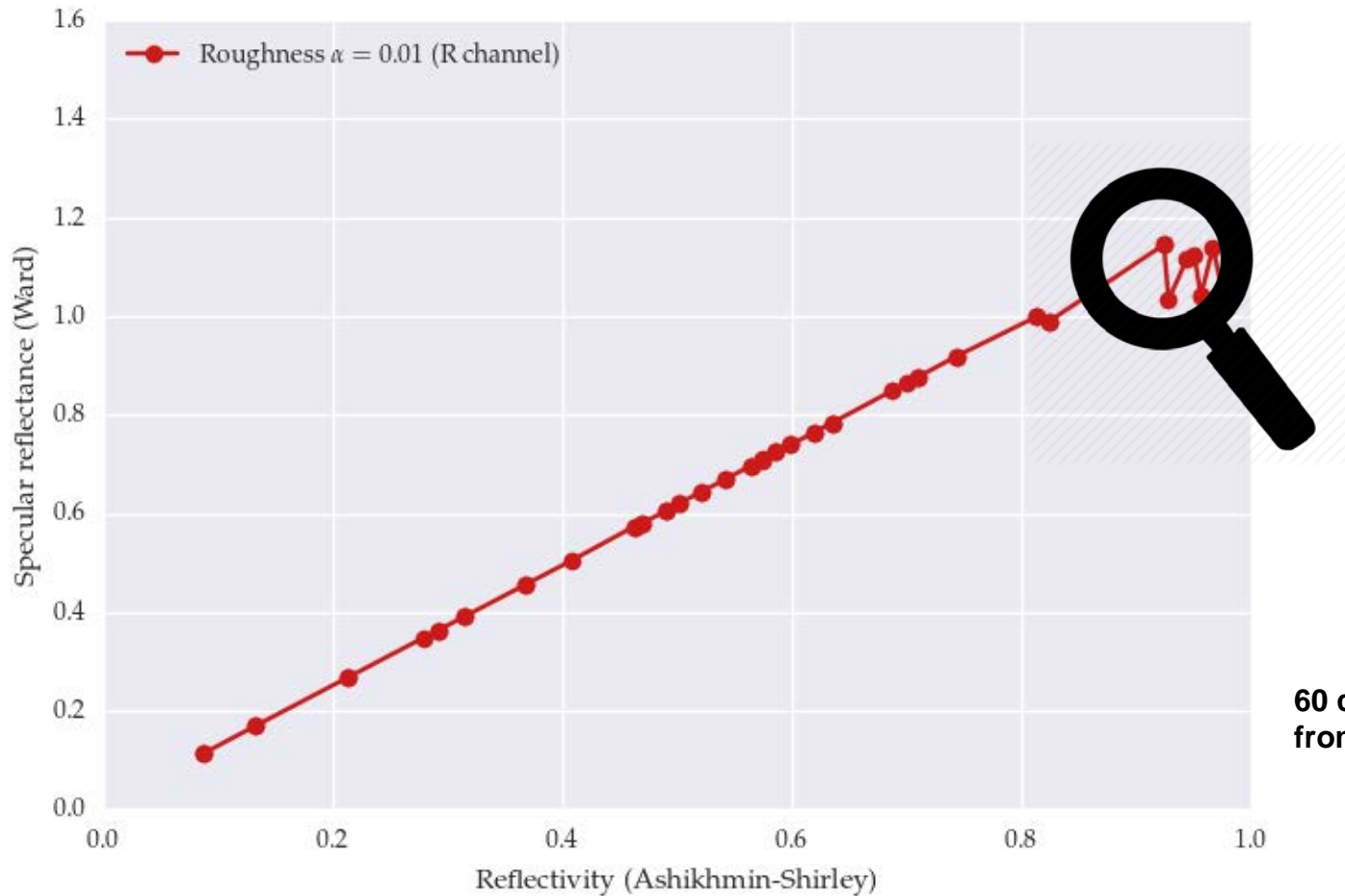
## Ashikhmin-Shirley

- RGB Reflectivity
- Roughness



## Ward

- RGB Specular reflectance
- Roughness



60 conductors  
from Mitsuba's DB

# Results: remapping of conductors

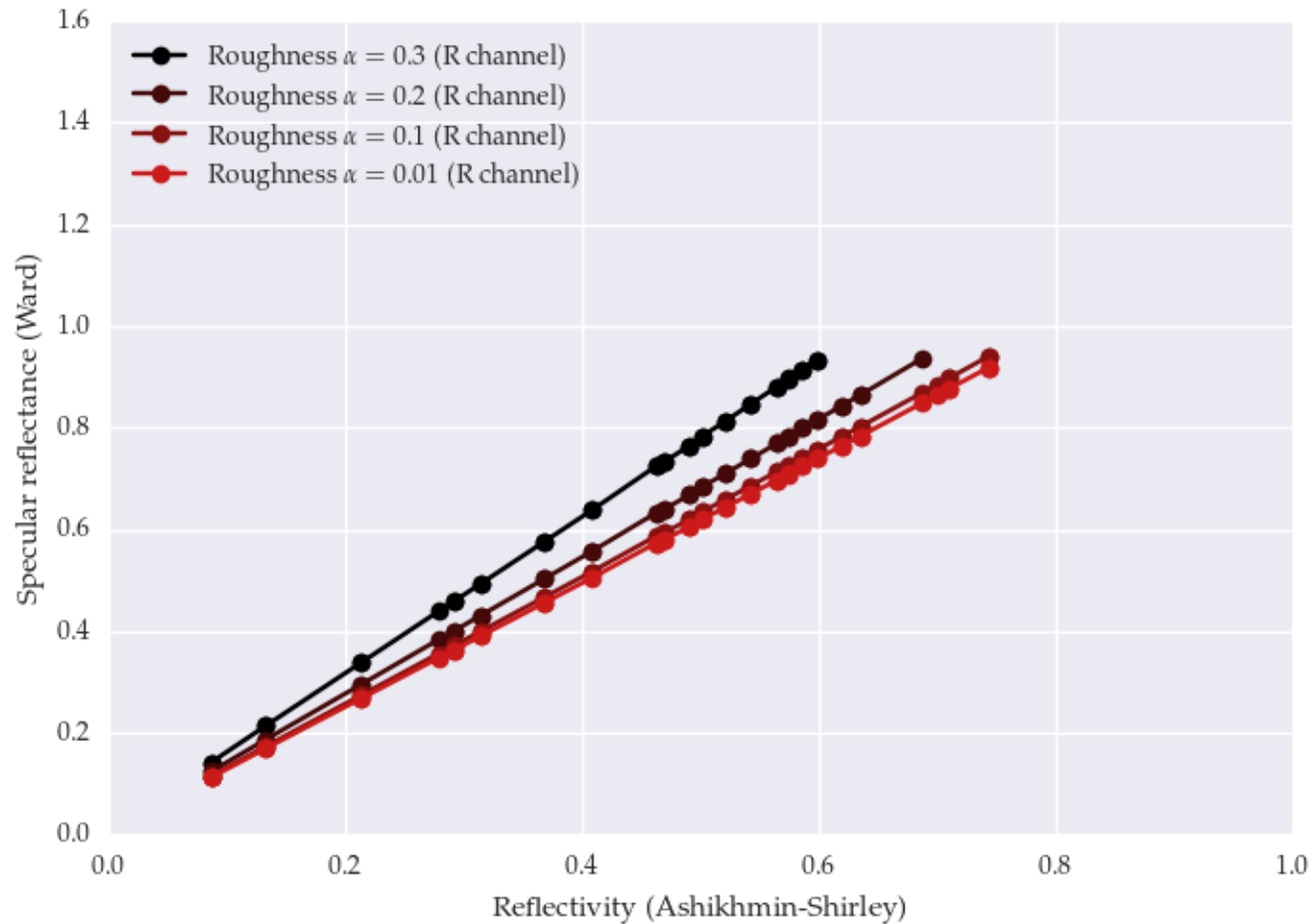
## Ashikhmin-Shirley

- RGB Reflectivity
- Roughness

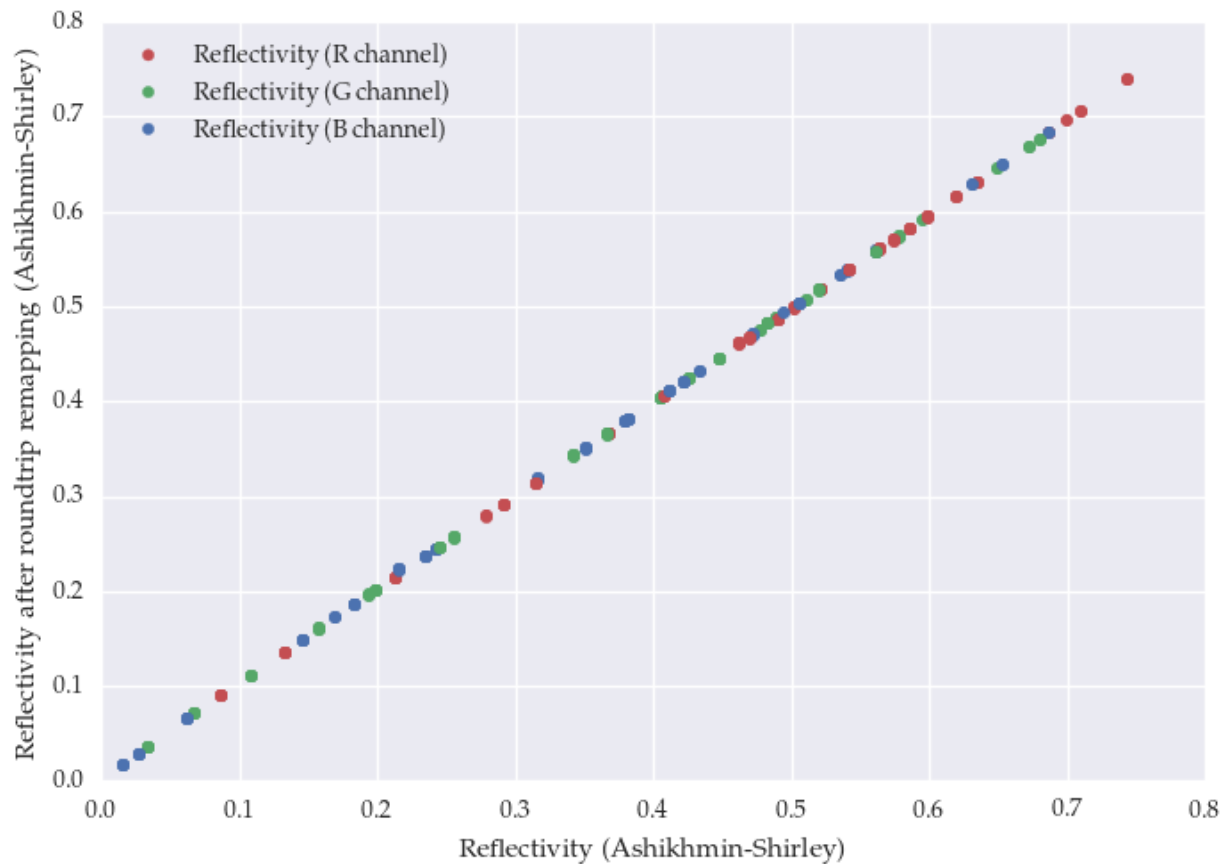


