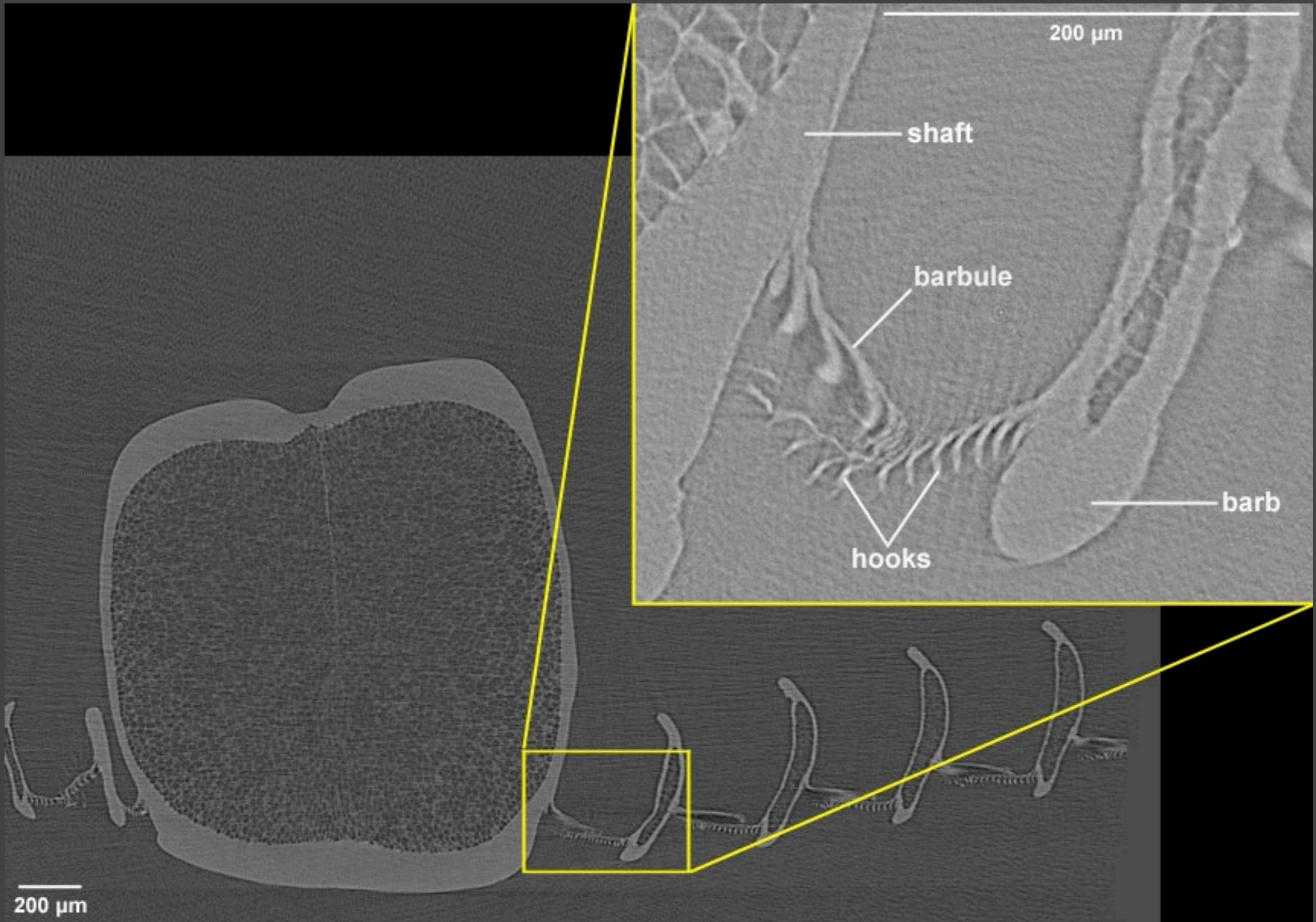
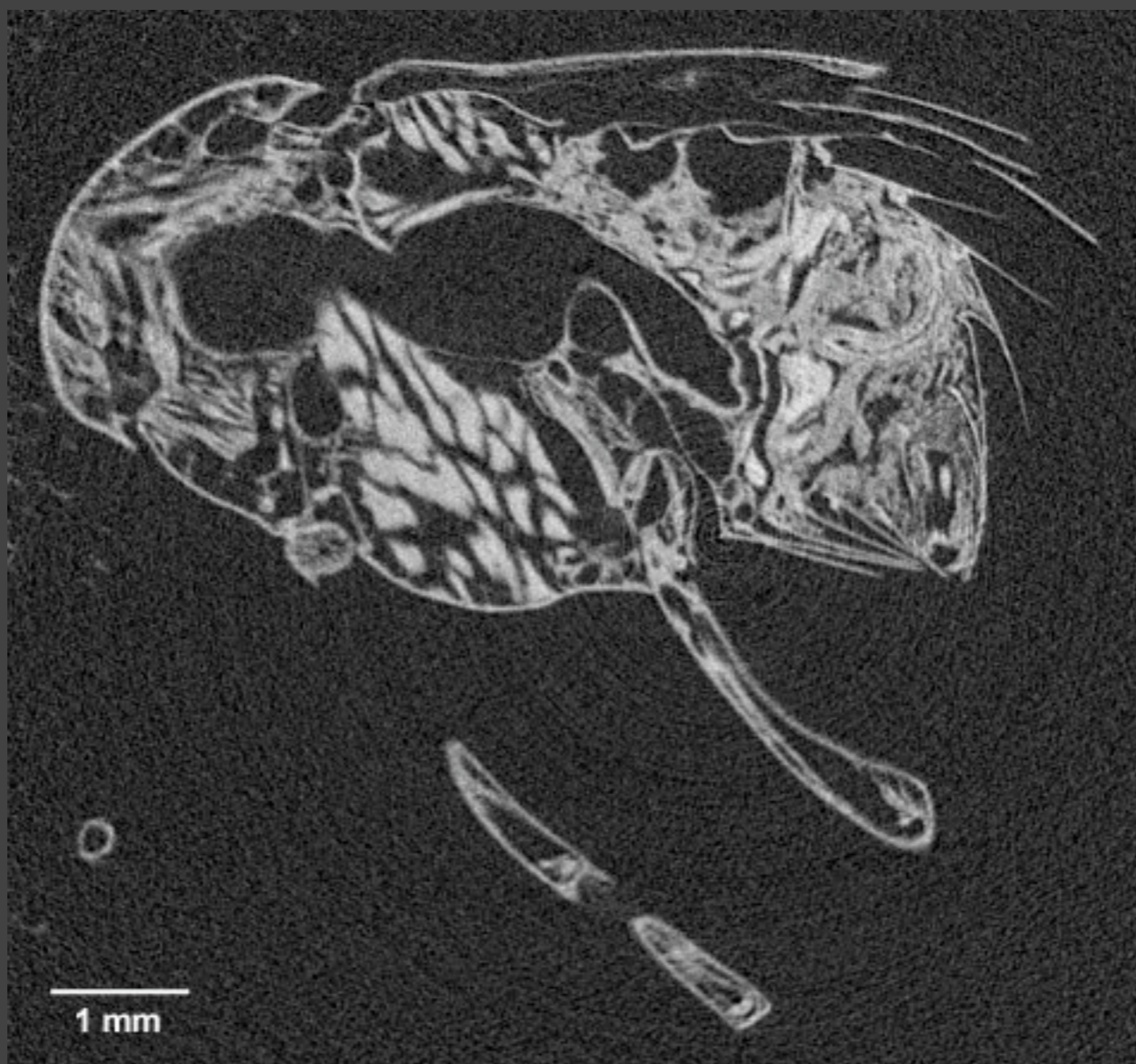


Volume visualization

Steve Marschner
CS 6630 — Fall 2009







U. Texas High-Res CT Facility

2 mm





U. Texas High-Res CT Facility



U. Texas High-Res CT Facility

Volume rendering methods

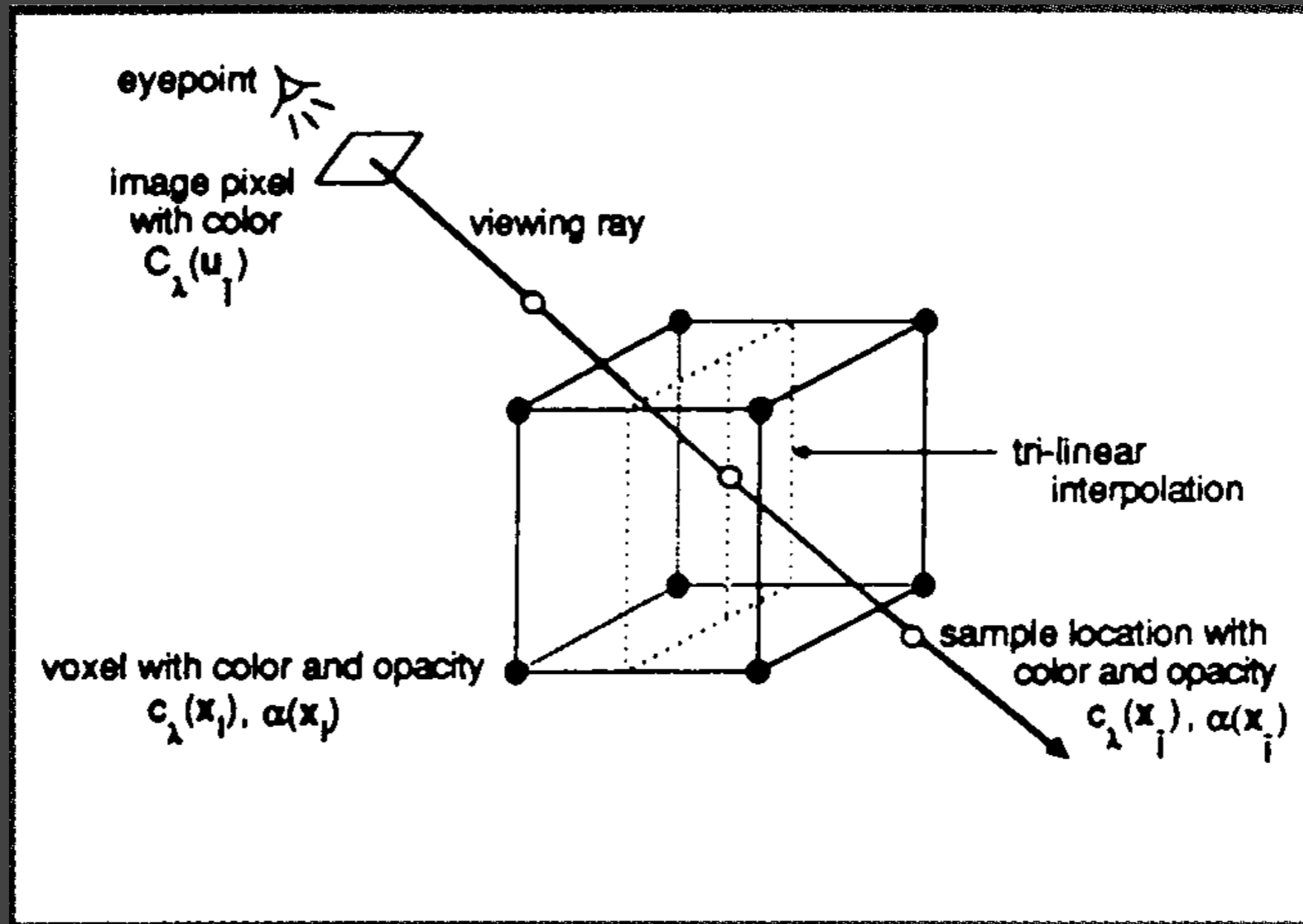
Ray casting (image order)

