Rendering Iridescent Rock Dove Neck Feathers

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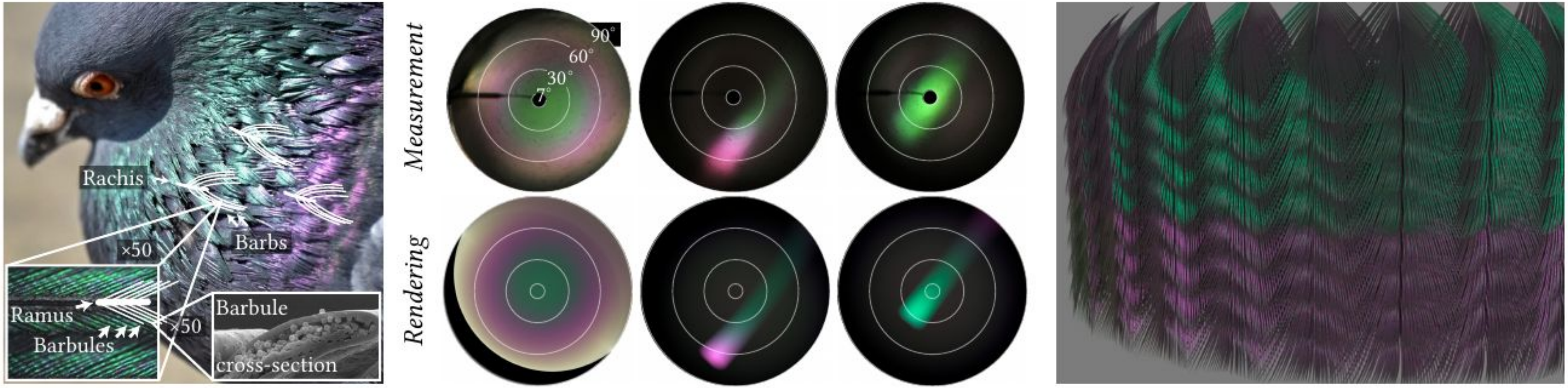
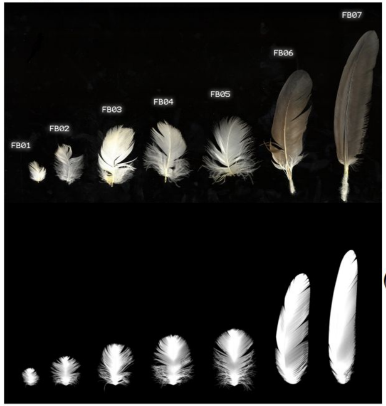


Pourquoi?

Travaux antérieurs

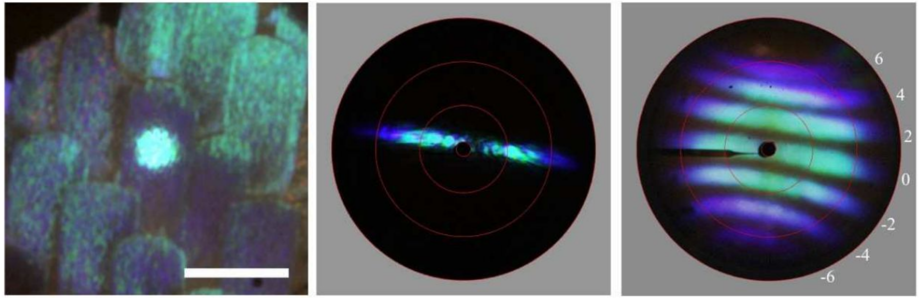
Splitting – imitates the splitting seen on feathers
Scraggle - random noise used to displace the barbs
Tangle – a scraggle that accumulates down the barb
Clipping - takes random cuts along the length of the barbs



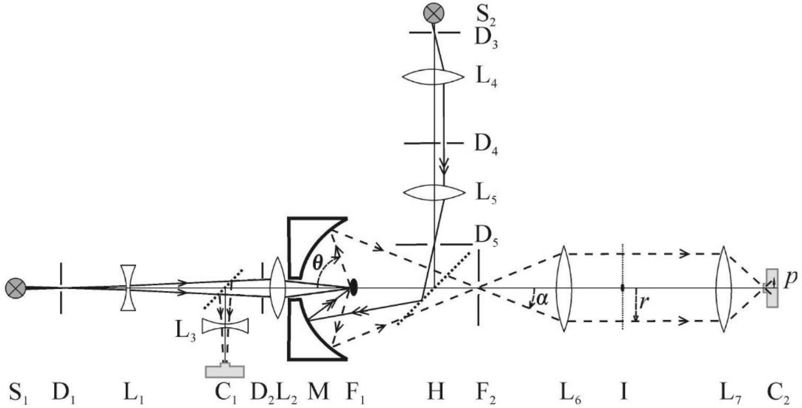
(a) Real

(b) Procedural

Rendertime Procedural Feathers Through Blended Guide Meshes, 2008

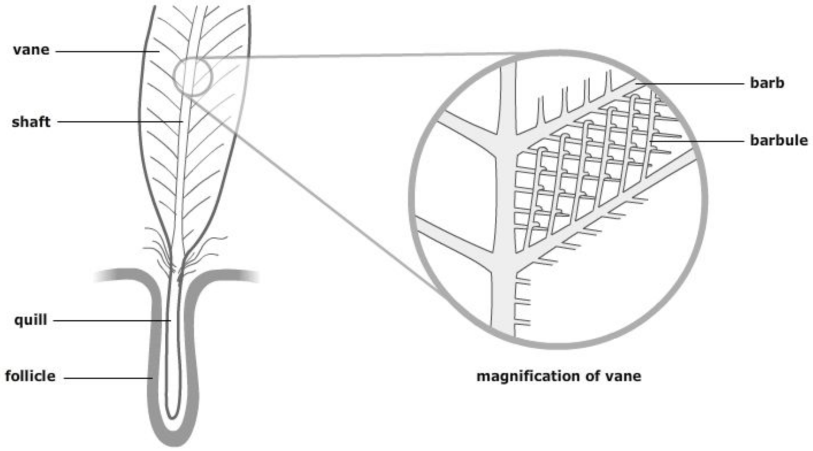


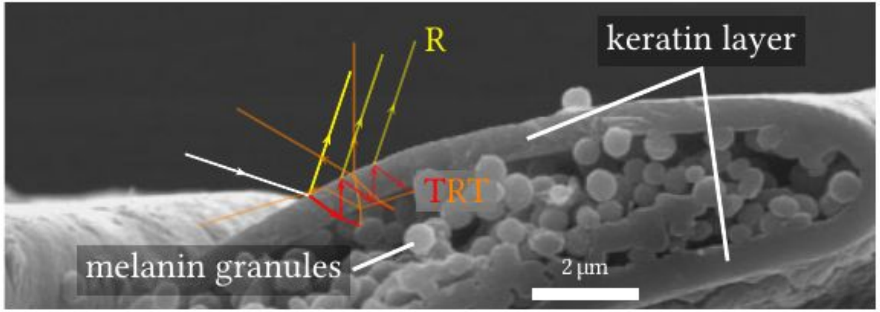
(a) (b) (c)



