



Understanding Anisotropic Highlights for Interactive Appearance Editing

Boris Raymond, Pascal Barla, Romain Pacanowski, Xavier Granier

► **To cite this version:**

Boris Raymond, Pascal Barla, Romain Pacanowski, Xavier Granier. Understanding Anisotropic Highlights for Interactive Appearance Editing. PRISM2: The science of light & shade, Oct 2013, Bordeaux, France. 2013. hal-00976697

HAL Id: hal-00976697

<https://hal.inria.fr/hal-00976697>

Submitted on 16 Apr 2014

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Understanding Anisotropic Highlights for Interactive Appearance Editing

Boris Raymond¹, Pascal Barla², Gaël Guennebaud², Romain Pacanowski³, Xavier Granier⁴.

¹Bordeaux University, ²Inria, ³CNRS, ⁴Institut d'Optique

Goals

- Understand the shape of **anisotropic highlights** on arbitrary objects
- Infer local **BRDF orientations** from user-specified highlight shapes

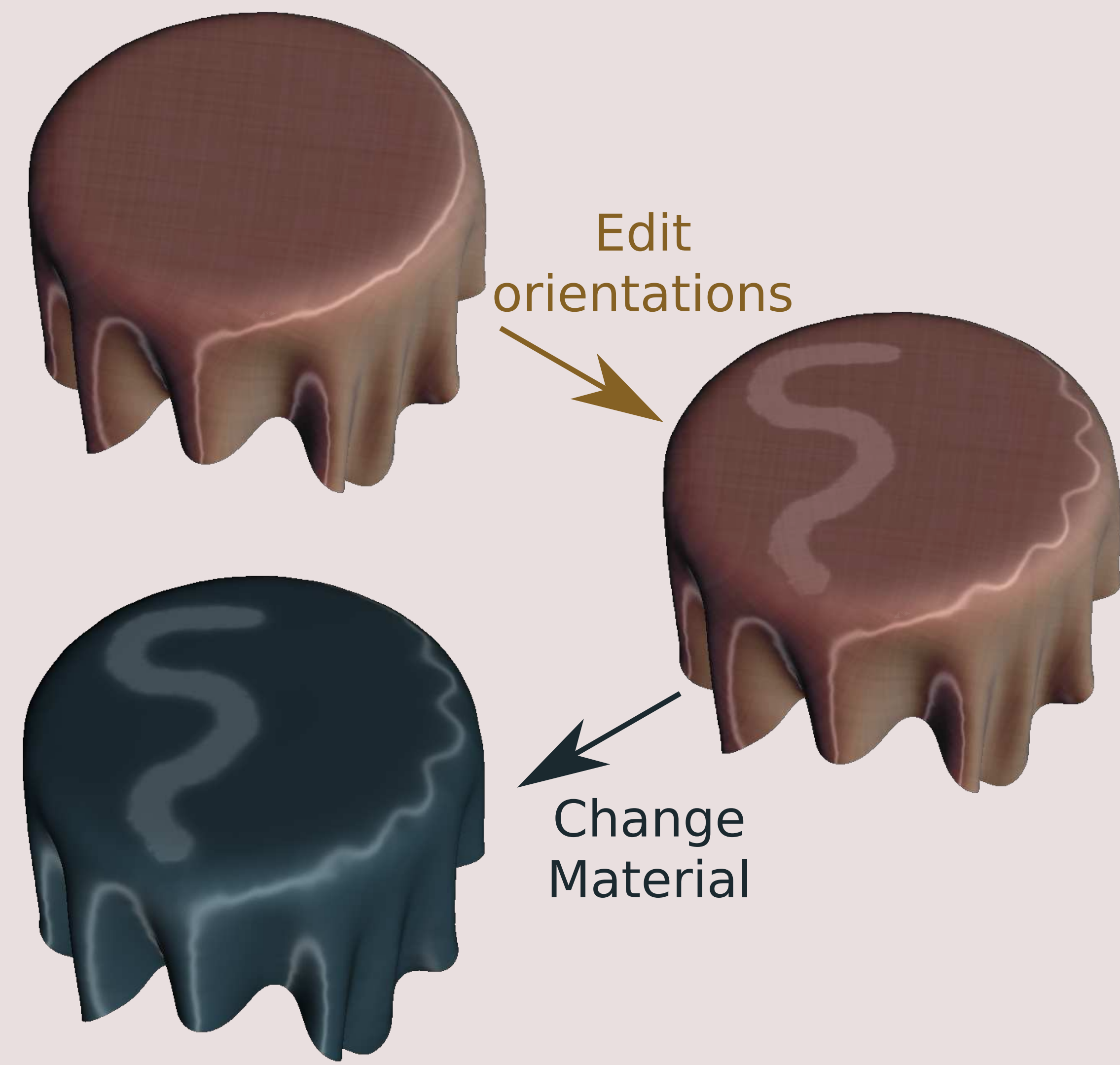
The shape of anisotropic highlights

Highlight Tangent

$$\ell(\varphi) = \mathcal{R}_{\pm\frac{\pi}{2}} \left[\overbrace{\nabla\varphi \bar{\mathbf{v}}(\varphi)^T}^{\text{BRDF Orient. Variations}} \underbrace{\mathbf{W}\bar{\mathbf{u}}(\varphi)}_{\text{Surf. Normal Variations}} \right] \mathbf{h}$$

BRDF Orientation

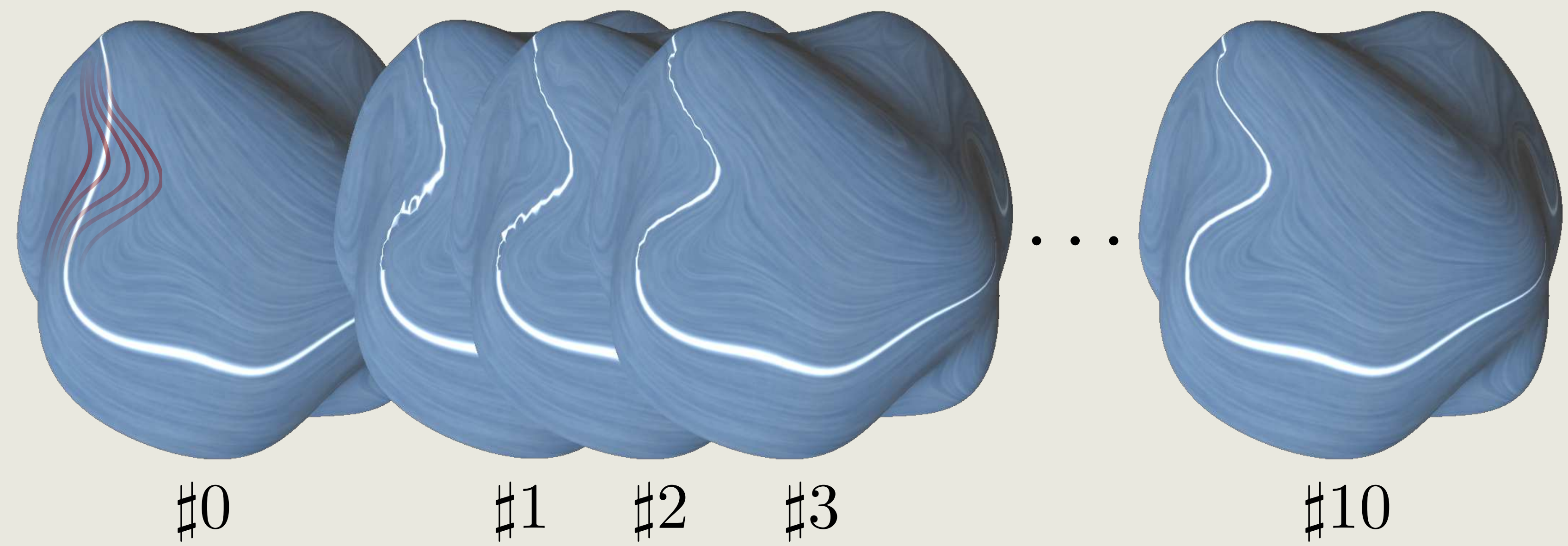
Halfway vector



The shape of anisotropic highlights is modified independently of the type of material.