Compositing (object becomes image order)

Spatting (object order)

Fourier

Volume rendering by ray casting



[Levoy 1988]

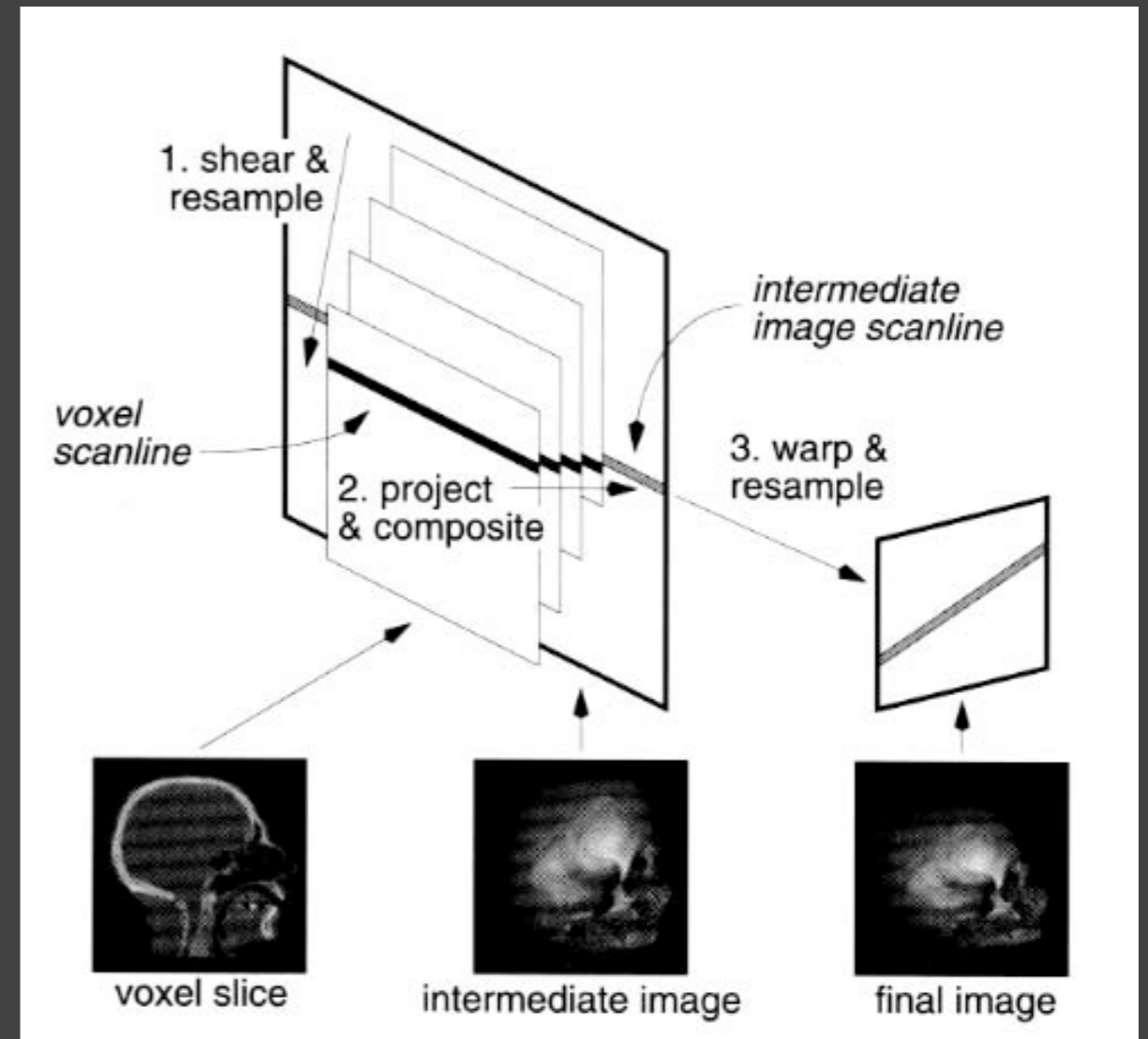
Volume rendering by resampling

and resampled to lie in that coordinate system. This is done as a sequence of 4 transformations,

$$T = P_z(z_e) R_z(\psi) R_y(\phi) R_z(\theta)$$

where R_z and R_y are rotations about the z and y axes, respectively, and P_z is the perspective transformation. The transfor-

[Drebin et al. 1988]



[Lacroute & Levoy 1994]

Volume rendering by resampling

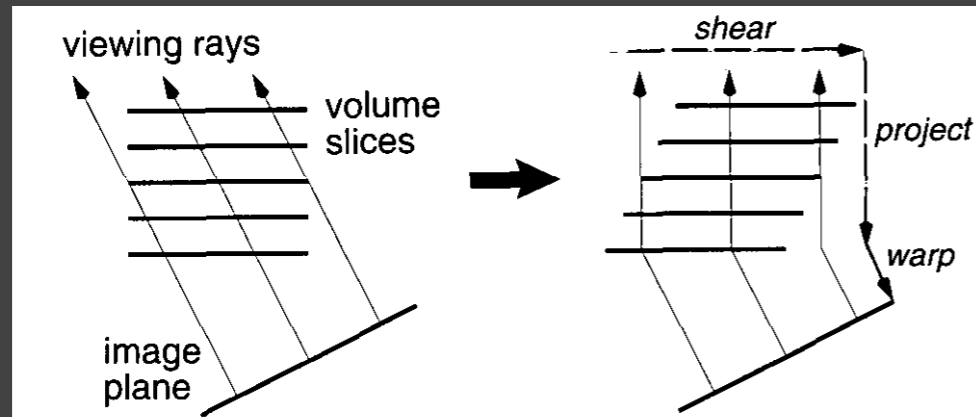


Figure 1: A volume is transformed to sheared object space for a parallel projection by translating each slice. The projection in sheared object space is simple and efficient.

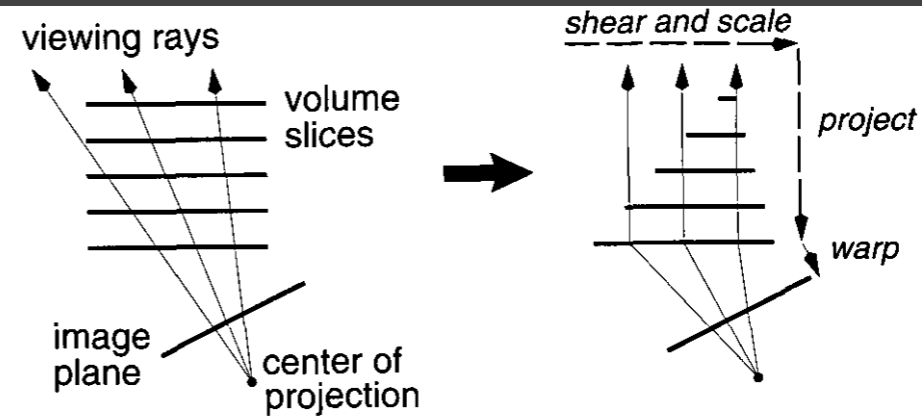
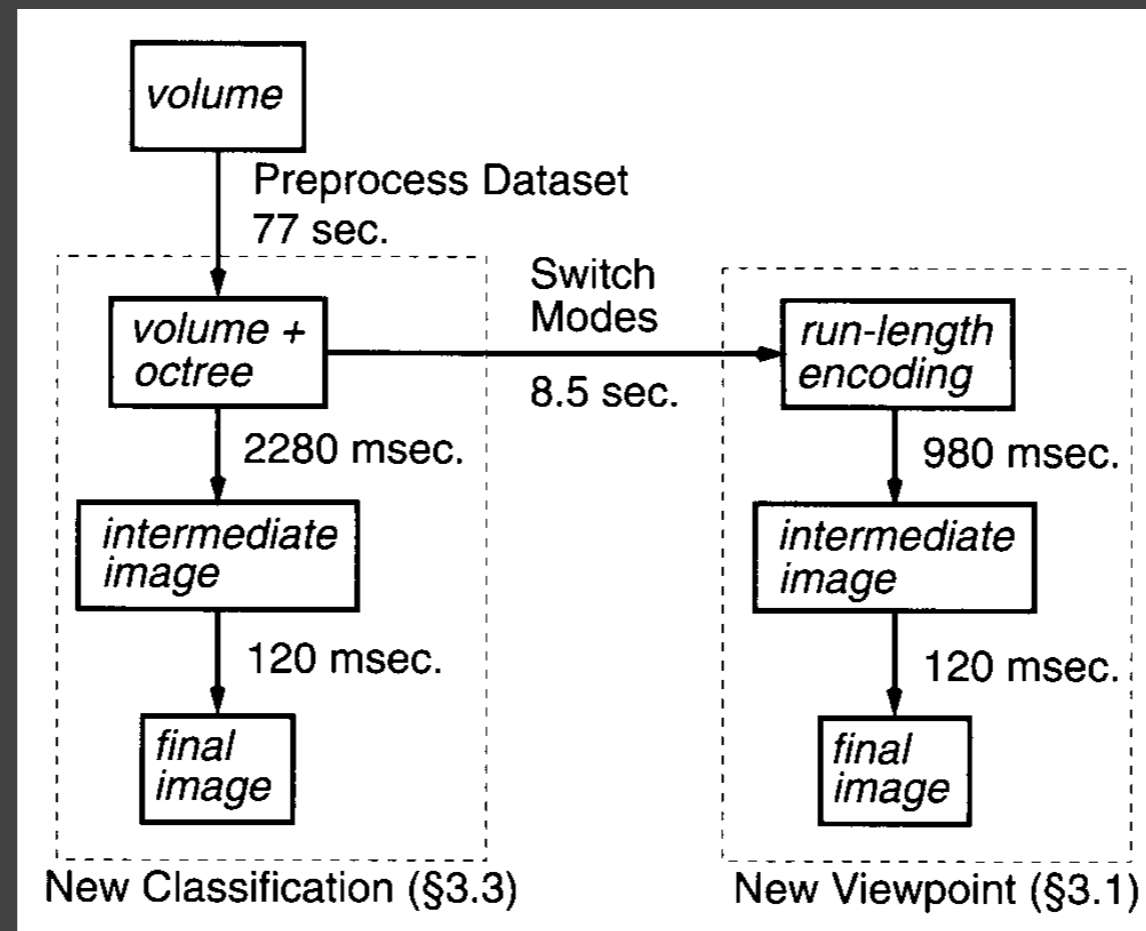