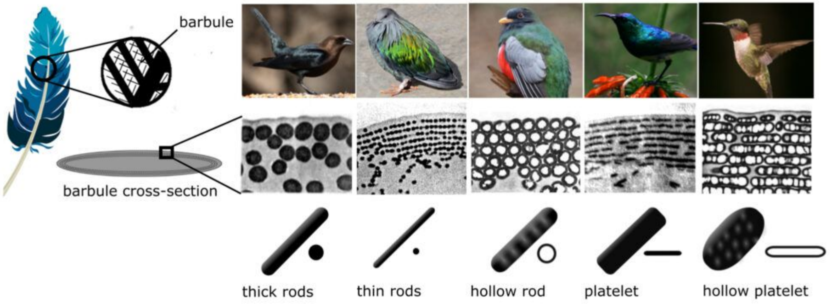
Imaging scatterometry of butterfly wing scales, 2009

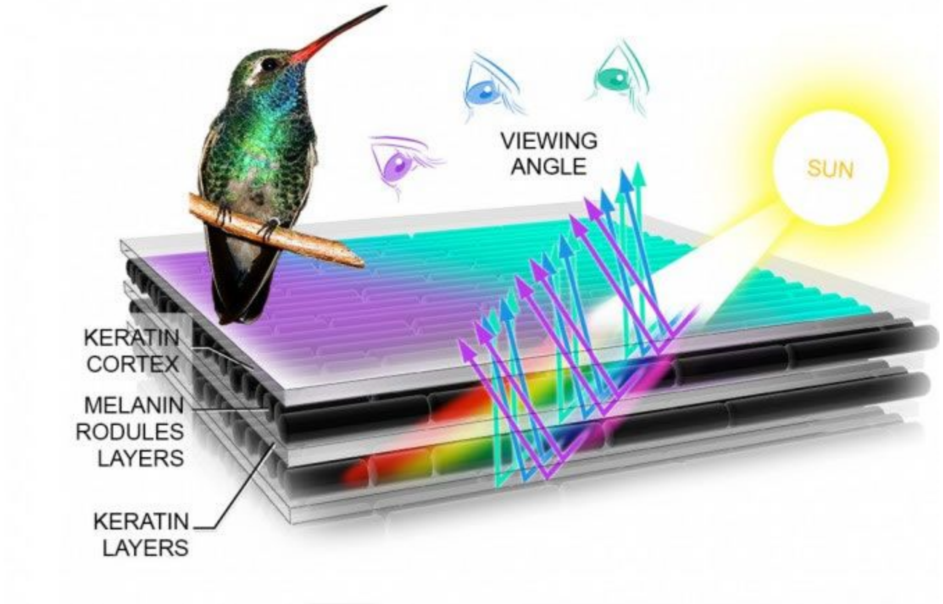
Géométrie des Plumes



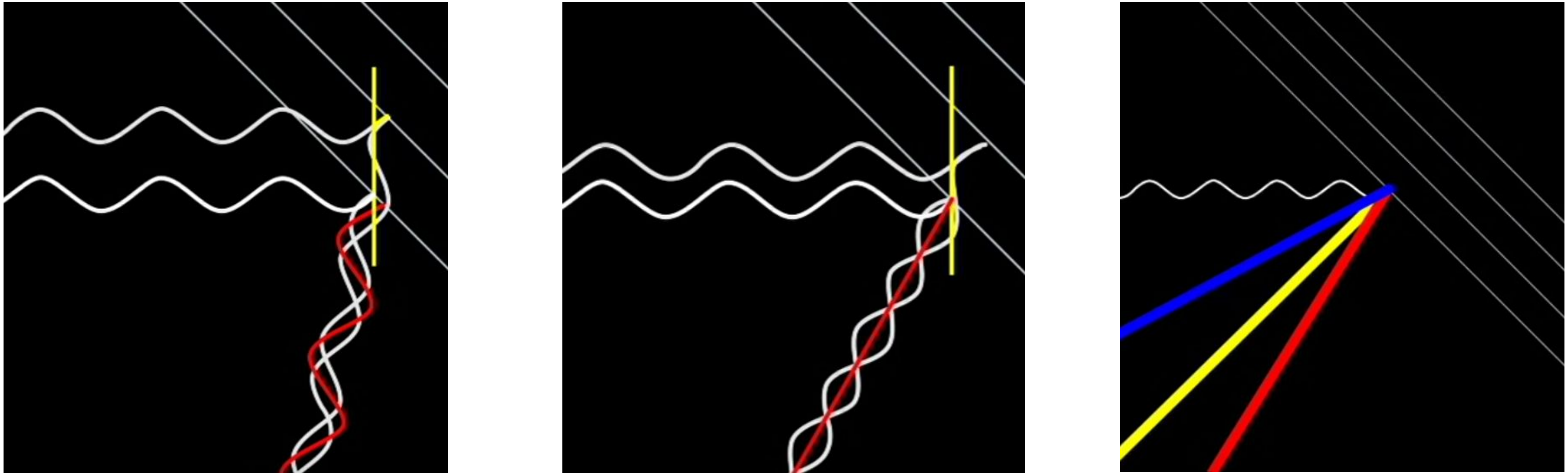


Iridescence