## Ward

- RGB Specular reflectance
- Roughness



# Results: remapping of conductors (roundtrip)



# Results: dielectrics

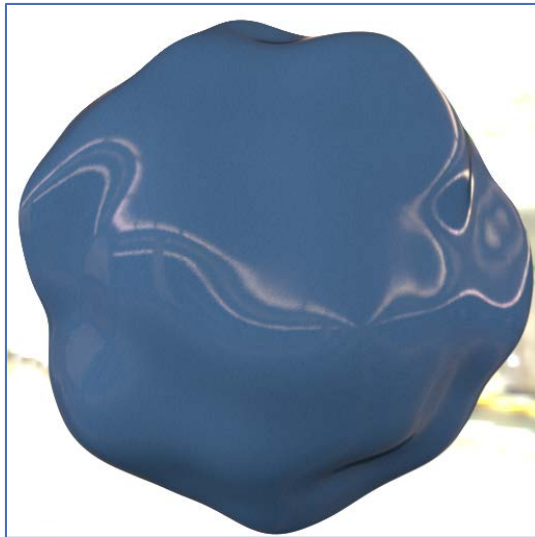
## Ashikhmin-Shirley

- RGB Diffuse reflectance
- IOR
- Roughness

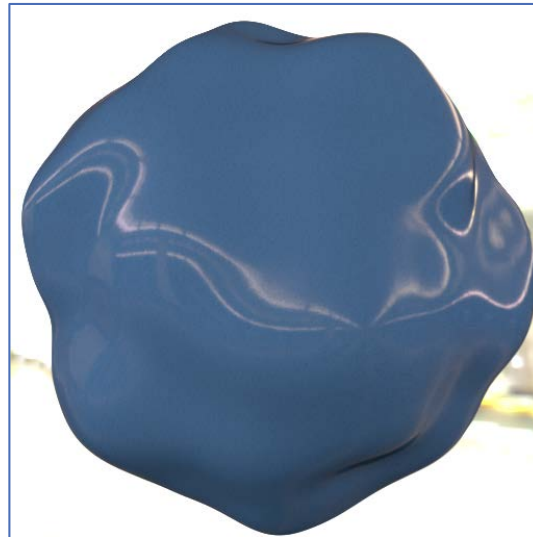


## Ward

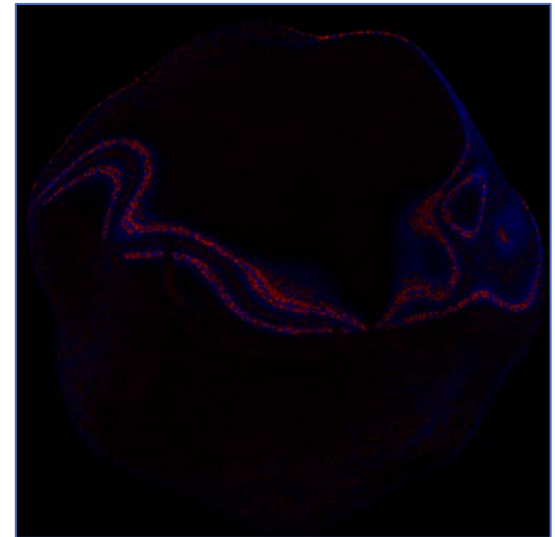
- RGB Diffuse reflectance
- RGB Specular reflectance
- Roughness



Reference Ashikhmin-Shirley BRDF.



External Remapped GGX BRDF



Error

# Results: remapping of dielectrics

## Ashikhmin-Shirley

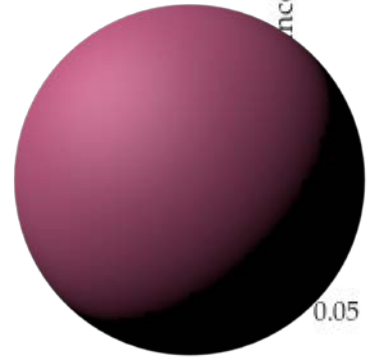
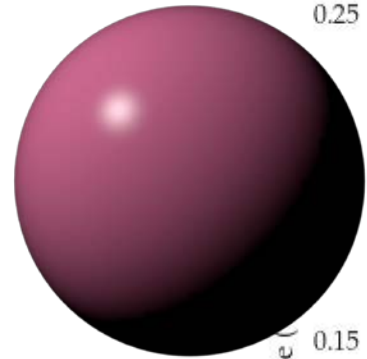
- RGB Diffuse reflectance
- IOR
- Roughness