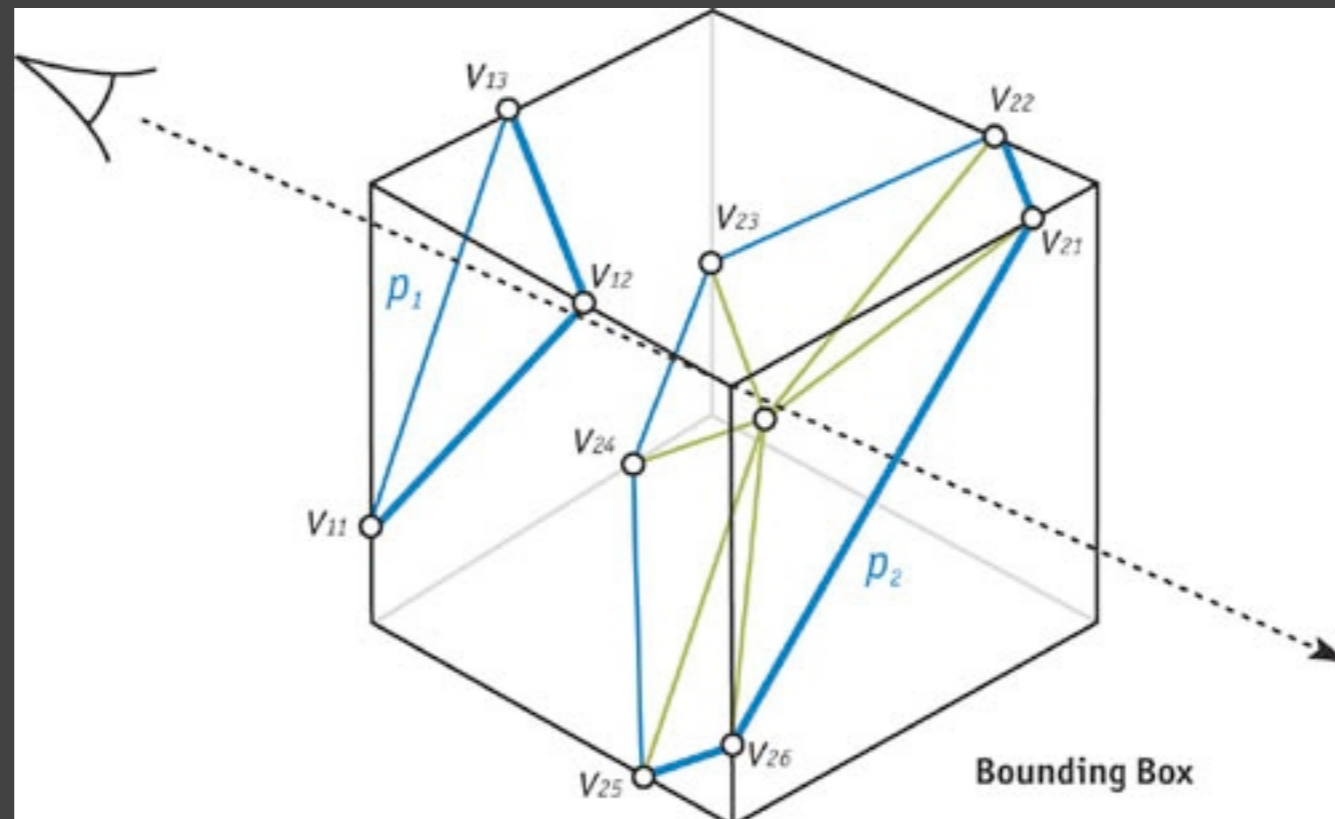
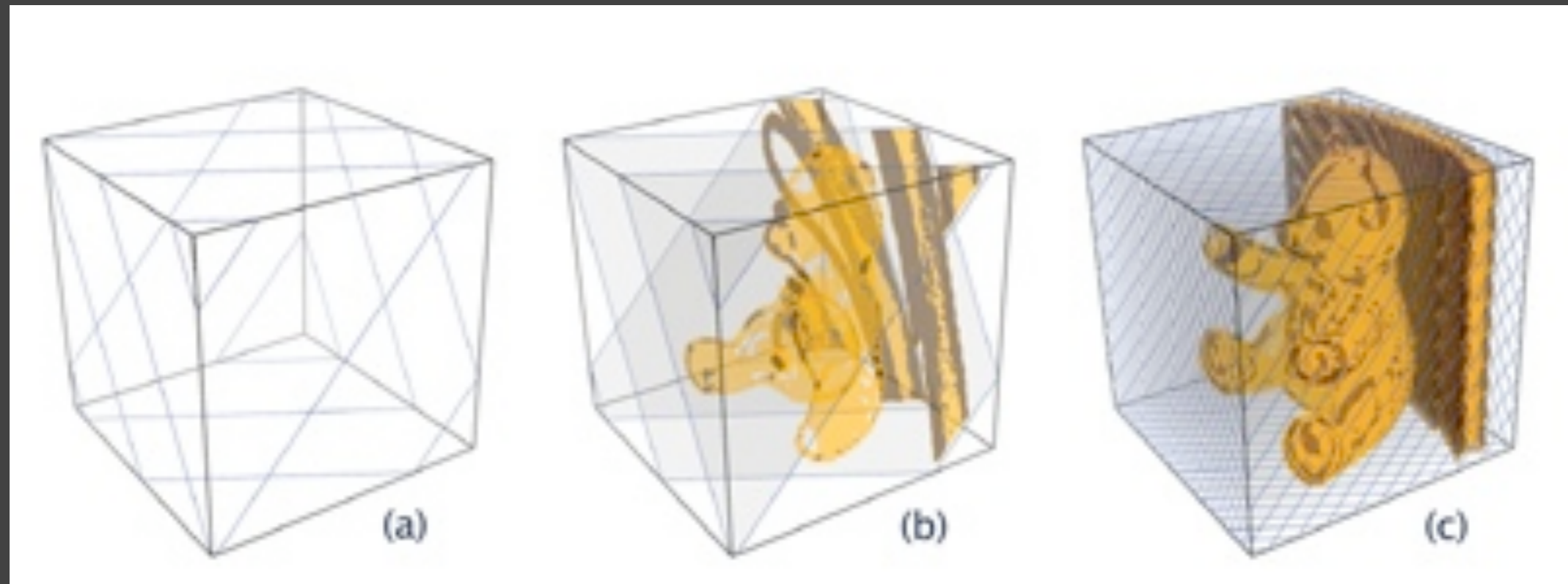
Figure 2: A volume is transformed to sheared object space for a perspective projection by translating and scaling each slice. The projection in sheared object space is again simple and efficient.

[Lacroute & Levoy 1994]