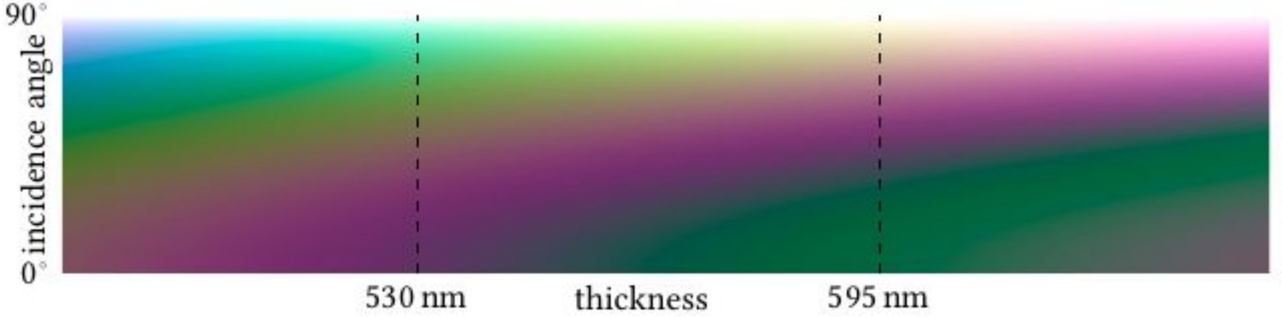




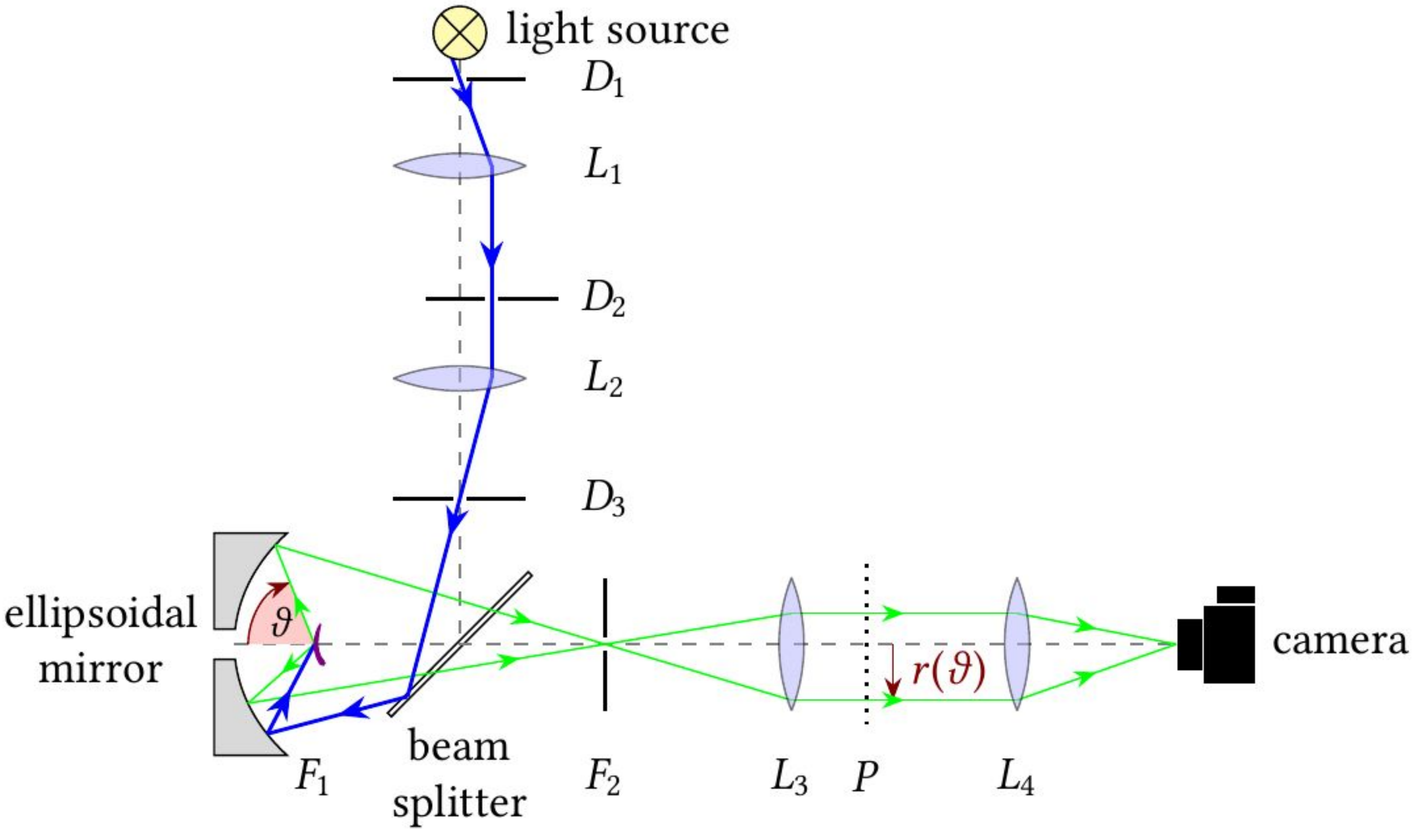
Iridescence



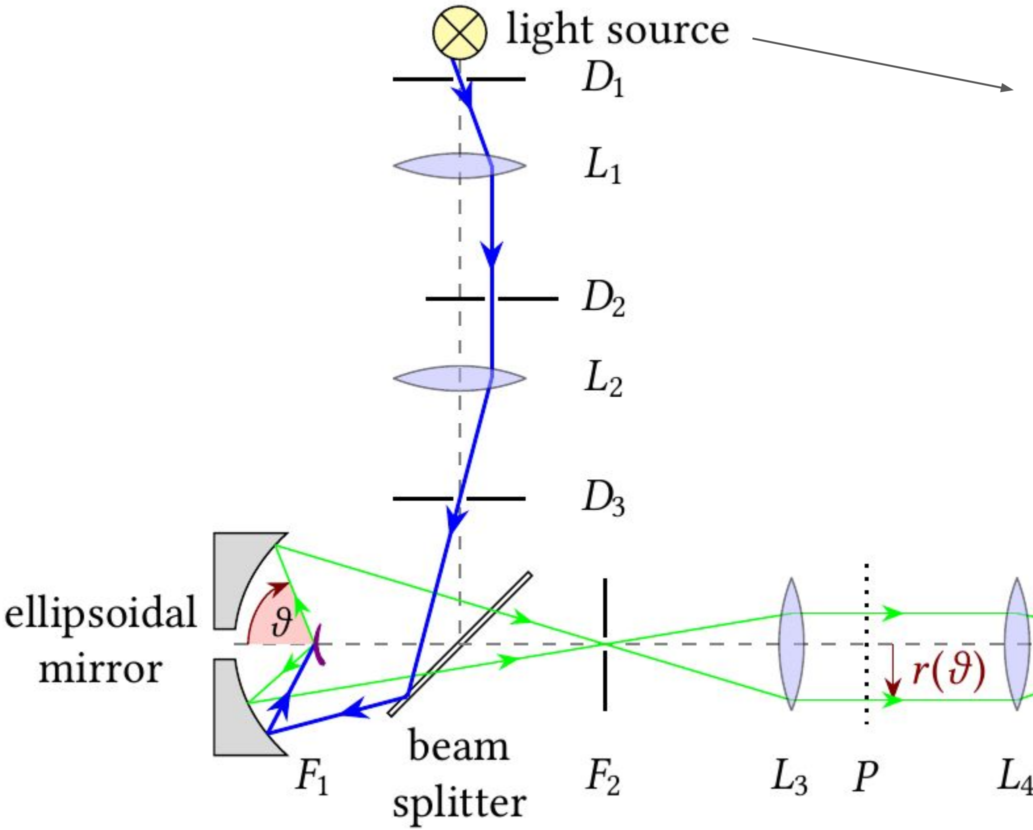
Iridescence



Imaging scatterometer



Imaging scatterometer



