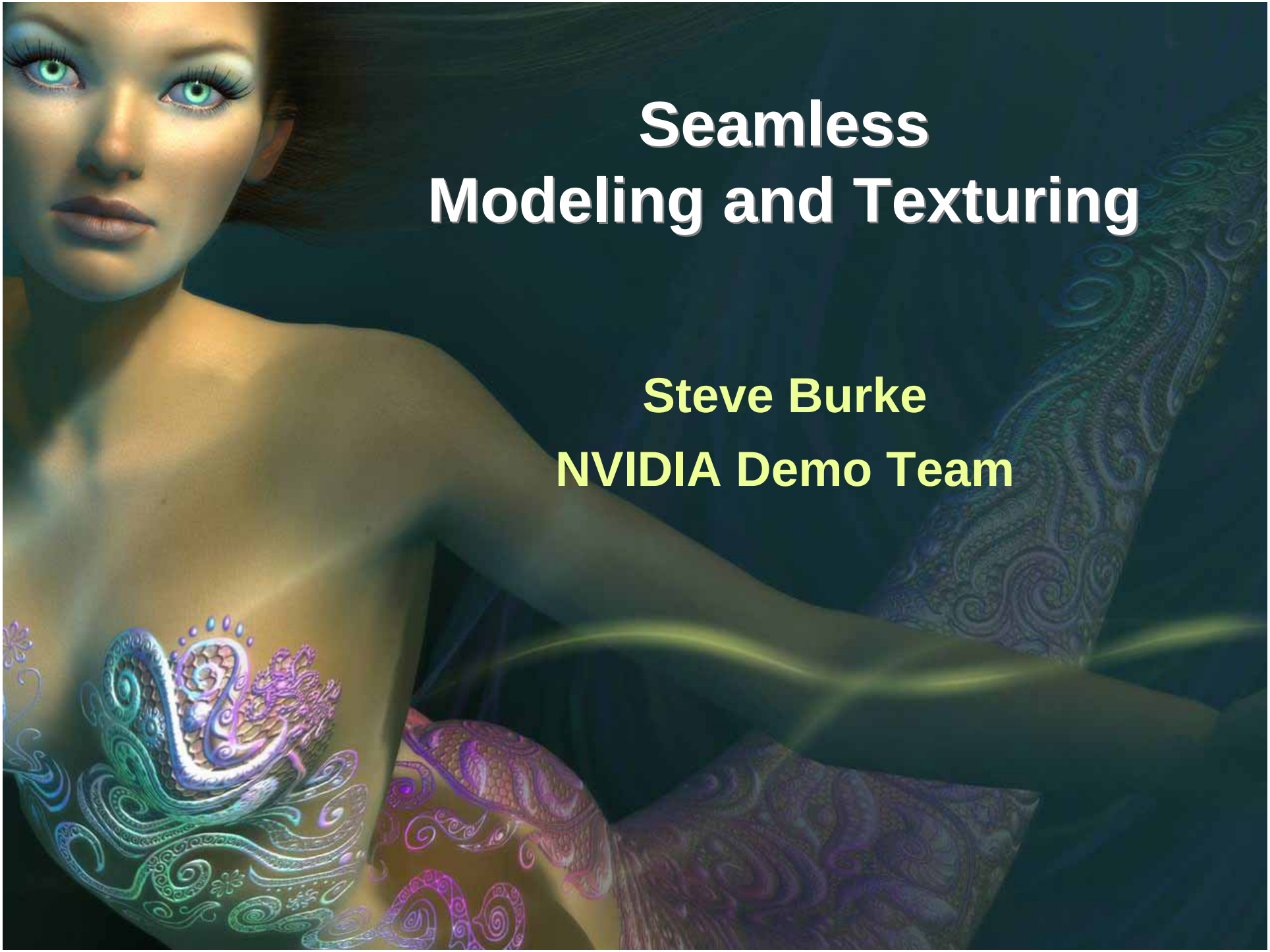


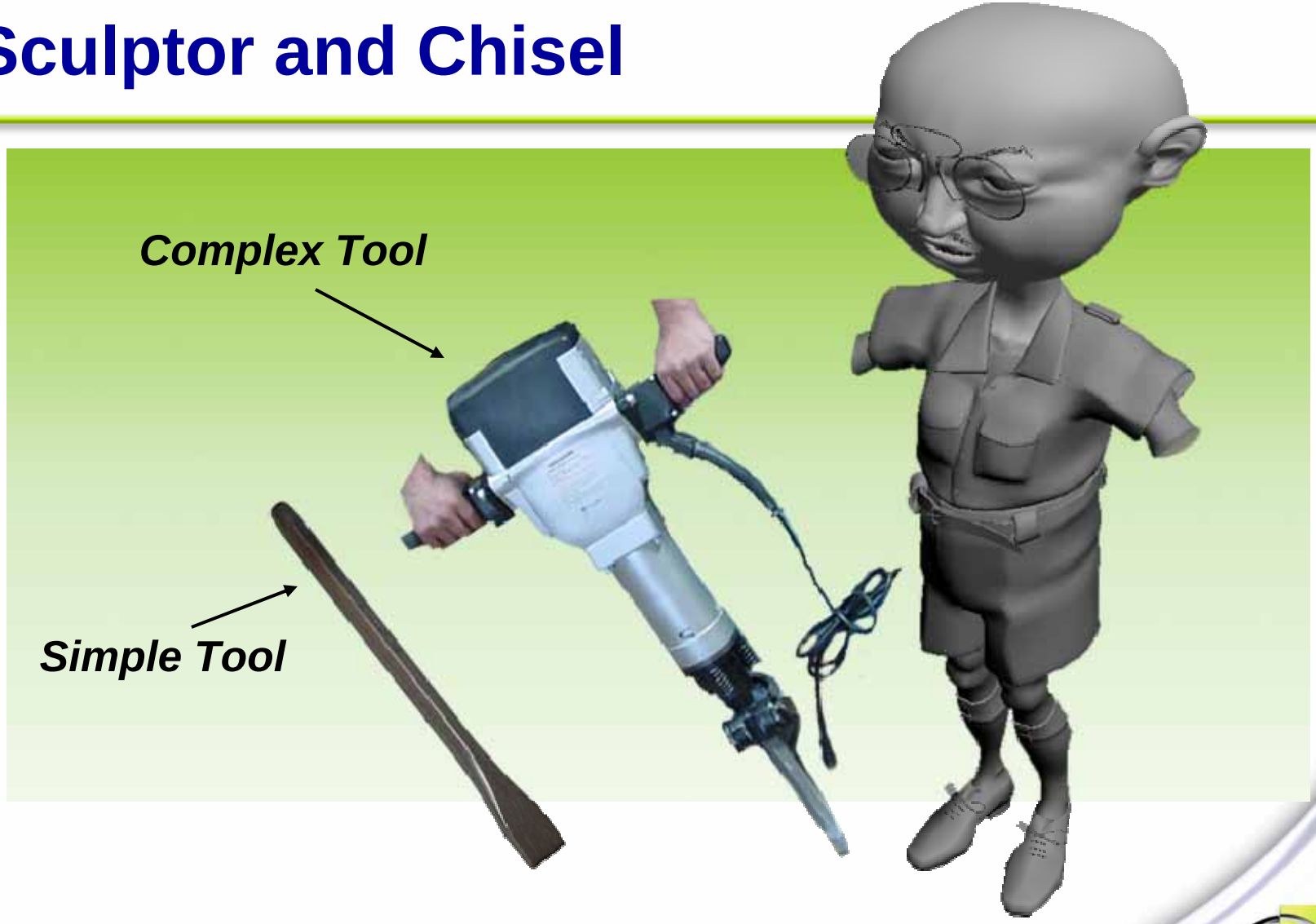
Seamless Modeling and Texturing

Steve Burke

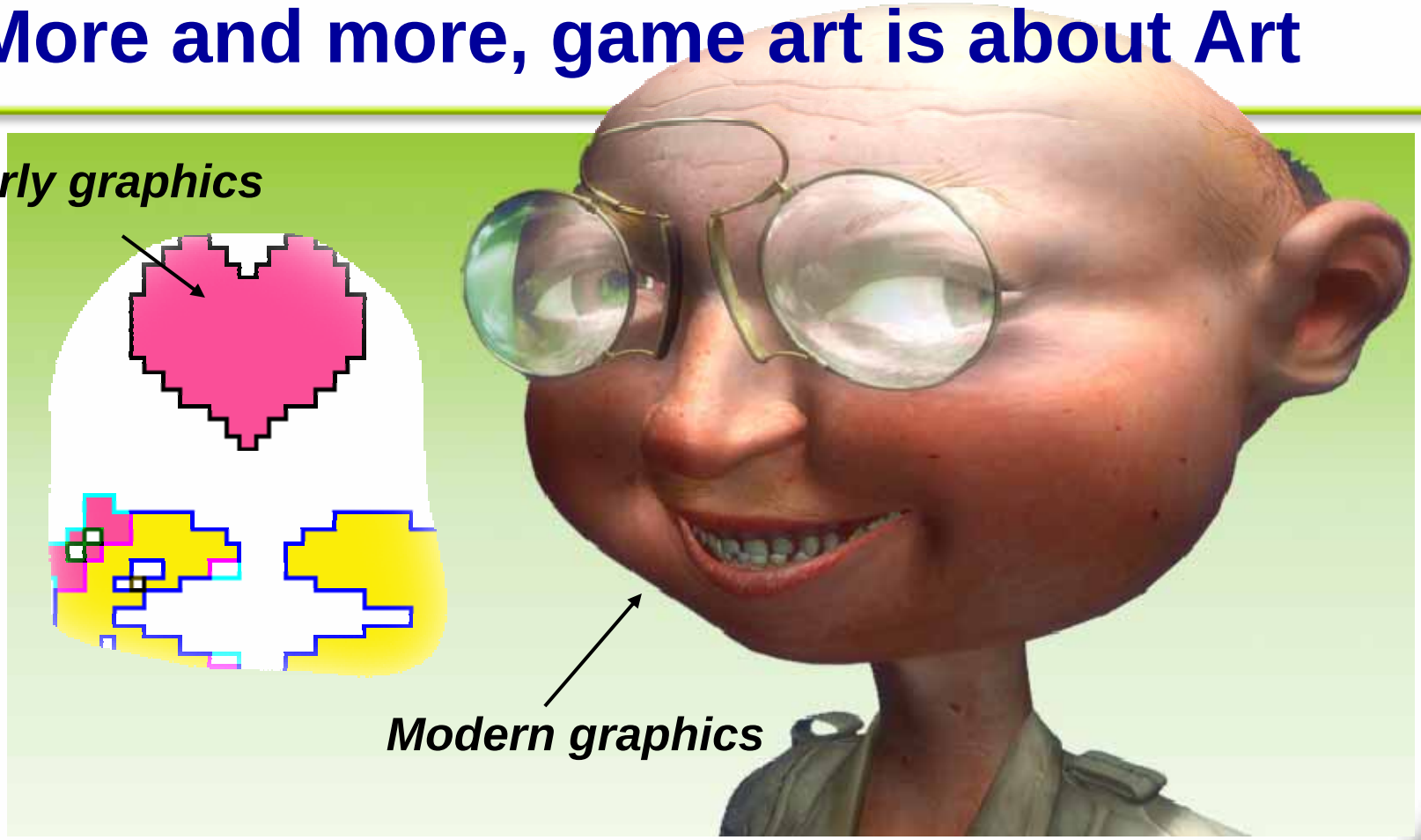
NVIDIA Demo Team

Harmony

Sculptor and Chisel

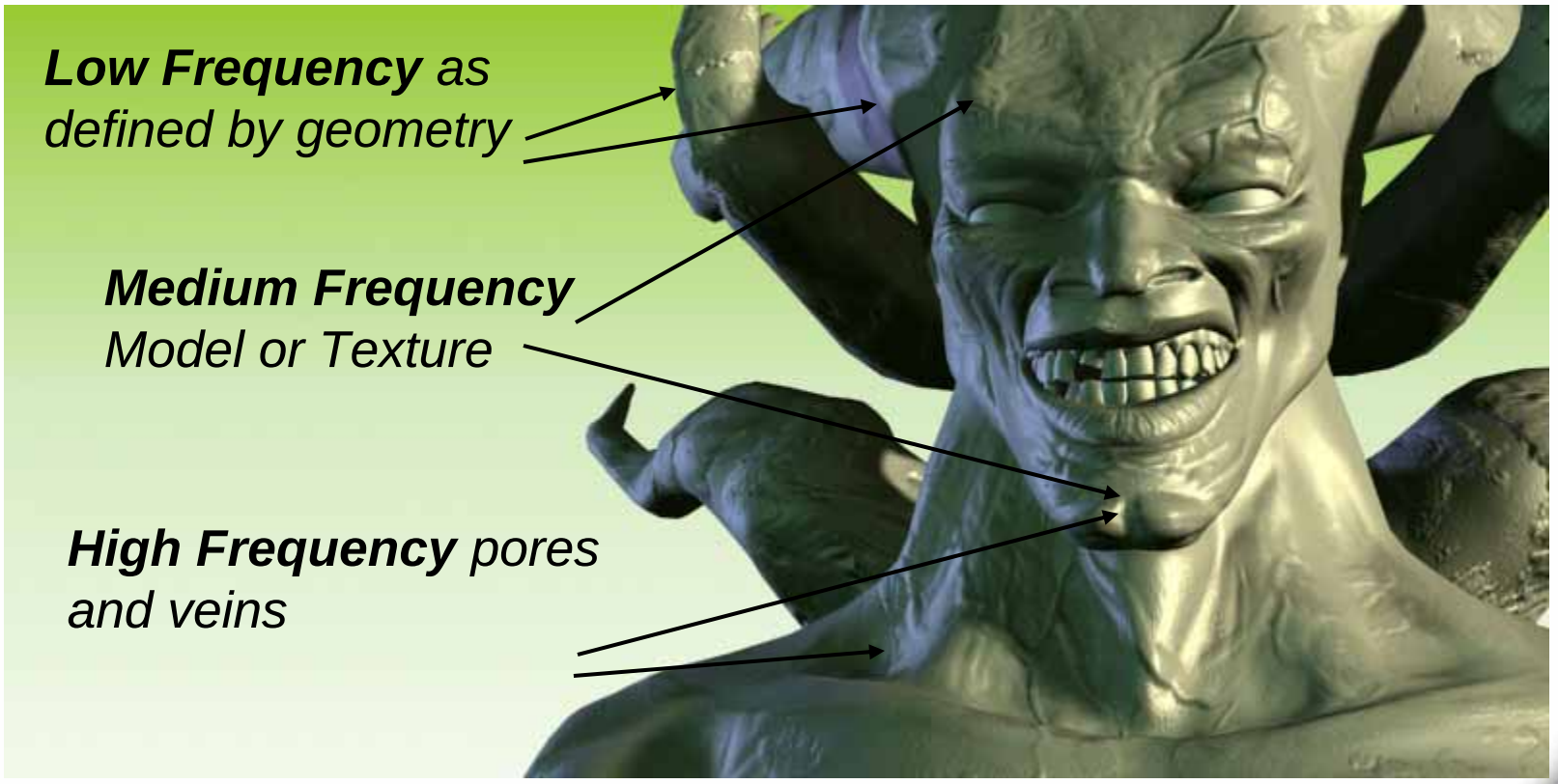


More and more, game art is about Art



Know your tools but put your energy into the art itself

Infinite Resolution

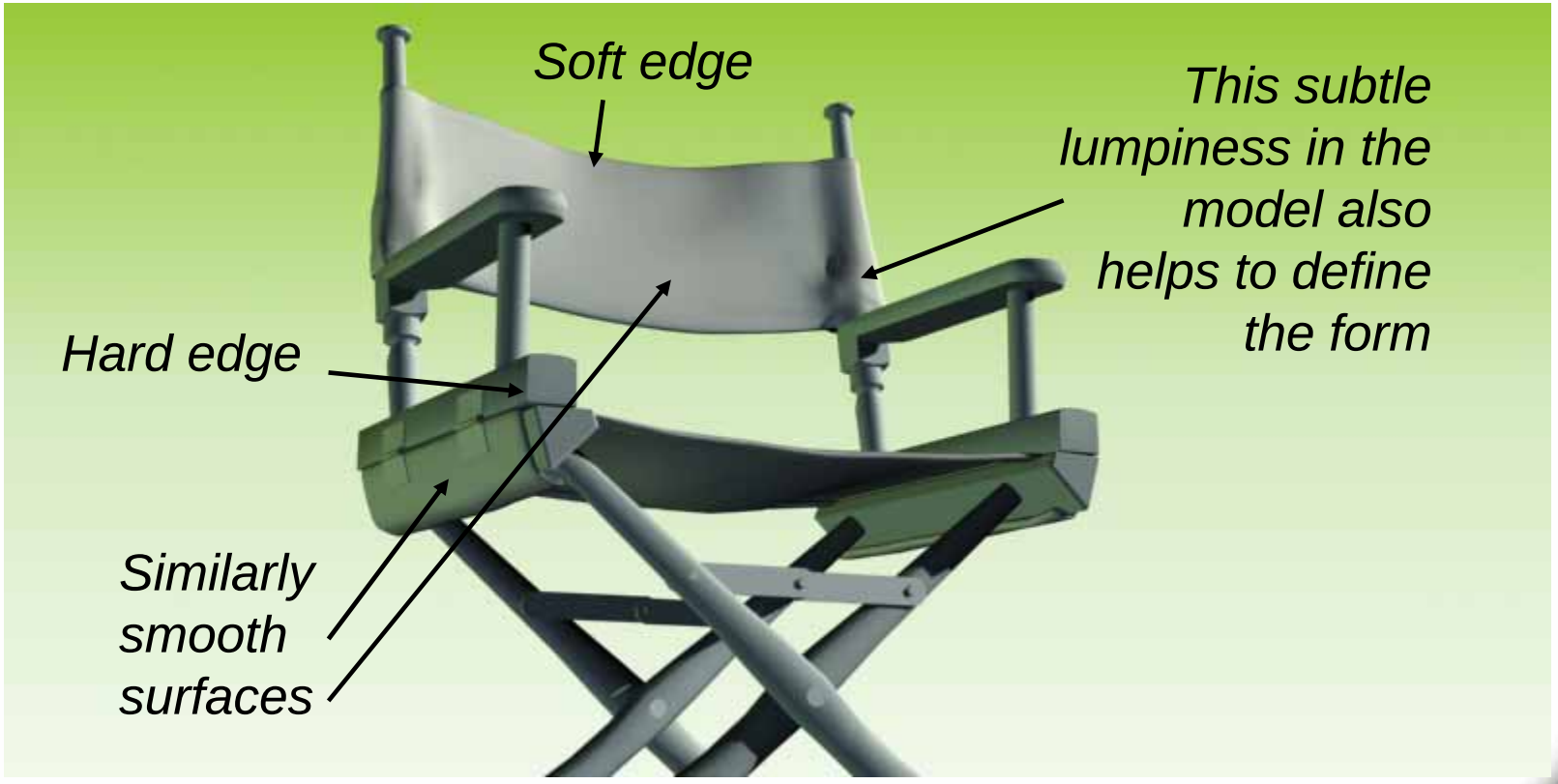


Three levels of resolution are seamlessly blended to create apparent infinite resolution

Materials Implied by Model Construction

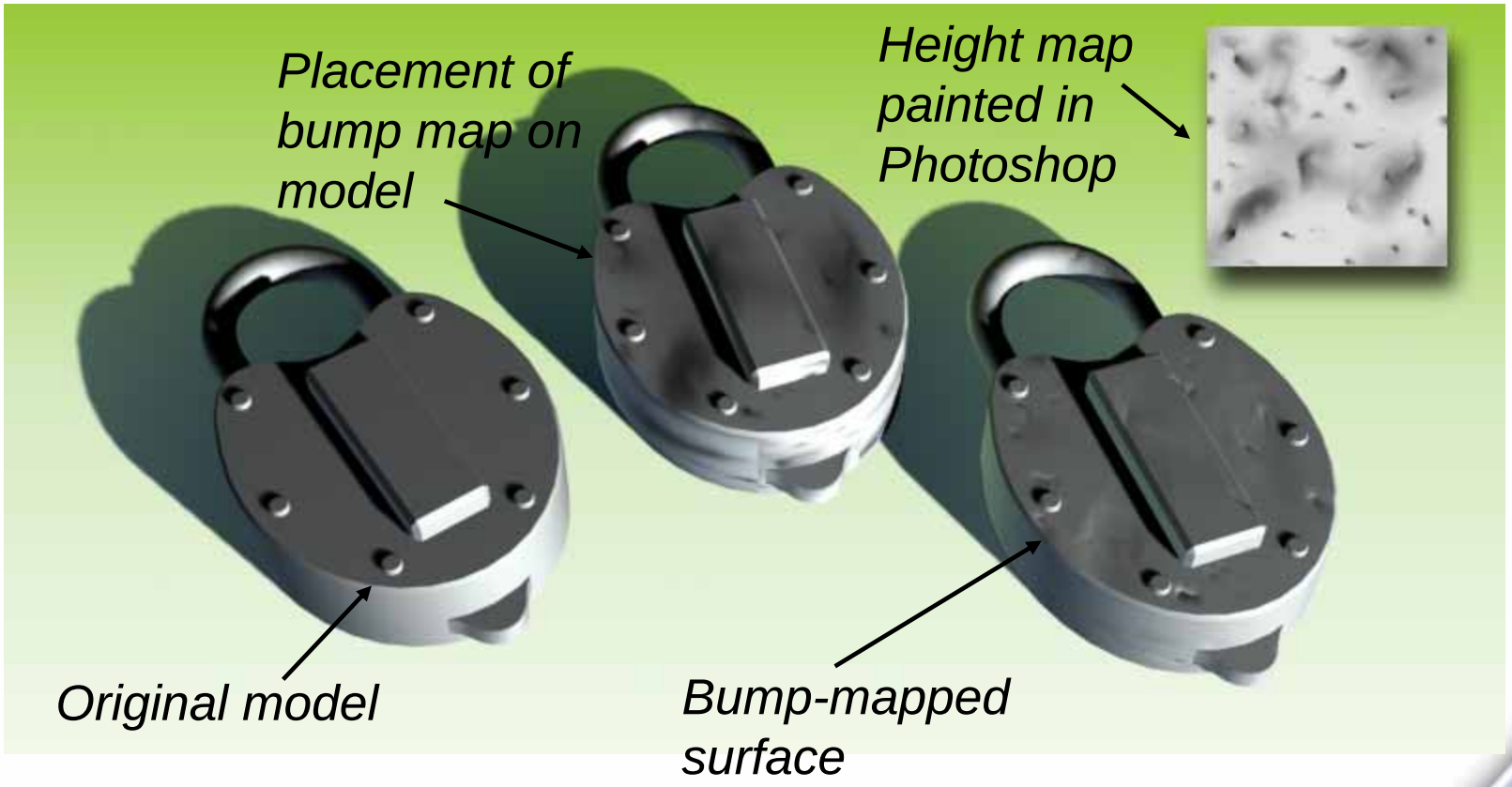
It is clear these models are comprised of different materials

Model Edges Vary More Than Surfaces



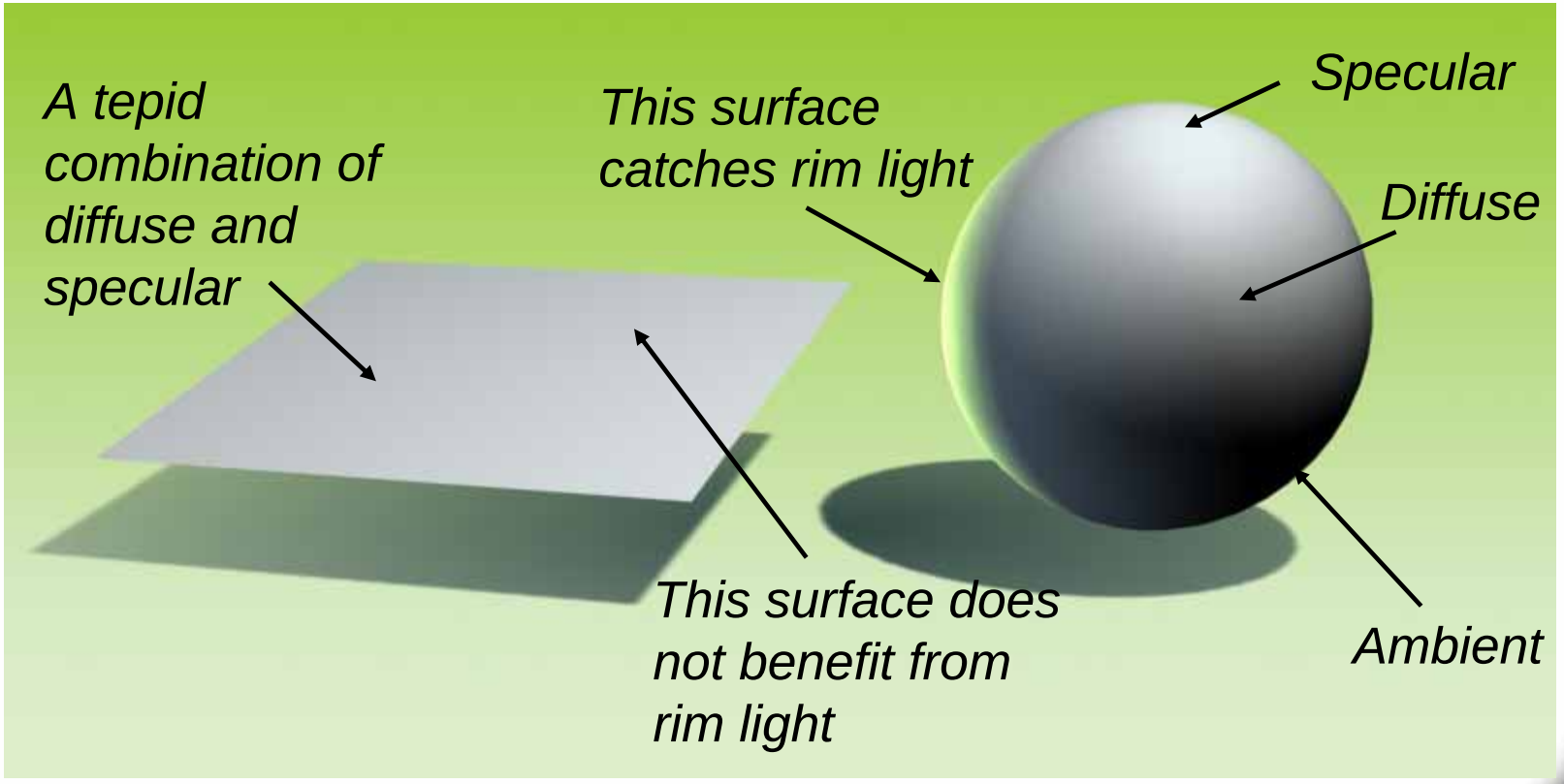
Most surfaces are generally smooth with the edges doing much to describe form

Small Details are Important to a Model



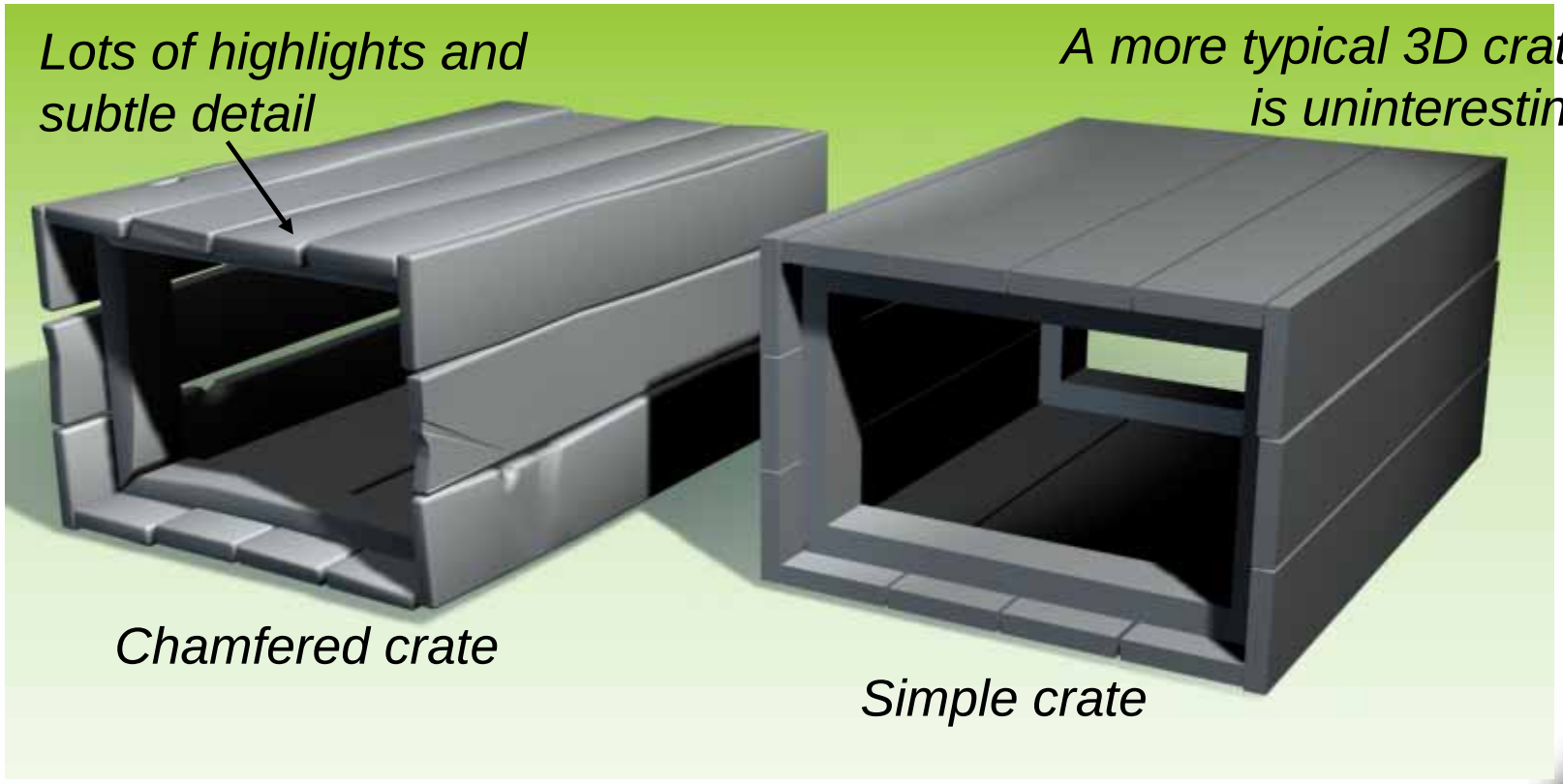
Small models details help to sell the model's believability and shouldn't automatically be replaced with bump maps