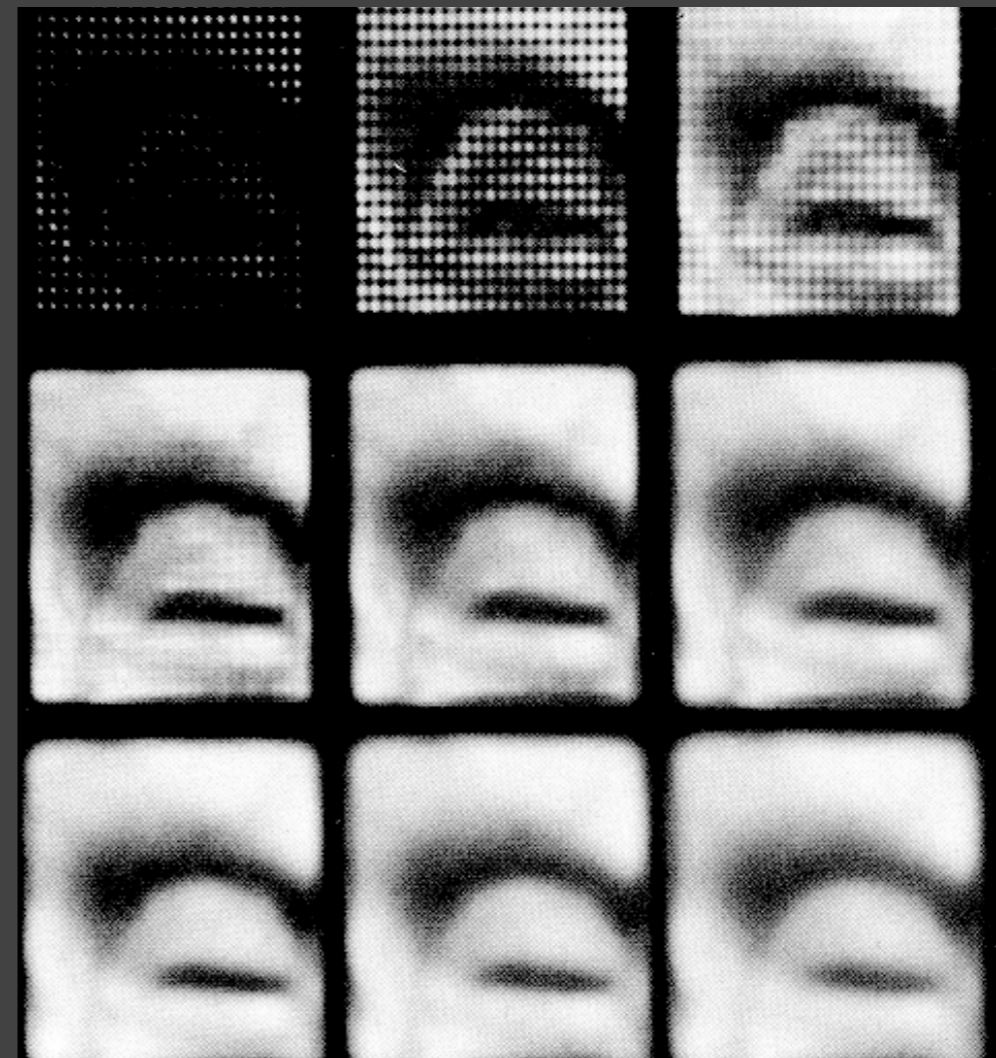
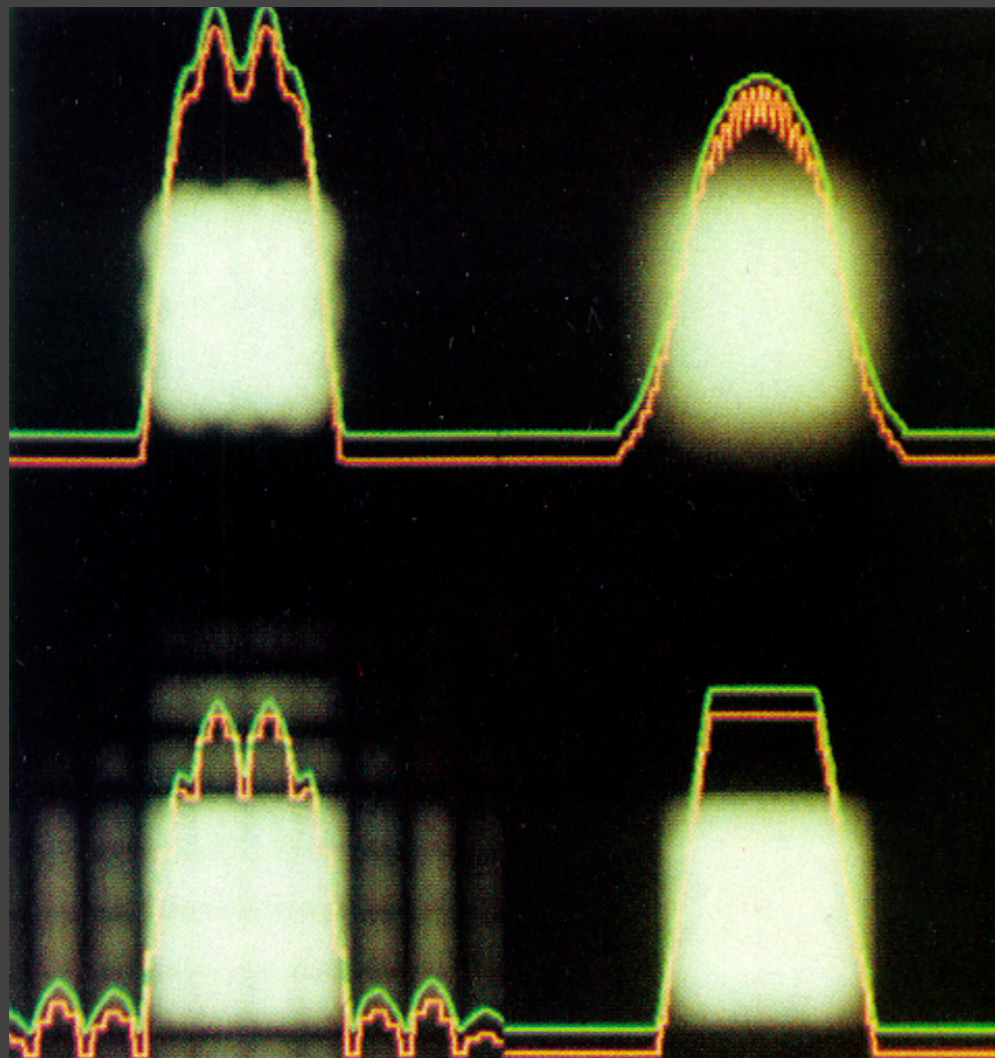
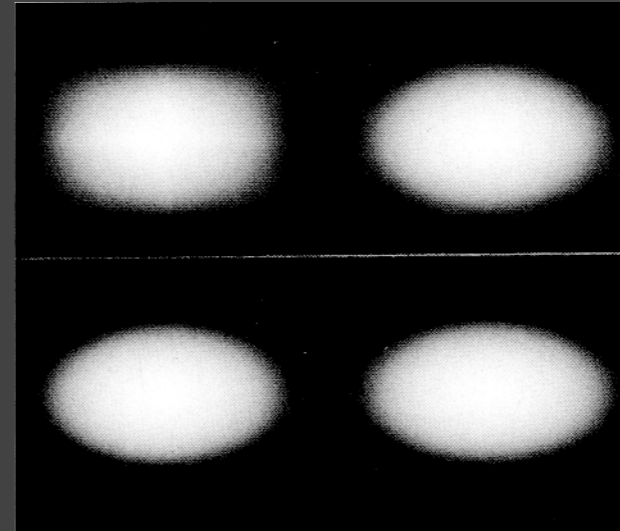
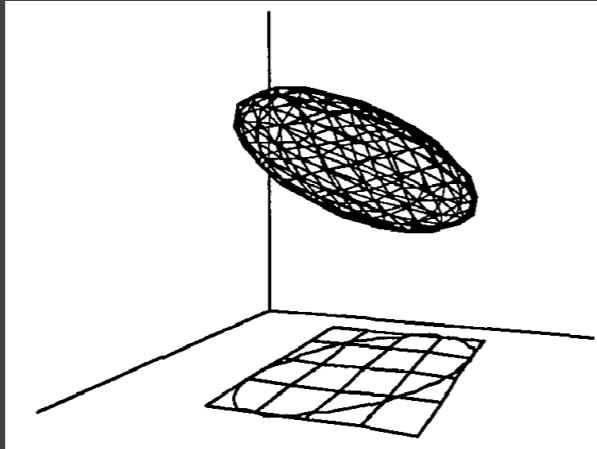


[Lacroute & Levoy 1994]

Texture-based resampling



Volume rendering by splatting



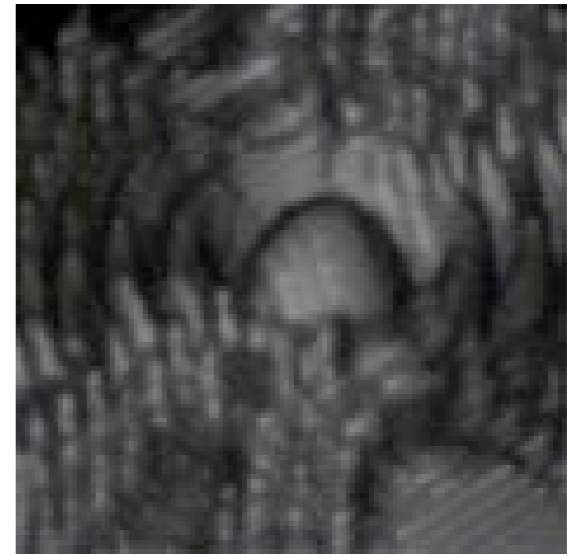
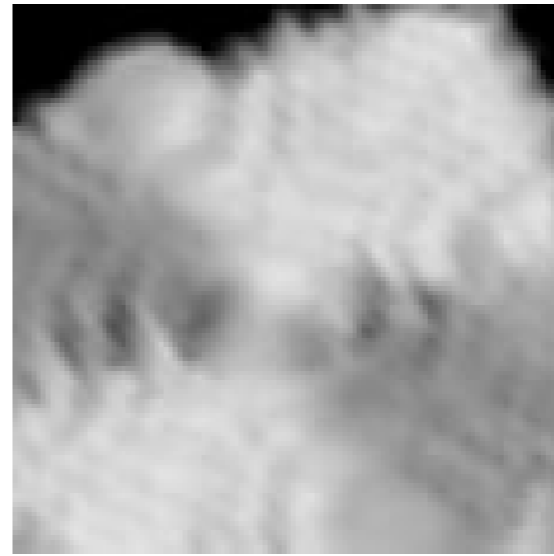
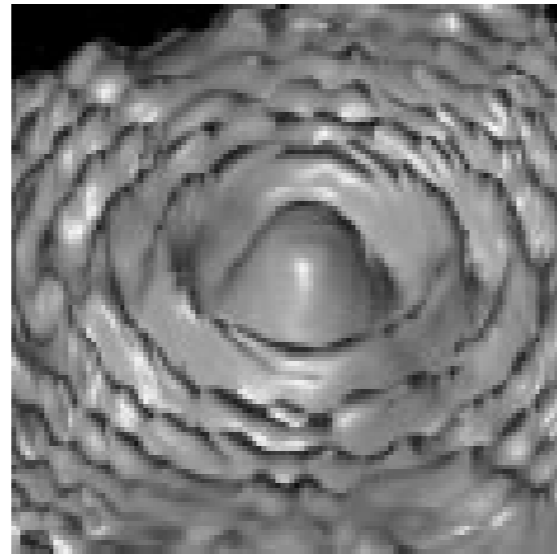
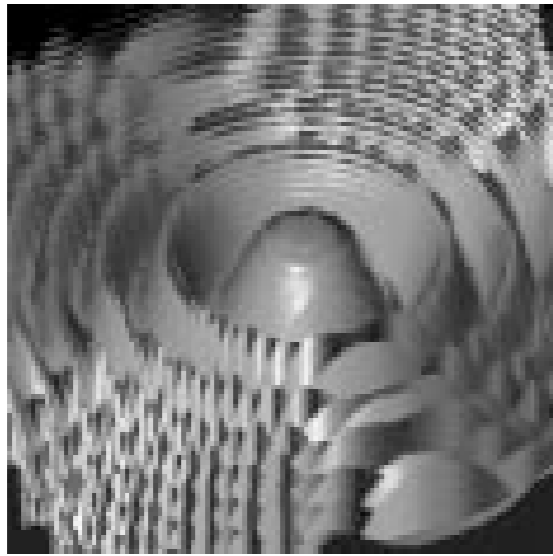
Raycasting

Splatting

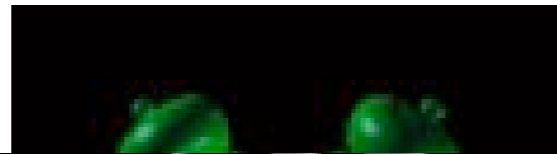
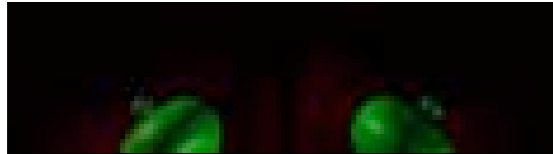
Shear-Warp