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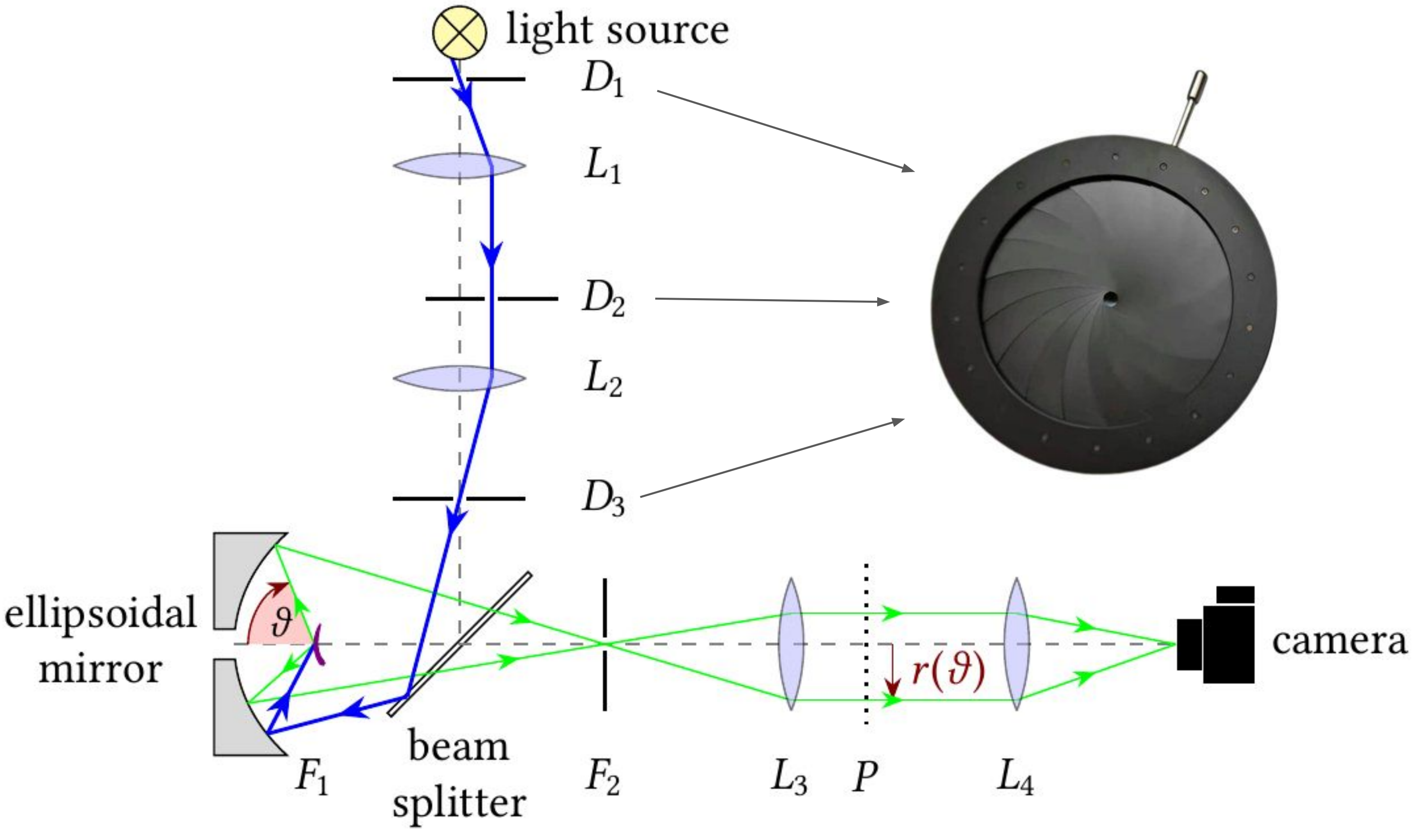

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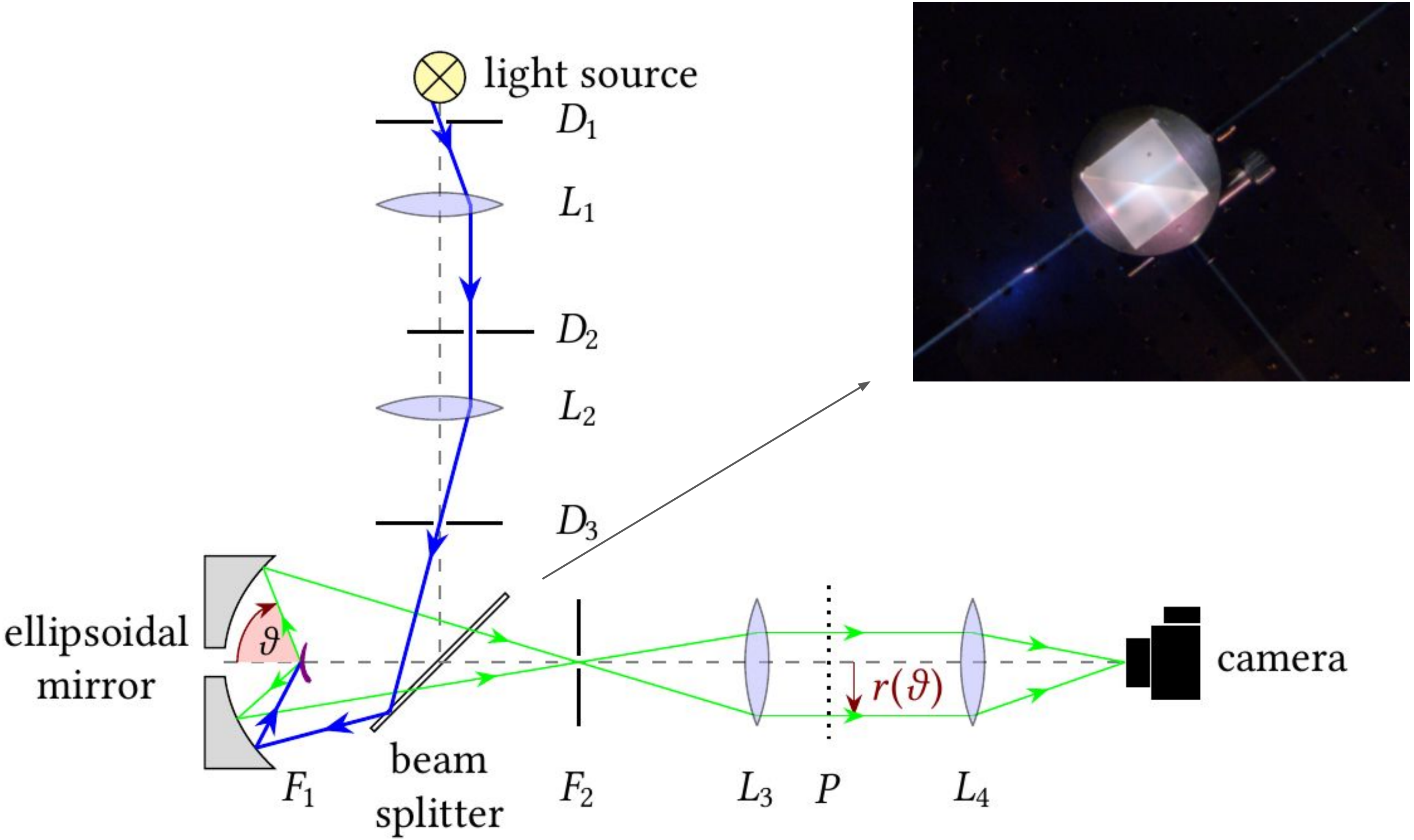
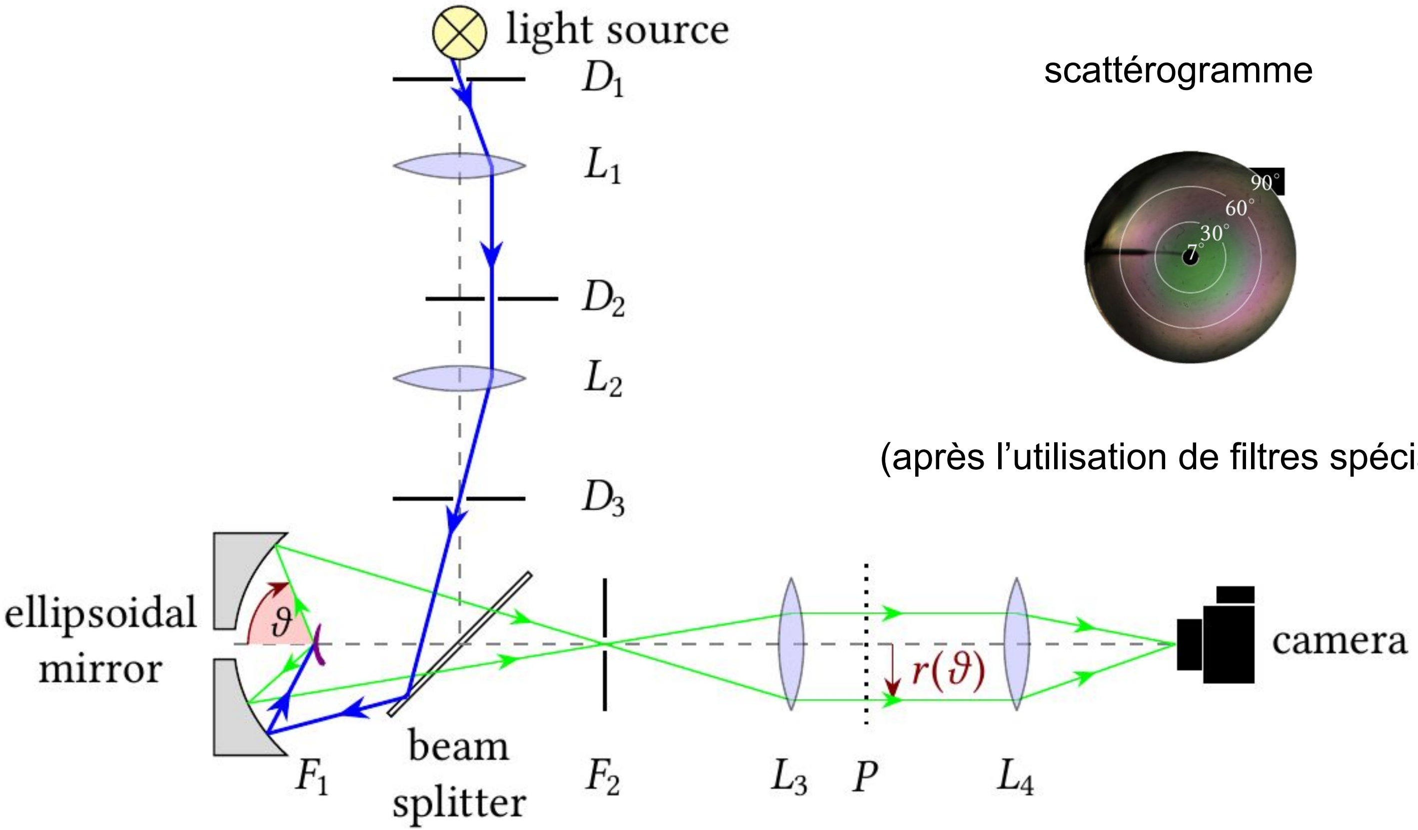