Curved Surfaces Look Better



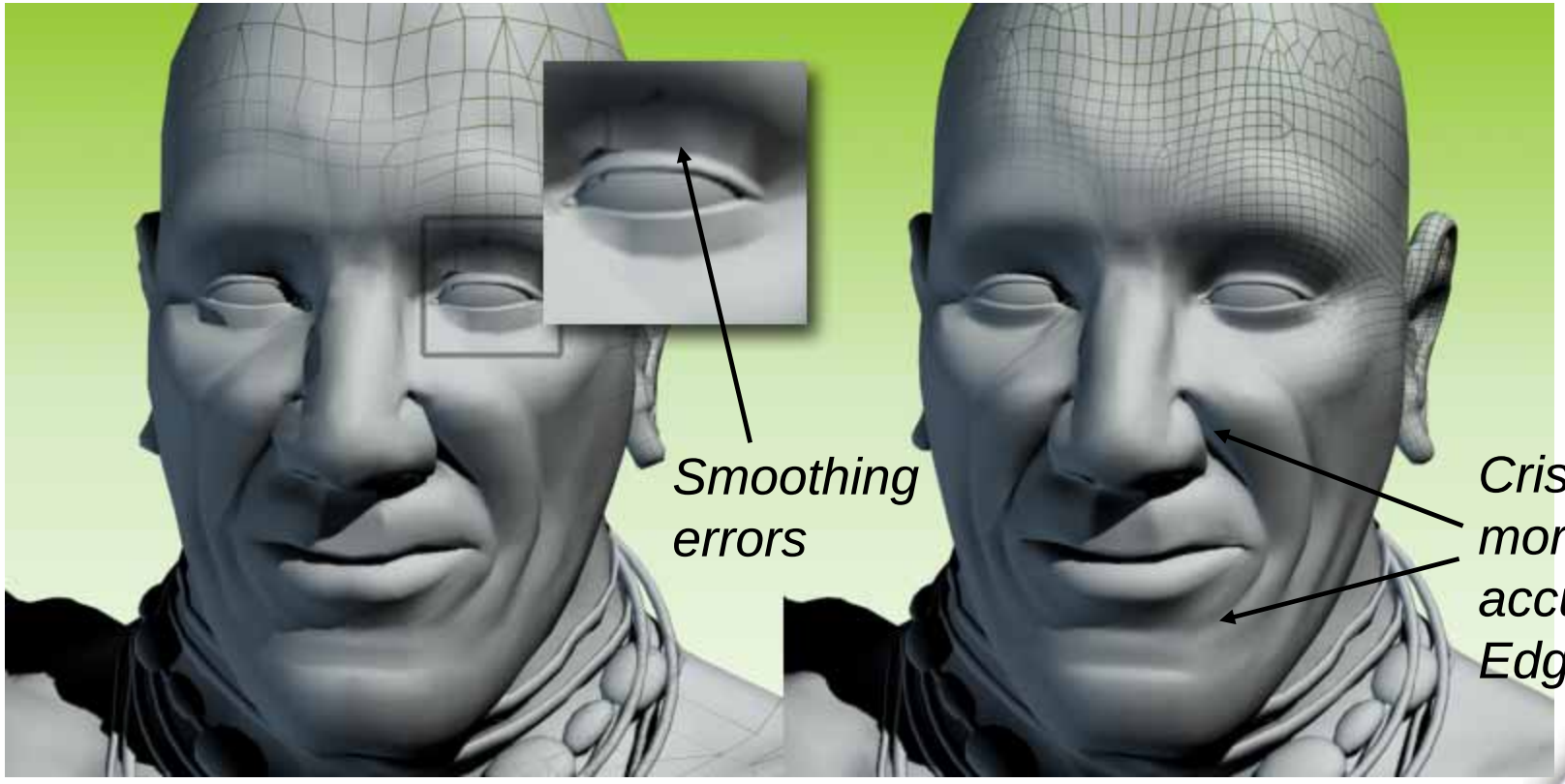
Different surfaces . . . same lighting conditions

Comparison of Two Similar Models



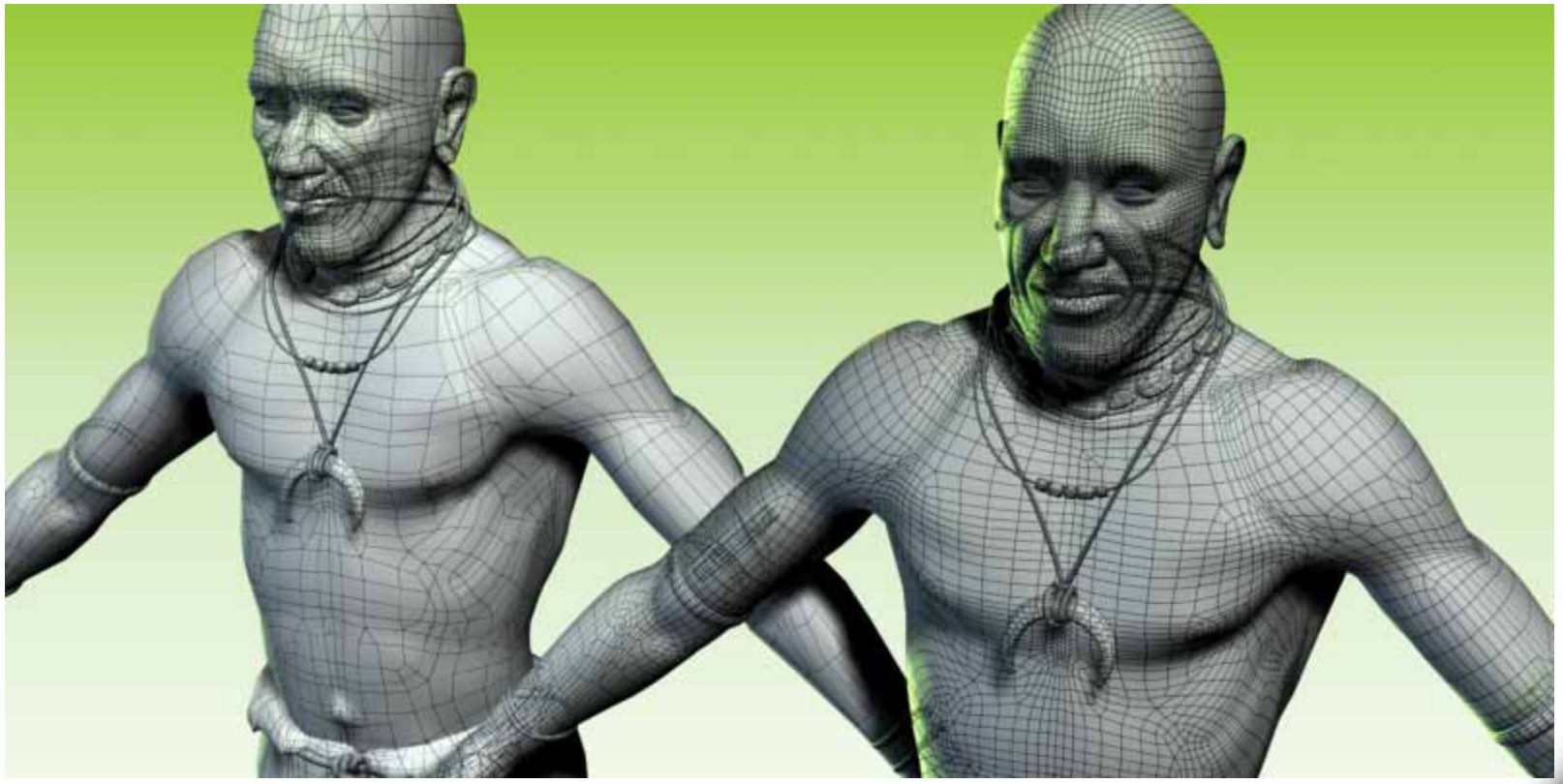
No amount of texturing will make the crate on the right look as good as the one on the left

Resolution adds realism



More resolution minimizes smoothing errors and creates a model which responds better to light and shadow

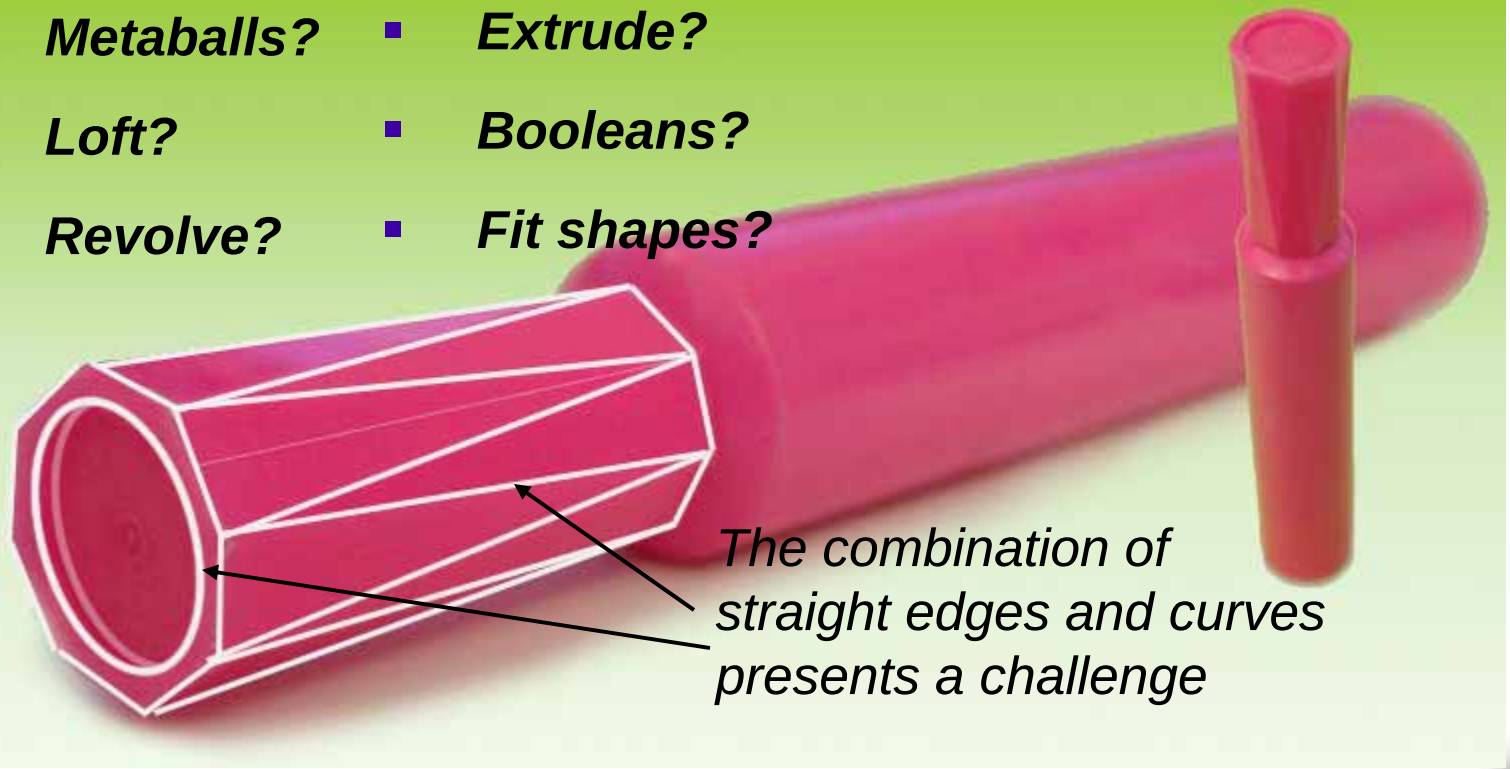
Creating a Highest Level LOD



Subdivision is a quick way to increase the resolution of your mesh

The Humble and Enigmatic Pink Marker

- ***Metaballs?***
- ***Loft?***
- ***Revolve?***
- ***Extrude?***
- ***Booleans?***
- ***Fit shapes?***

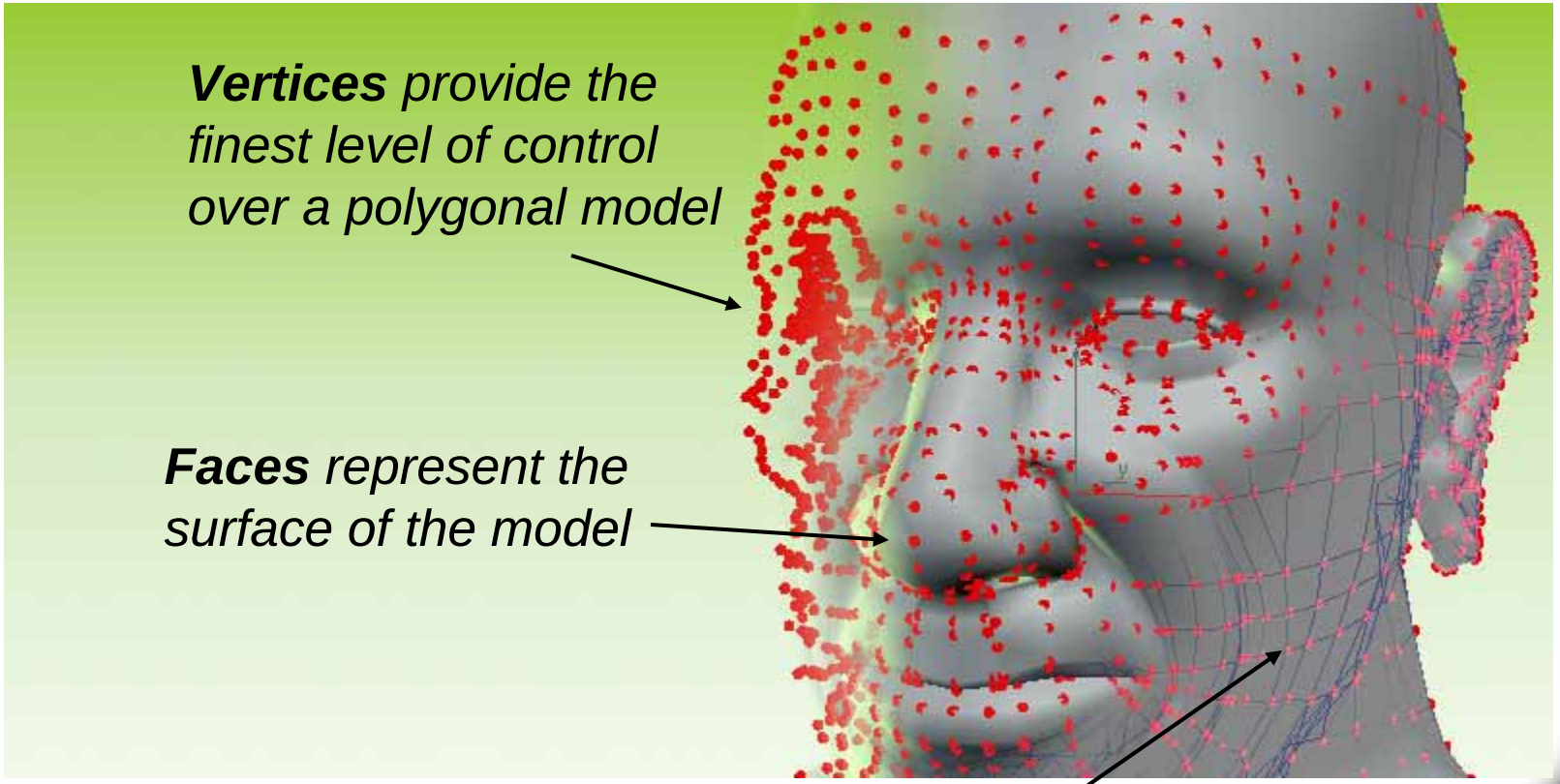


Even the simplest objects can be too complex for traditional methods of modeling

Vertices, Faces, and Edges

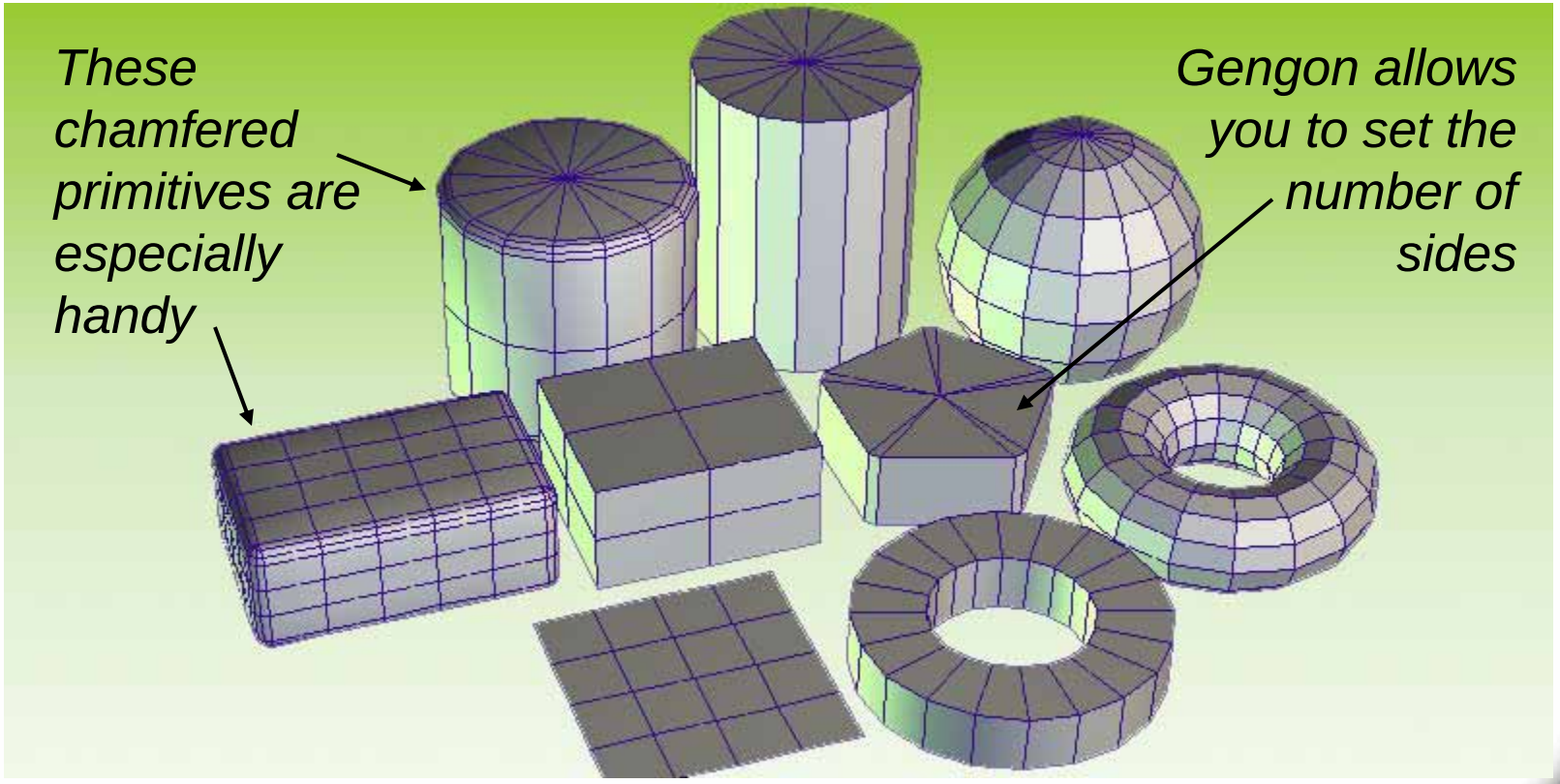
Vertices *provide the finest level of control over a polygonal model*

Faces *represent the surface of the model*



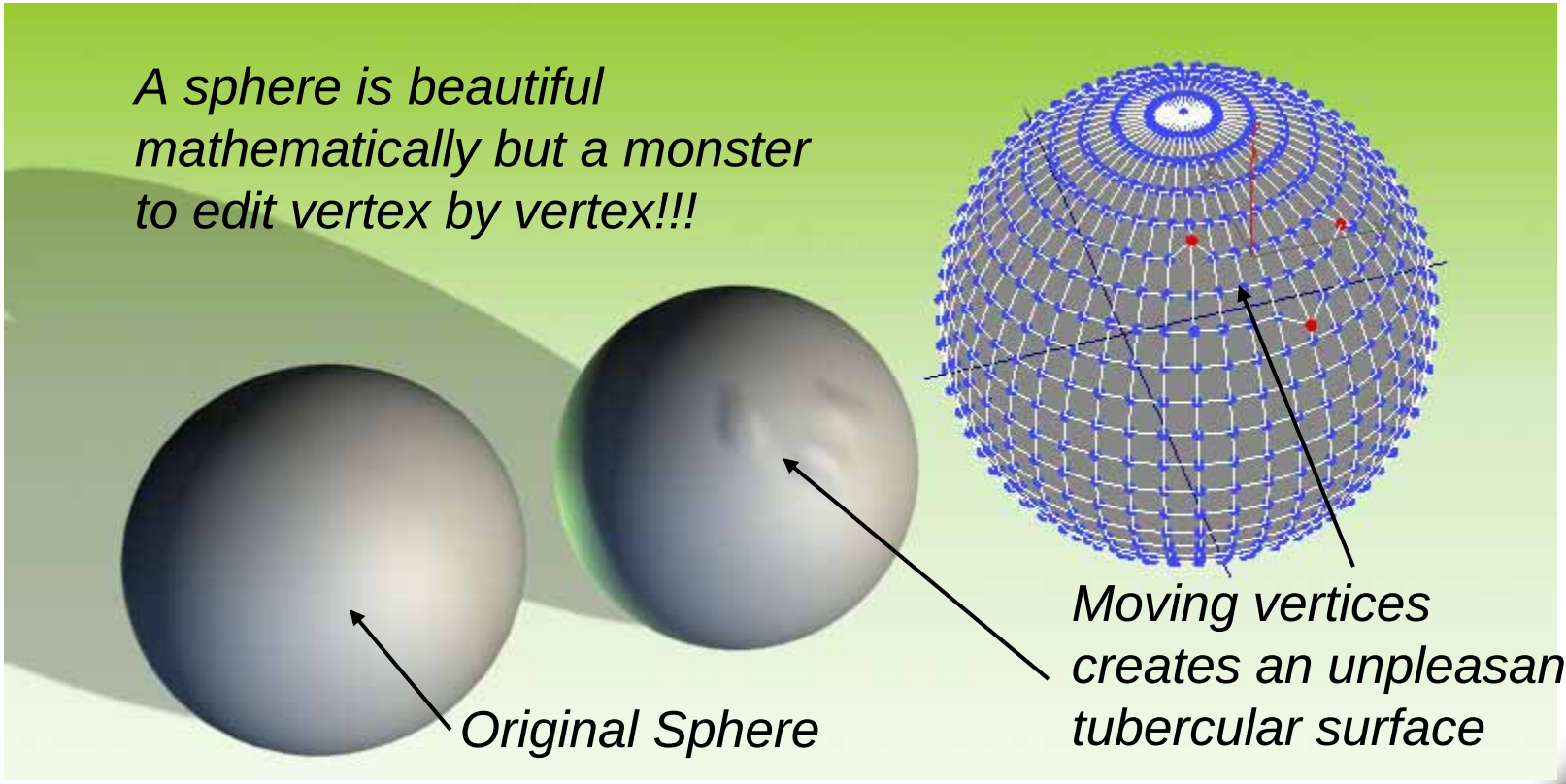
Edges *highlight the relationship of one vertex to another*

Primitives



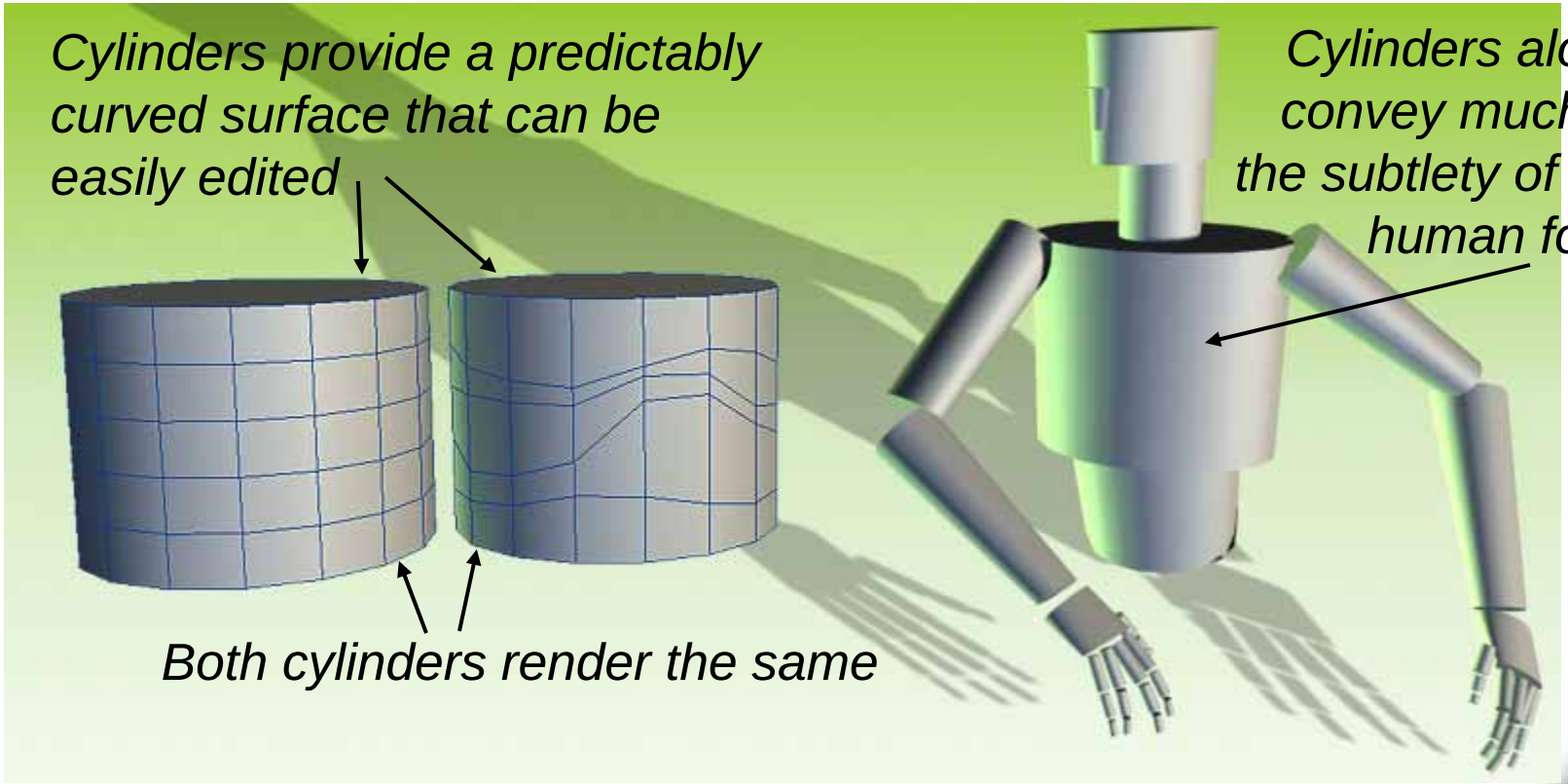
These standard primitives provide a great starting point for most any model

The Sphere: You Can't Fight Perfection!