Texture Mapping

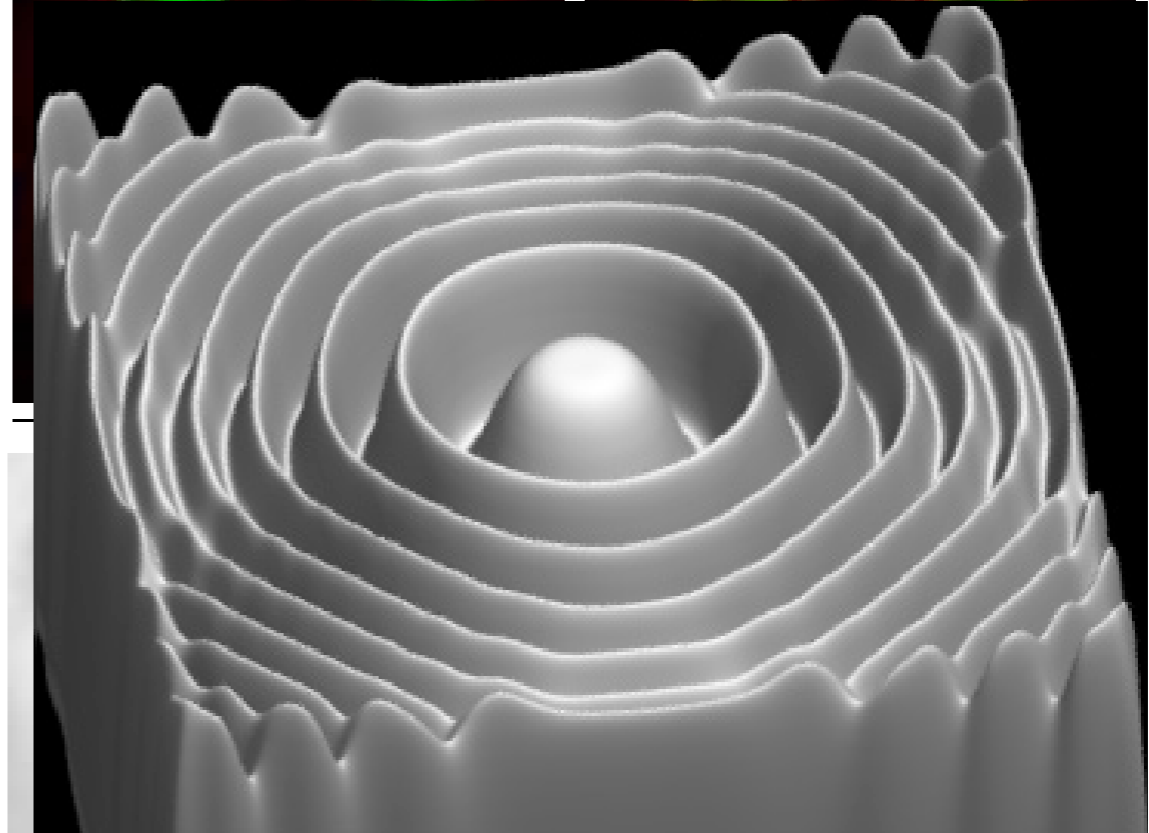
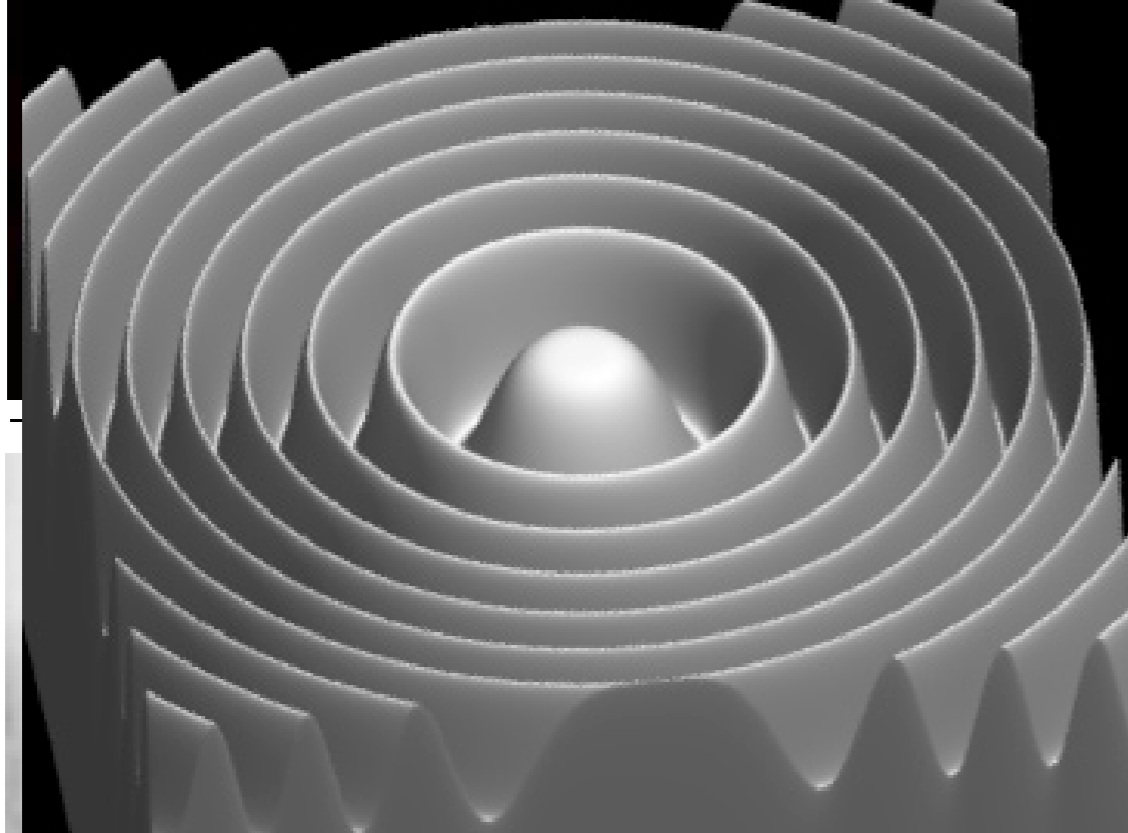
Marschner-Lobb Function



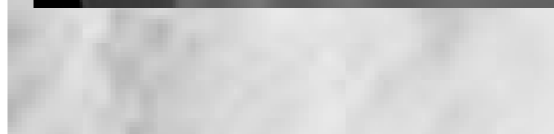
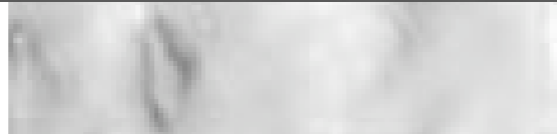
(a) Magnification: 6