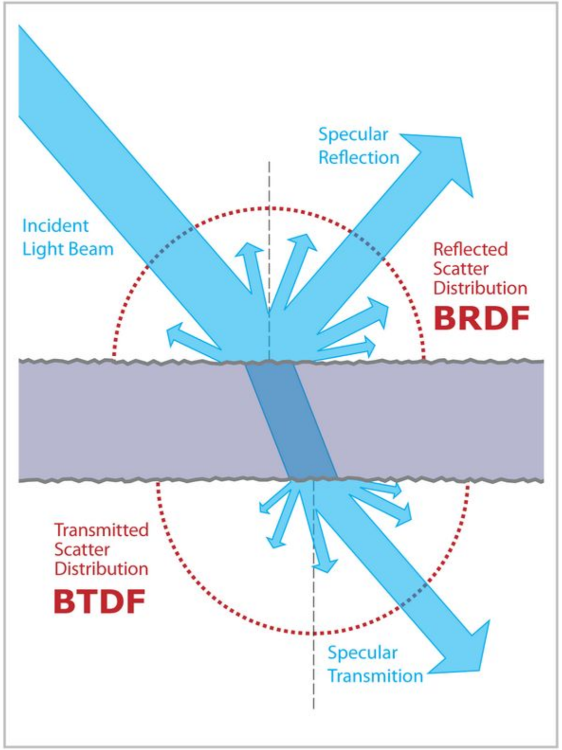
Imaging scatterometer



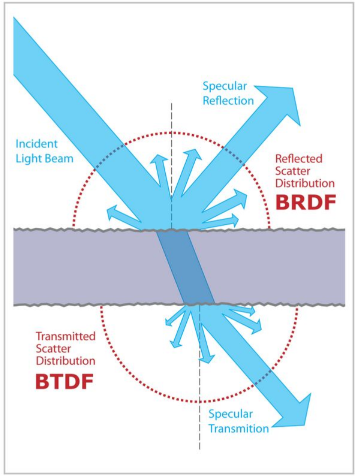
scattérogramme

(après l'utilisation de filtres spéciaux)

BSDF


Specular
Reflection
Incident
Light Beam
Reflected
Scatter
Distribution
BRDF
Transmitted
Scatter
Distribution
BTDF
Specular
Transmition

Pourquoi un BSDF ?



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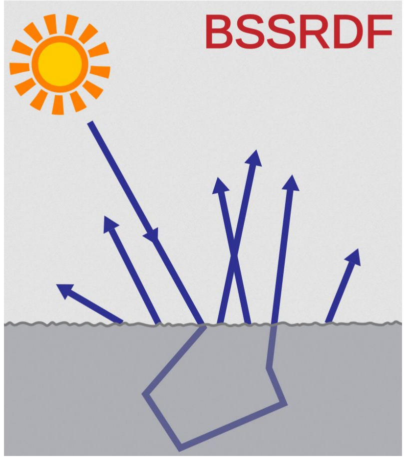
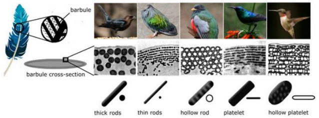
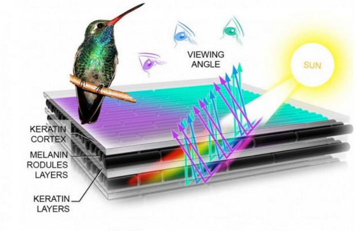
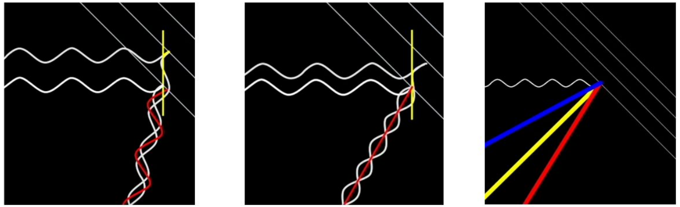