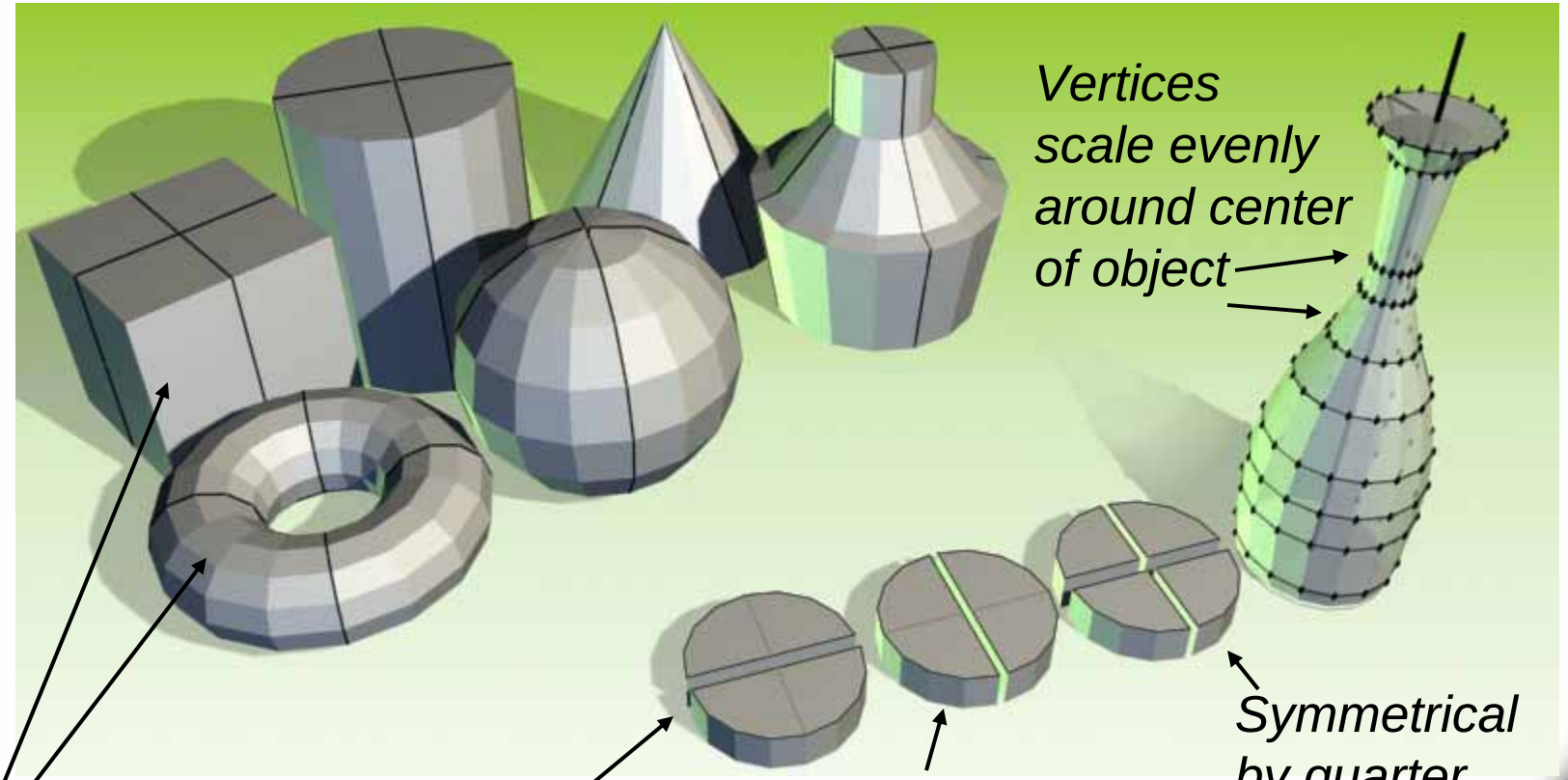
A sphere is not a good starting point . . . most anything you do to a sphere will destroy its simple beauty

The World is a Cylinder

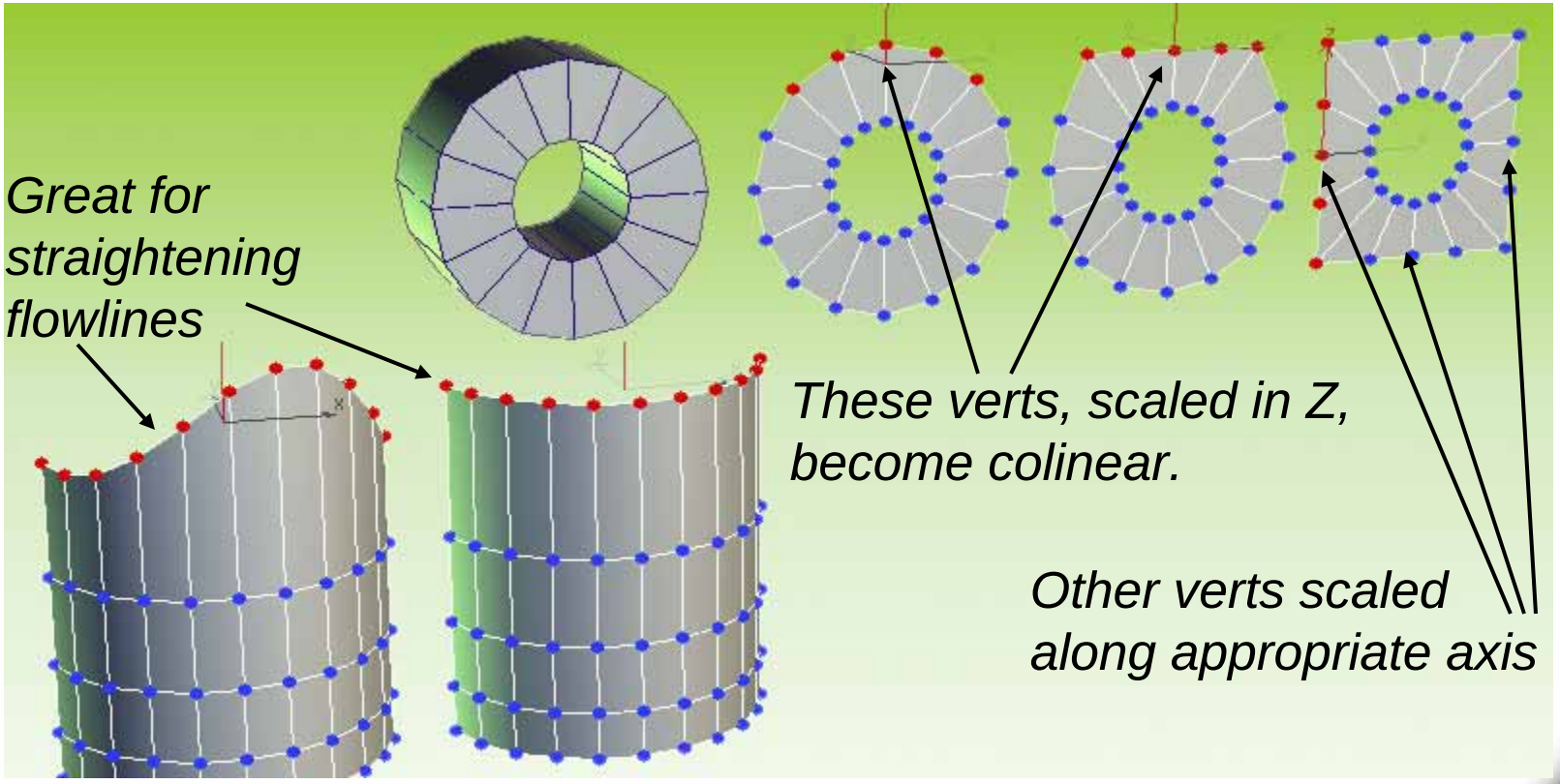


Cylinders are a good foundation for most any organic shape

Rule of 4's*: *Objects Divisible into Quarters

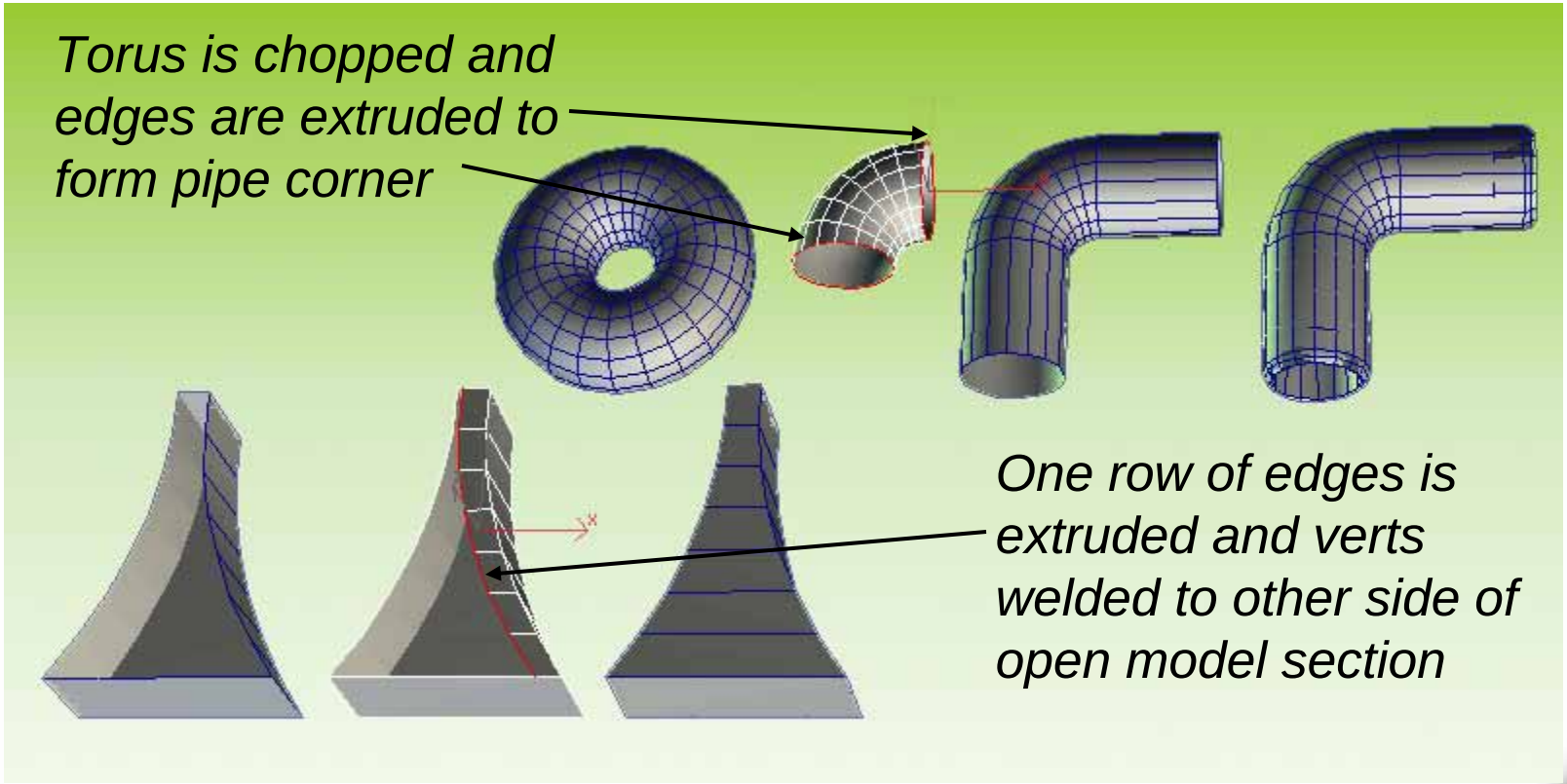


Non-uniform Vertex Scaling



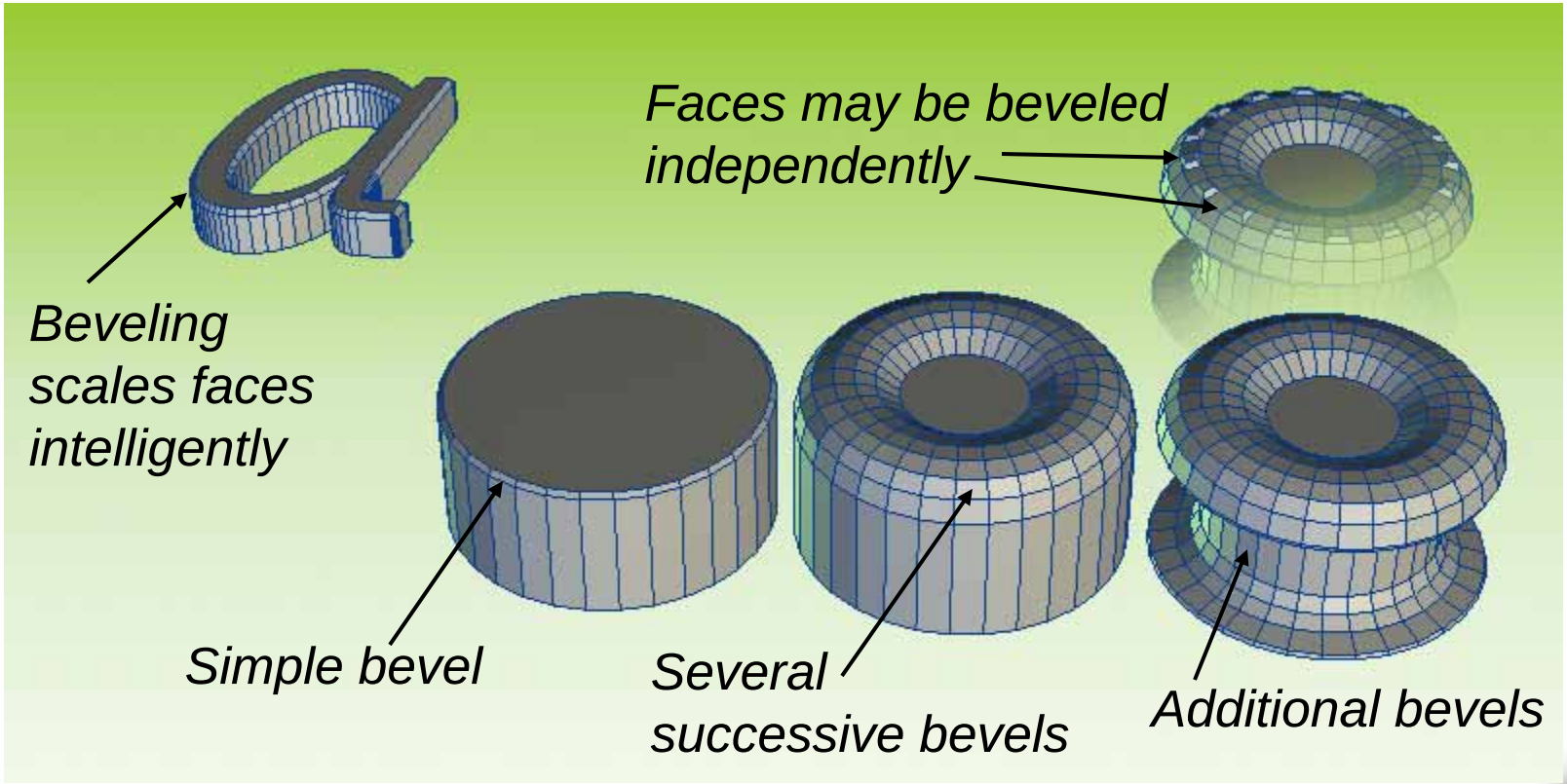
Scaling down in a single axis minimizes differences along that axis, eventually that distance becomes nil

Extruding Edges



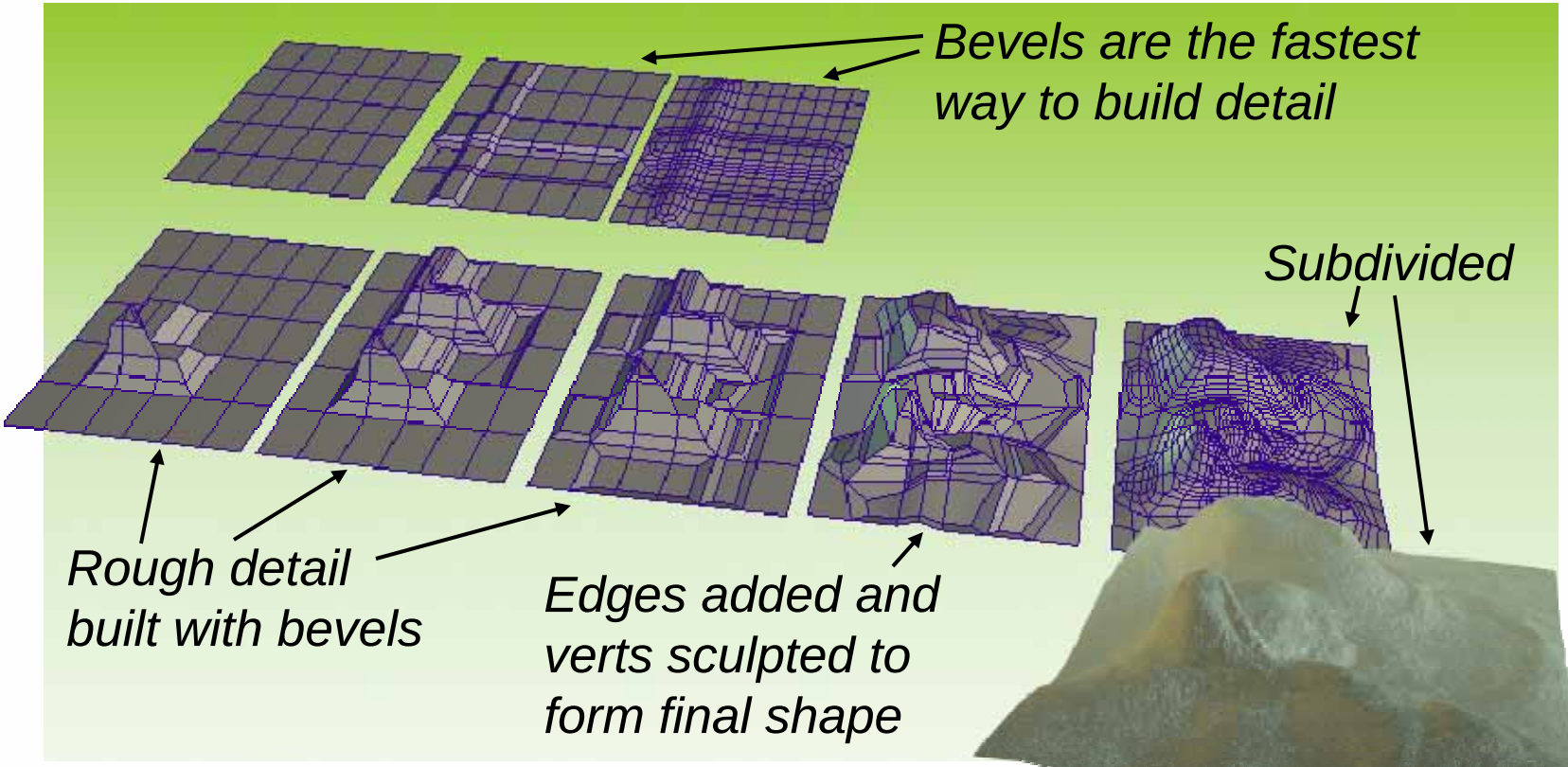
Extruding edges can be used to solve some tricky modeling dilemnas such as predictably capping a hole or creating curved section of pipe.

Beveling



Beveling is one of the most powerful polygonal modeling tools

Sculpting Terrain

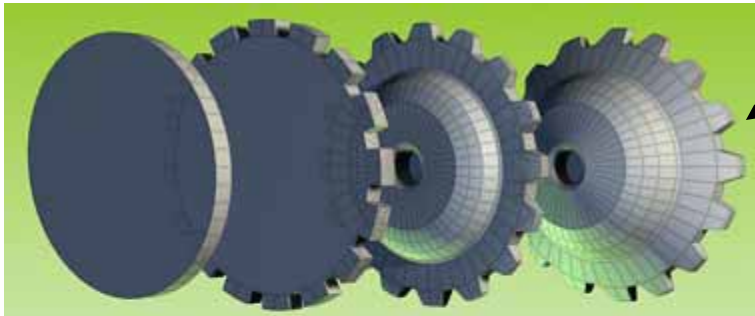


Sculpting terrain is a great way to learn the ins and outs of subdivision modeling

Mechanical vs. Organic

Require different methods

Mechanical vs. Organic

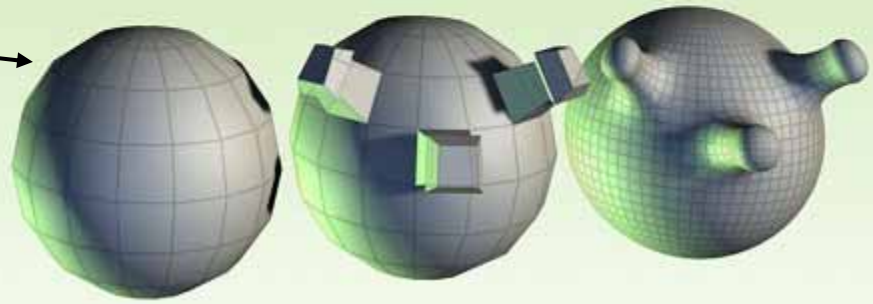


Mechanical

1. Build basic form at full-resolution
2. Shape and substitute parts
3. Add curvature

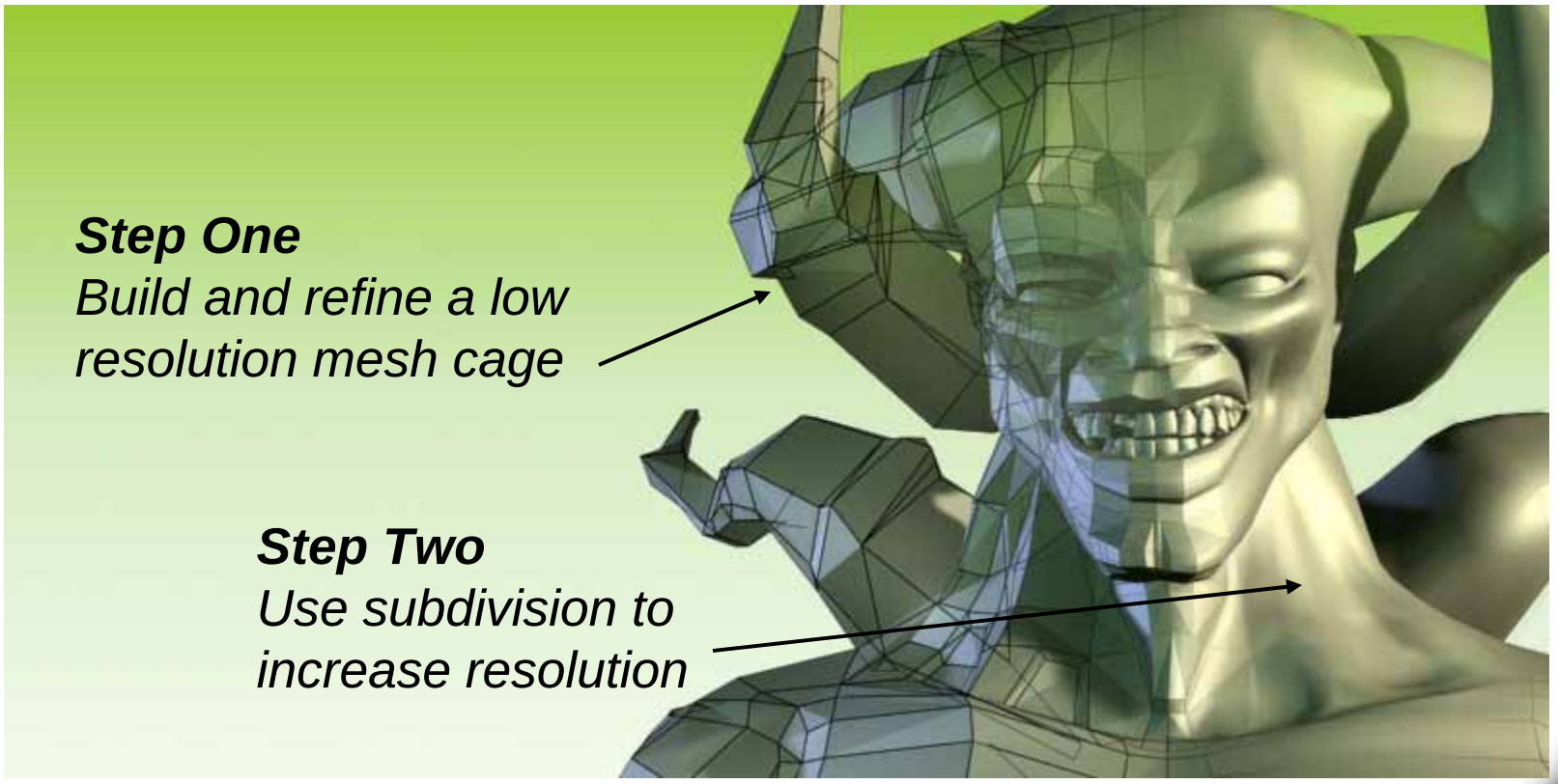
Organic

1. Build model at low-resolution
2. Subdivide to final resolution



There are two discreet types of models

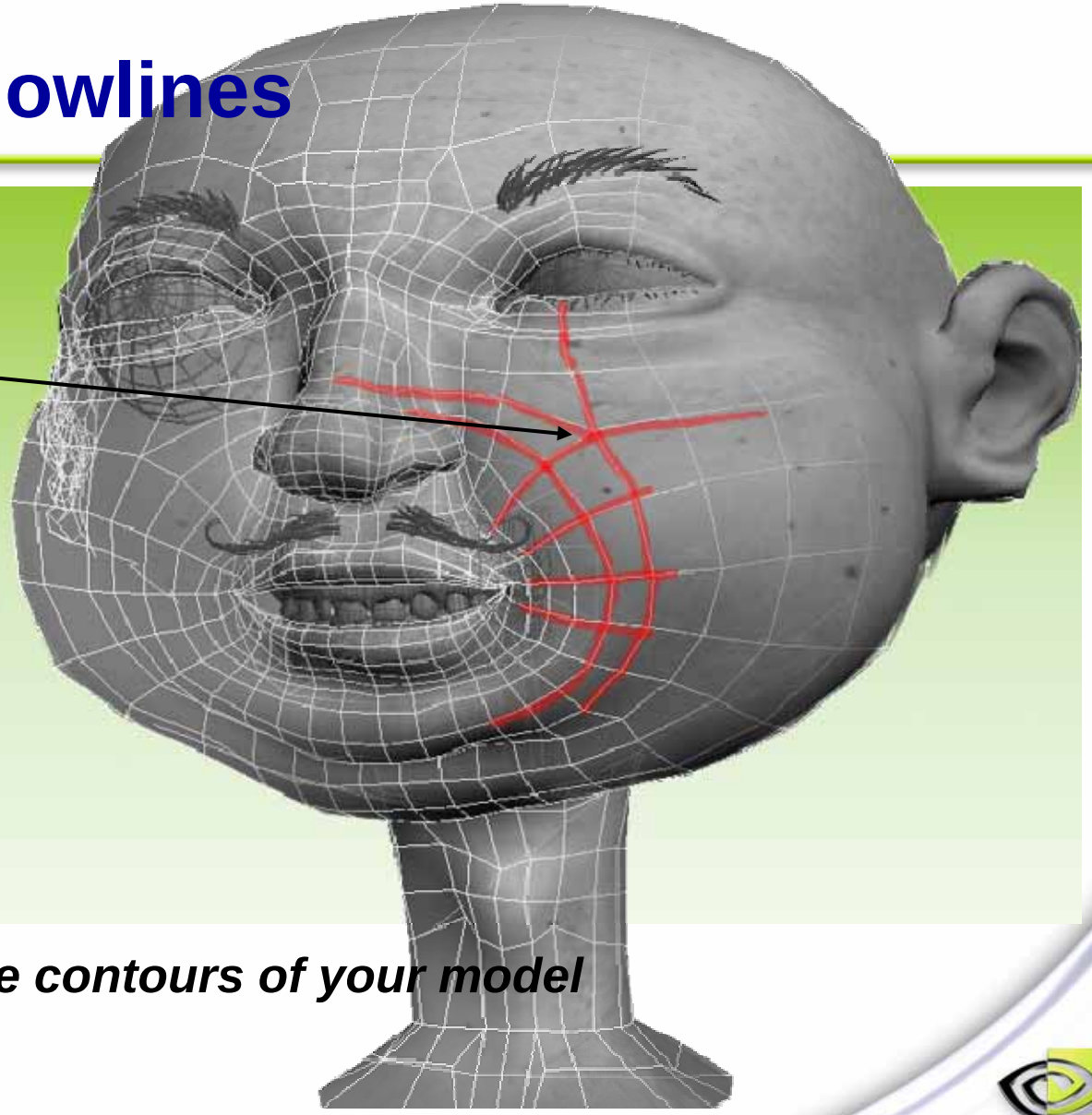
Organic Modeling Process



Subdivision gives polygonal models much of the flexibility of patches and other high-level modeling methods

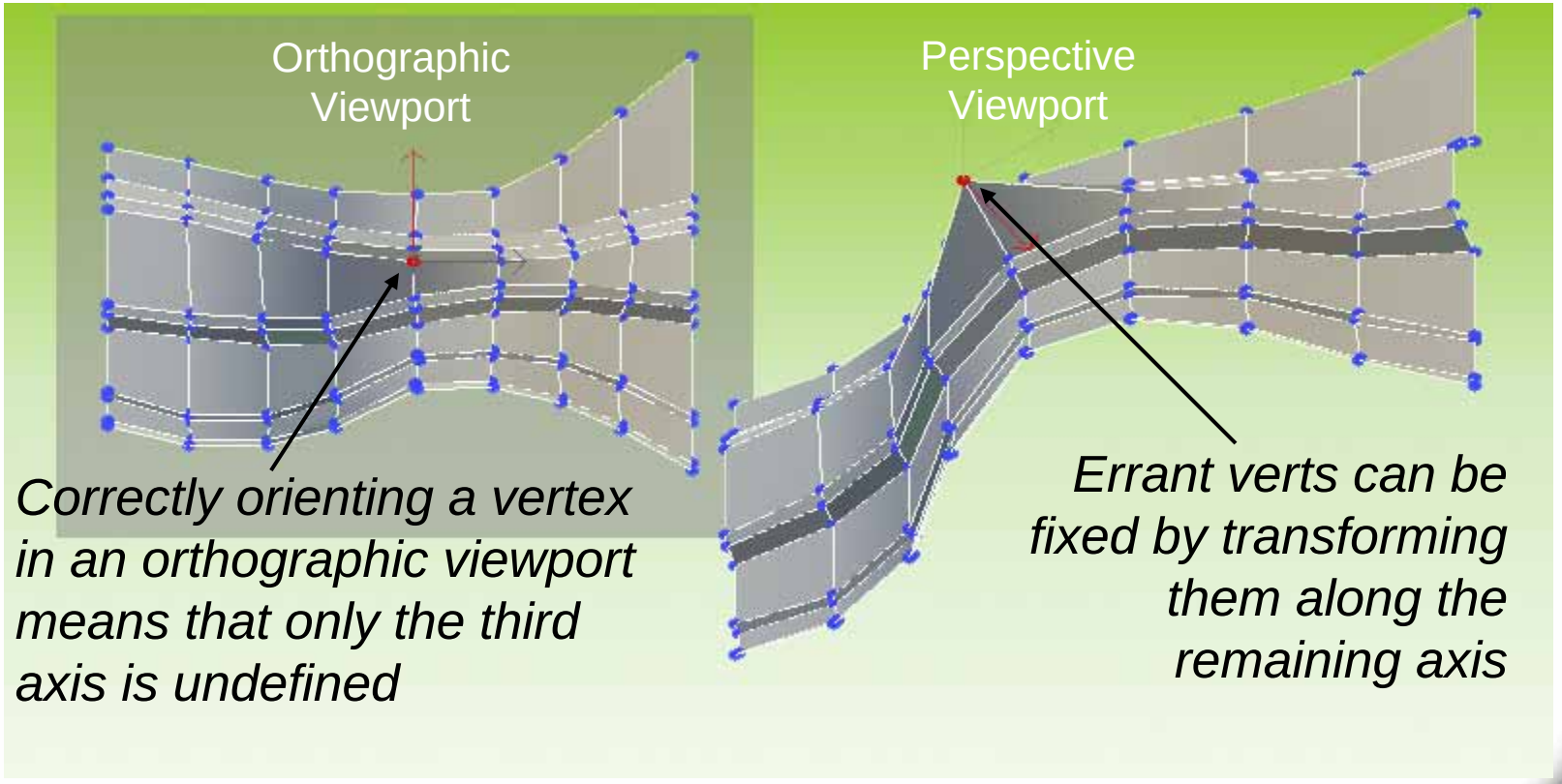
Edges as Flowlines

Flowlines should be smooth, predictable, and clean



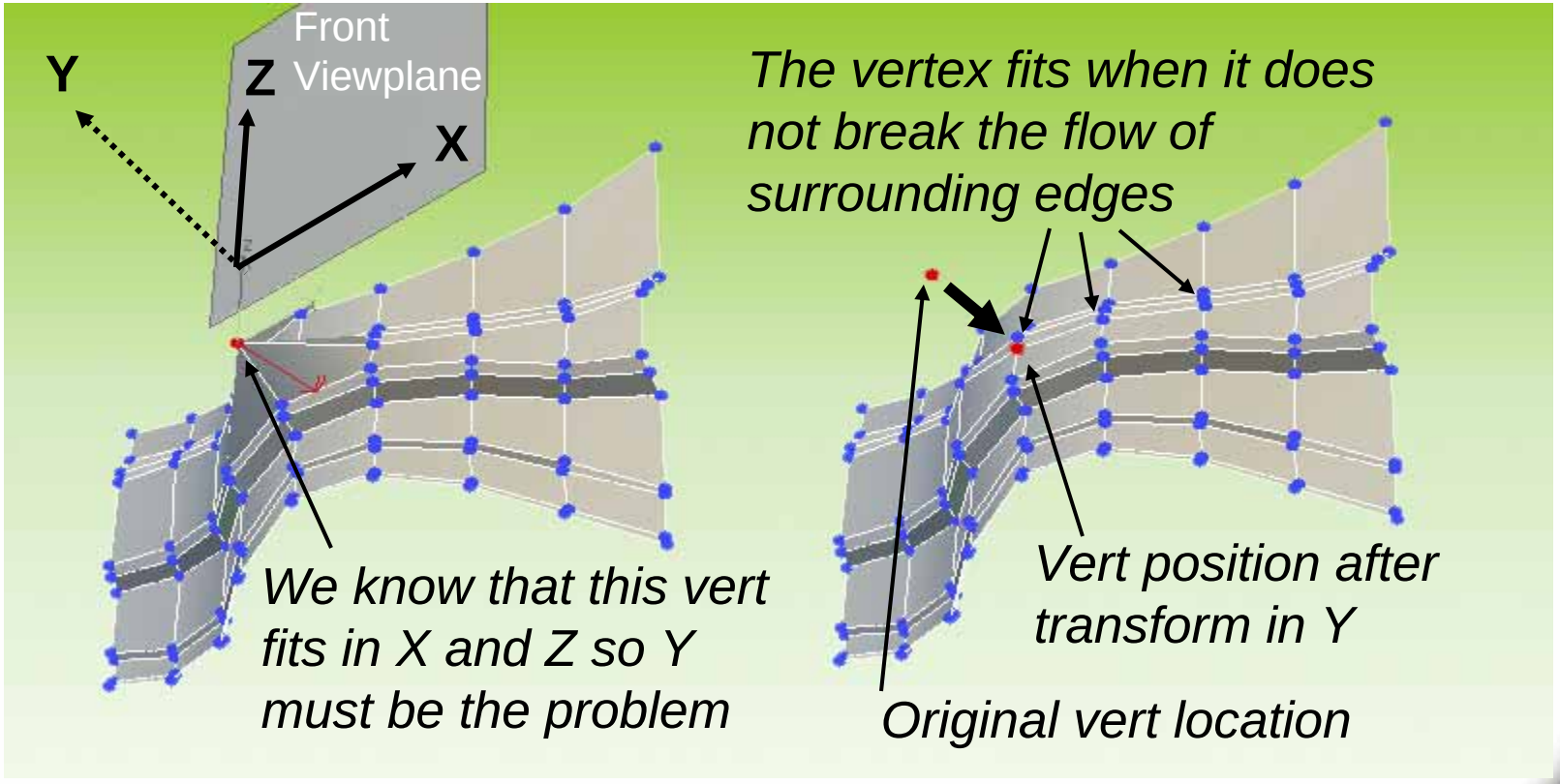
Flowlines form the contours of your model