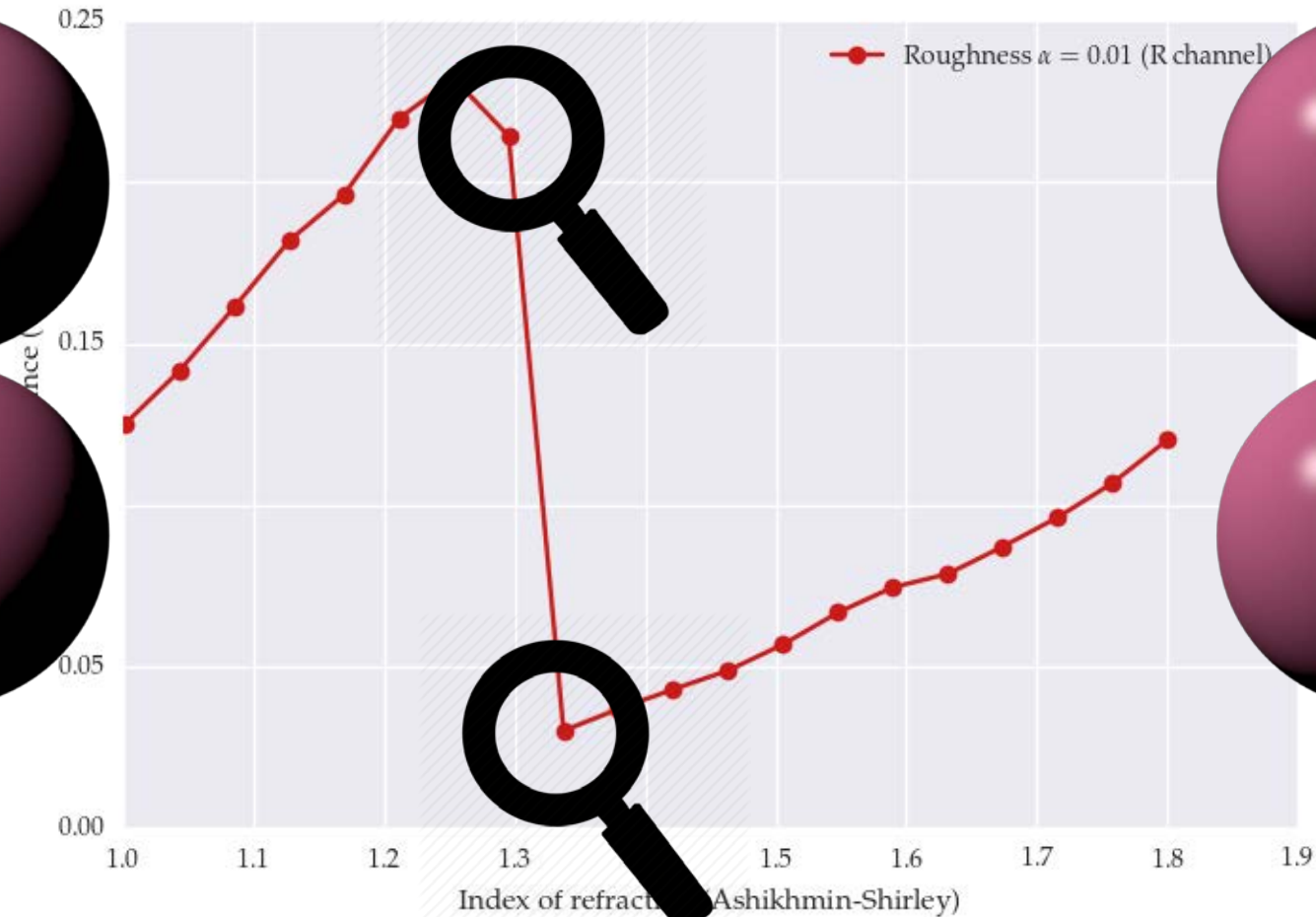
## Ward

- RGB Diffuse reflectance
- RGB Specular reflectance
- Roughness

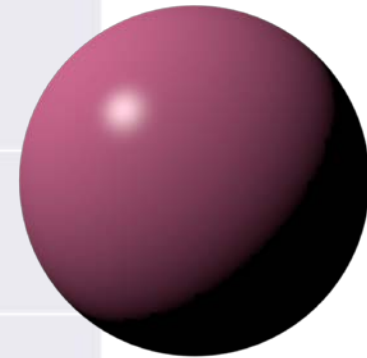
[Ashikhmin-Shirley]



[Ward]

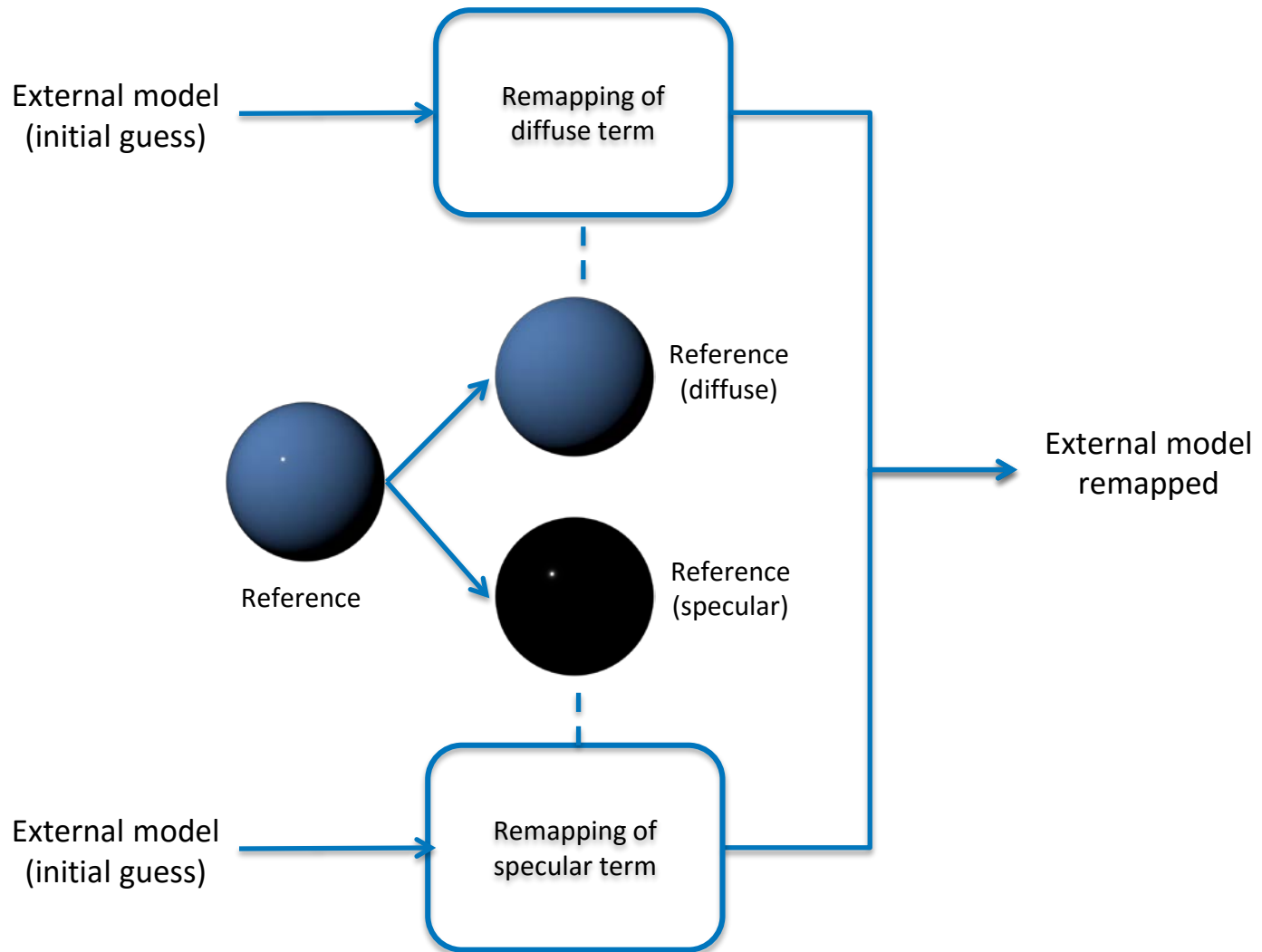


[Ashikhmin-Shirley]



[Ward]