Construire le BRDF : Microfacet BRDF

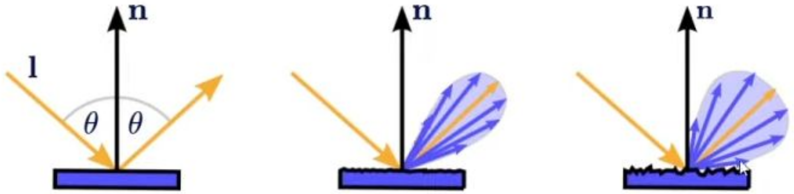
Réflectance

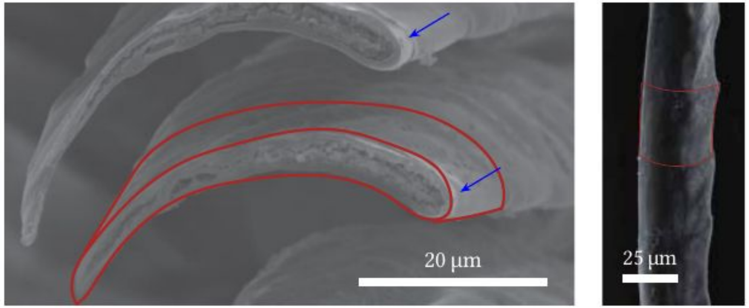
NDF

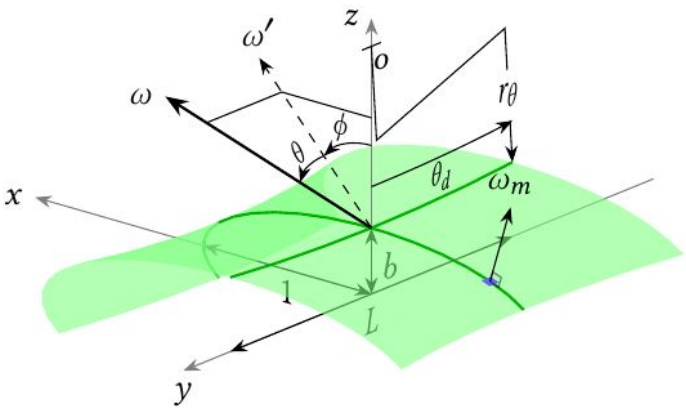
Fonction Géométrique

$$S_{\mathrm{R}}(\omega_i, \omega_o, \lambda) = \frac{I_{\mathrm{R}}(\omega_i, \omega_o, \lambda) D(\omega_m) G(\omega_i, \omega_m, \omega_o)}{4\langle \omega_i, \vec{n} \rangle \langle \omega_o, \vec{n} \rangle}$$

NDF : Normal Distribution Function



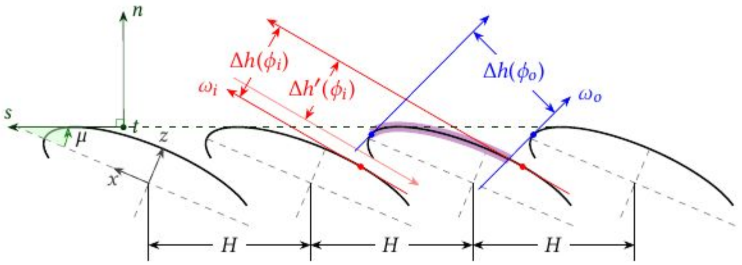


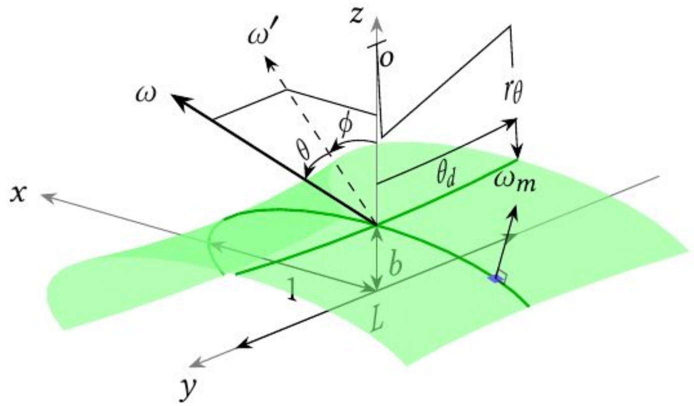


$$D(\omega_m) = \frac{b^2}{2H \sin\theta_d \cos\theta_m} \left(\sin^2\phi_m + b^2\cos^2\phi_m\right)^{-\frac{3}{2}}$$

NDF : Normal Distribution Function

$$D_\phi(\phi_m) = \frac{1}{H\kappa(\phi_m)} = \frac{b^2}{H}\left(\sin^2\phi_m + b^2\cos^2\phi_m\right)^{-\frac{3}{2}}$$





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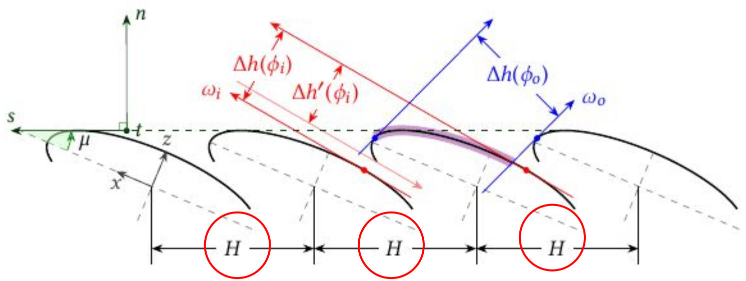

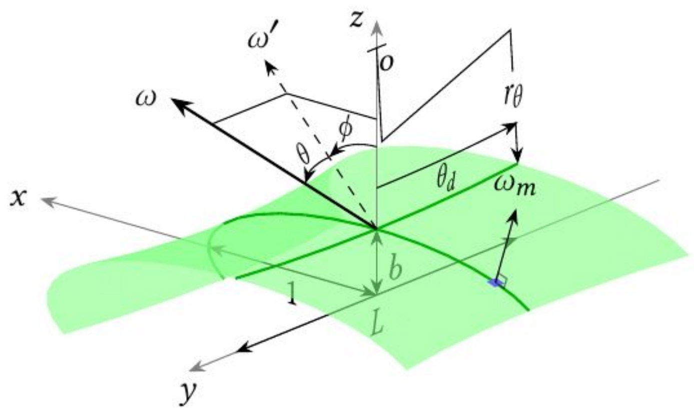

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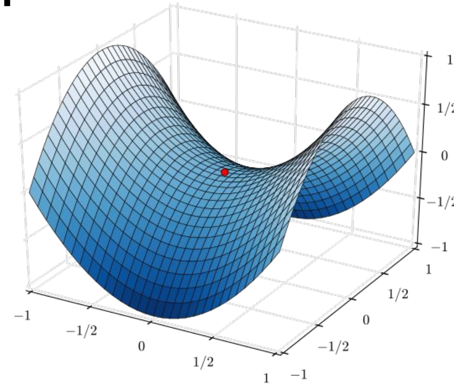

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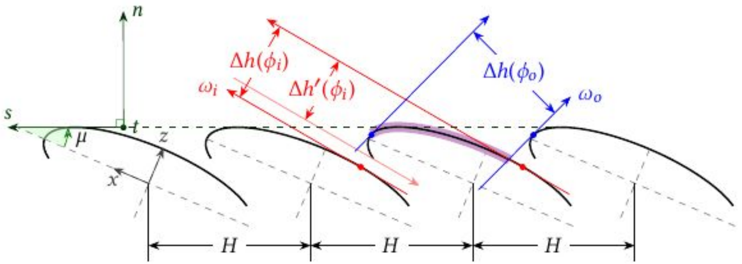