Reading Vertex Positions in Perspective



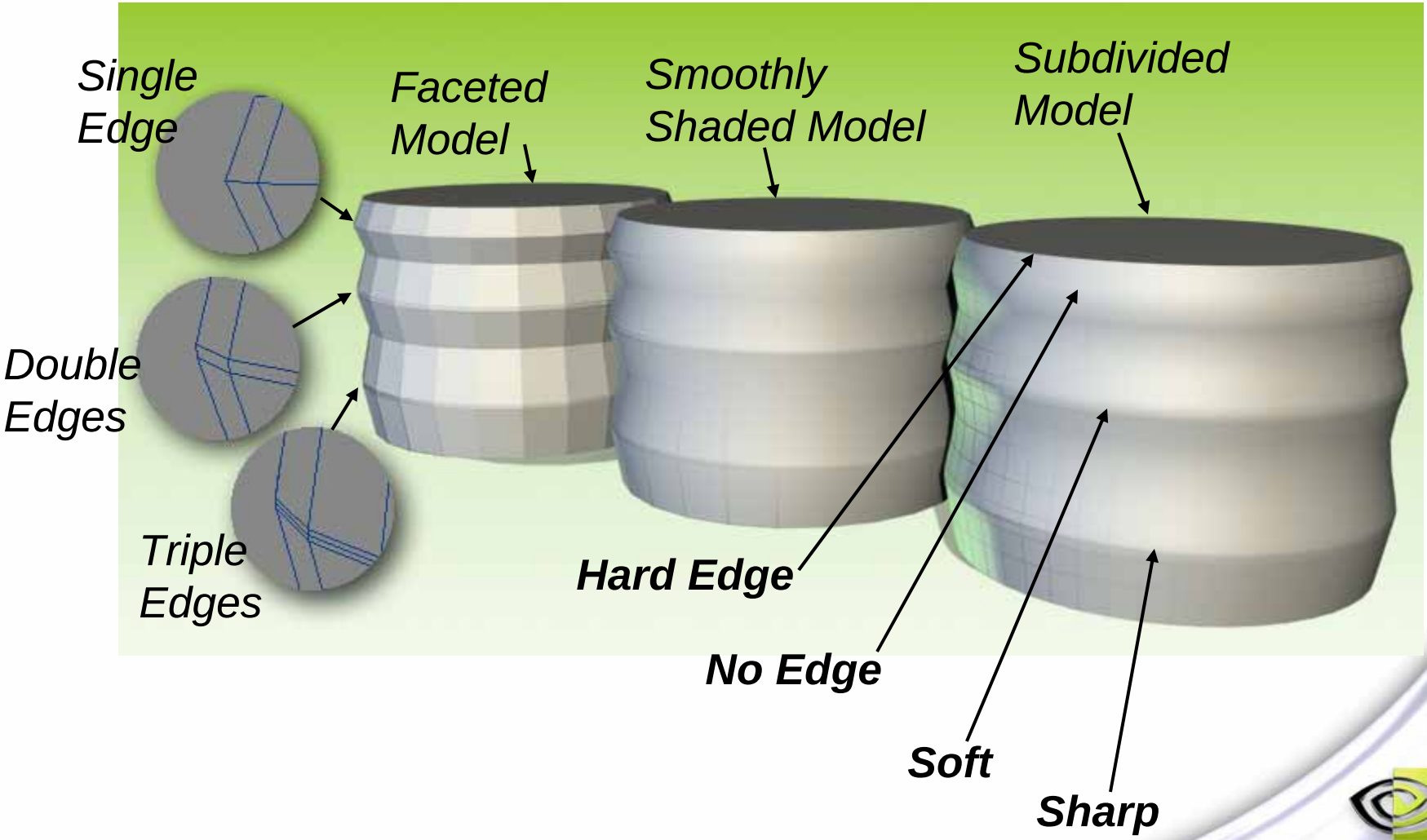
Understanding vertex relationships in a perspective viewport is critical to modeling complex objects

Moving Verts in Perspective

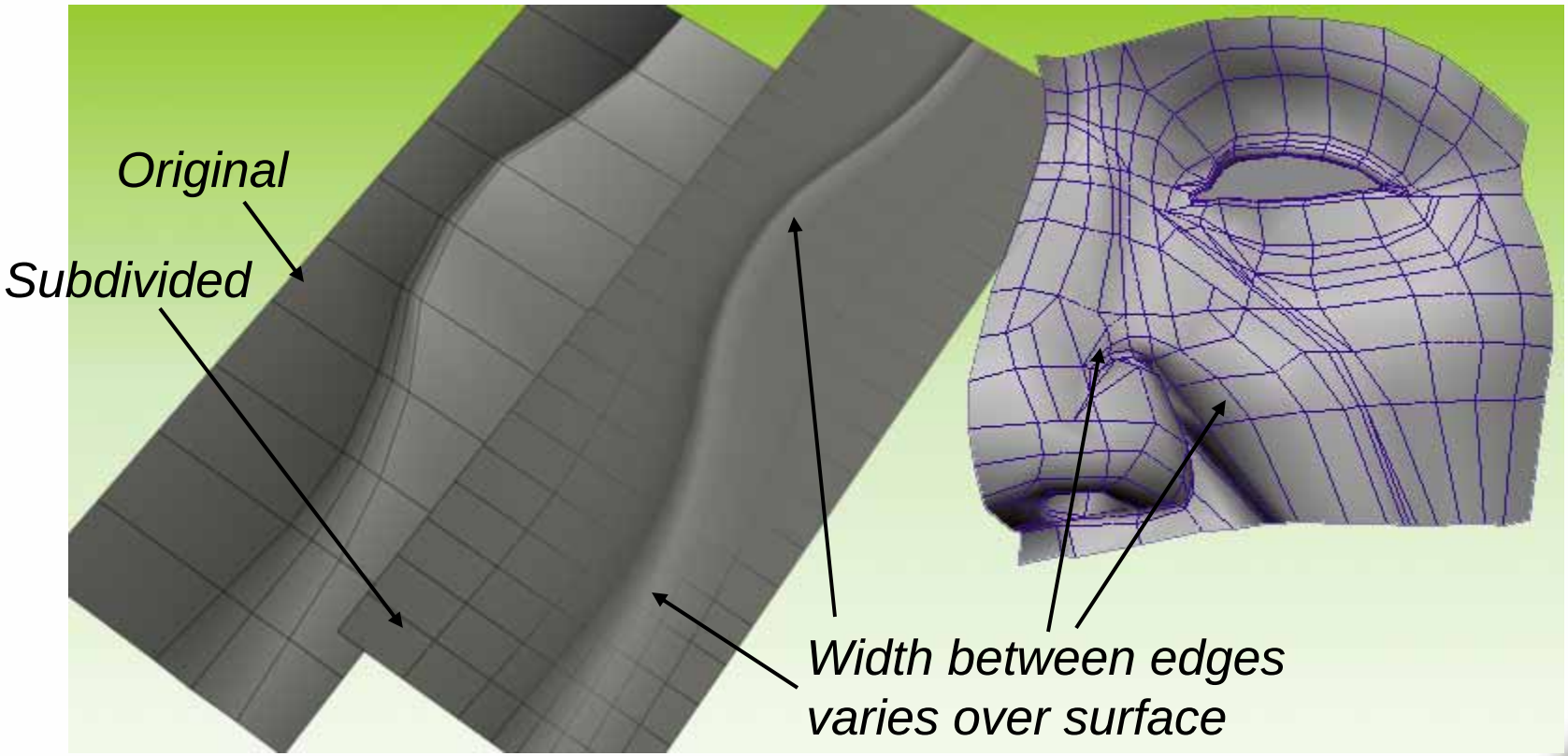


If vert is aligned in X and Z planes (front view) then move the vert in Y until it fits the flow of other verts

Creating Different Types of Edges

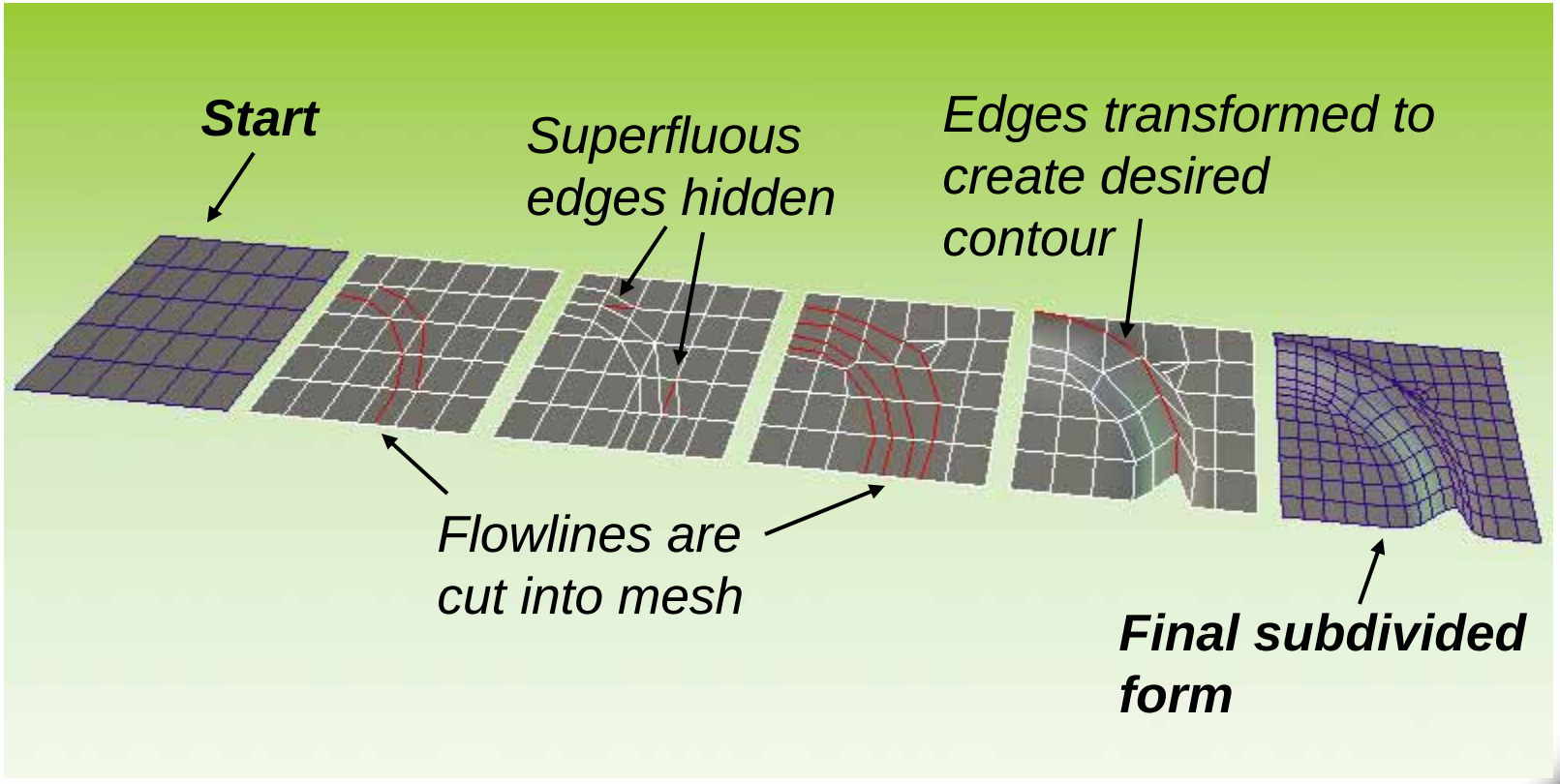


Edge Transitions



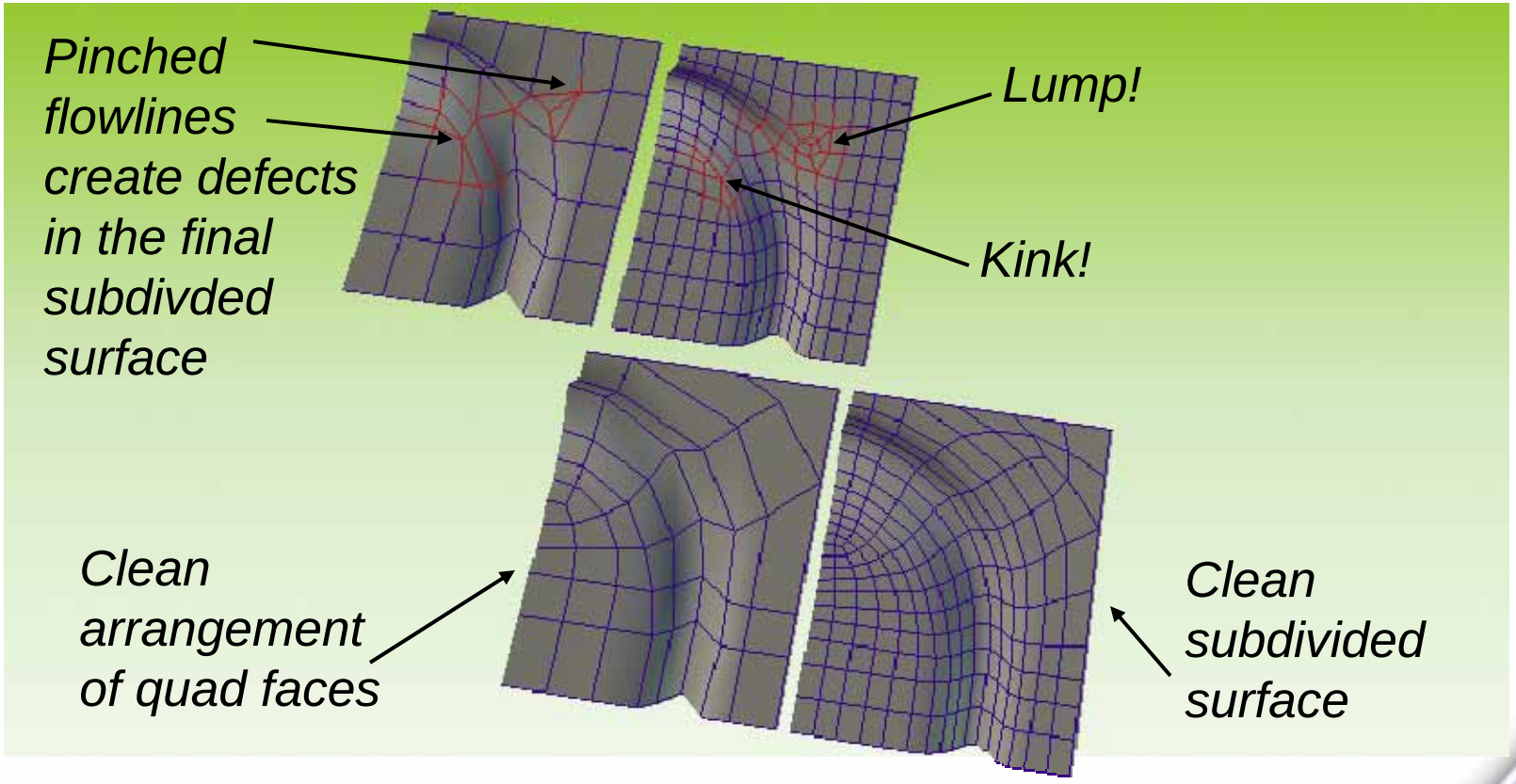
Varying edge distance creates more natural edges in organic models.

Cutting Flowlines



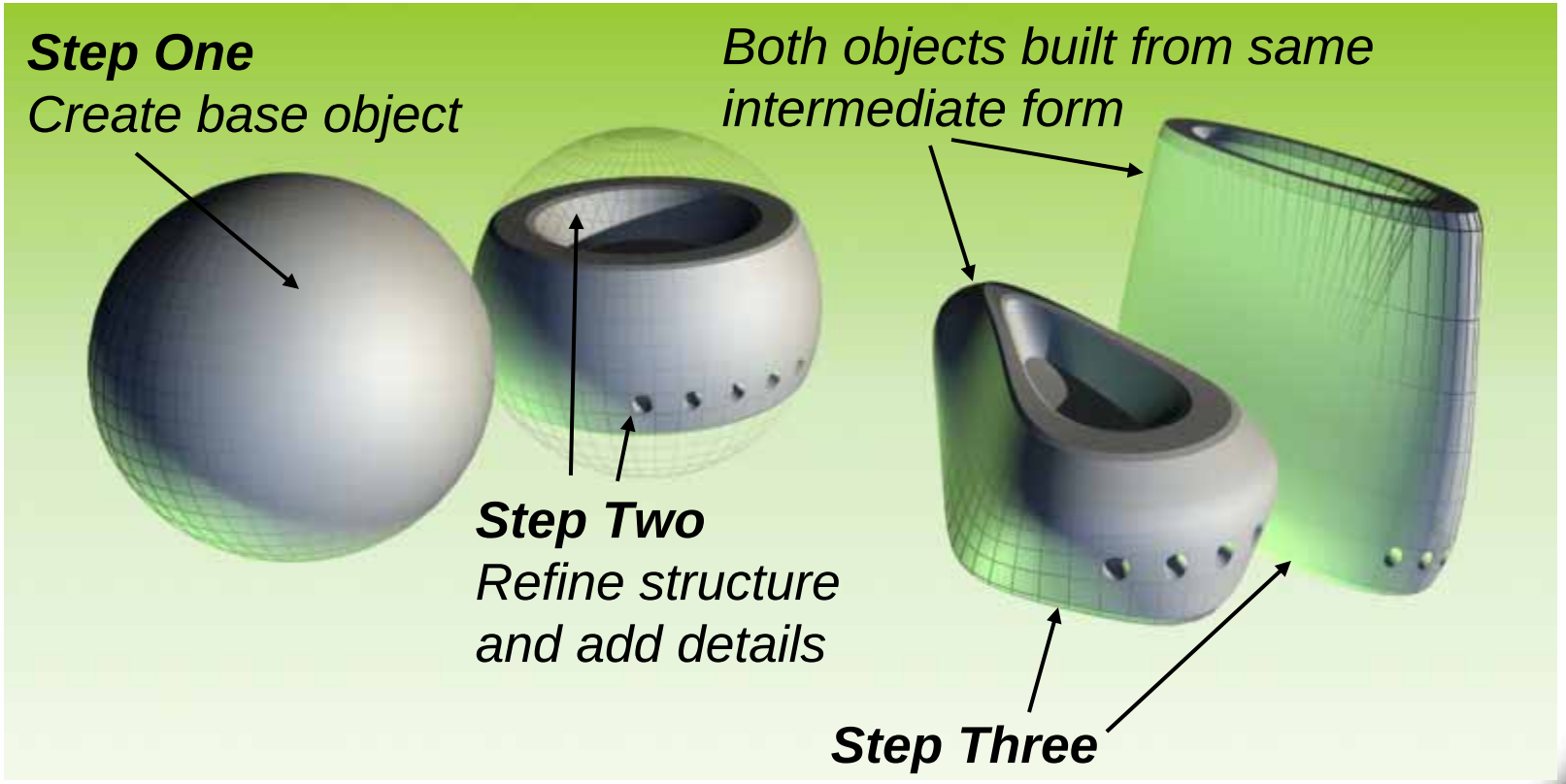
Cut flowlines across the surface of the model and use these flowlines to sculpt form

Cutting Flowlines



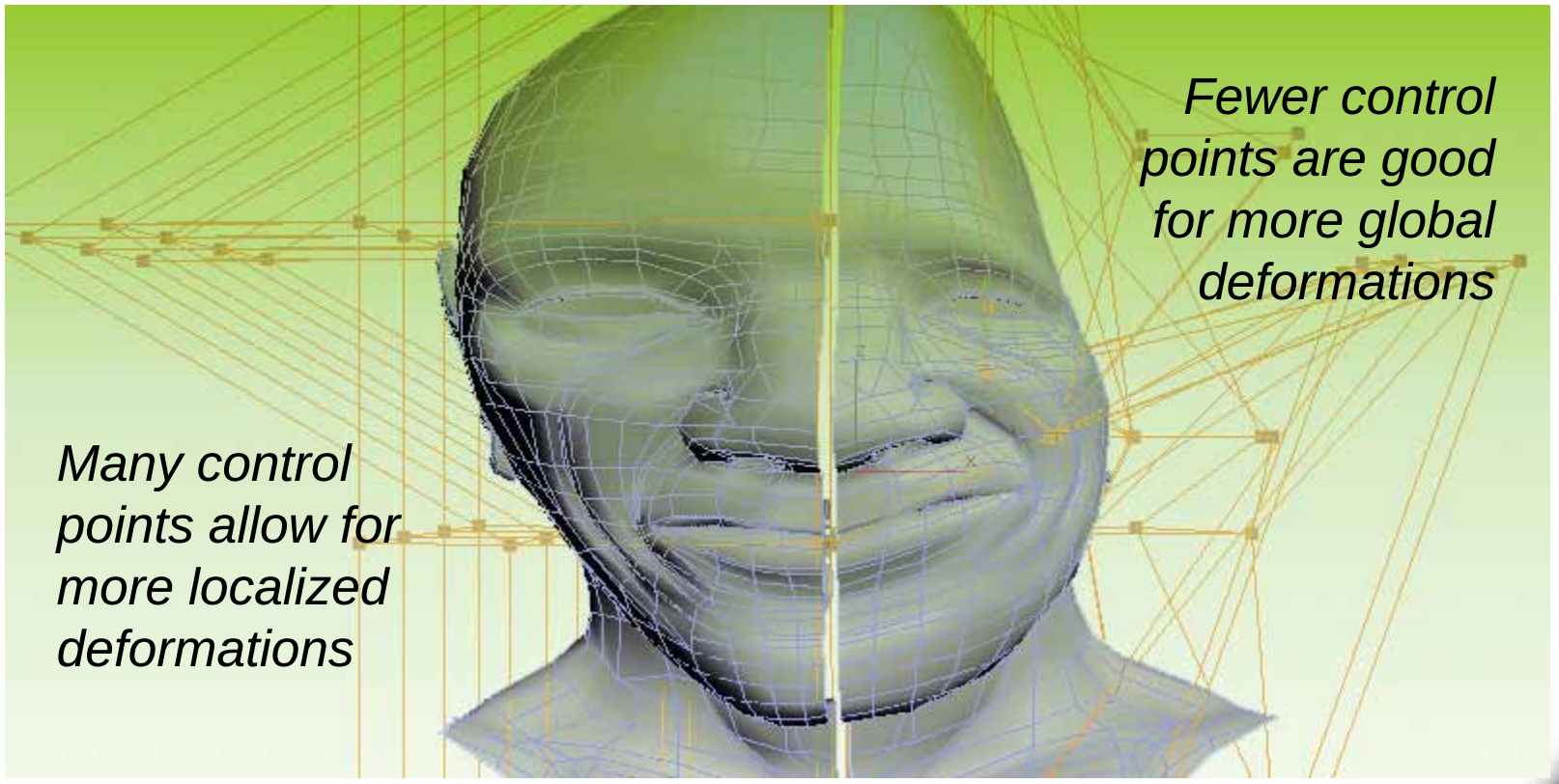
A more uniform mesh will give you cleaner and more predictable results when subdividing

Mechanical Modeling Process



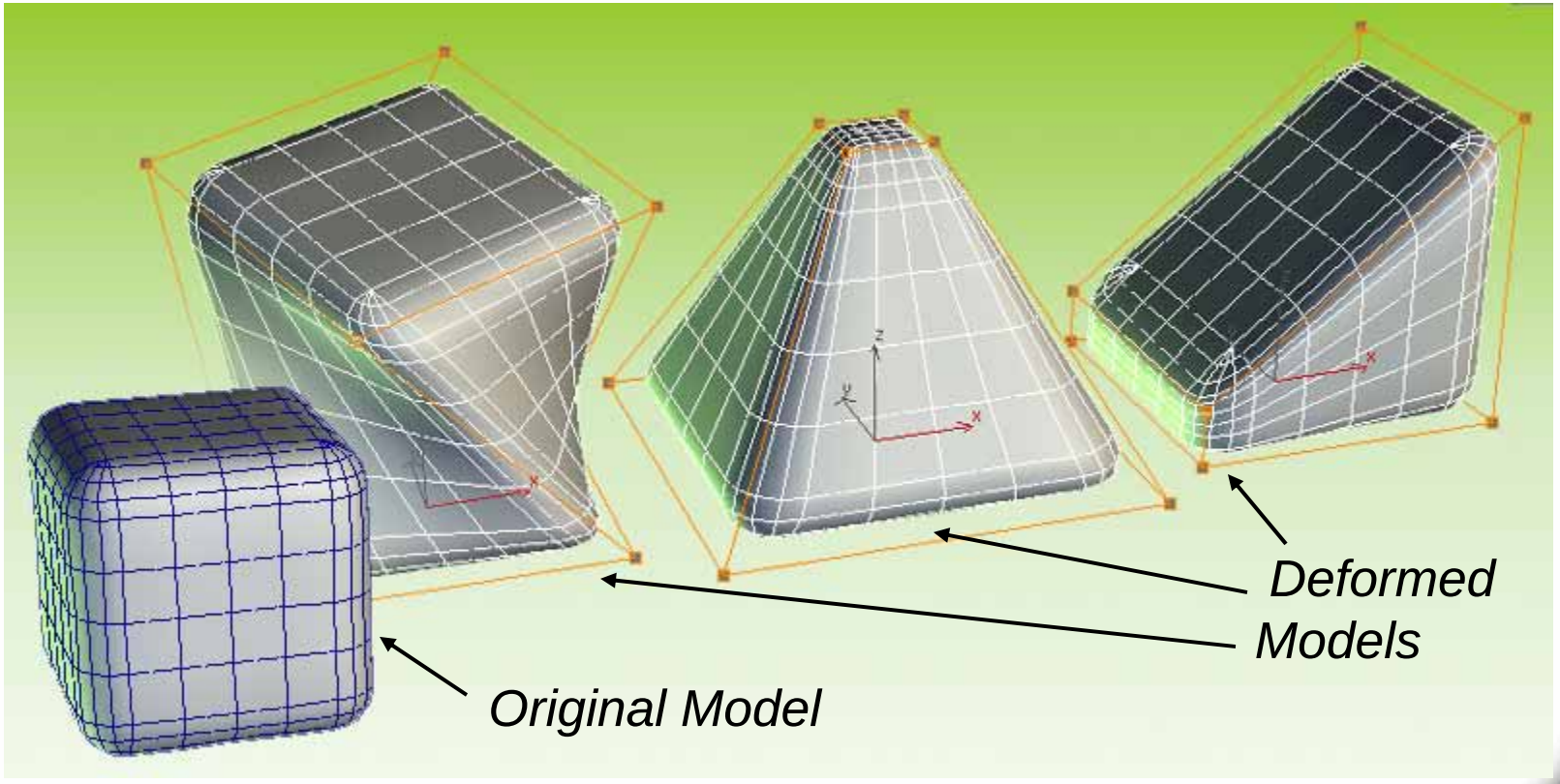
Three step process of building mechanical objects with polygons

Deformation Lattices



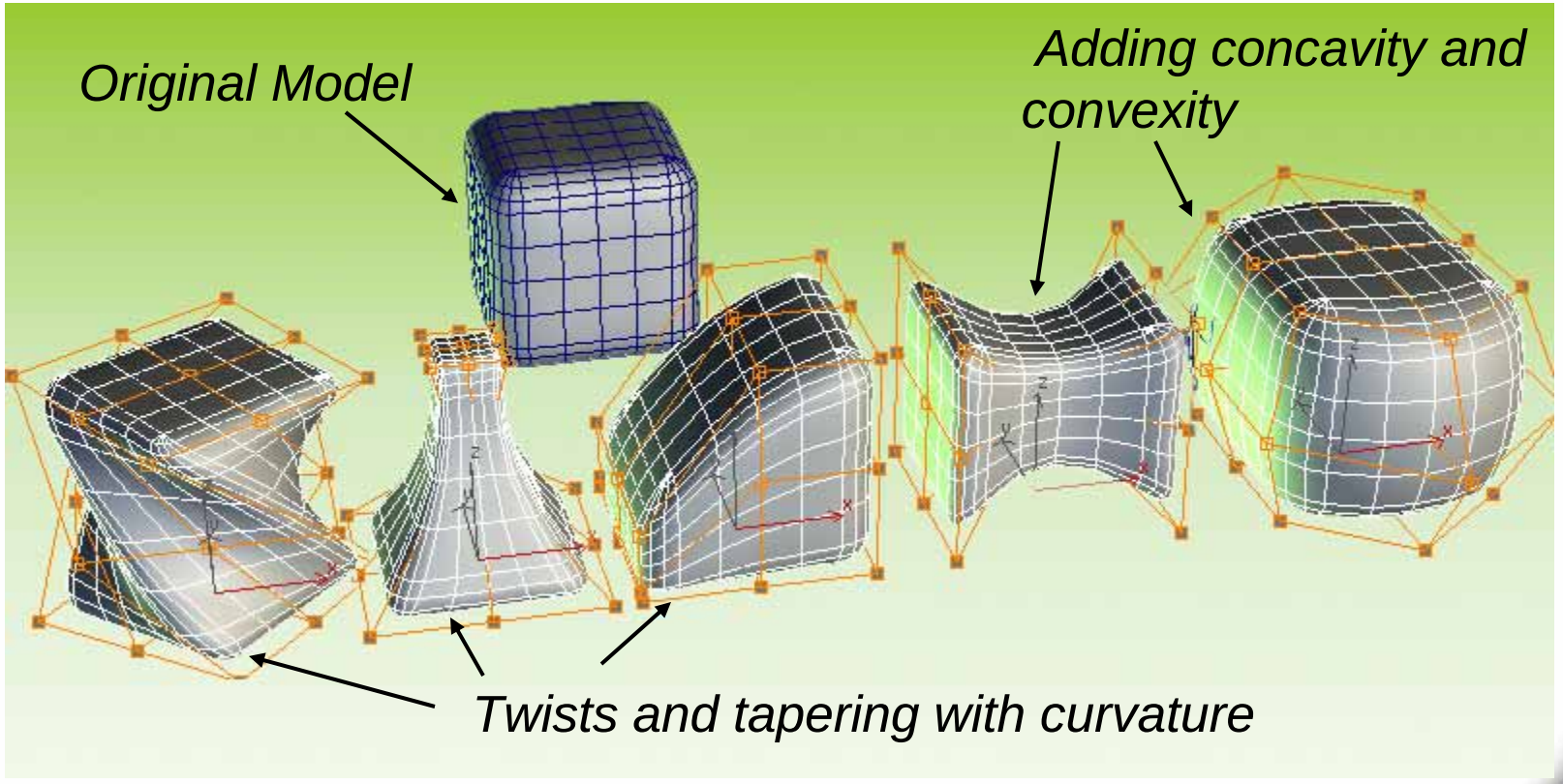
Deformation lattices are a workhorse of any type of polygonal modeling.