# Remapping in two stages



# Results: 2-stage remapping of dielectrics

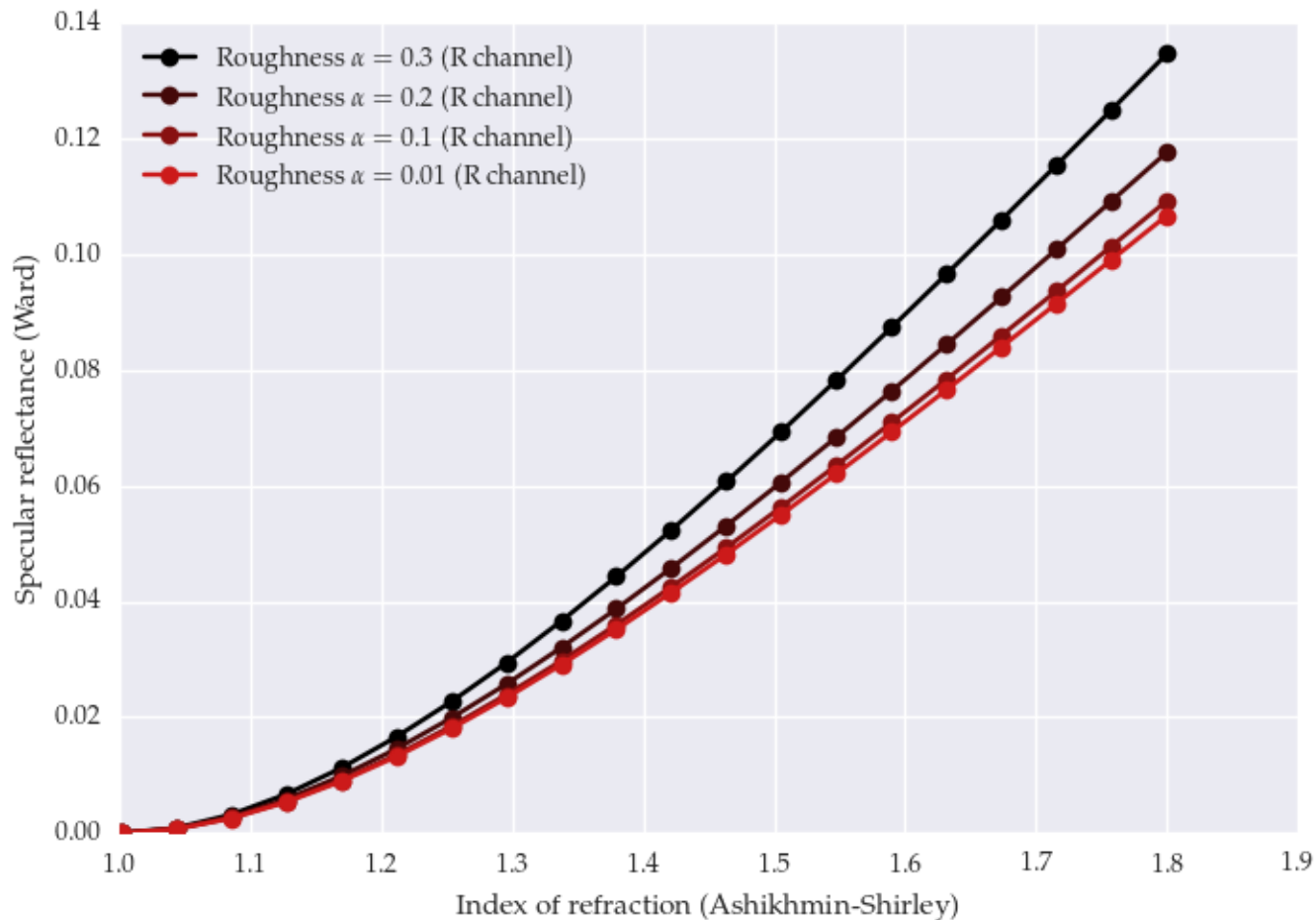
## Ashikhmin-Shirley

- RGB Diffuse reflectance
- IOR
- Roughness

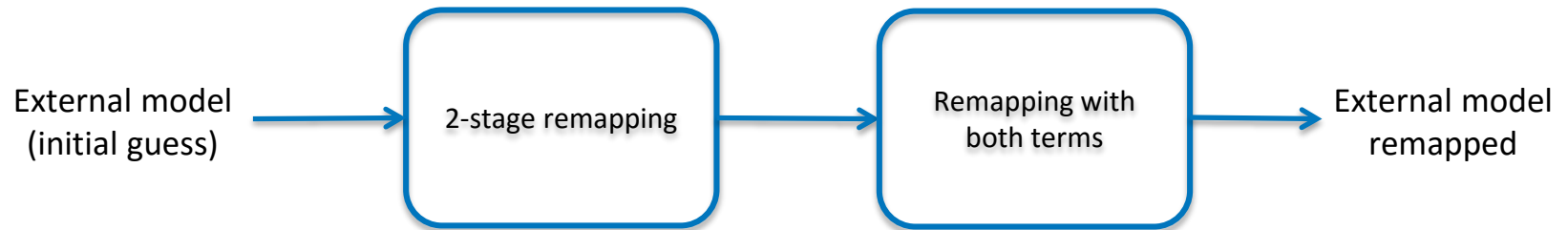


## Ward

- RGB Diffuse reflectance
- RGB Specular reflectance
- Roughness