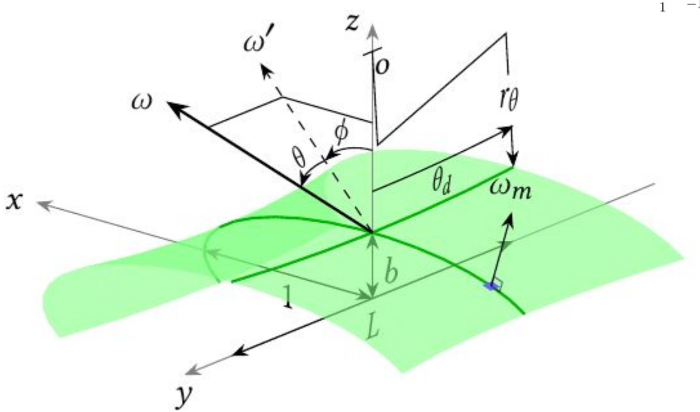

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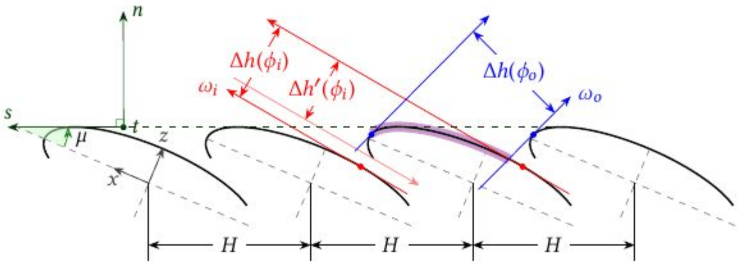

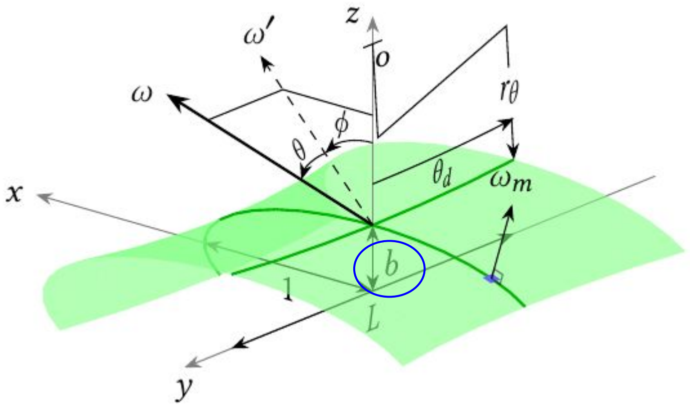

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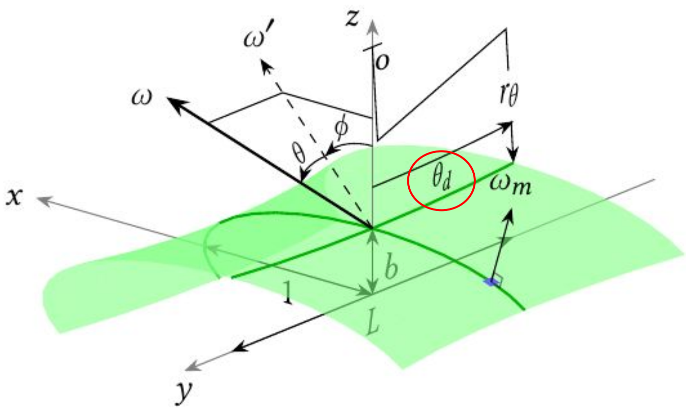
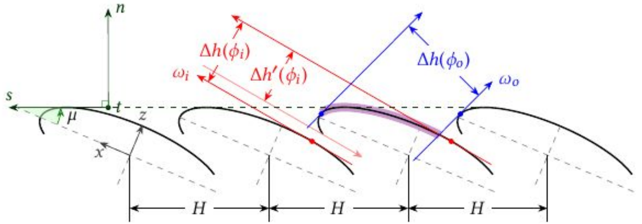
$$D(\omega_m) = D_\theta(\theta_m)D_\phi(\phi_m)\left(\cos\theta_m\right)^{-1}$$

$$D(\omega_m) = \frac{b^2}{2H\sin\theta_d\cos\theta_m}\left(\sin^2\phi_m + b^2\cos^2\phi_m\right)^{-\frac{3}{2}}$$





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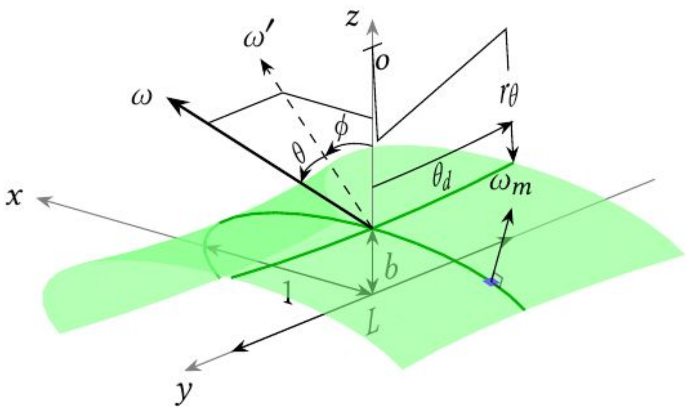
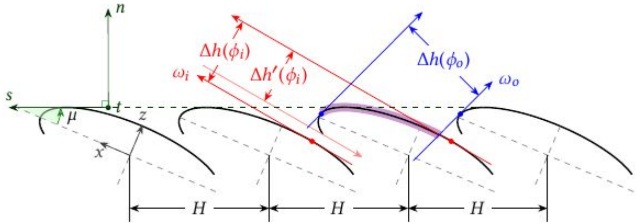
$$\boxed{D(\omega_m) = \frac{b^2}{2H\sin\theta_d\cos\theta_m}\left(\sin^2\phi_m + b^2\cos^2\phi_m\right)^{-\frac{3}{2}}}$$





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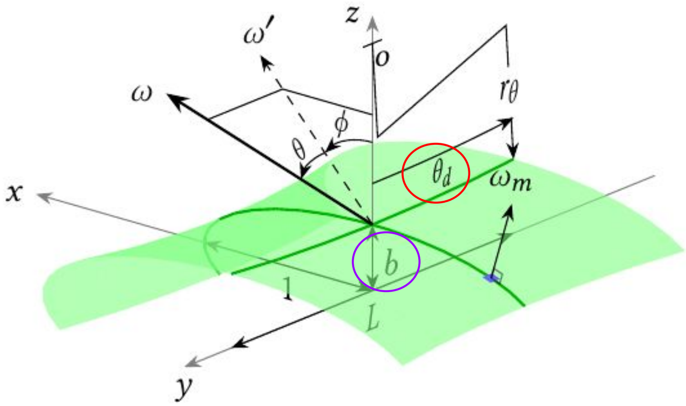