Deformation Lattices: 2 x 2



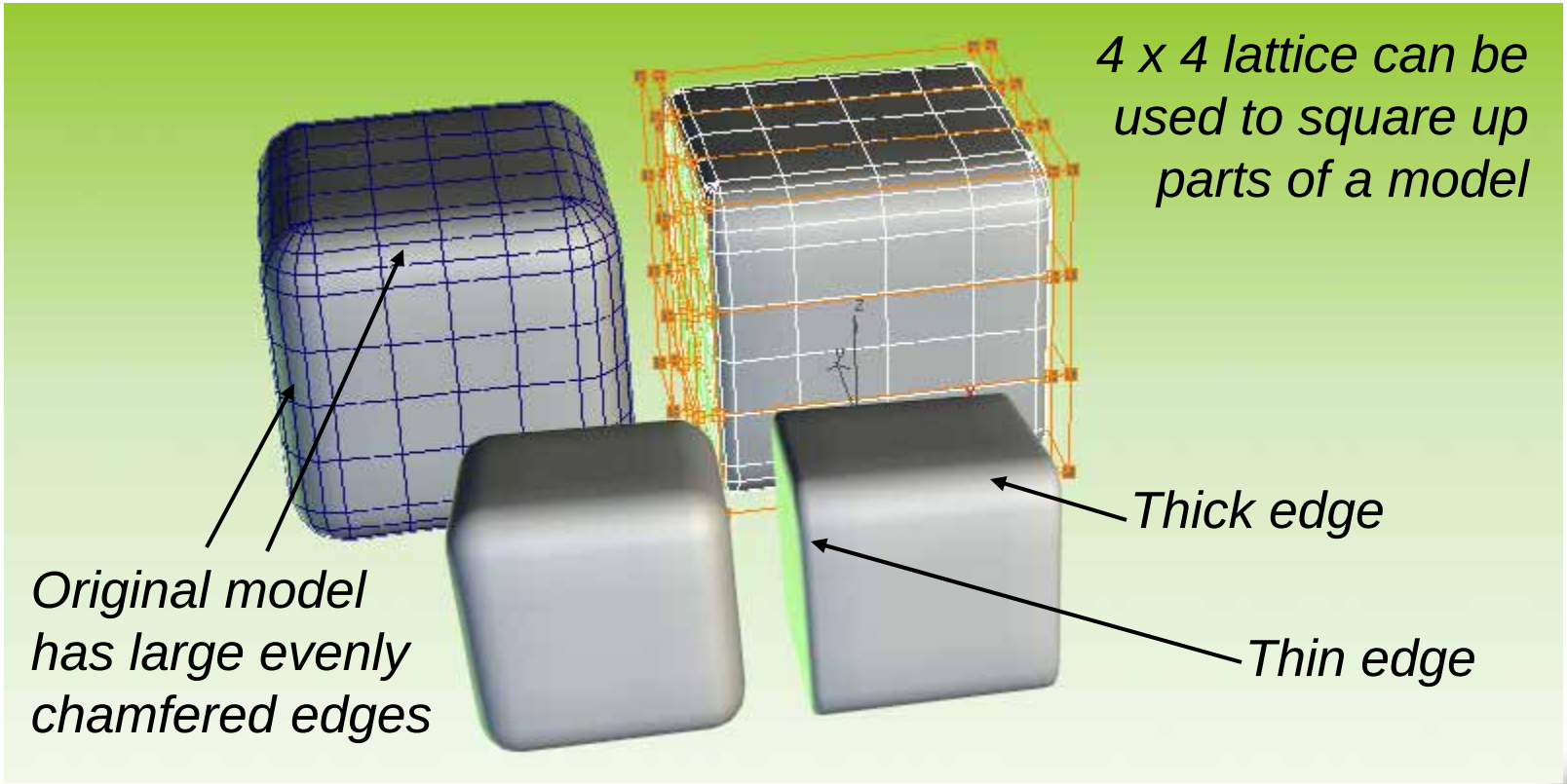
A 2x2 lattice is good for TAPERING and LINEAR deformations

Deformation Lattices: 3 x 3



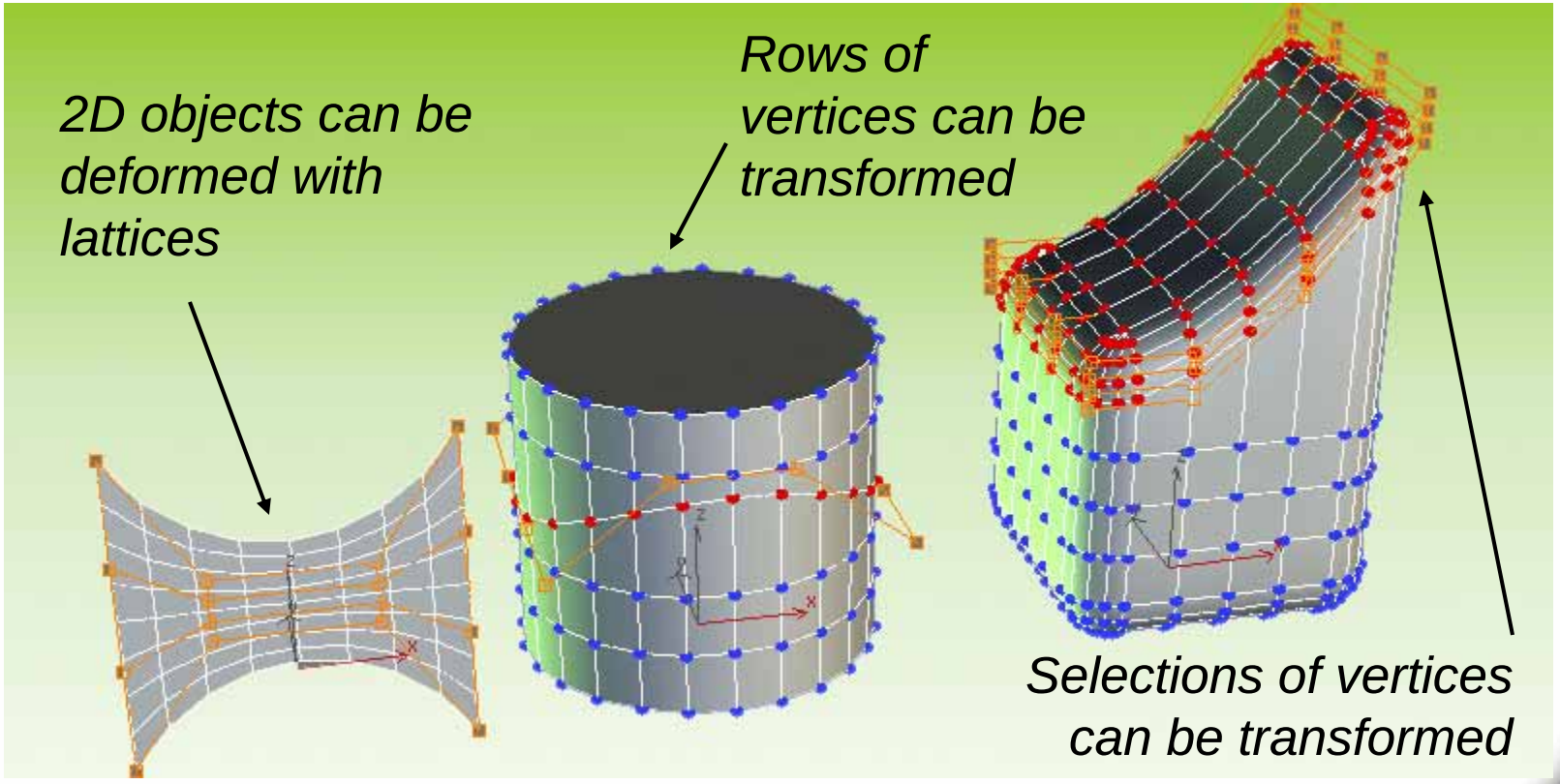
A 3 x 3 lattice can deform and add CURVATURE to a model

Deformation Lattices: 4 x 4



A 4 x 4 lattice can deform with more precision and the deformation can be more localized, in this case, to some edges

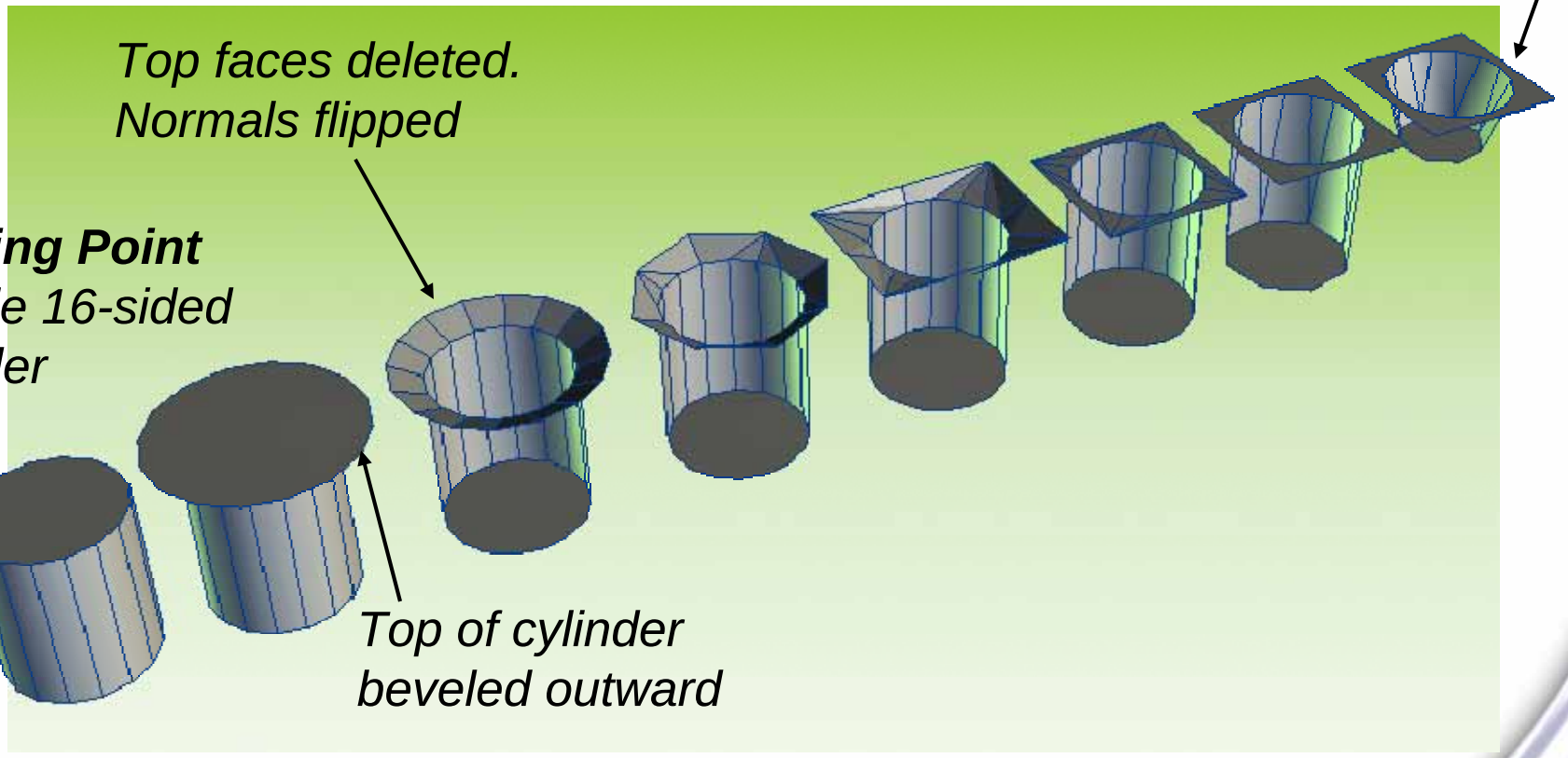
Still More on Deformation Lattices



A 4 x 4 lattice can deform with more precision and the deformation can be more localized, in this case, to some edges

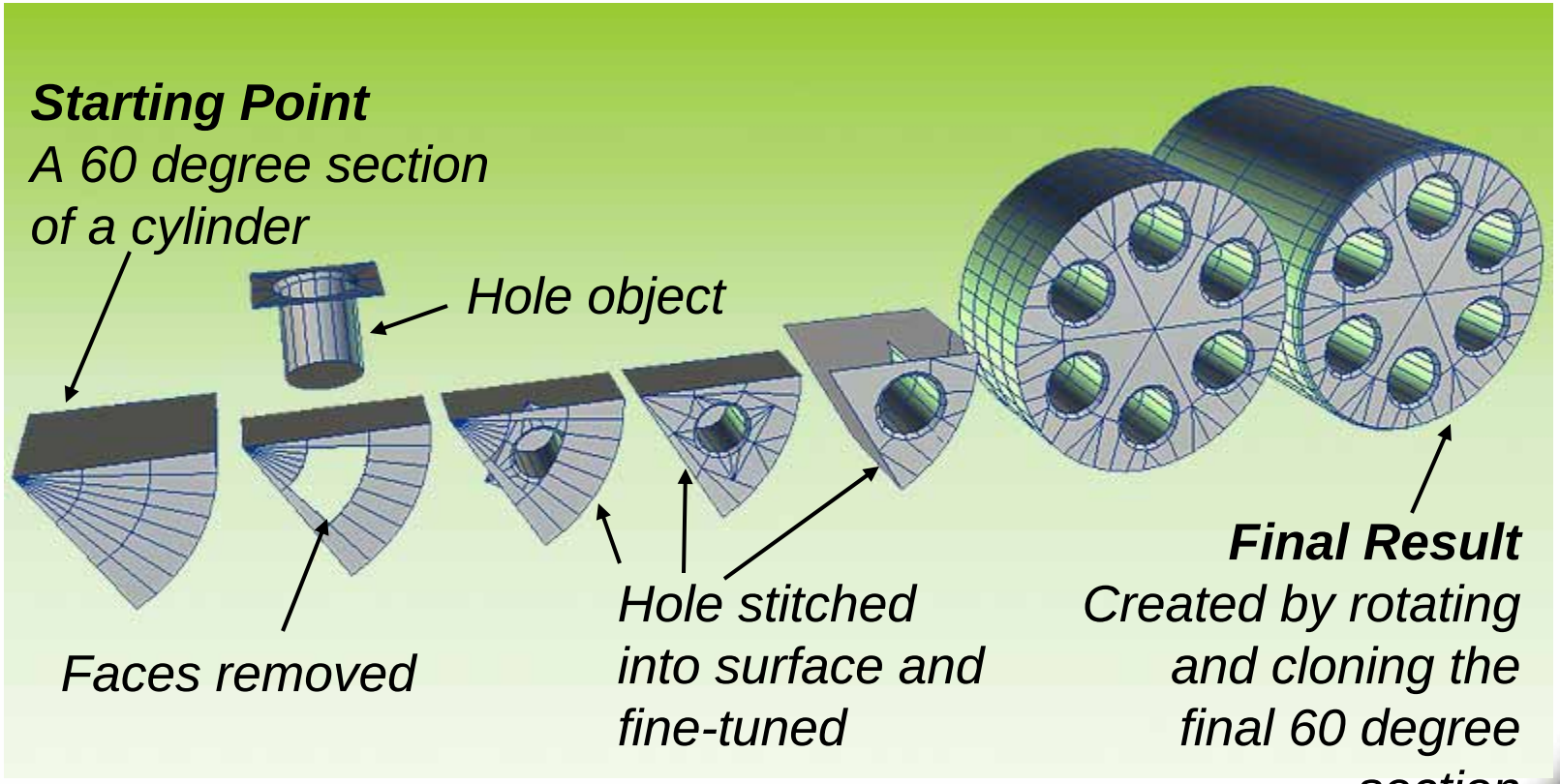
Building a Hole

Final Result
A hole that fits within a single polygon



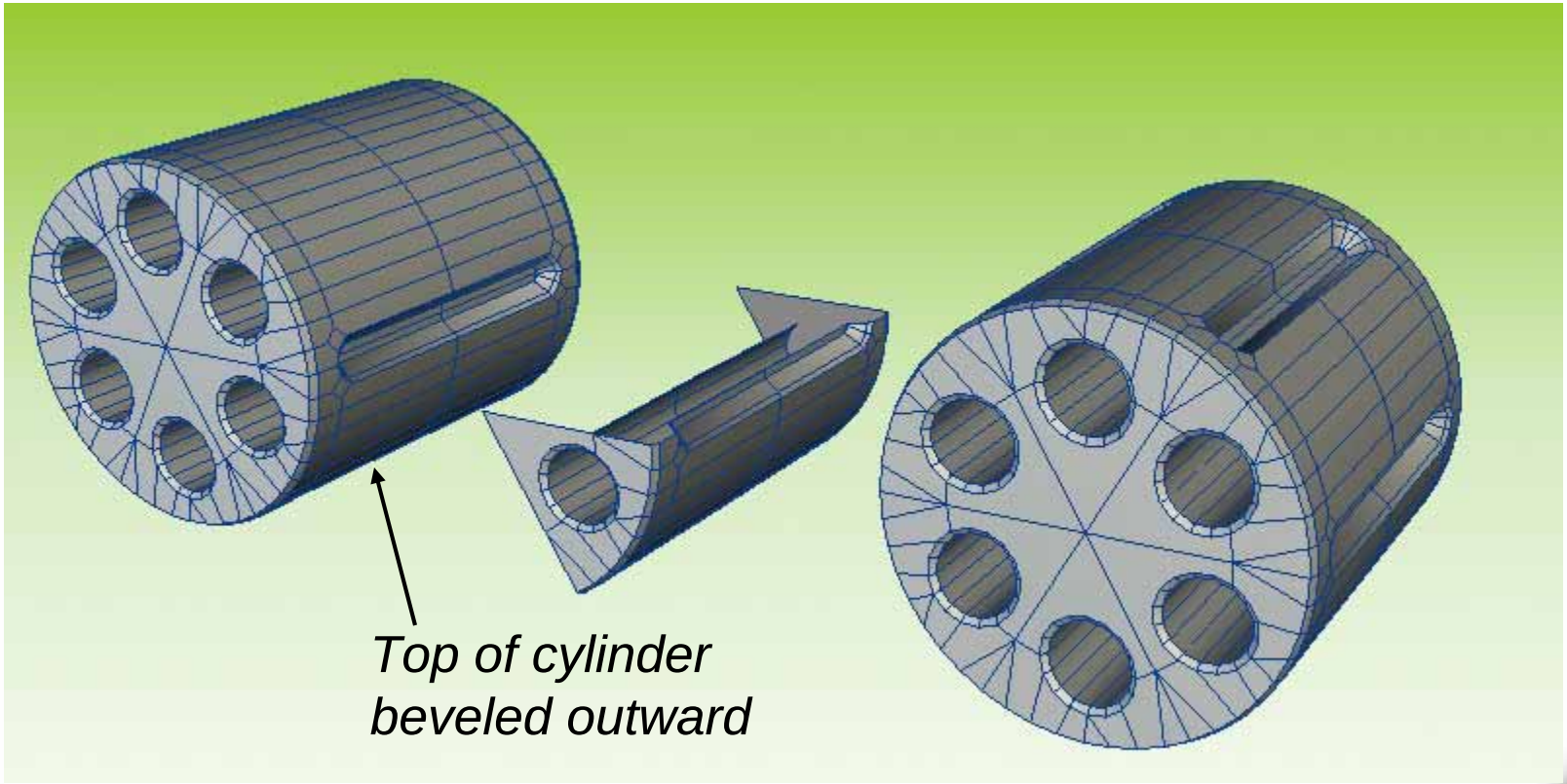
Once complete, the hole detail fits within a single polygon and can therefore be substituted for any polygon in your model

Building Up



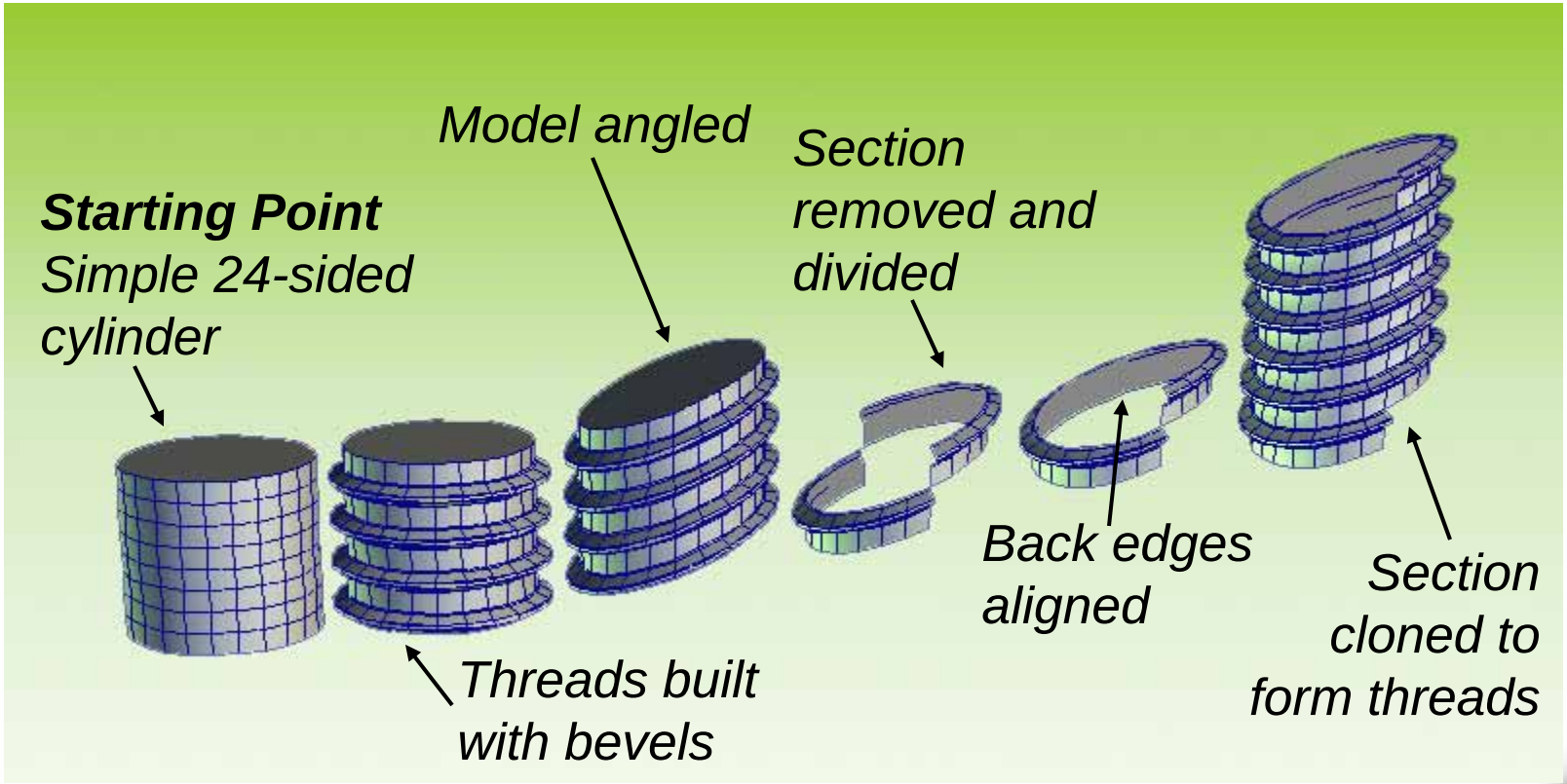
Many objects can be derived from stitching together smaller sections of geometry

Building Up: Adding Detail



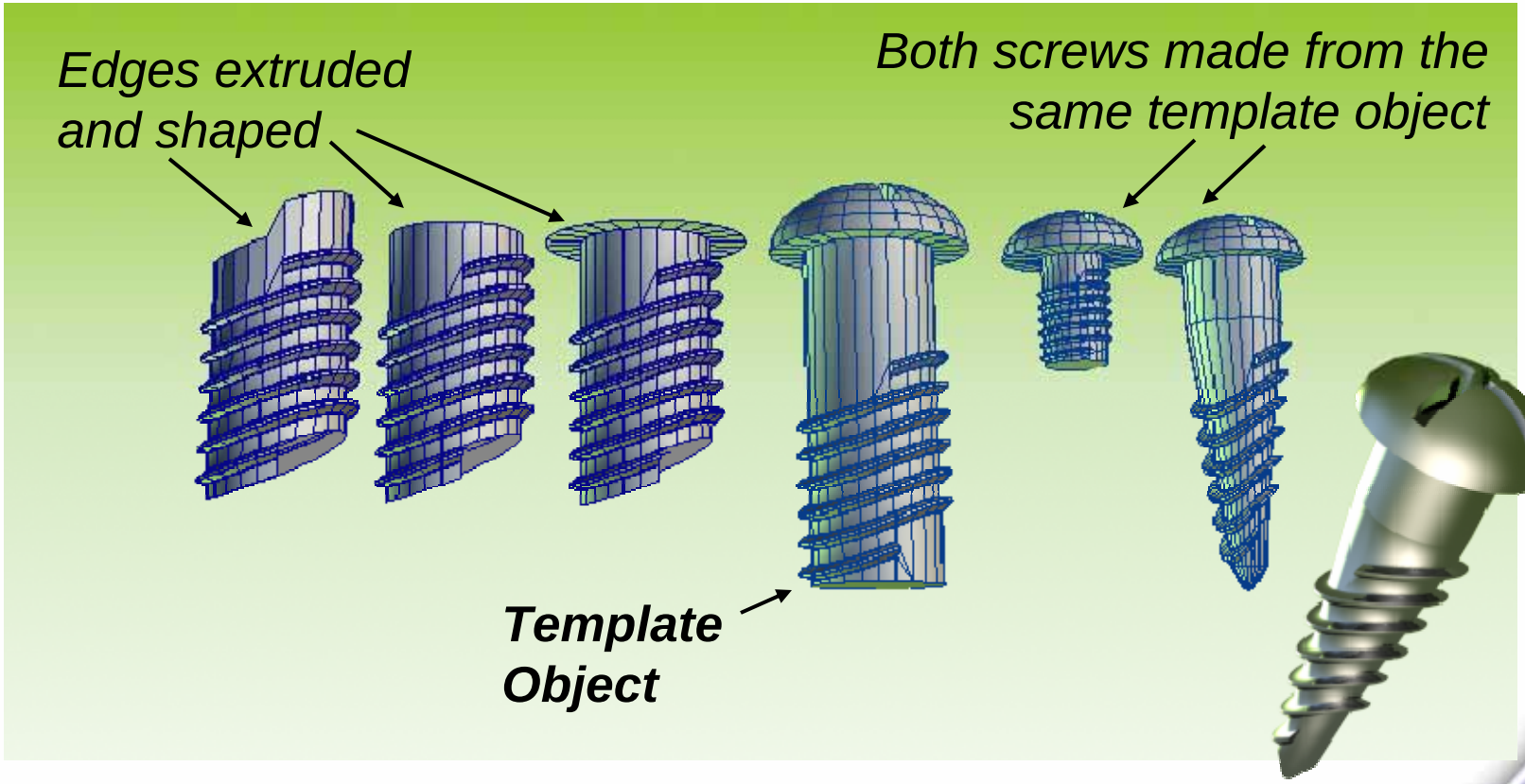
Detail can be added, the form chopped to a 60 degree section, and then rebuilt