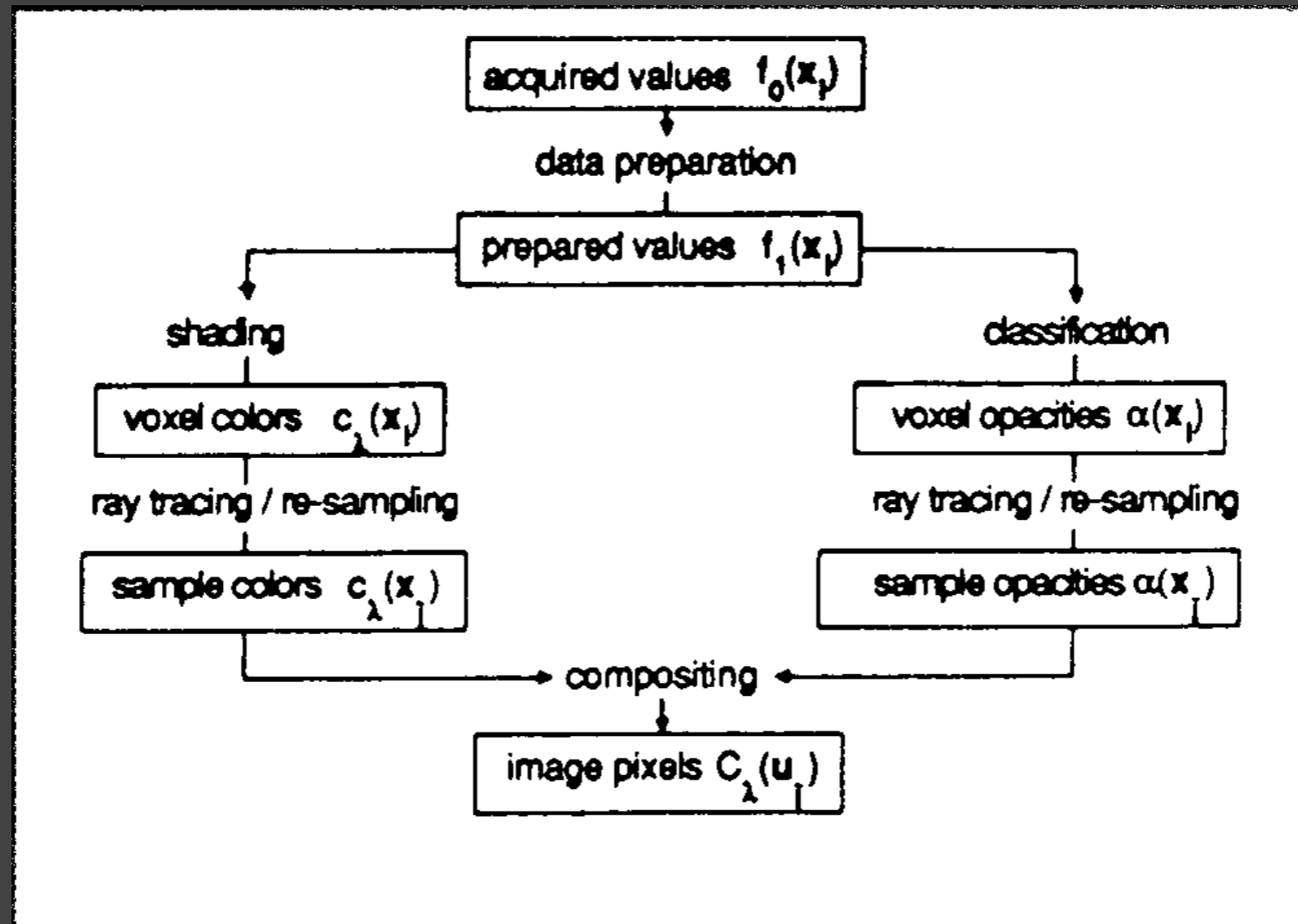
(b) Viewed at 45°



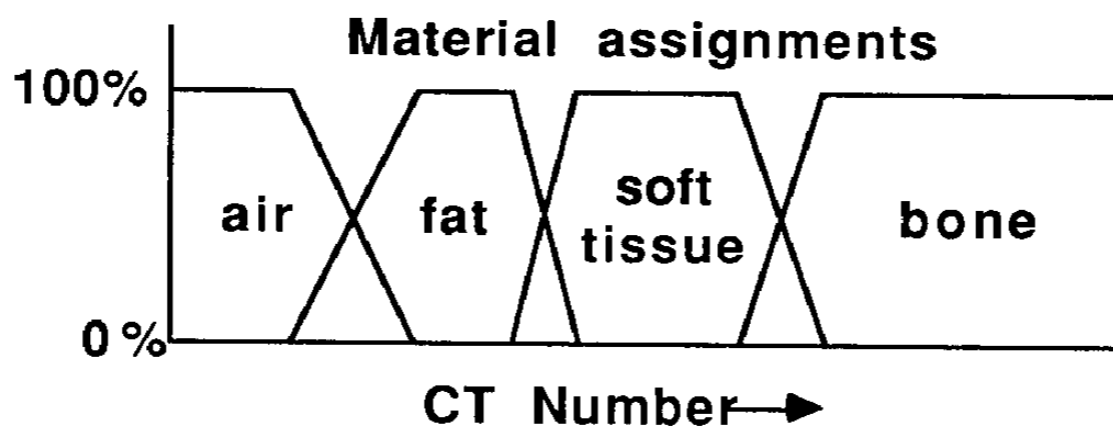
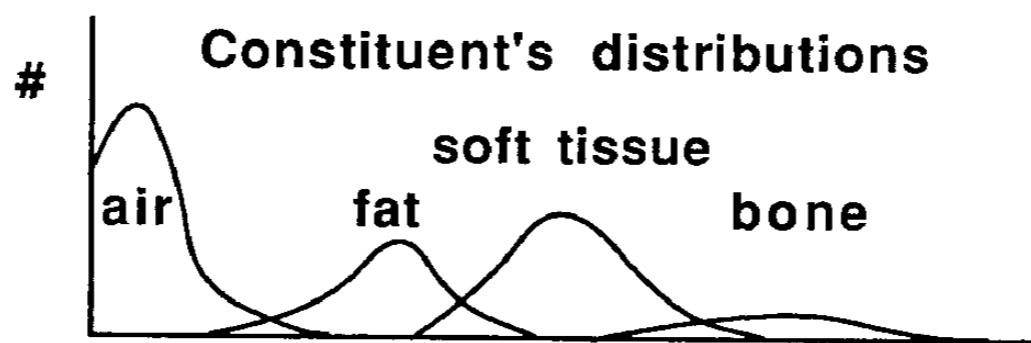
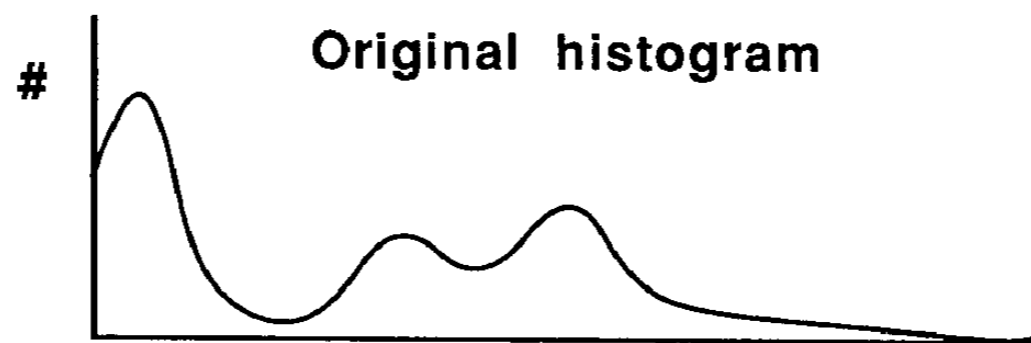
(c) Magnification: 8



Classification and shading



[Levoy 1988]



[Drebin 1988]

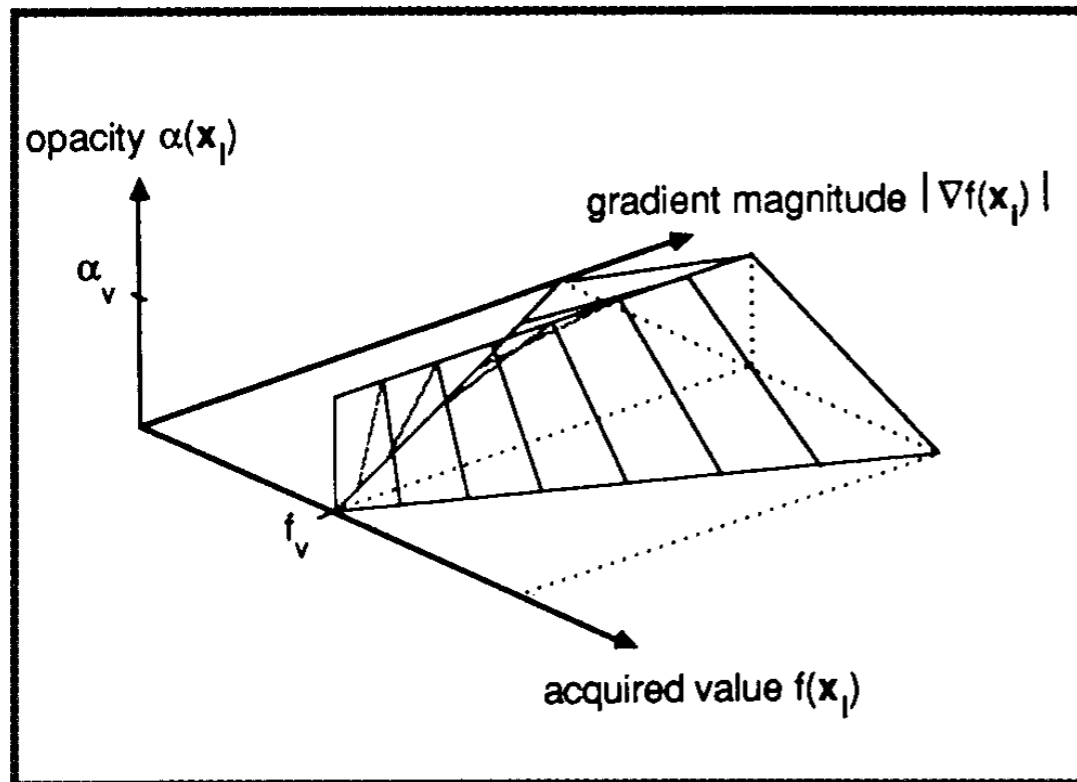


Figure 3. Calculation of opacities for isovalue contour surfaces.

[Levoy 1988]

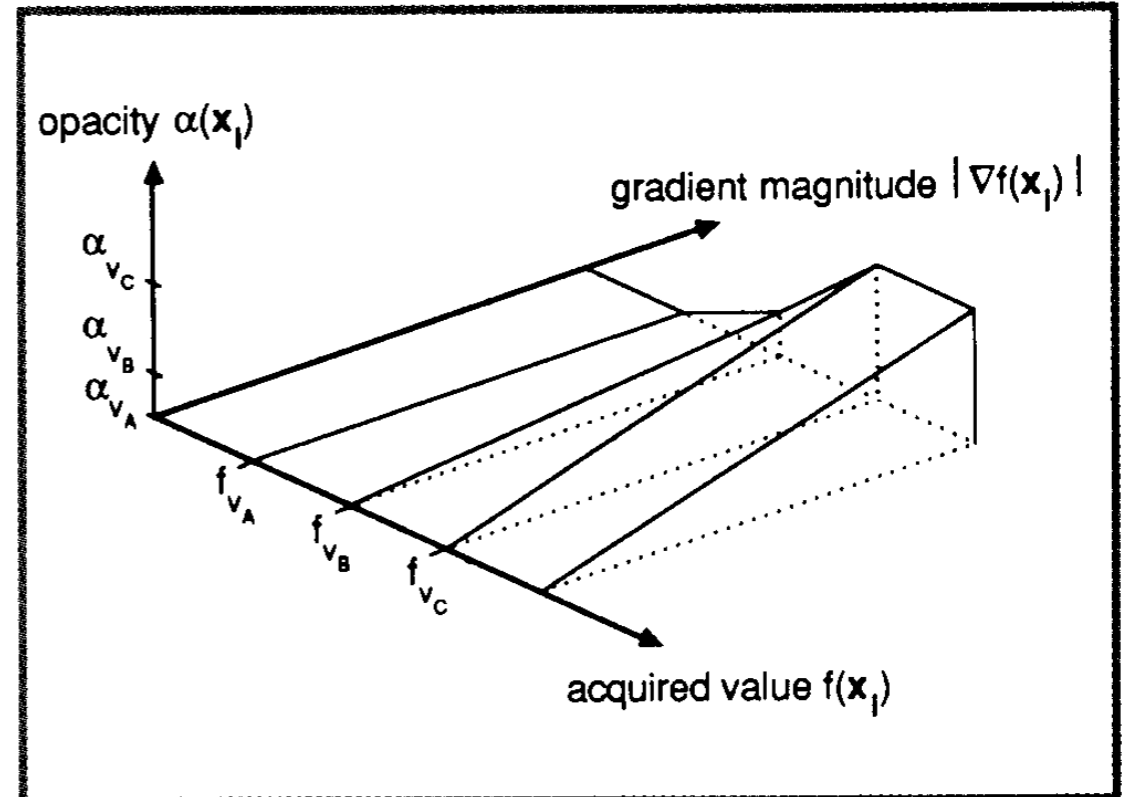
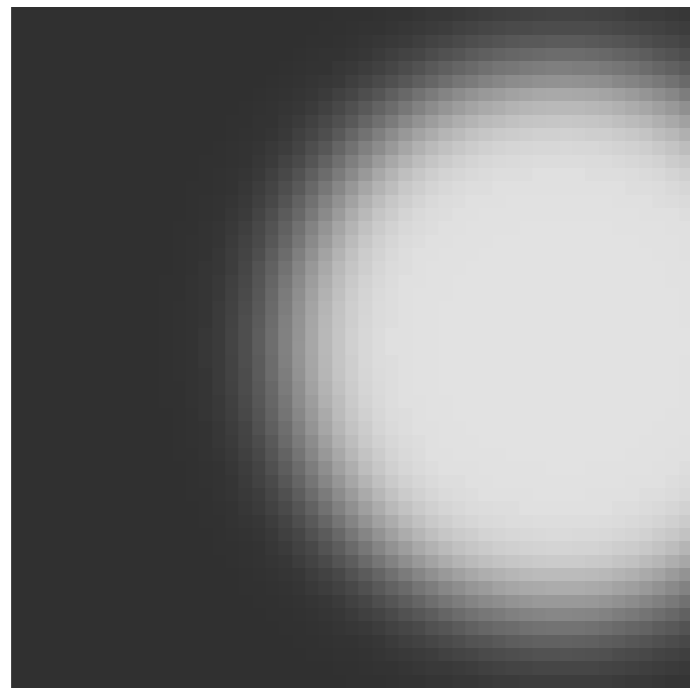
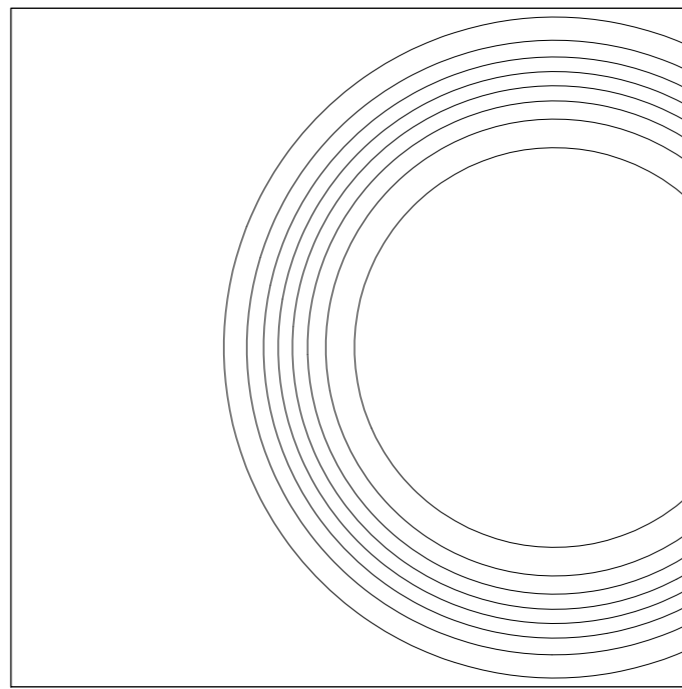