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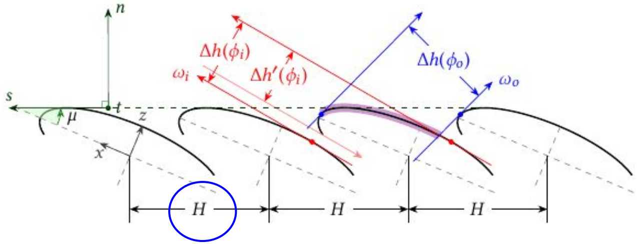
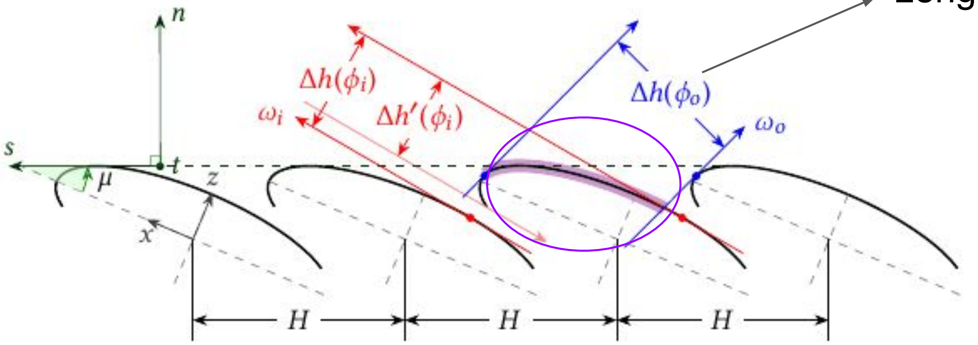


Fonction géométrique : Fonction de visibilité

G = 0 ou 1

Length of elliptical arc

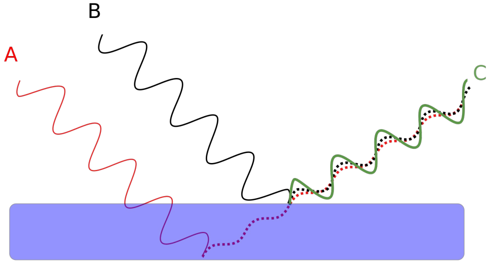


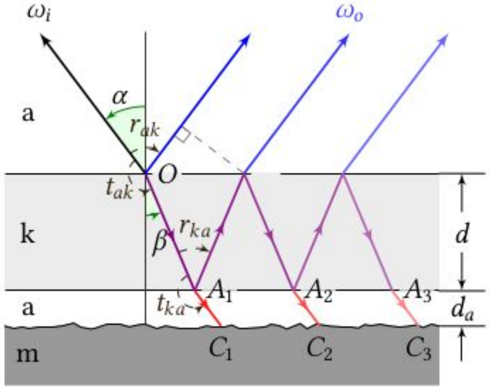
Réflectance et Iridescence

A Practical Extension to Microfacet Theory
for the Modeling of Varying Iridescence

LAURENT BELCOUR, Unity Technologies
PASCAL BARLA, Inria

Airy formula [Belcour and Barla 2017; Yeh 2005]





$$r = r_{ak} + \frac{t_{ak} r_{ka} t_{ka} e^{i\Delta\psi}}{1 - r_{ka}^2 e^{i\Delta\psi}}, \qquad t = \frac{t_{ak} t_{ka}}{1 - r_{ka}^2 e^{i\Delta\psi}}$$

$$\Delta\psi = \frac{2\pi\mathcal{D}}{\lambda} = \frac{4\pi d \eta_k \cos\beta}{\lambda}$$

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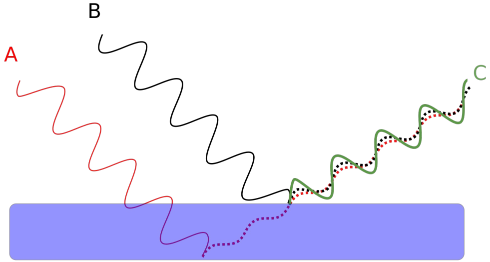

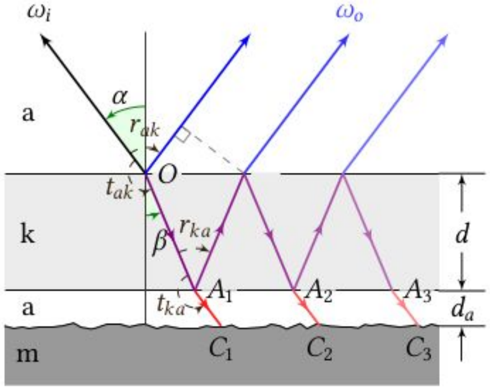

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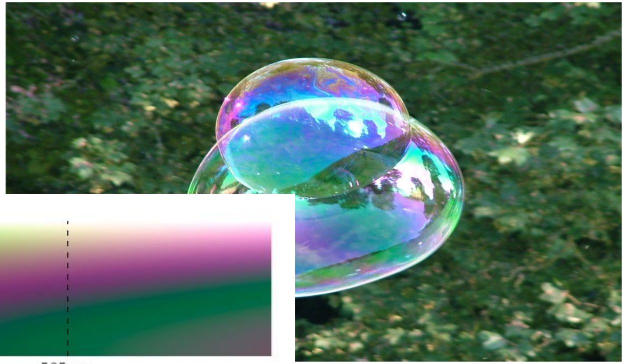
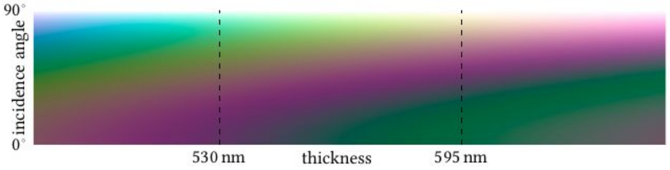
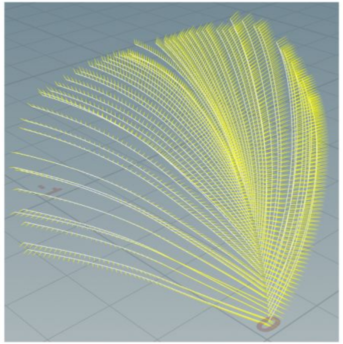


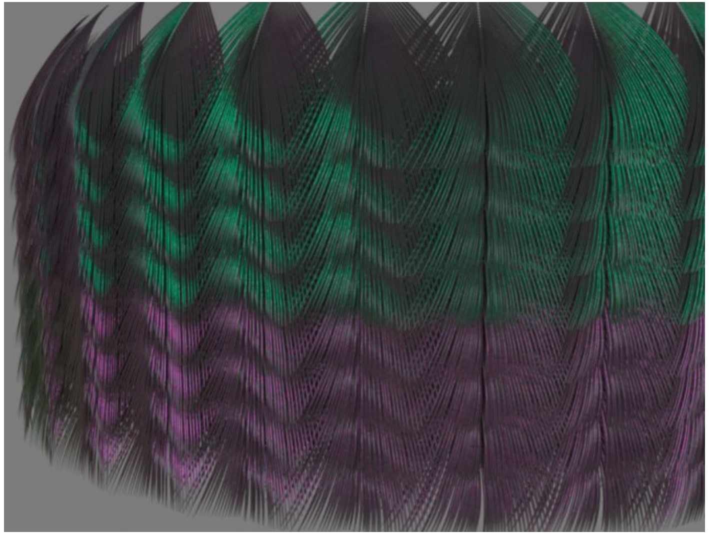


Résultats



Houdini

Résultats



Conclusion