Building Up: Screw Example



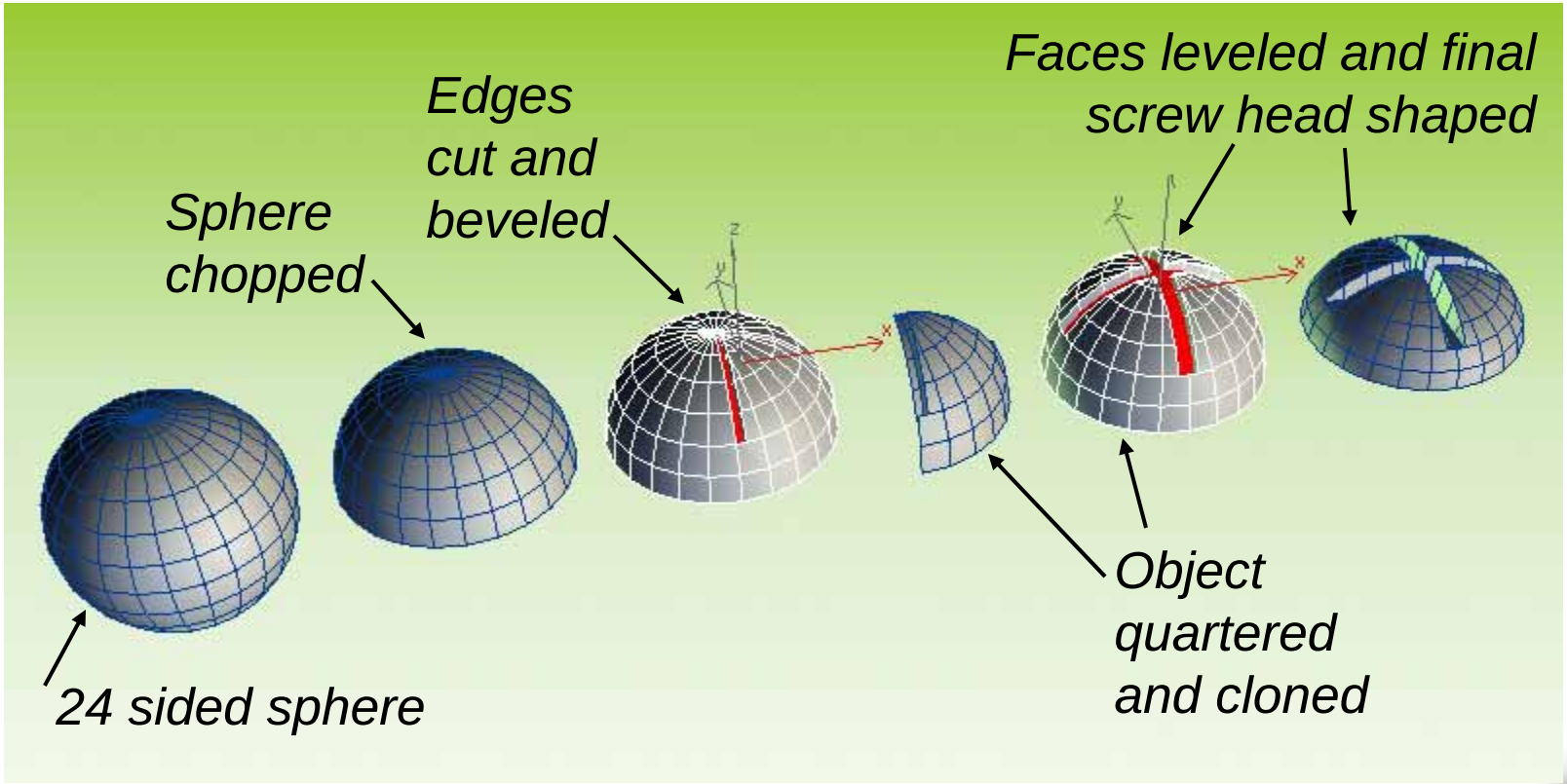
Complex objects like screws can be built by building up from smaller components

Screw Contiuned



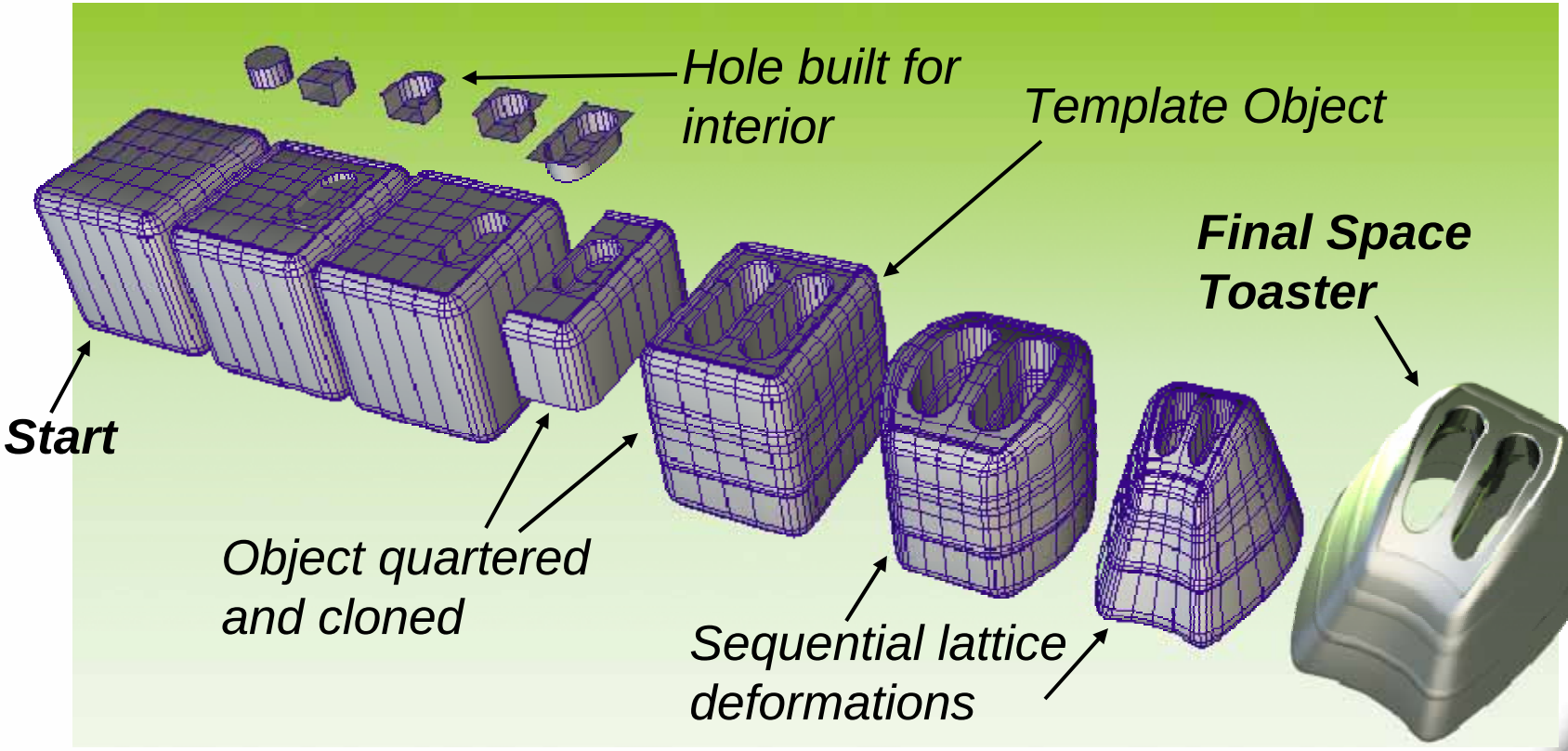
A Template Object is a near finished object which contains the final structure of an object and can be shaped into different final results

Screw Top



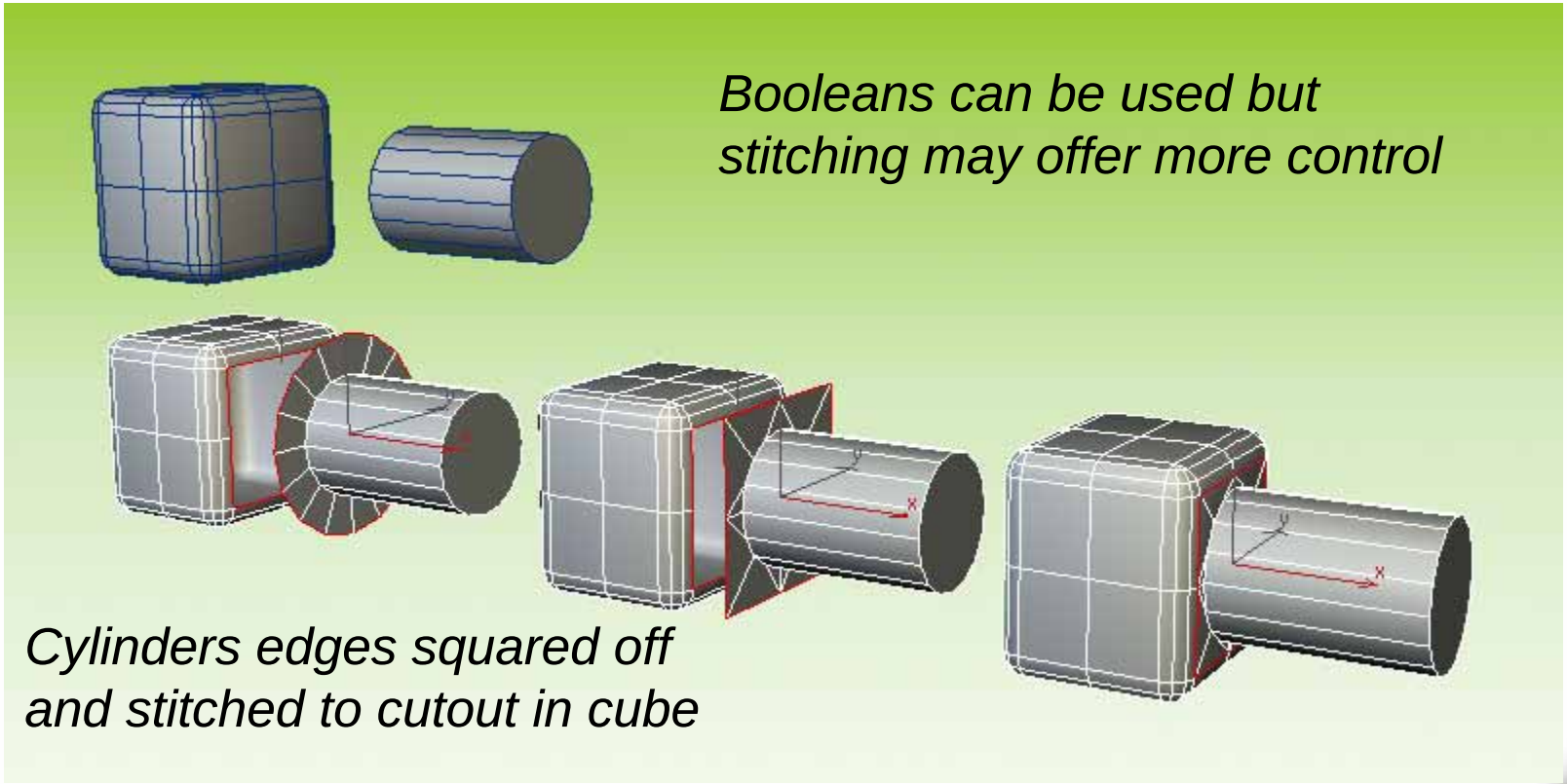
A 24 sided sphere is used so that the edges of the sphere align to the base screw object which was built from a 24 sided cylinder

Chamfered Box Example



The chamfered box is a great starting point. It has bevels and the flat sides make the verts easy to transform

Intersecting Objects



Stitching object together is one method of creating intersecting objects without using booleans

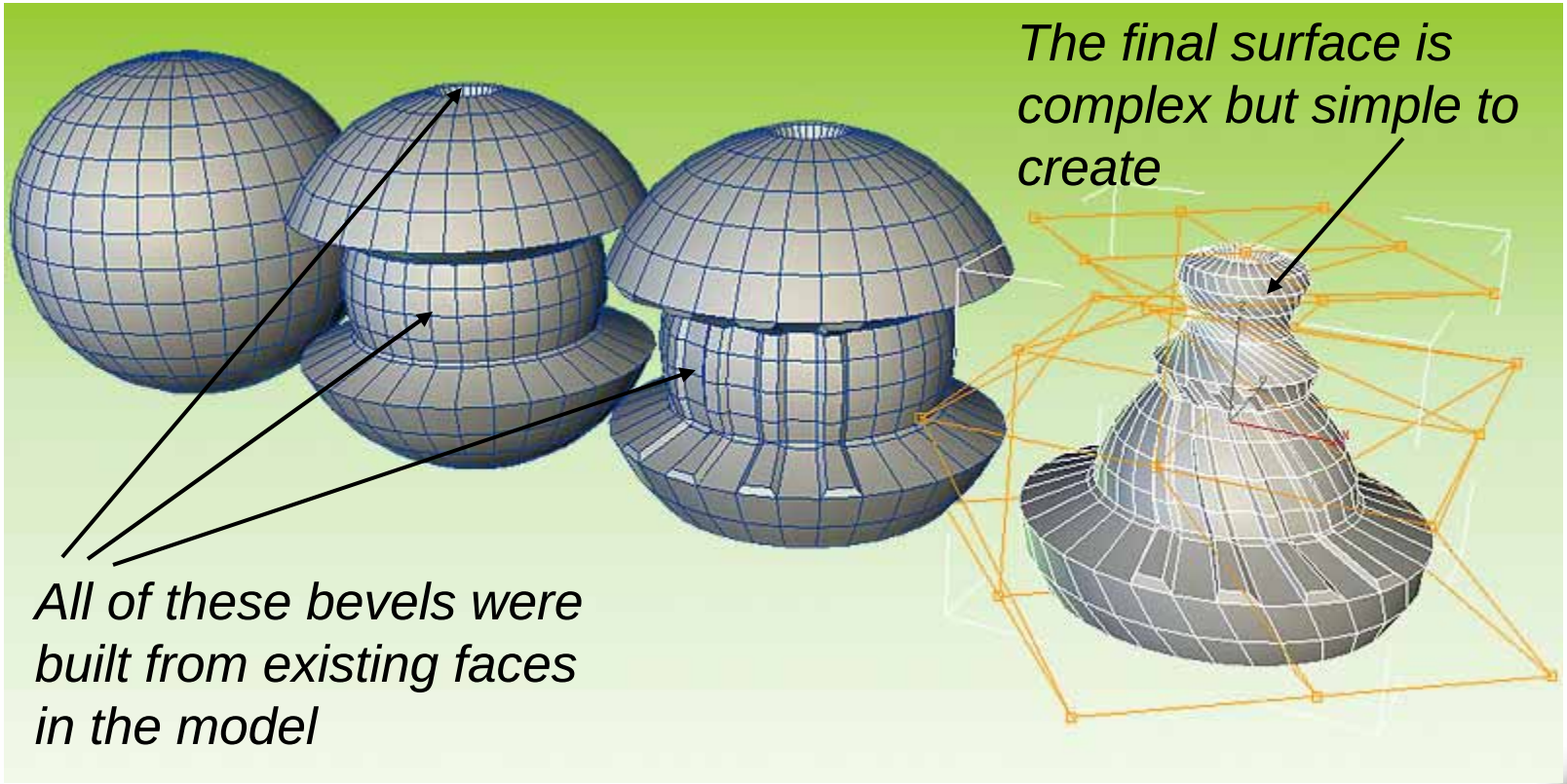
Quick Modeling

The tenets of modeling for speed

- ***Approximate shapes***
- ***Build what's easy*** *(i.e. primitives with bevels)*
- ***Give every object a little bit of love***
- ***Put special care into just a few objects***
- ***Don't be careless . . . just efficient***

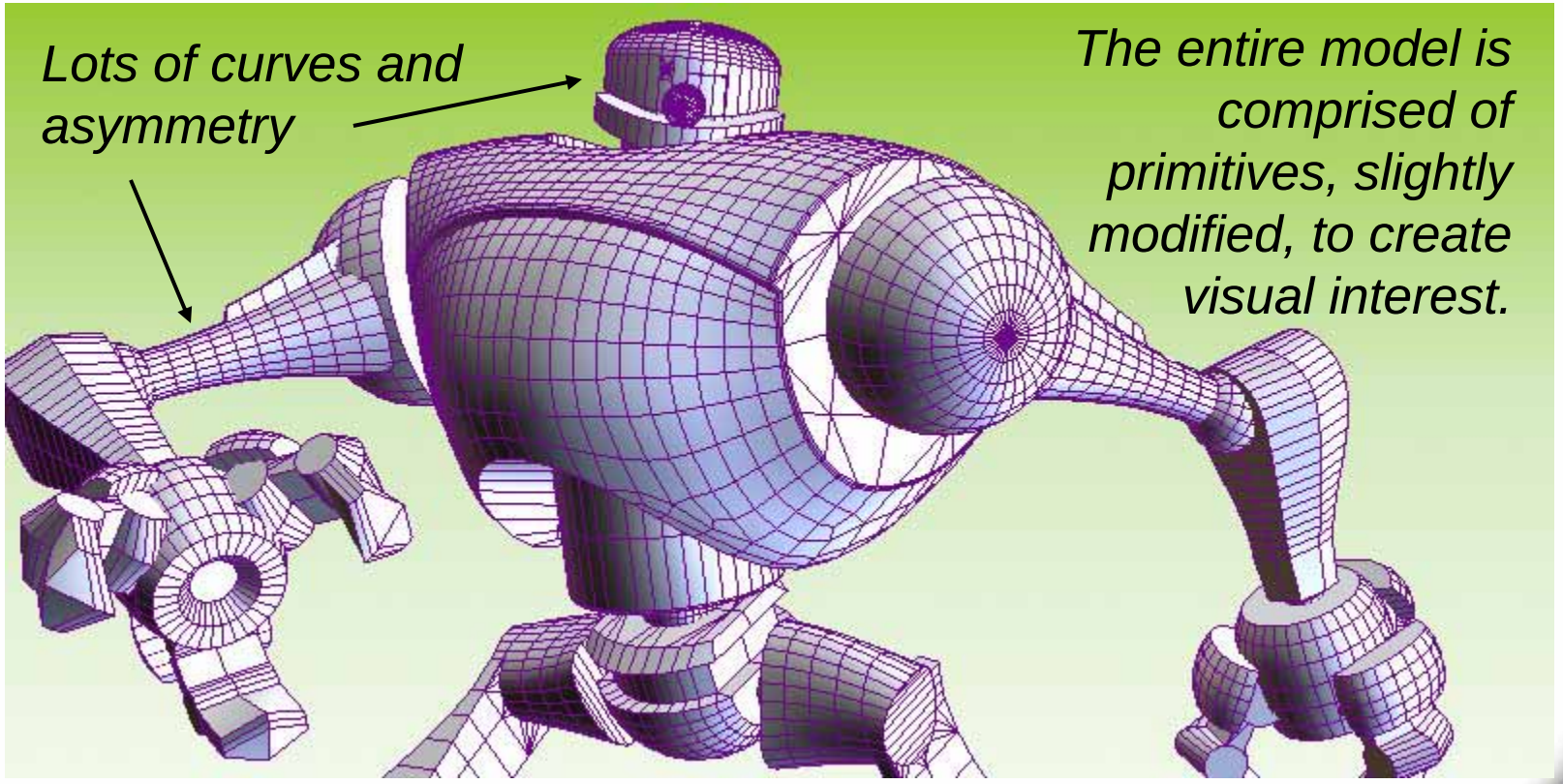
Streamline by avoiding costly modeling challenges that don't provide a substantial benefit.

Building What's Easy



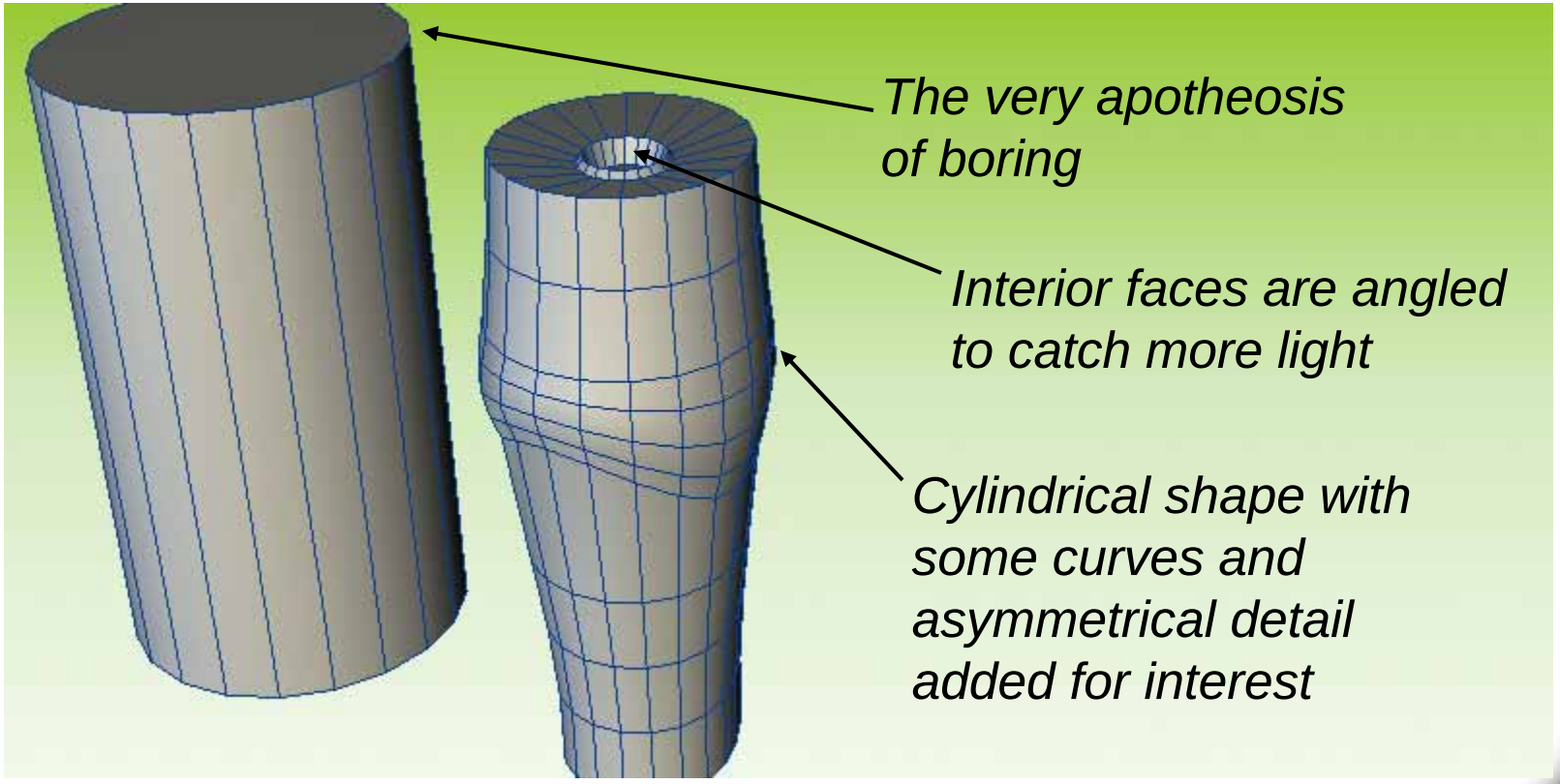
Use the faces and edges already built into a model as a means to add quick detail

Give Every Object a Little Bit of Love



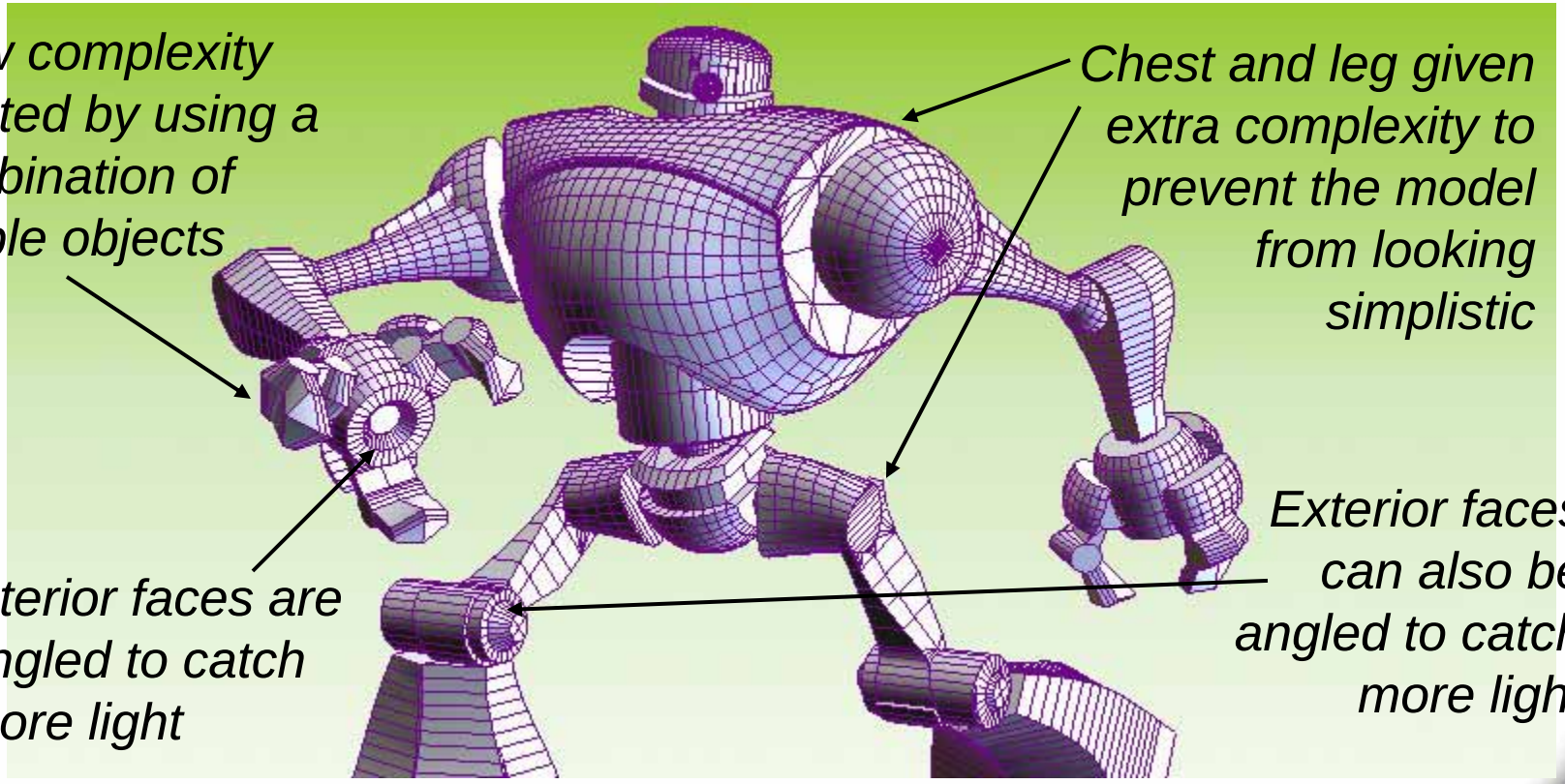
Any surface that can be easily described by the viewer ceases to be interesting.

Give Every Object a Little Bit of Love



Subtle curves and asymmetry can make a simple object more interesting.

Special Care in a Few Objects



Using too many simple objects in a single model would become uninteresting.