Figure 4. Calculation of opacities for region boundary surfaces.

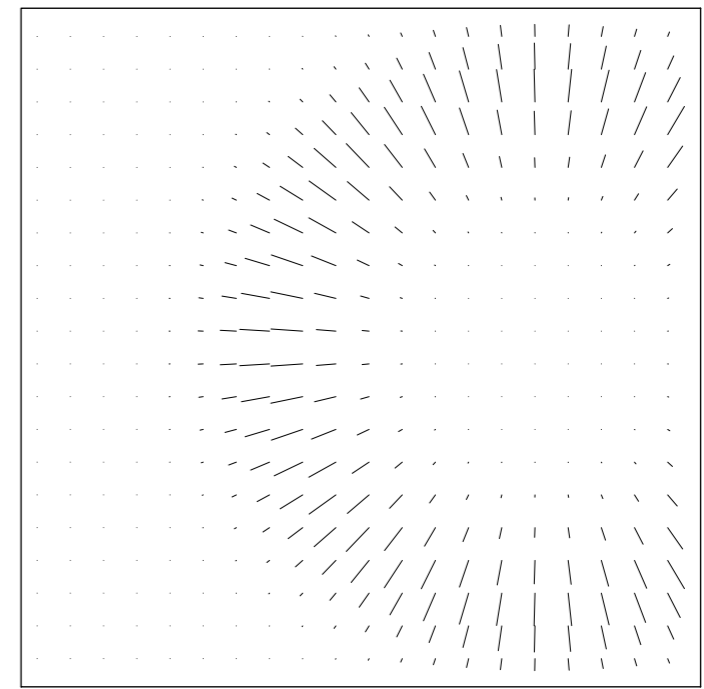
[Levoy 1988]



(a) $f(\mathbf{x})$



(b) Isosurfaces of f



(c) ∇f

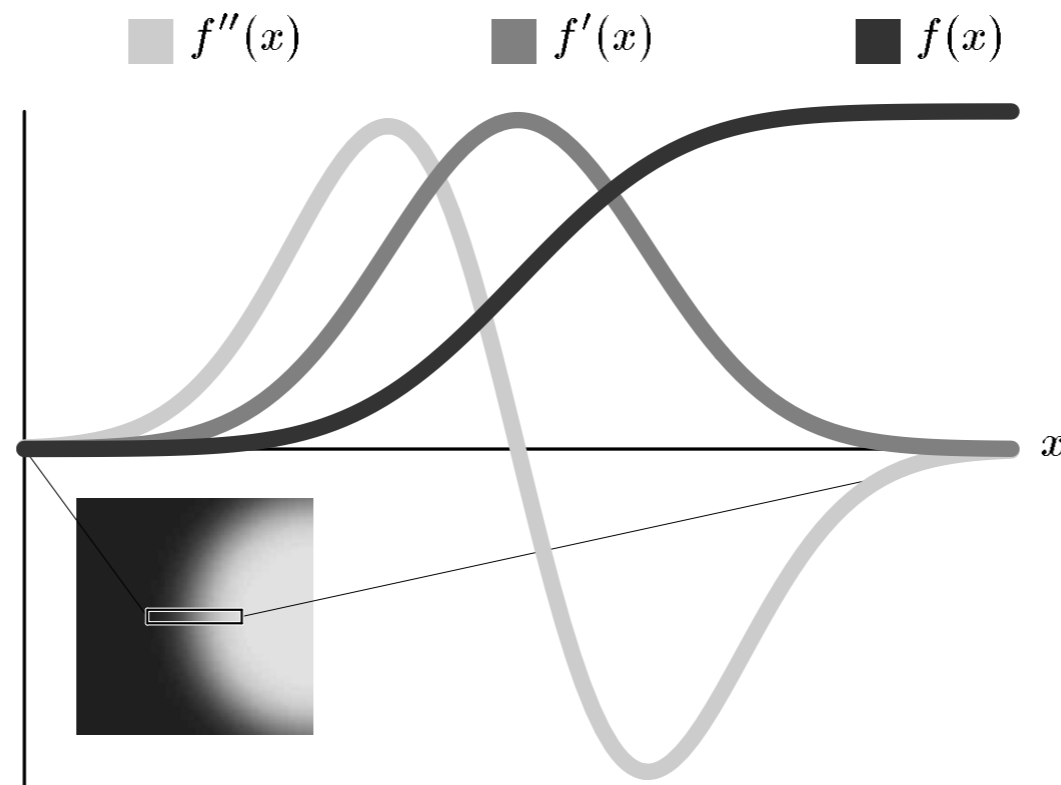


Figure 4: Measuring f , f' , and f'' across boundary.

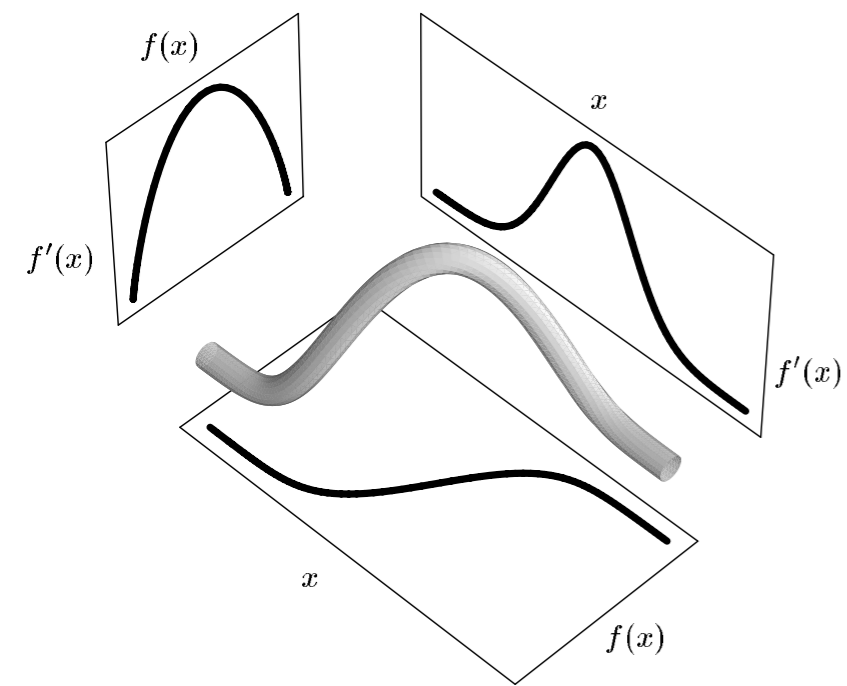


Figure 5: f , f' and position x .

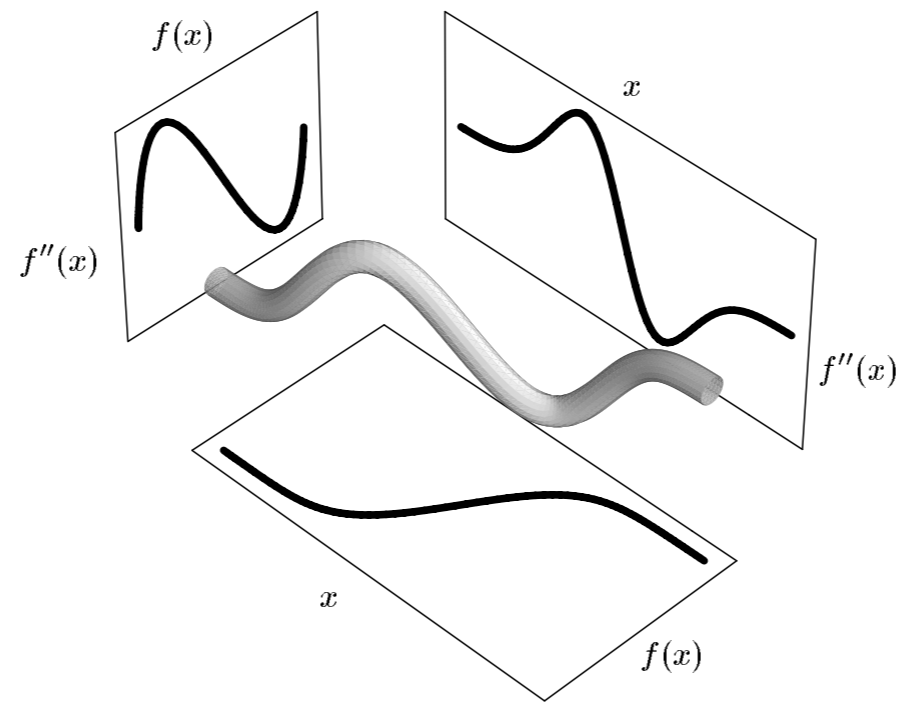


Figure 6: f , f'' and position x .