Highlight tangent field depends on variations...
 ... of *BRDF orientations* (geodesic curvature & splay)
 ... of *surface normals* (directional curvature & torsion)

Our non-linear solver optimizes BRDF orientations φ to yield the desired highlight tangent field ℓ



Highlights deformed into their desired shape (red curves) in a few iterations.

Highlight manipulation tools

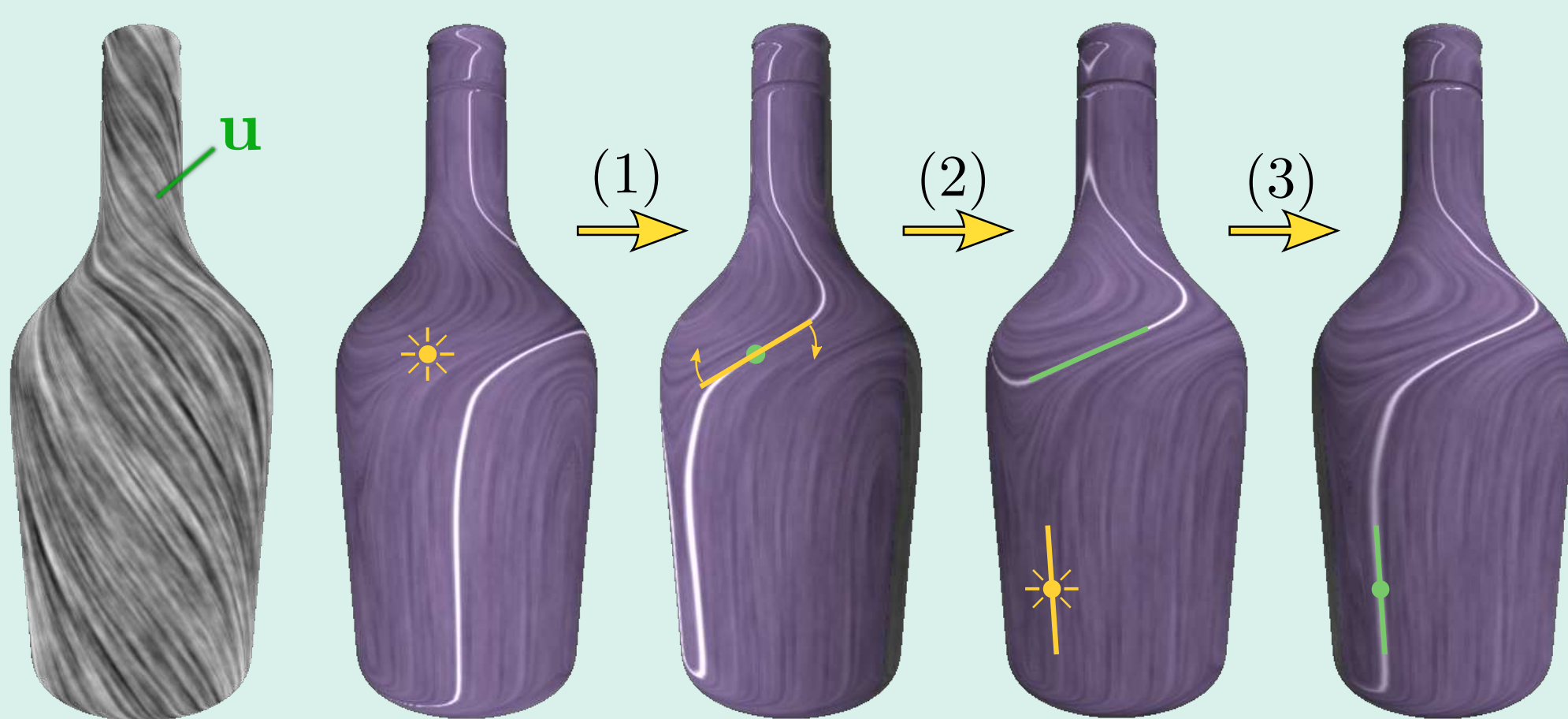
Warp tool

Deform the highlight tangent field to deviate trajectories of highlight curves



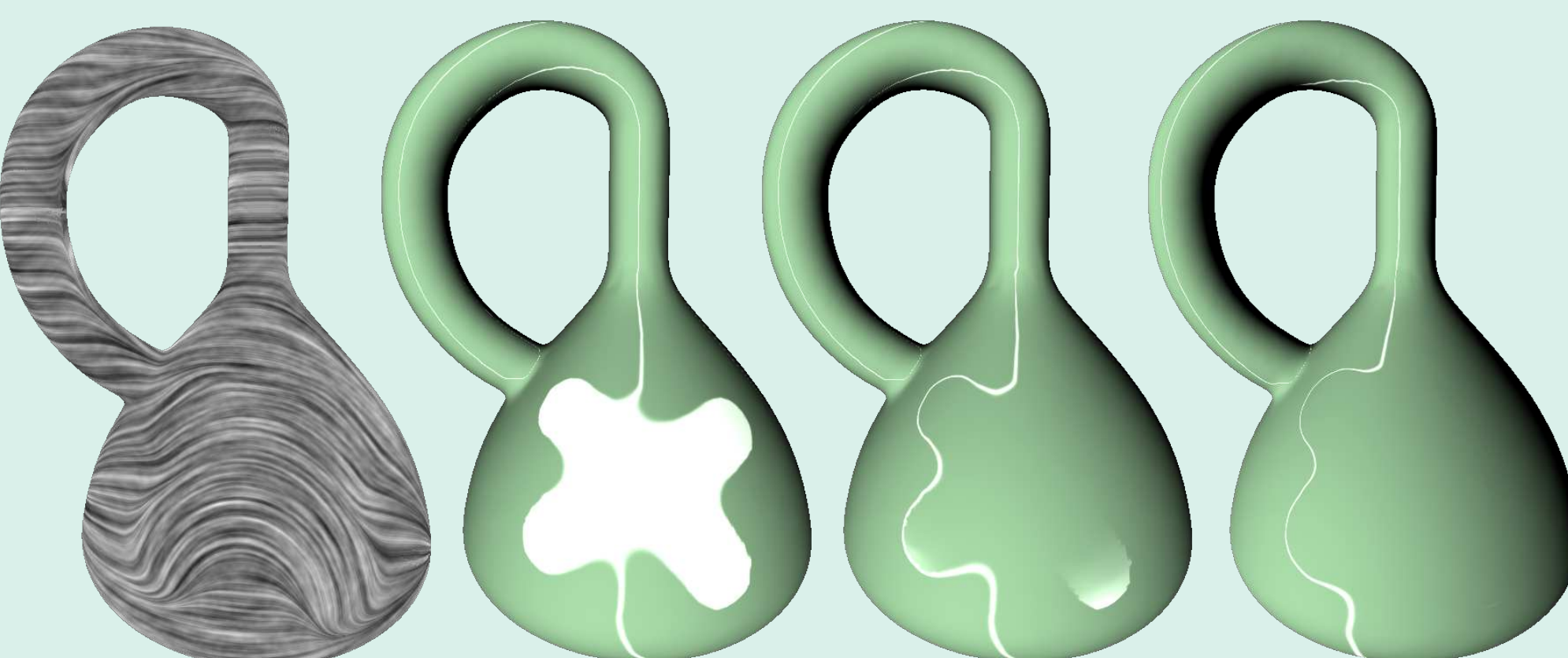
Light tool

Retrieve a light source given a point/tangent constraint for the highlight curve

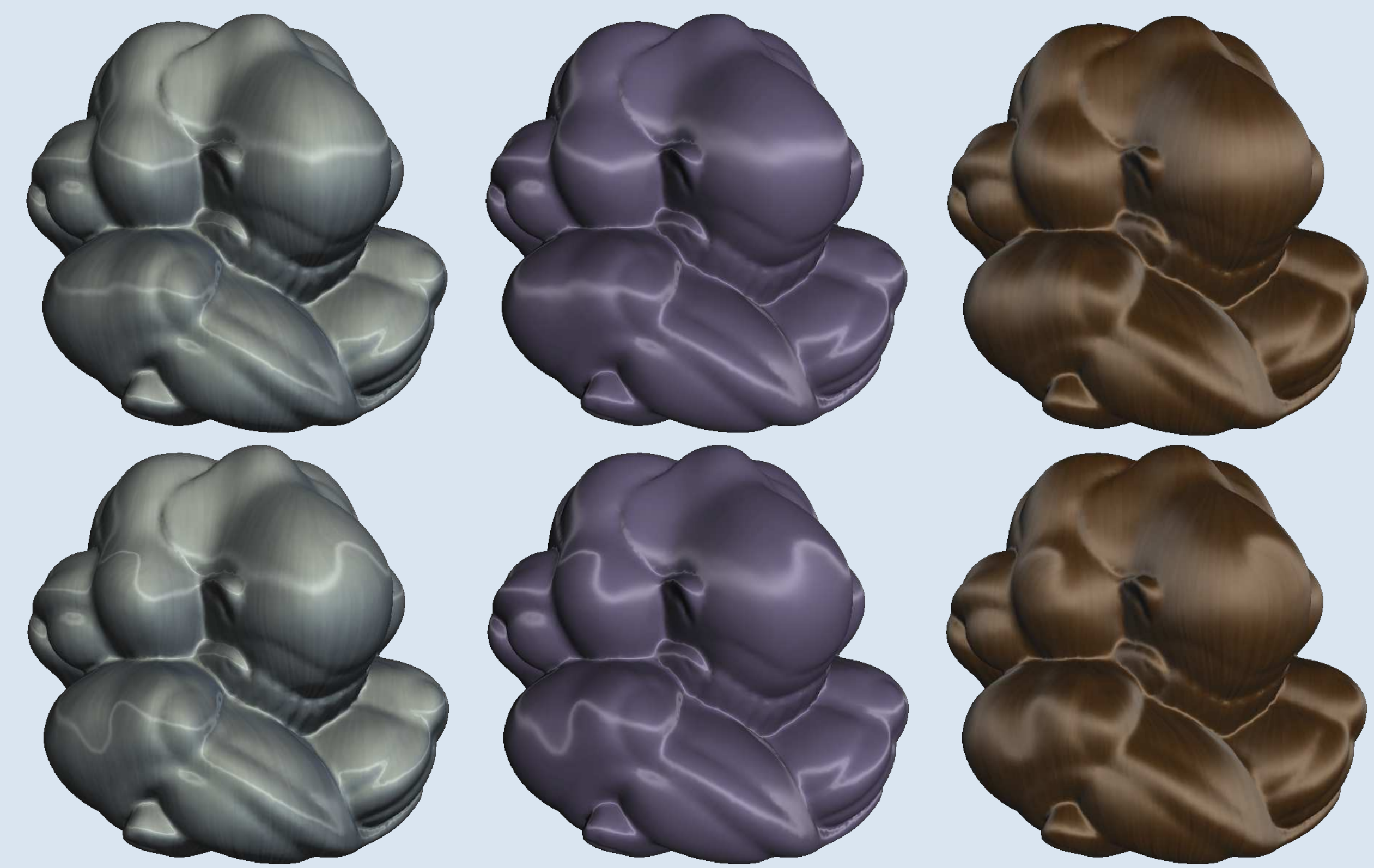


Stencil tool

Paint a degenerate highlight region that quickly vanishes when lighting is rotated



Additional results



Top/bottom row: initial/edited highlights. Manipulations are preserved across material changes.



Manipulated highlights are preserved even in complex scenes rendered with global illumination.

Conclusions

- Provide **explicit relations** between highlights, lighting and surface properties.
- Future work: investigate **relevance** of highlight tangent formula to Human Vision.