Cinematic Texturing

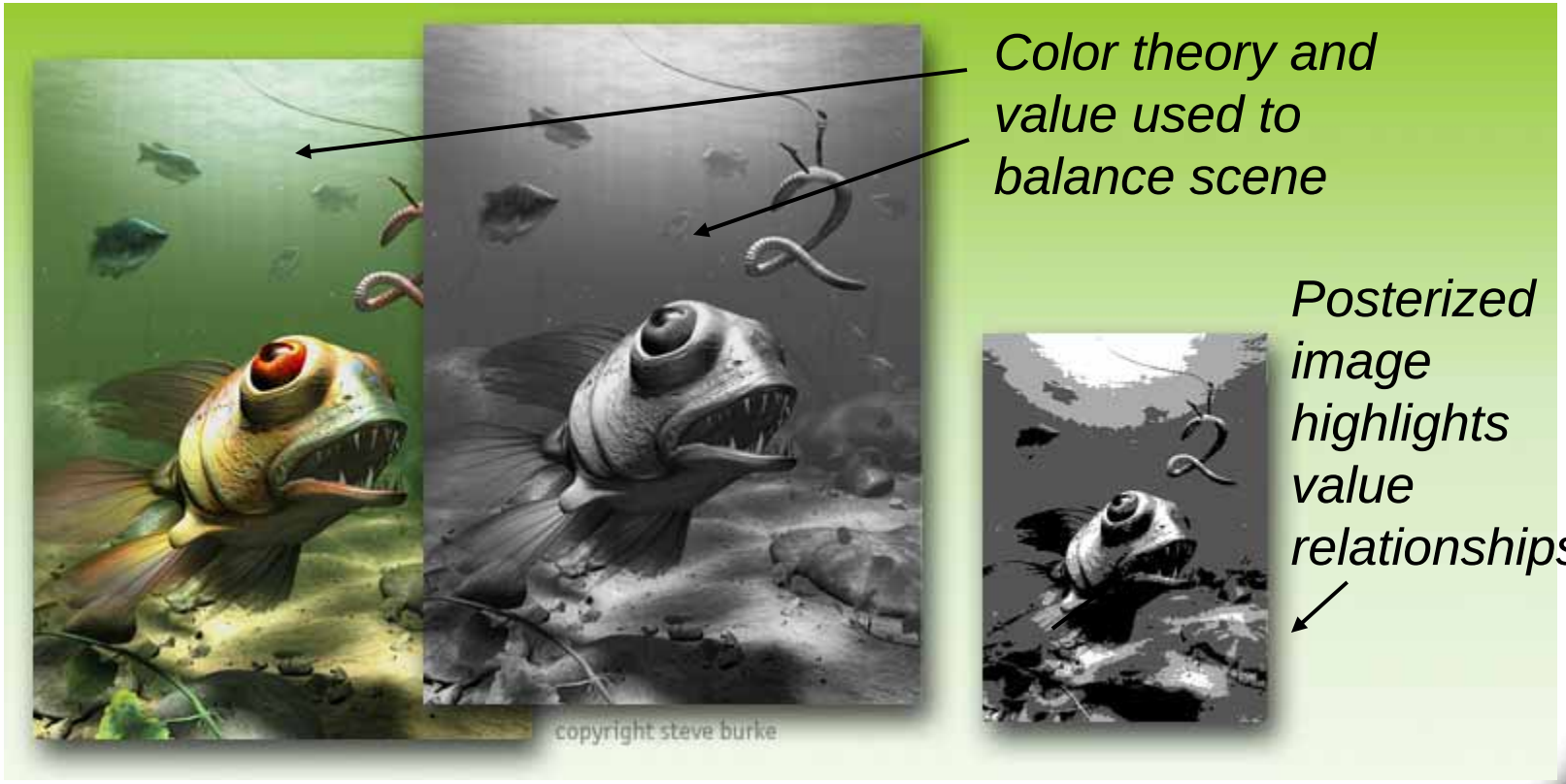
Strategies and techniques for creating cinematic quality textures

Purpose of Texture Maps

1. *Enhance the resolution of the model*
   - *Opacity maps*
   - *Bump and normal maps*
2. *Control color and value of surfaces*
   - *Diffuse color maps*
   - *specular, self-illumination maps, etc.*

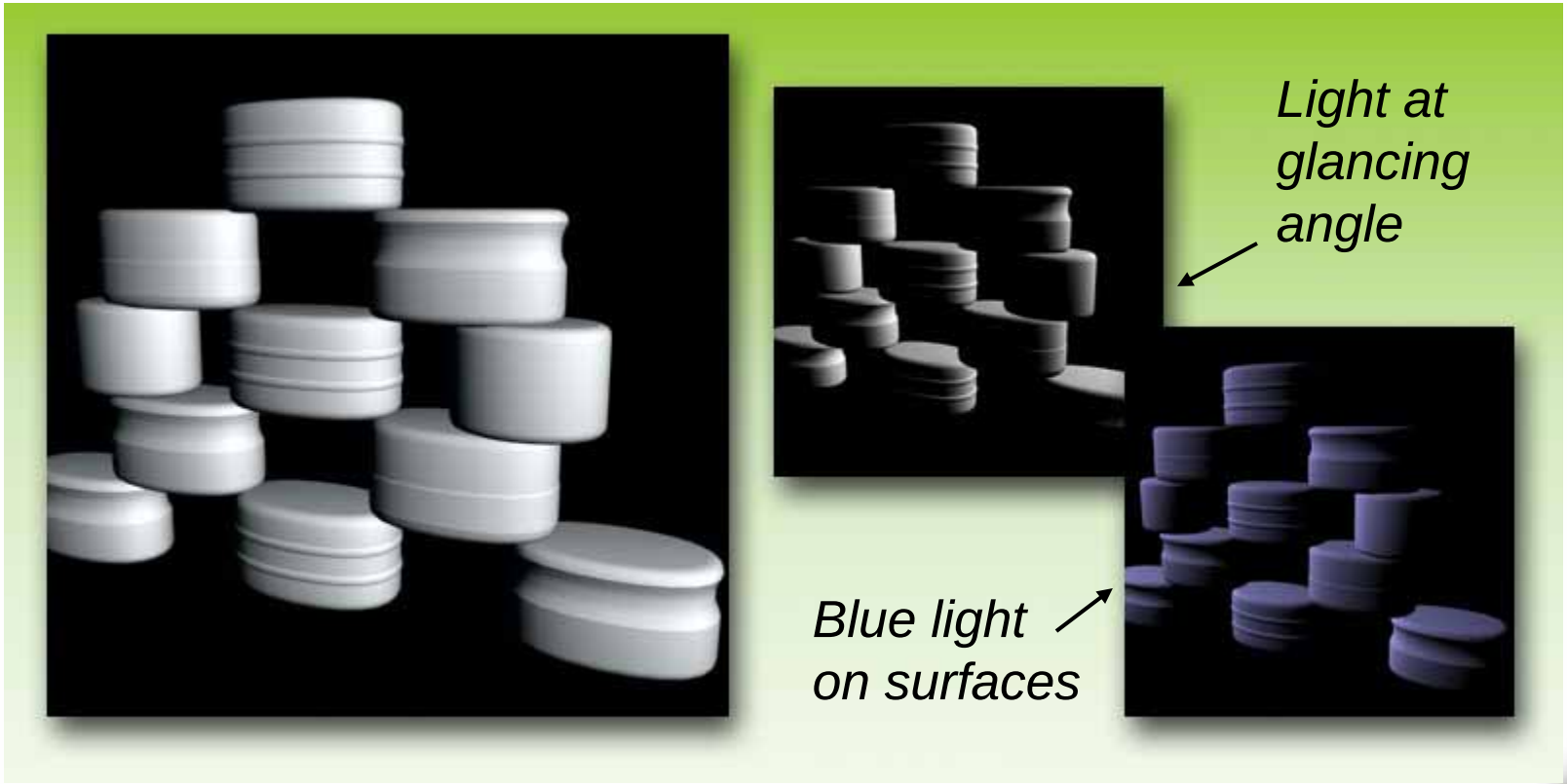
Contrasts should be managed at a scene level, model level, and texture level

Value and Color



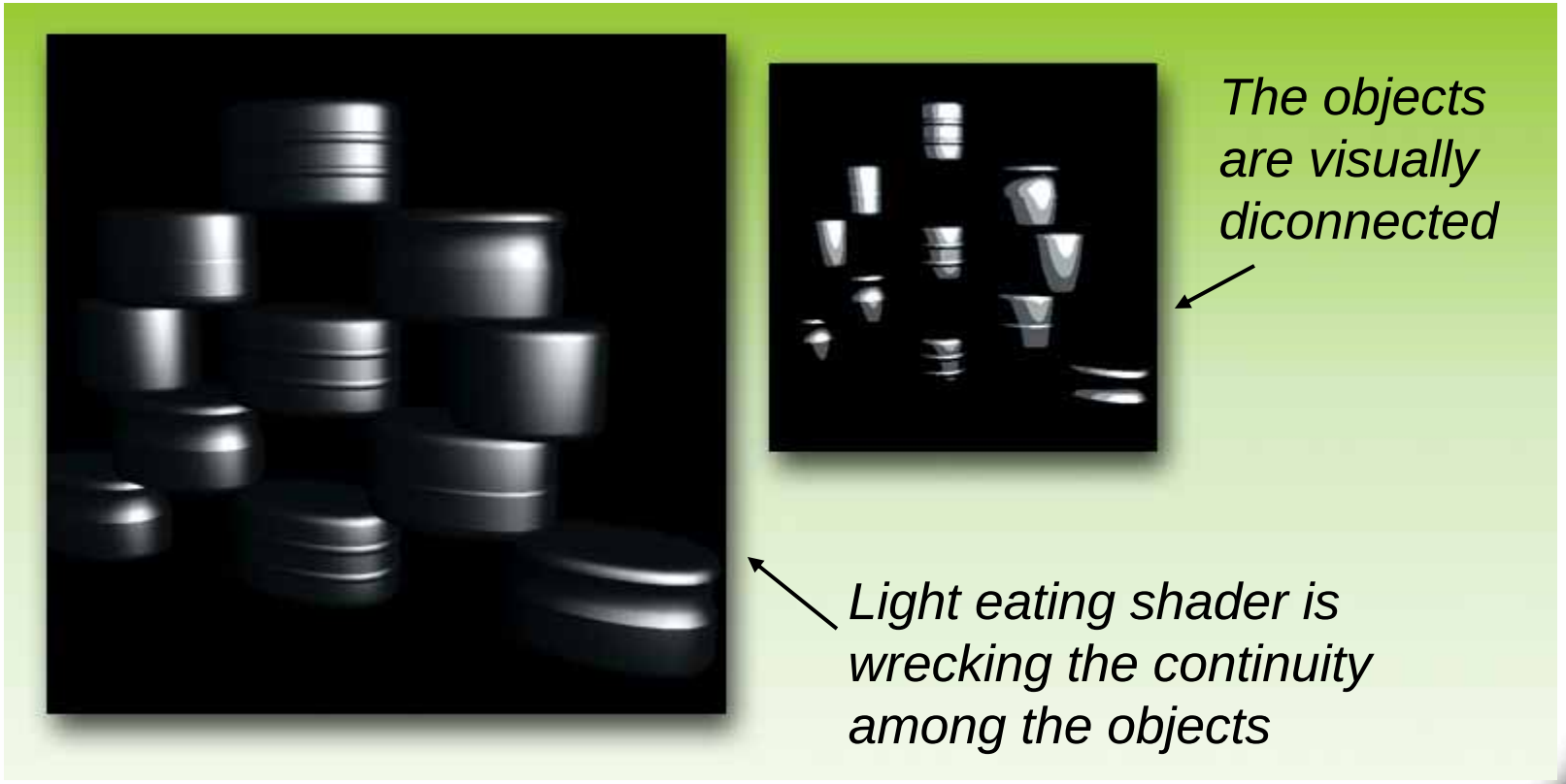
Value and color need to be controlled for each model and across each scene or game level

Defining Value in 3D; the Easy Case



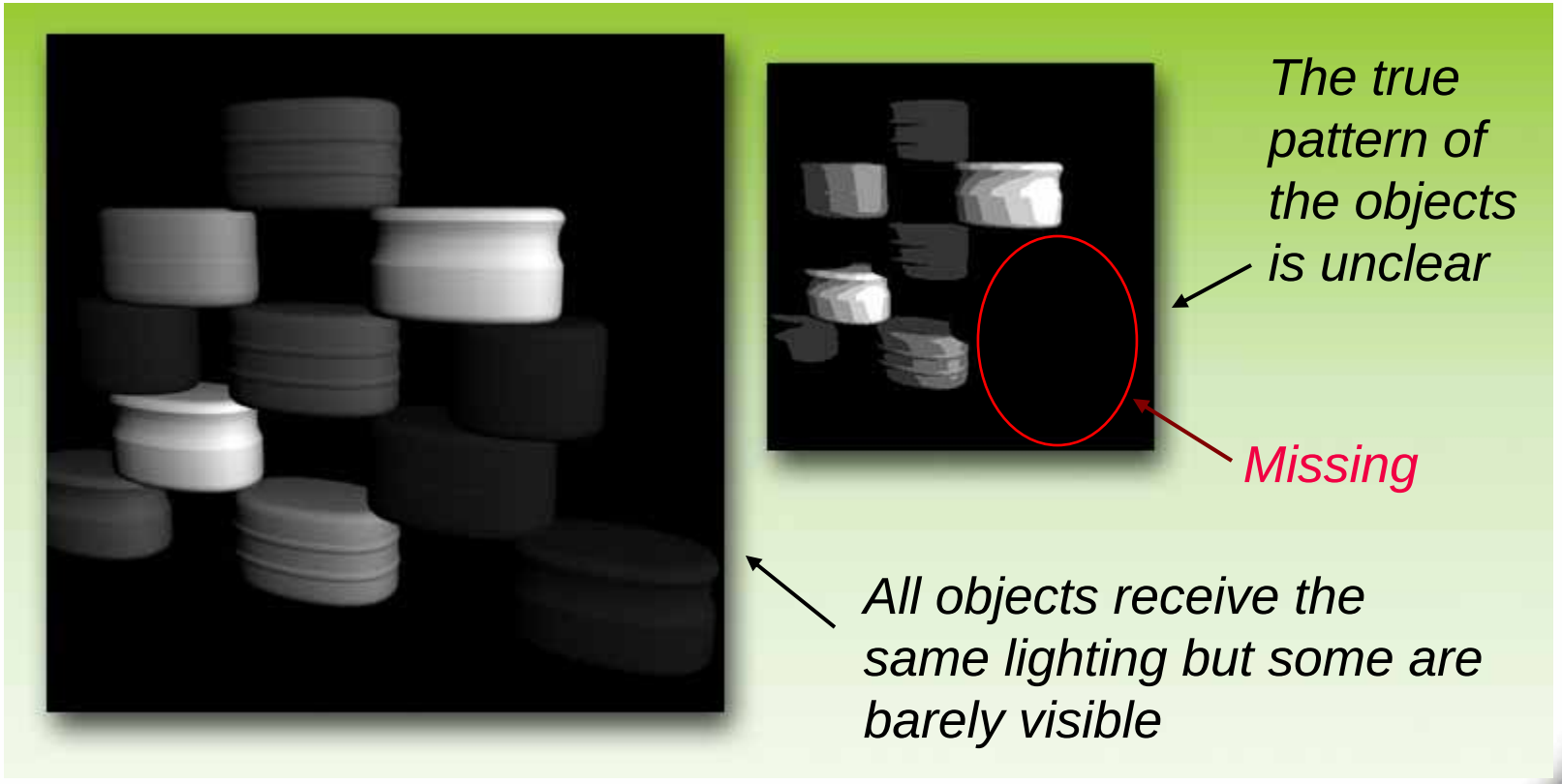
White, matte surfaces offer complete control over surface value and color with the use of lighting

Defining Value in 3D; Shader Problems



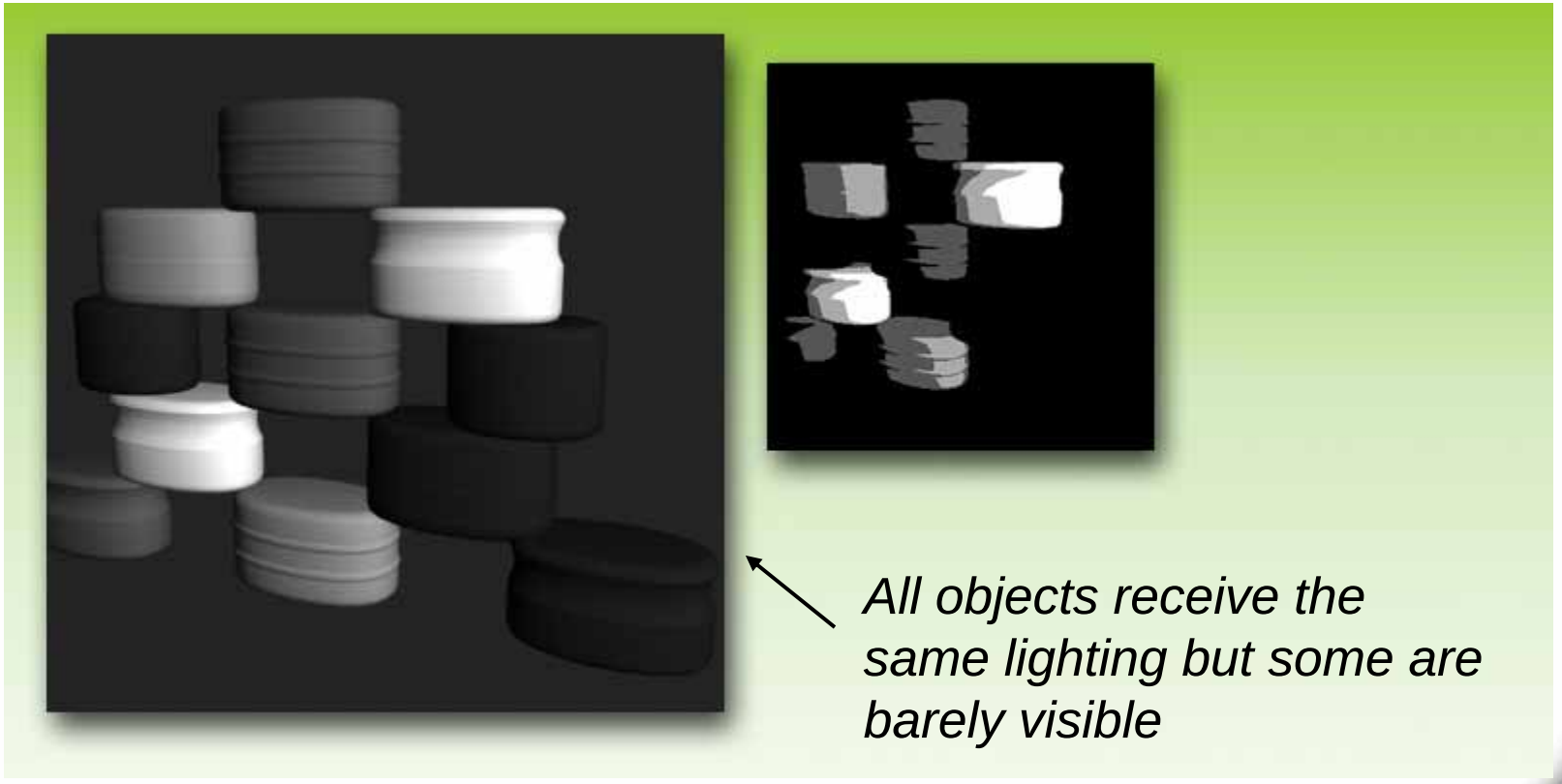
Shaders with sharp falloffs can create disjointed scenes since the light does not disperse far across the surface of the objects

Defining Value in 3D; Texture Value



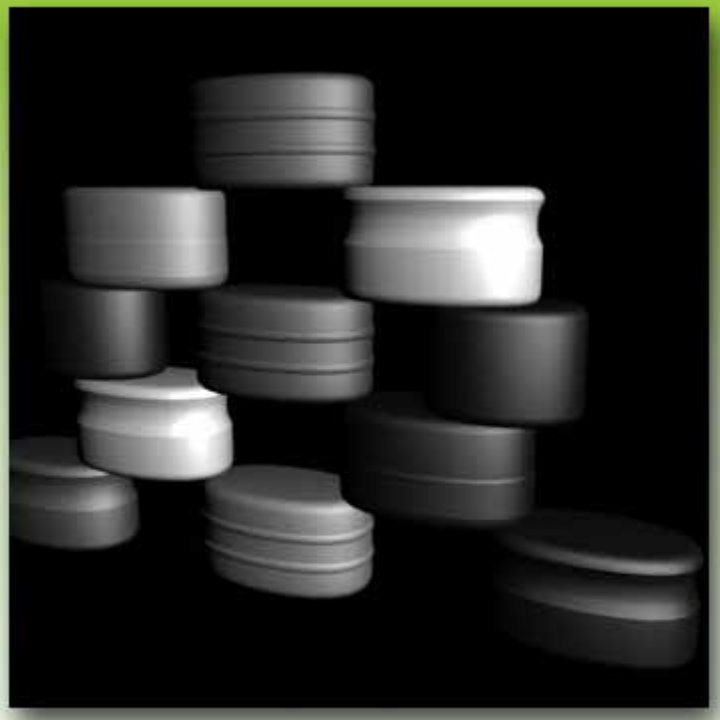
Texture value places an upper limit on how bright a surface will be under full illumination

Defining Value in 3D; Ambient Light



Ambient lighting helps a little but doesn't solve the underlying value problem

Defining Value in 3D; Normalizing Darks

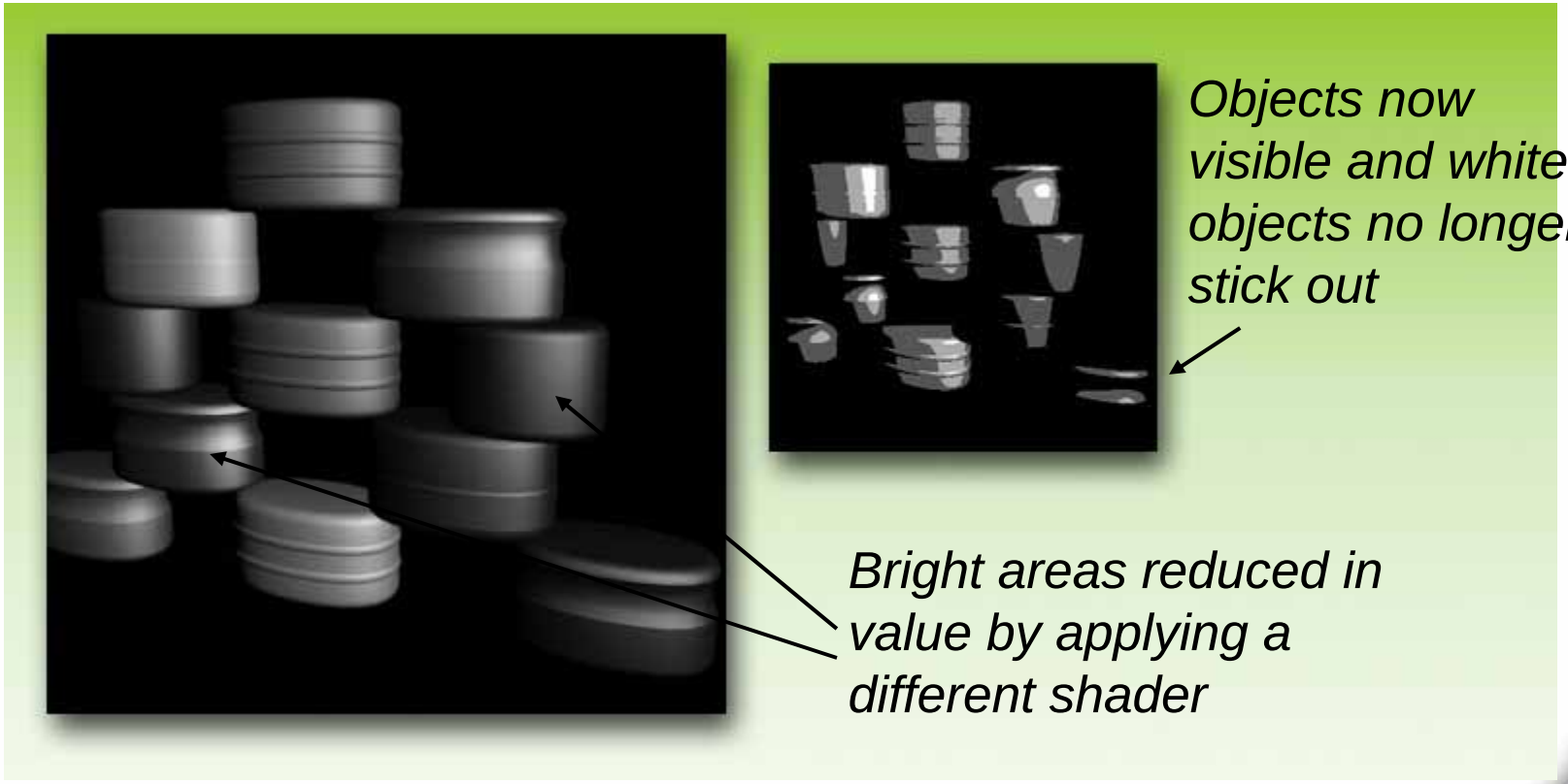


Objects now visible and all objects visually connected

Dark objects are given a high but dispersed specular

Normalize surfaces so that they respond more evenly to lighting. Dark objects are given a high specular level with low glossiness

Defining Value in 3D; Normalizing Brights



Normalize bright areas by using a shader to reduce the light on their surface

Defining Value in 3D; Backgrounds

Background really makes the objects pop

Put dark values behind bright objects and bright values behind dark objects for maximum impact

Defining Value in 3D; Rim Lighting

Rim light also emphasizes individuality of surfaces, note the very strong highlights on the metal surfaces

Rim light helps to further links objects together visually and to further separate them from the background

Defining Value in 3D; Shadows

Shadows help to tie all of the objects together and show how the objects relate to their environment

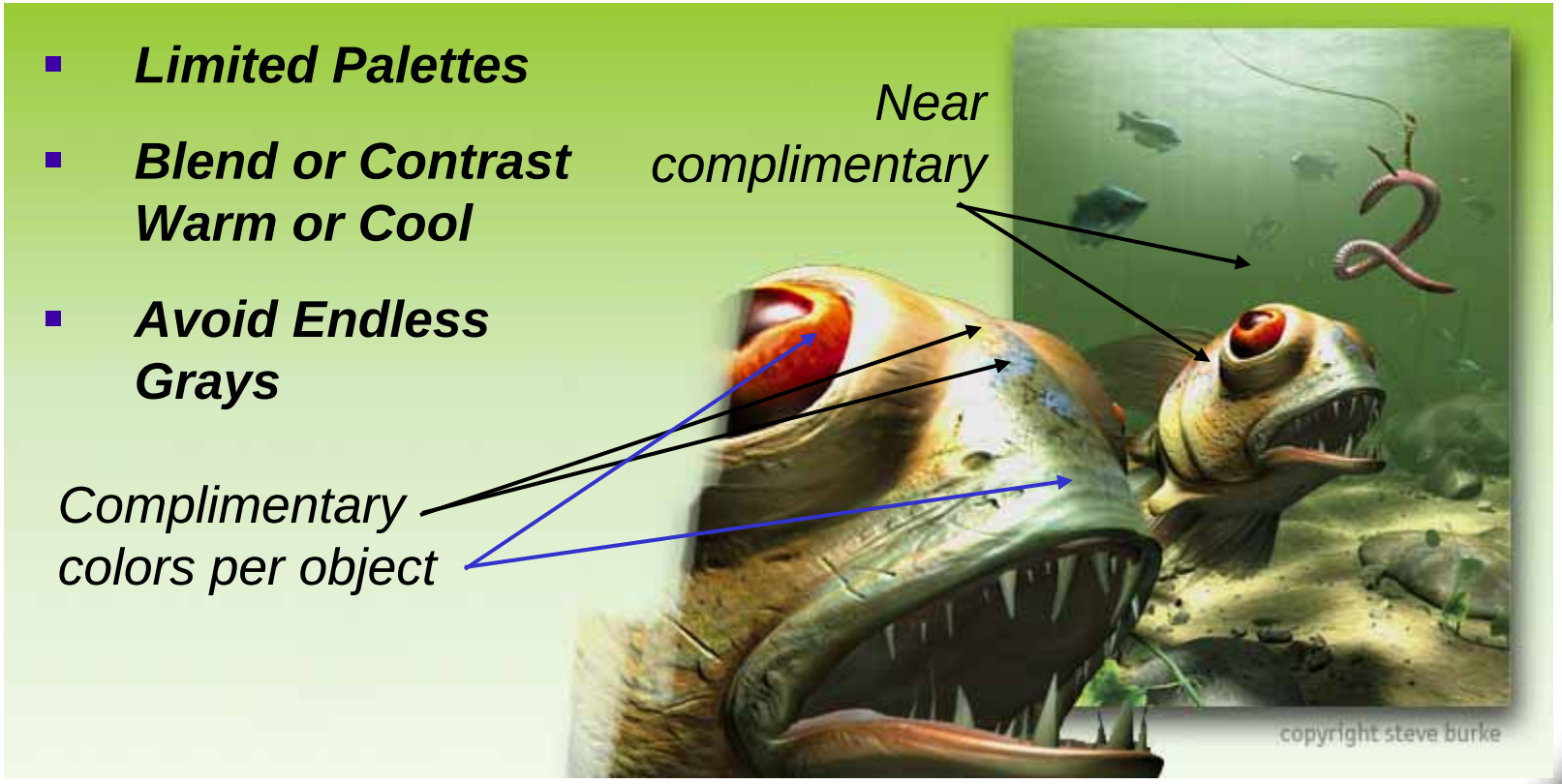
Impediments to Managing Value

- ***Flat or hard to light objects***
- ***Objects blocked from light***
  (under or behind bigger objects)
- ***Situations where background values can't be controlled***

Compensate and possibly avoid some of these situations or you may have to resort to awful ambient lighting

Manage Color on a Global Scale

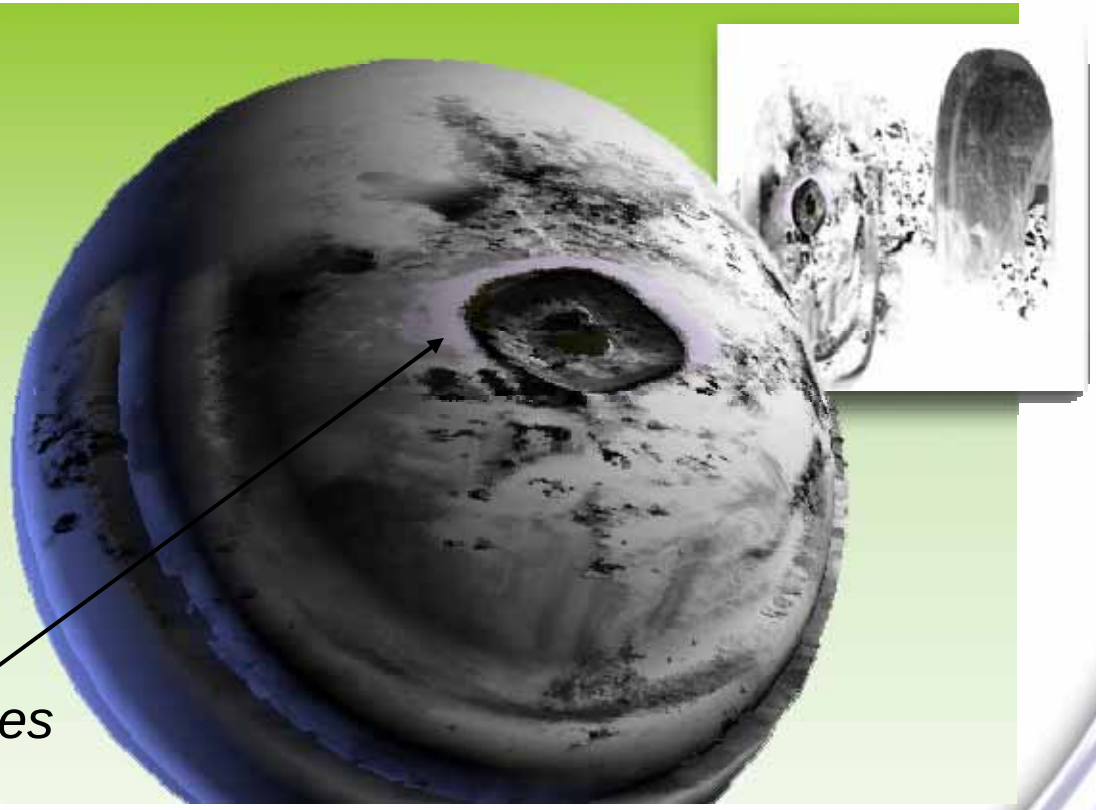
- ***Limited Palettes***
- ***Blend or Contrast Warm or Cool***
- ***Avoid Endless Grays***



Define a strategy for managing color combinations per object, scene, and on a global level