# Remapping in three stages





# Results: 3-stage remapping of dielectrics

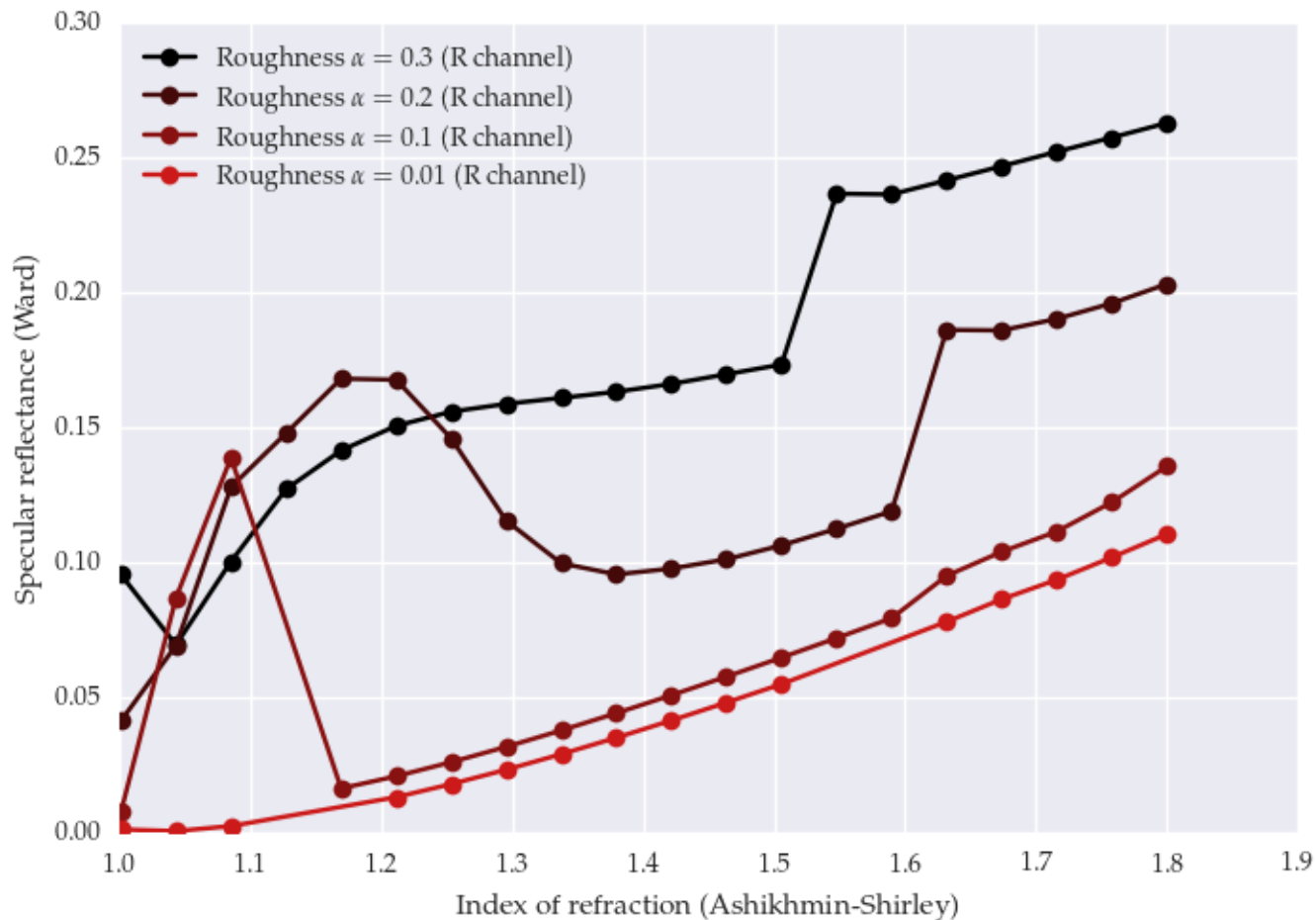
## Ashikhmin-Shirley

- RGB Diffuse reflectance
- IOR
- Roughness

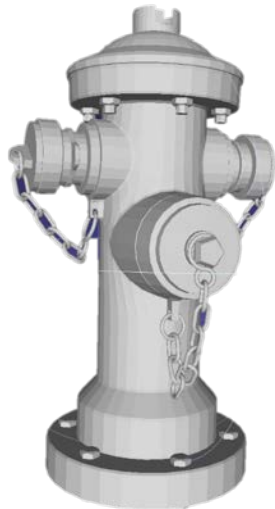


## Ward

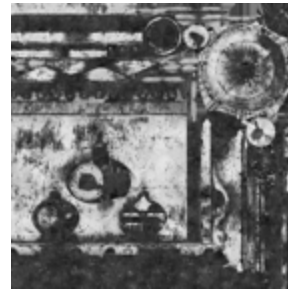
- RGB Diffuse reflectance
- RGB Specular reflectance
- Roughness