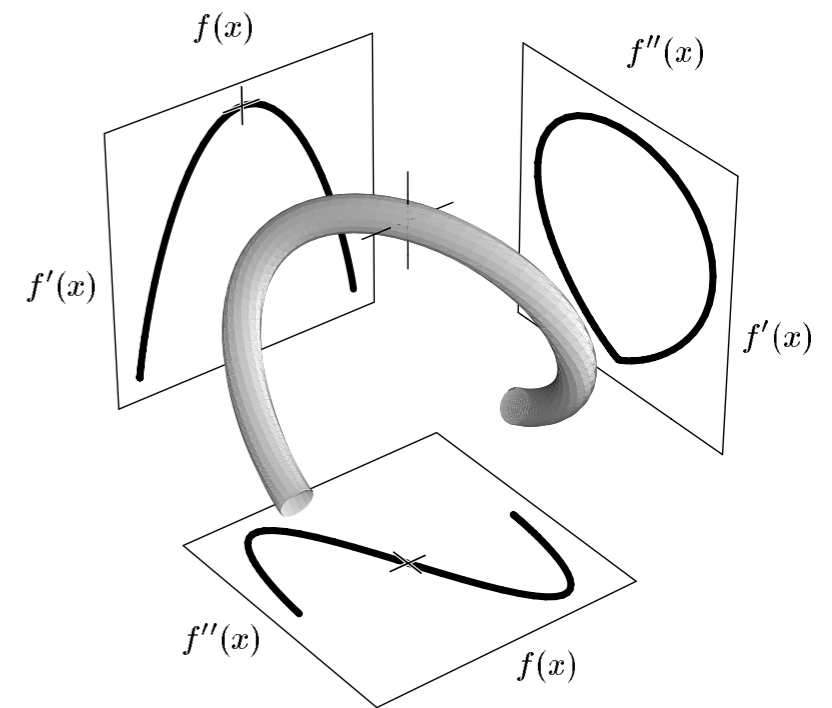
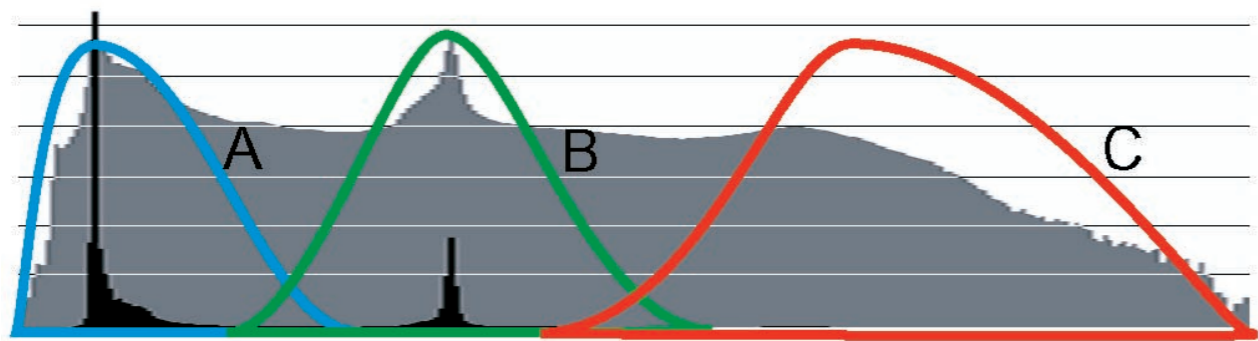
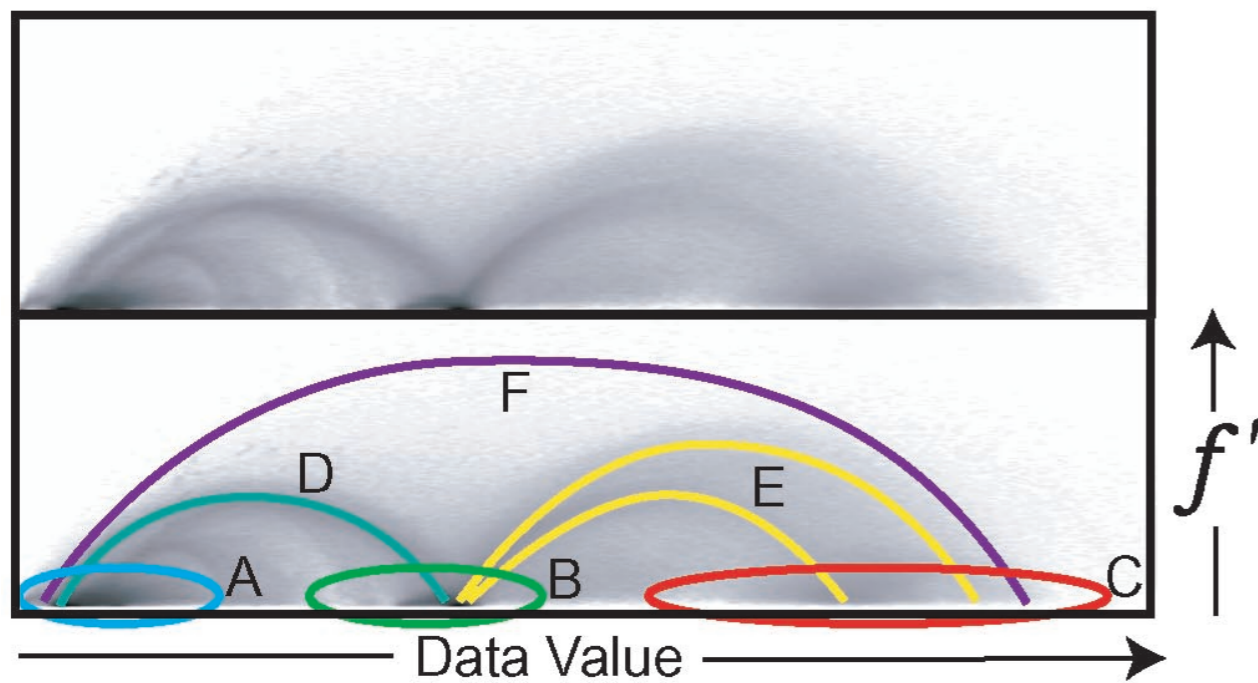


Figure 7: The underlying relationship of f , f' , and f'' .

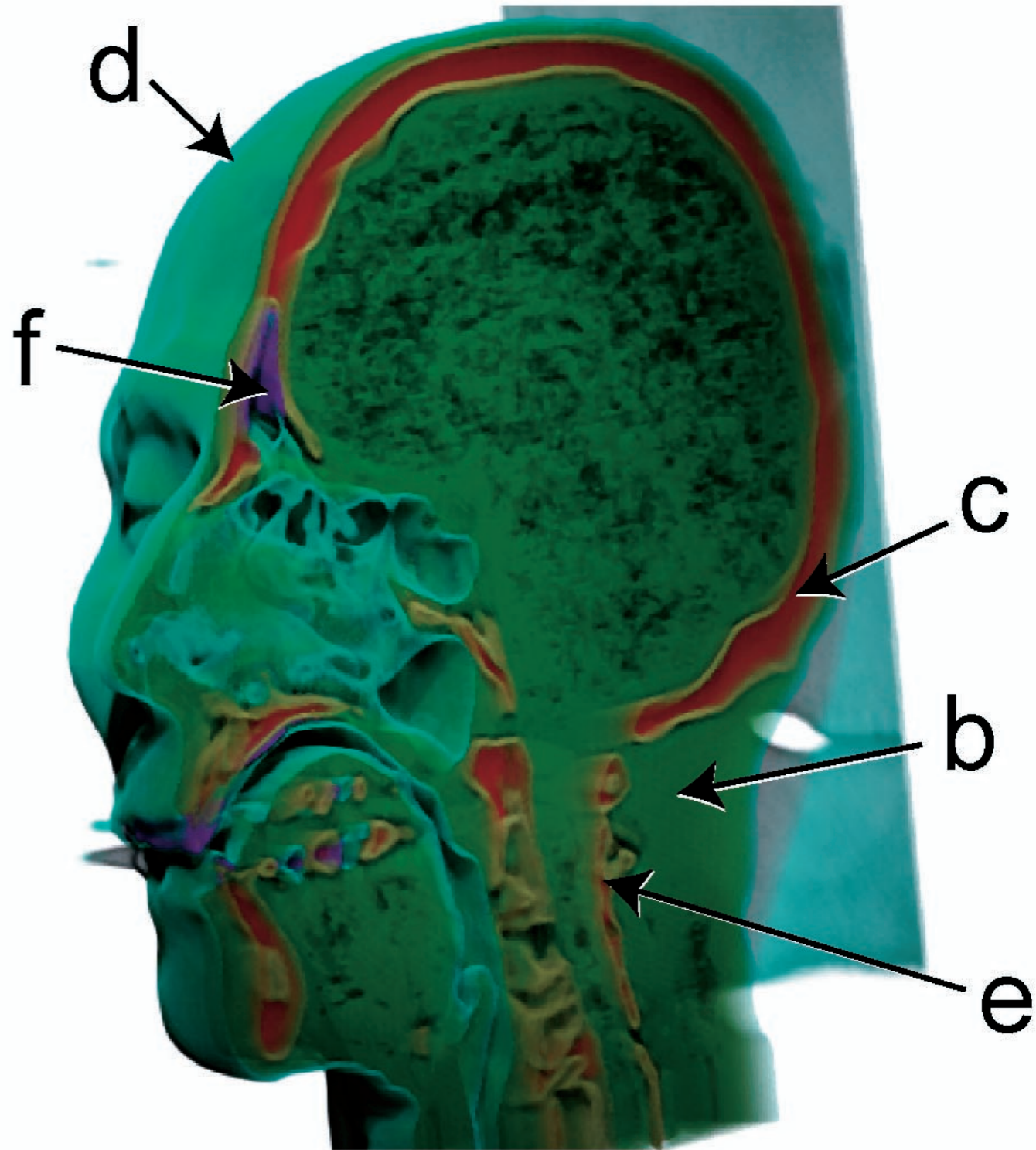
[Kindlmann & Durkin 1998]



(a)



(b)



(c)