Juxtaposition of Opposites

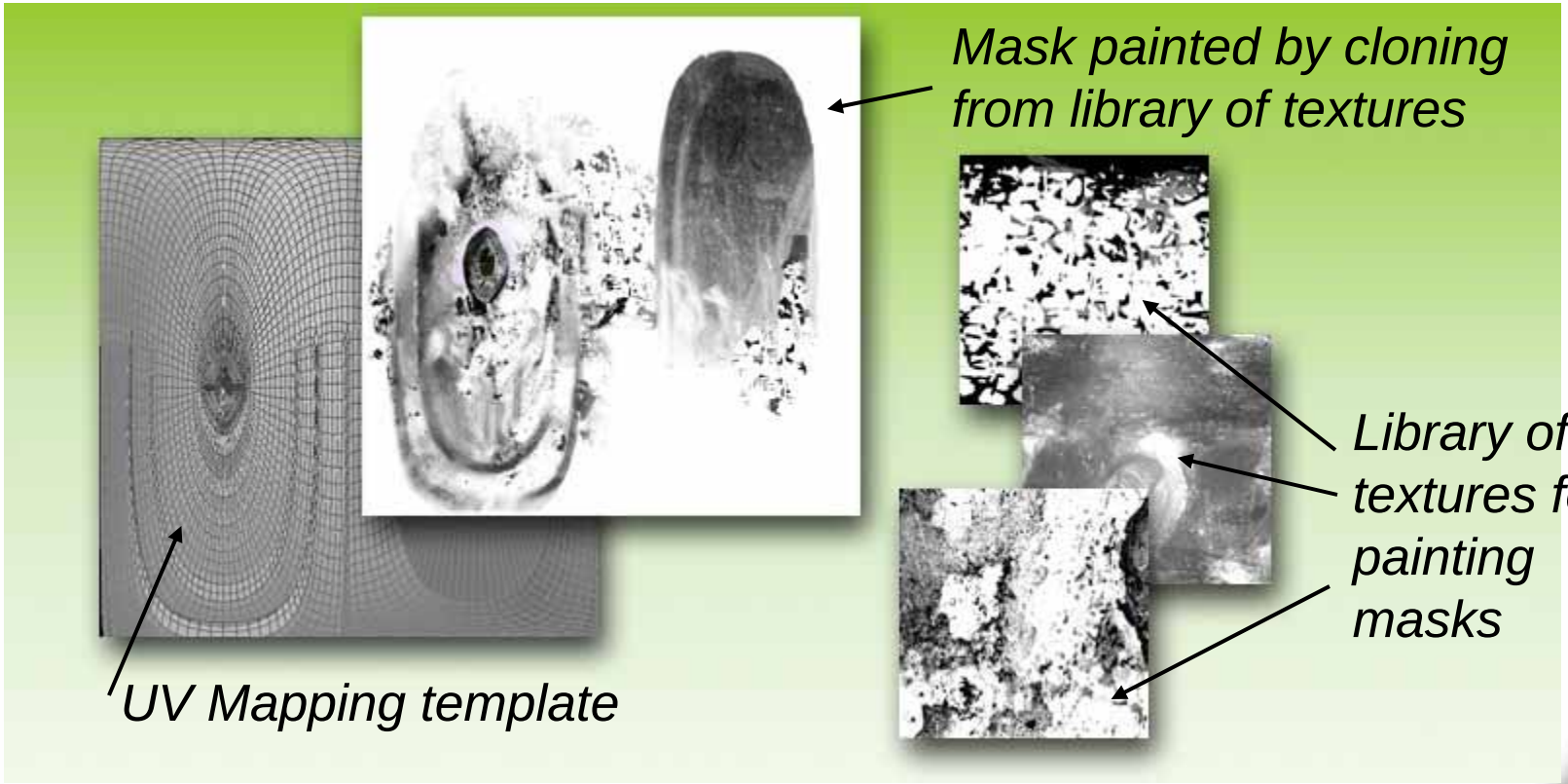
- ***Busy - calm***
- ***warm - cool***
- ***rough - smooth***
- ***shiny - dull***
- ***clean - dirty***



Mask used to define distribution of opposites

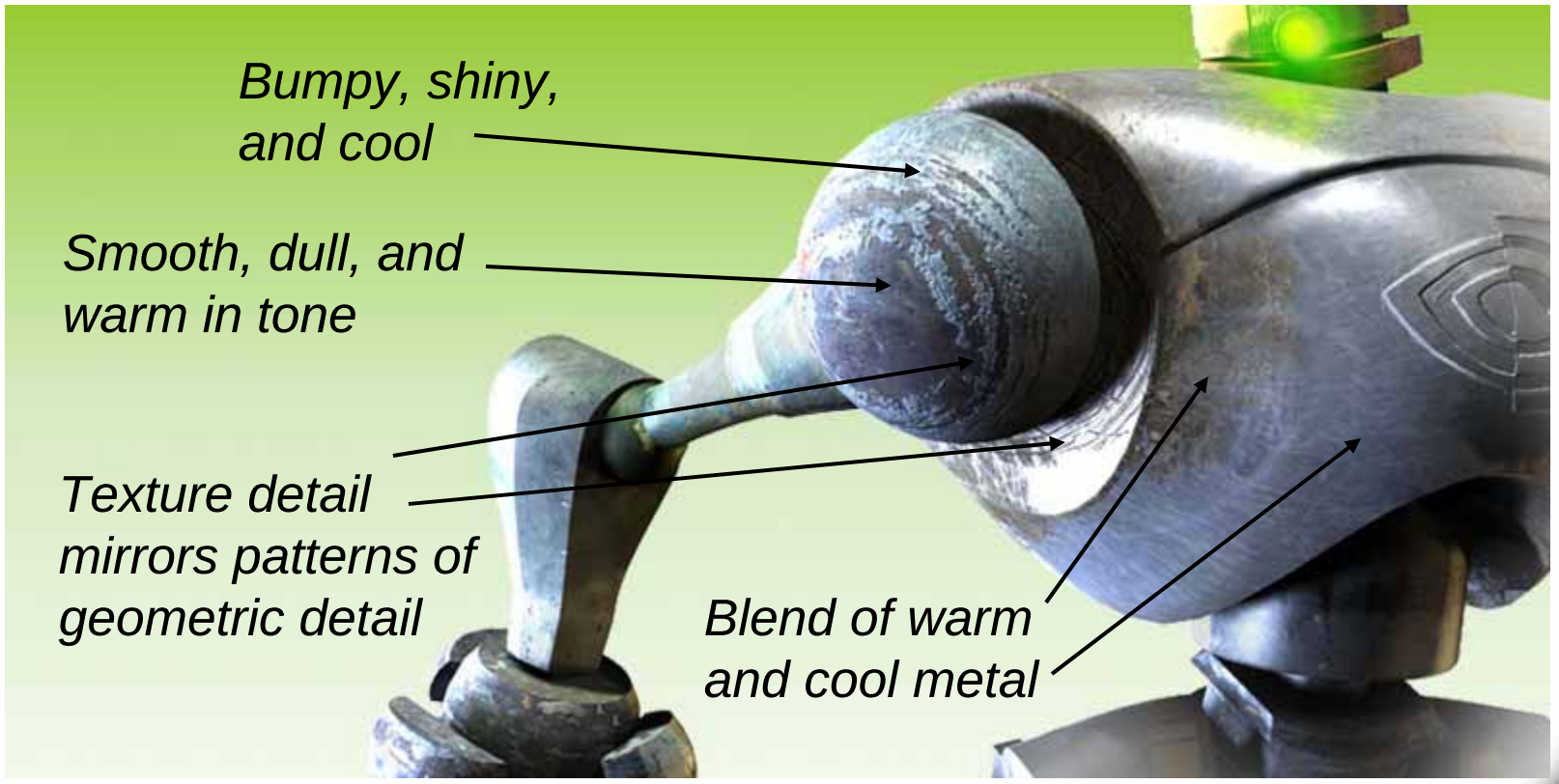
Manipulating the distribution of opposing surface qualities gives life to surfaces

Creating Selection Masks



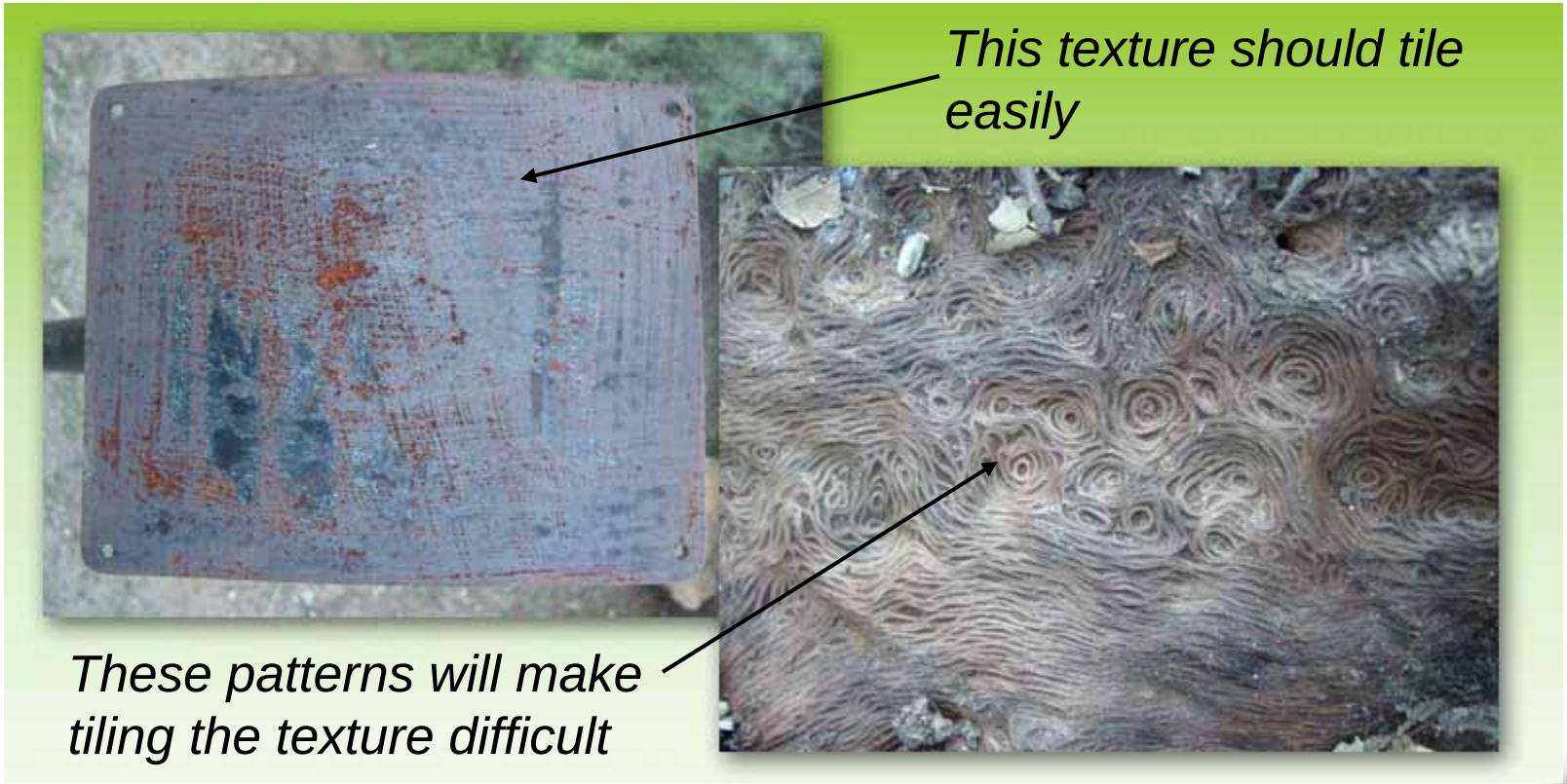
Use Layers and Layer Masks to for blending layers using selection masks in Photoshop

Juxtaposition of Opposites



Subtle or obvious contrasts can be made with the same underlying mask

Photographic Texture Sources



The most practical way to build a large texture library

Textures as Patterns

Textures are just color and value combinations, the same texture can be used in many different ways

Photographic Reference

Build your reference library continuously with anything you find interesting

Photographic Reference

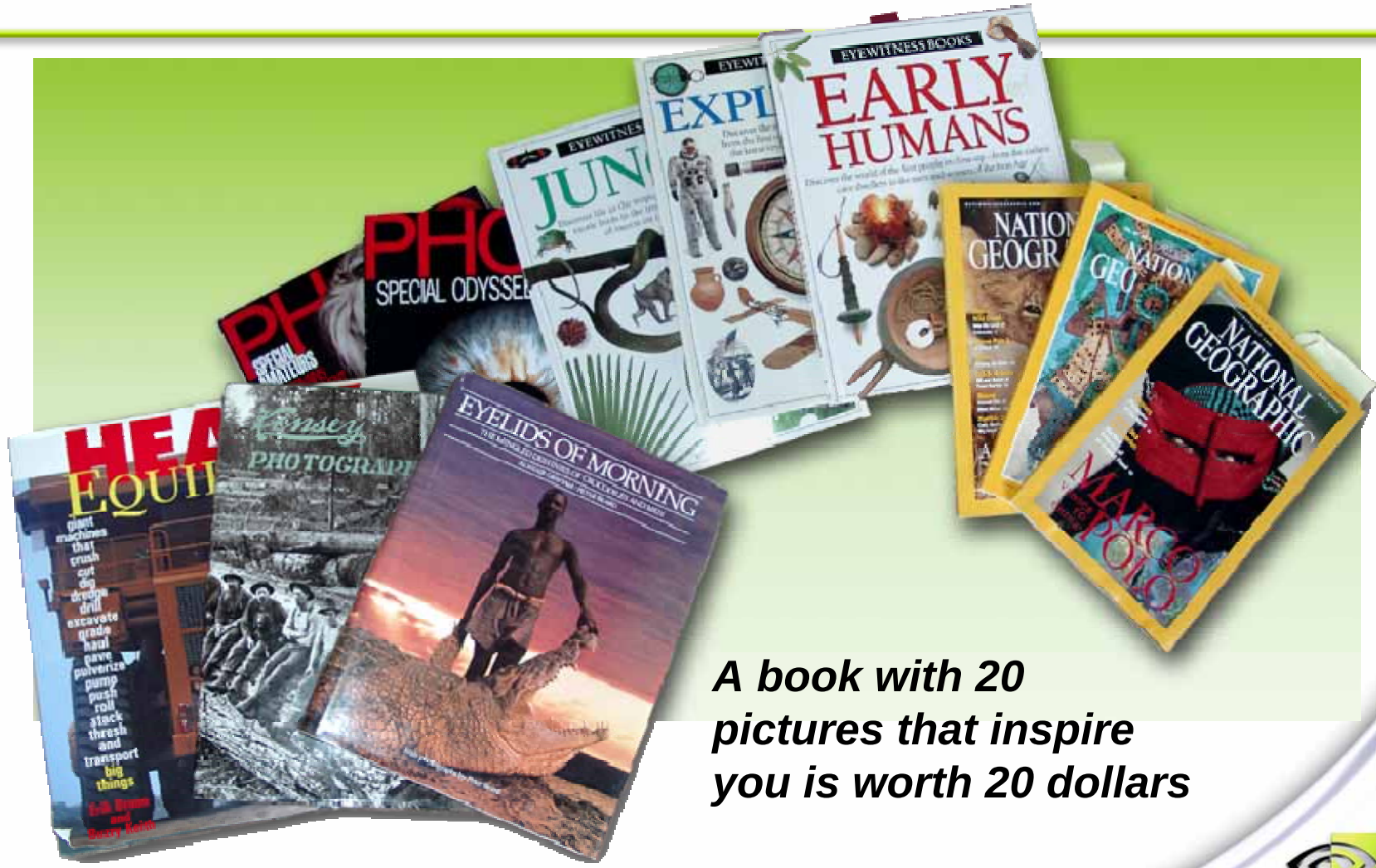
Even random things that pass you on the road can provide a twisted kernel of inspiration

Using Art Reference

- ***Color combinations***
- ***Shape combinations***
- ***General Concepts***
- ***Lighting, etc.***

Art reference is valuable far beyond a literal description of how things look

A Good Picture is Worth a Dollar!

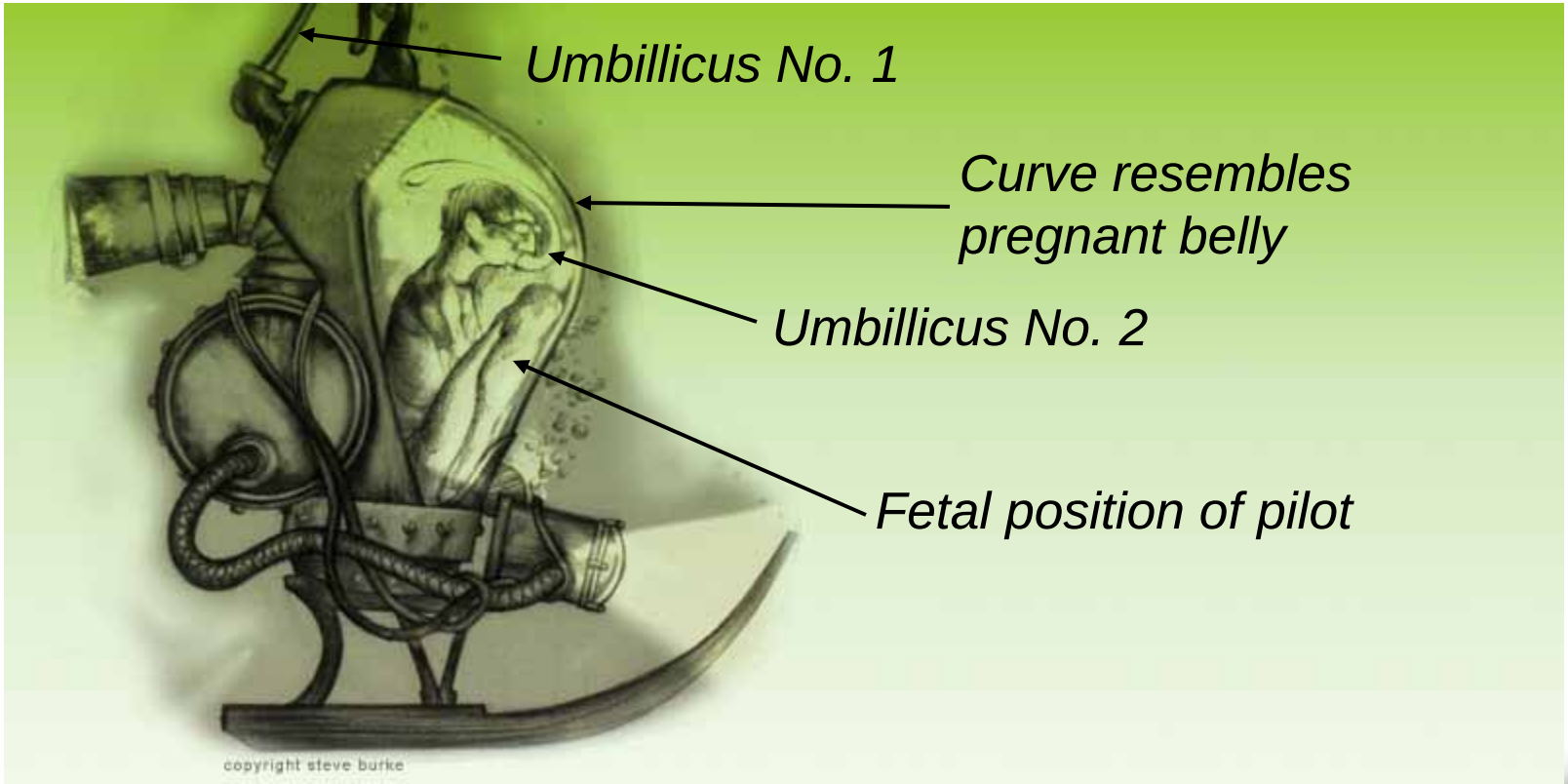


A book with 20 pictures that inspire you is worth 20 dollars

NVIDIA.

Draw Inspiration From the Real World

Personalizing Your Work



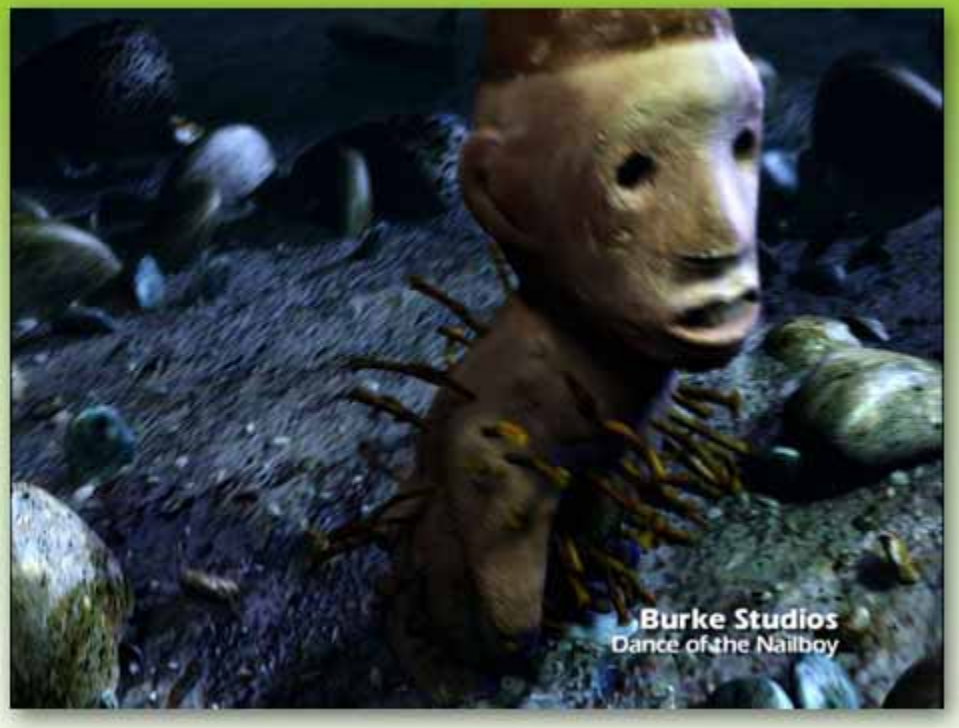
Old saying, "The more personal you make it, the more universal it becomes"

Remember These

1. Make it Specific
2. Give it History
3. How Does it Feel?

Moody is a Good Thing

'Fun, Creepy, and Surreal'



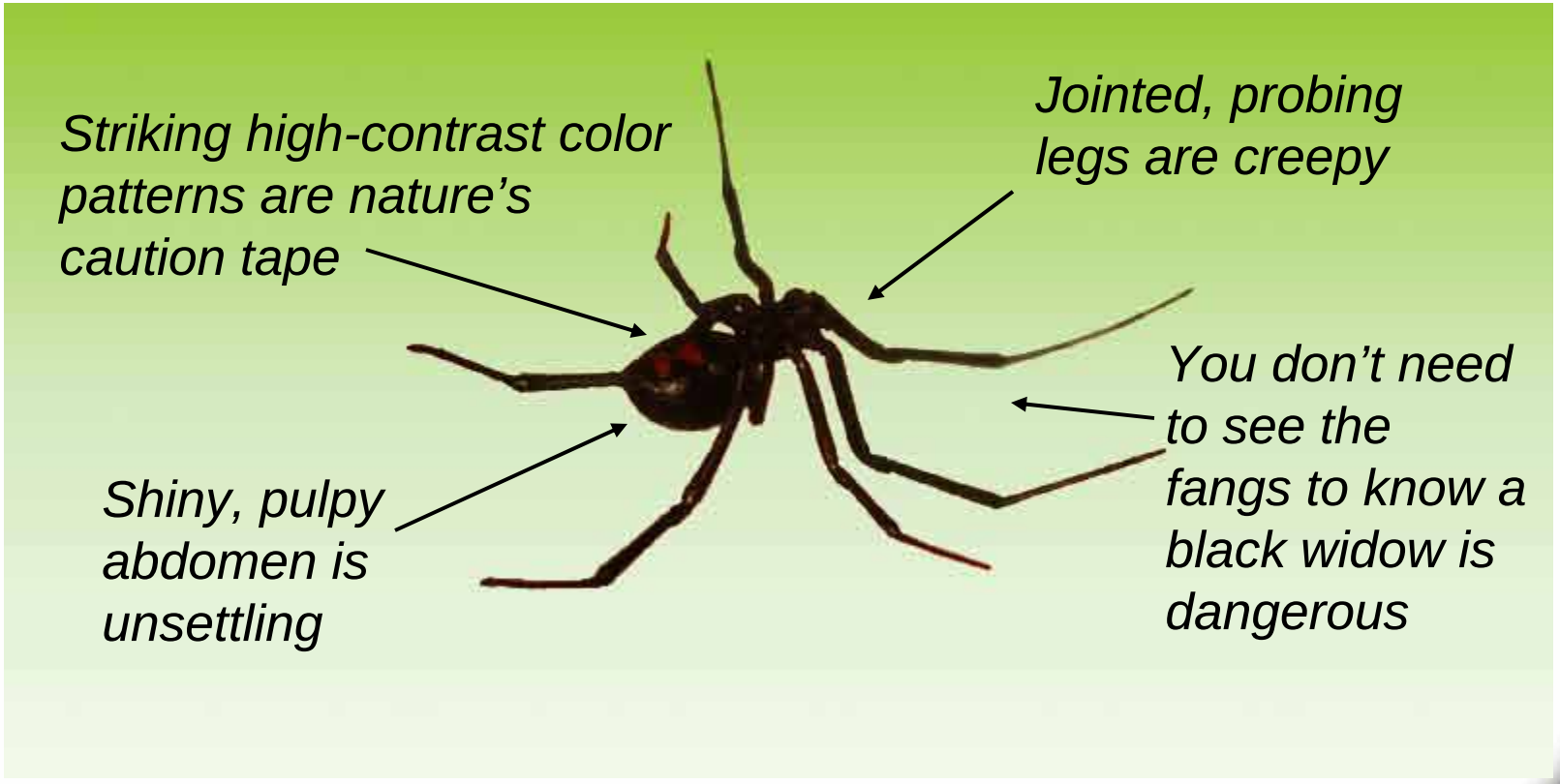
Use mood to steer the emotional content of your art and influence your choices in color, lighting, and textures

Do Everything Well (Except this slide)

- ***Design***
- ***Modeling***
- ***Texturing***
- ***Lighting***
- ***Effects***

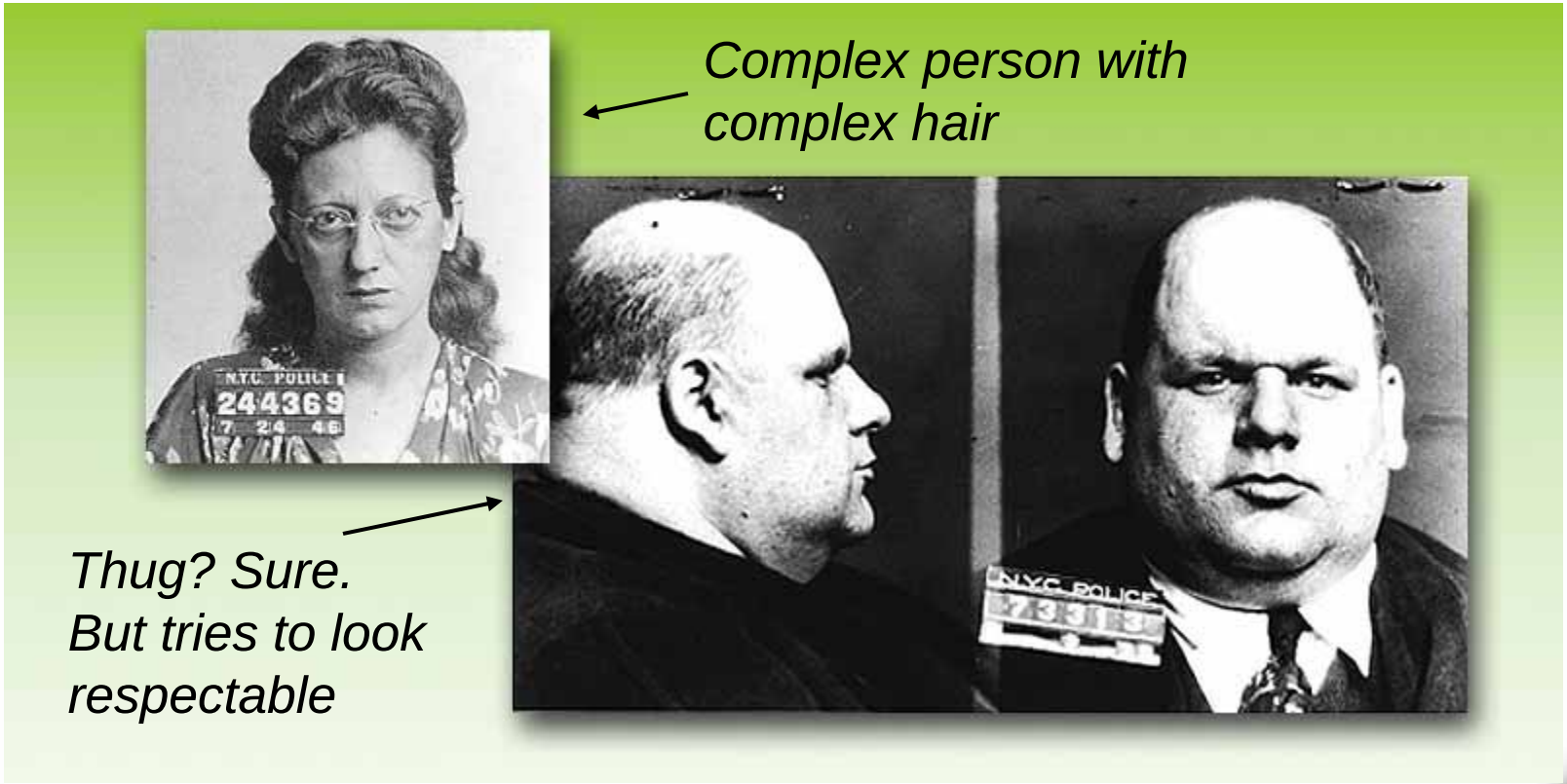
You cannot fix a deficiency in one area of your work by compensating in another area

Spiders Look Evil...Even Spiders Think So



Nature provides several universally understood cues about an organism

First Impressions



Real people evoke nuanced first impressions, so should everything you build

NVIDIA

Words to Know That Begin with ‘P’

Prosaic:
Lacking in imagination and spirit; dull

Pedestrian:
Undistinguished; ordinary

Platitudinous:
A trite or banal remark or statement, especially one expressed as if it were original or significant

The American Heritage® Dictionary of the English Language, Fourth Edition

Ensure that none of these words apply to your artwork

Adjectives are Texture Enhancers

Boring	*Not Boring!*
metal	*rough, crusty, roguish METAL*
rock	*Buttery smooth, sun-warmed rock*
cloth	*Pestilent shards of mummy wrap*

Thanks! Questions?

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