# Current work: SVBRDF remapping



Diffuse map



Glossiness map



Specular map

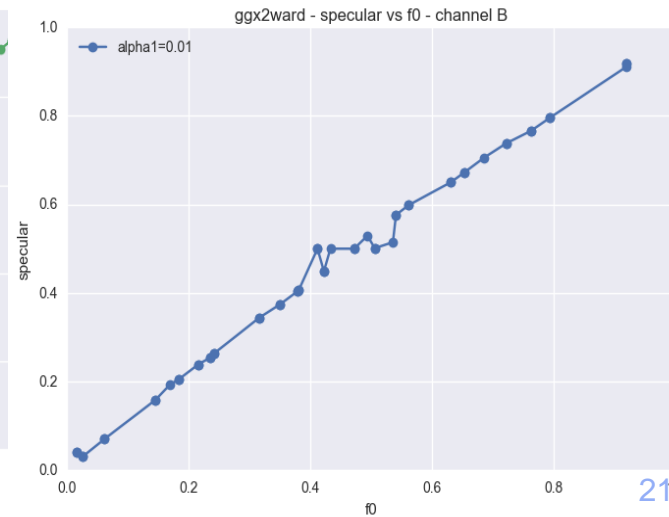
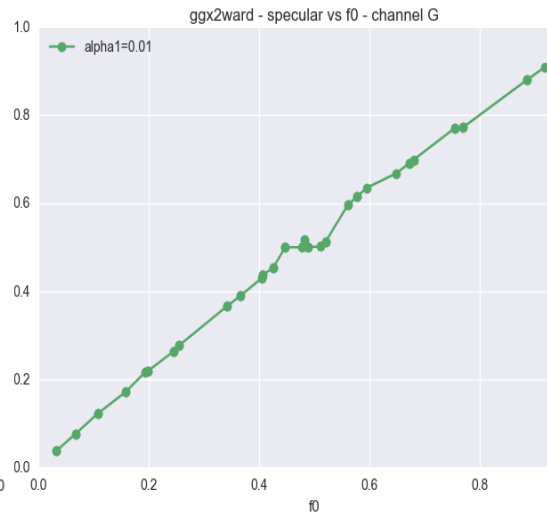
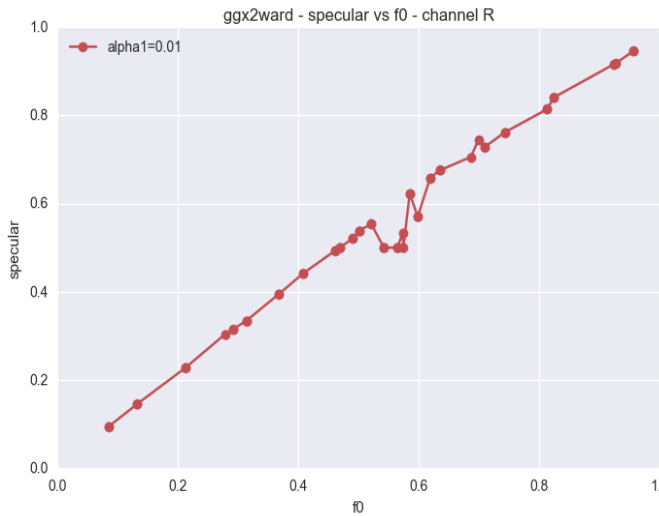
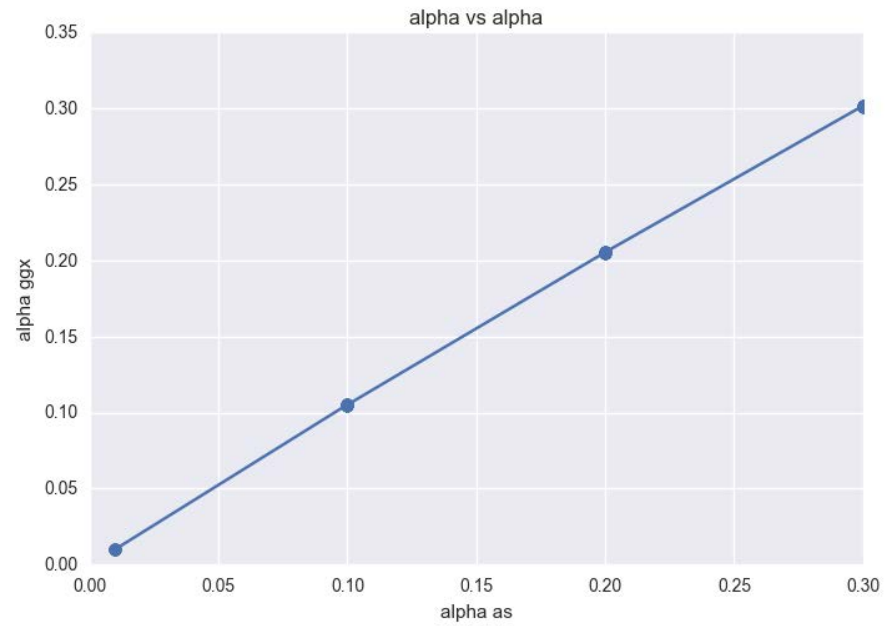
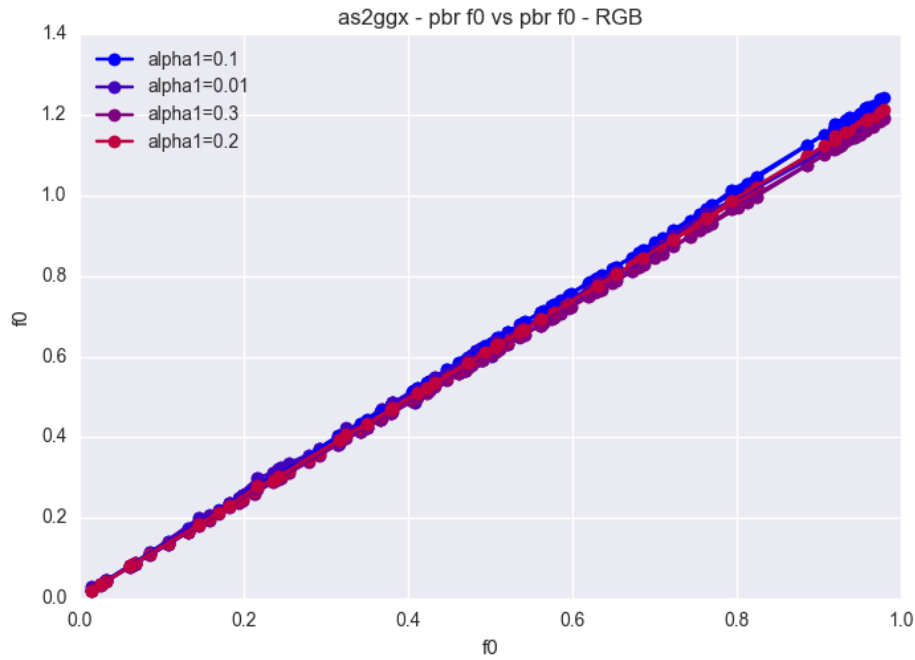
# Conclusions

- **We presented a scheme for automatic remapping of uniform BRDFs without access to the BRDF implementations.**
- **The remapping procedure has been tested with both dielectric and conductor materials and with multiple BRDF models. Overall the transformation between models is robust, and in the cases where we find instabilities, these are generally located in a well-defined area of parameter space.**
- **When dealing with materials with both diffuse and specular terms, both need to be remapped independently to avoid instabilities.**

**Thank you!**

\*We would like to thank **Cyrille Domez** from **allegorithmic**  for his contribution to the project.





# Results: remapping of conductors

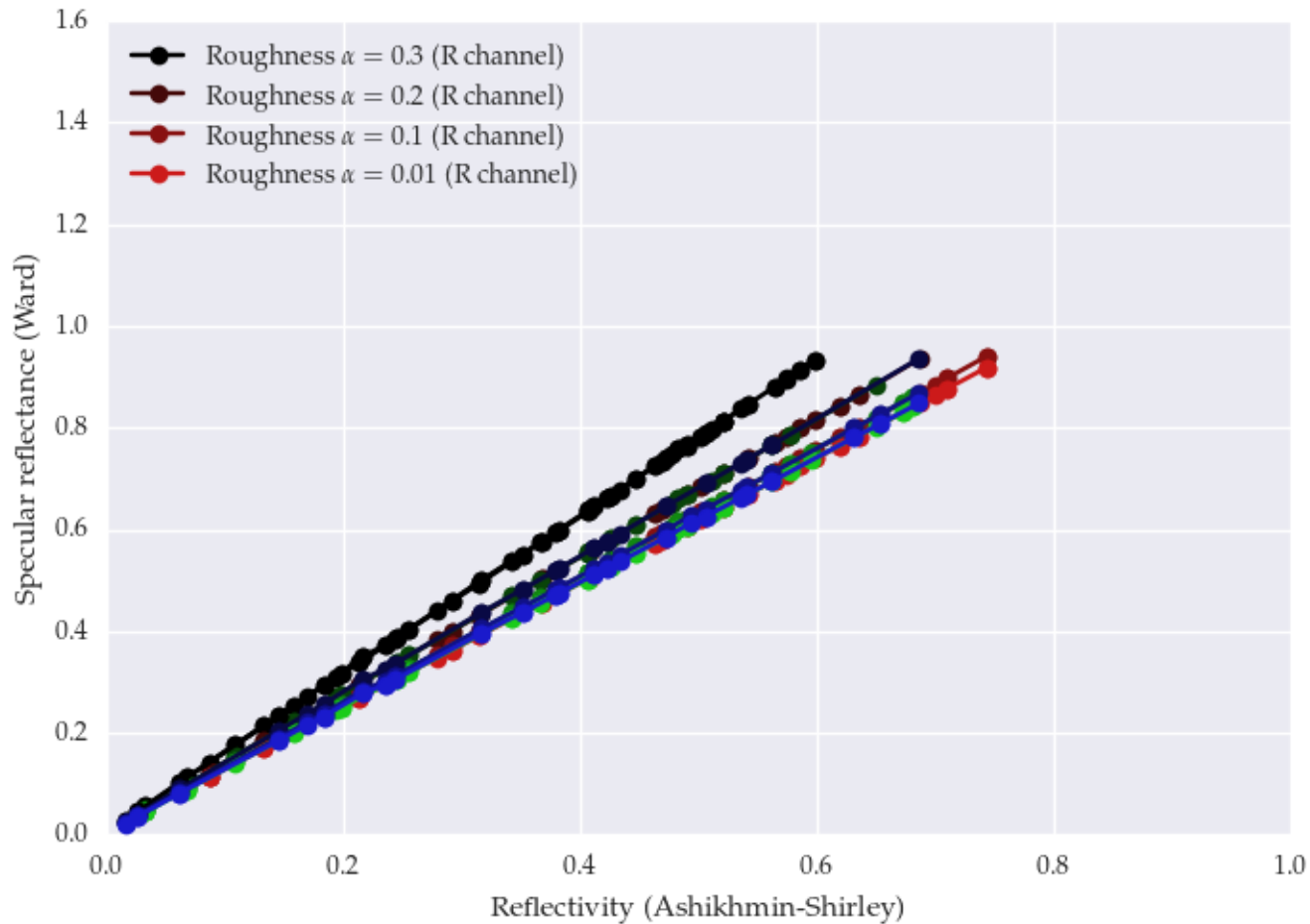
## Ashikhmin-Shirley

- RGB Reflectivity
- Roughness



## Ward

- RGB Specular reflectance
- Roughness



# Results: remapping of conductors

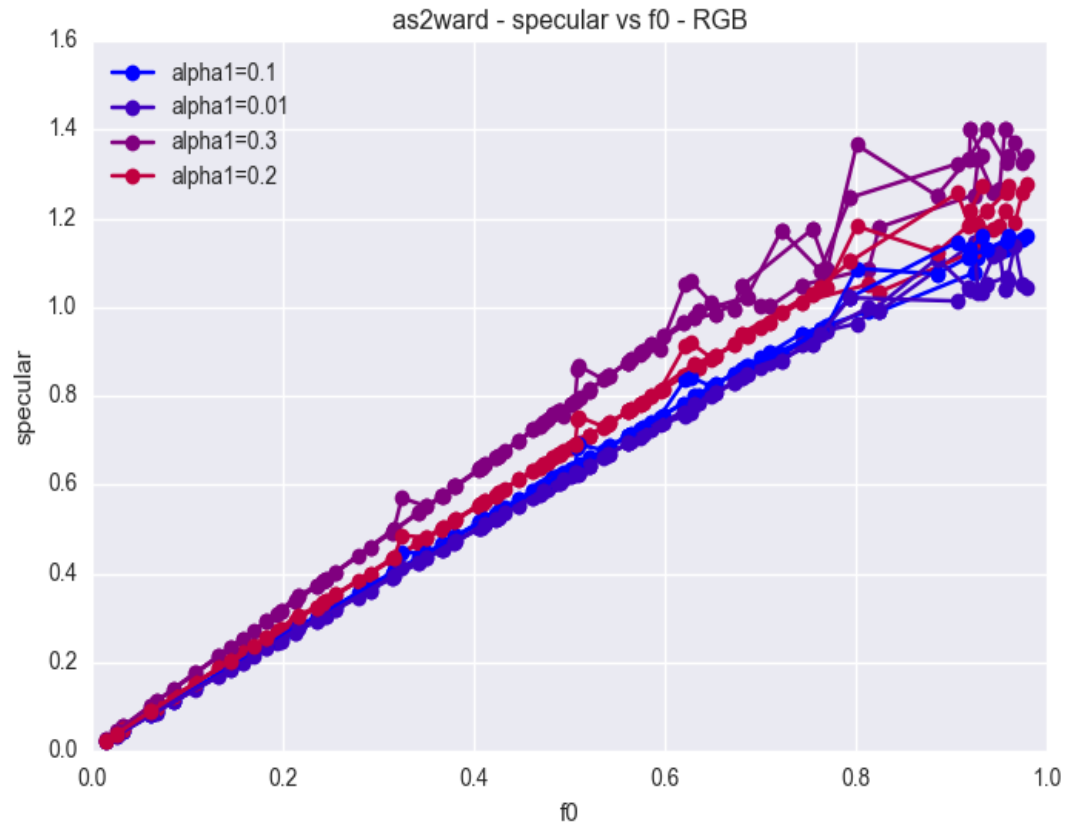
## Ashikhmin-Shirley

- RGB Reflectivity
- Roughness



## Ward

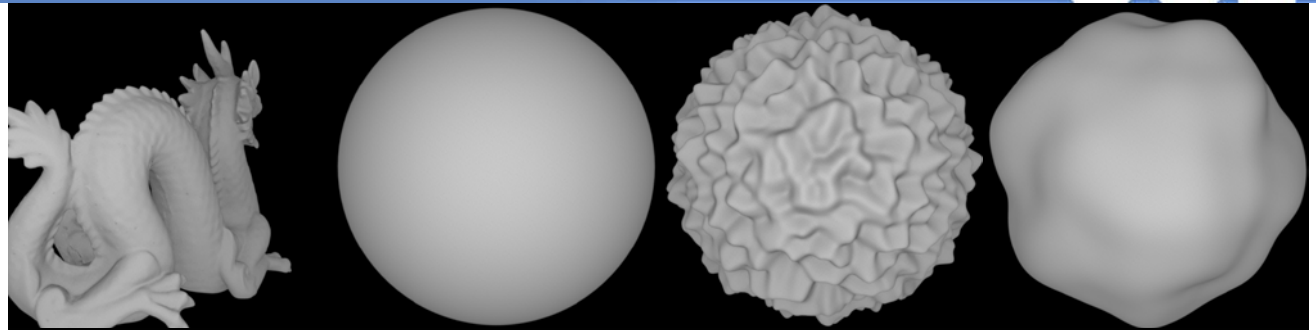
- RGB Specular reflectance
- Roughness





# Results

Geometry used for remapping



Original BRDF



Remapped BRDF



Error

