

*Lecture 17*

*More Surfaces*

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1) Spheres Review

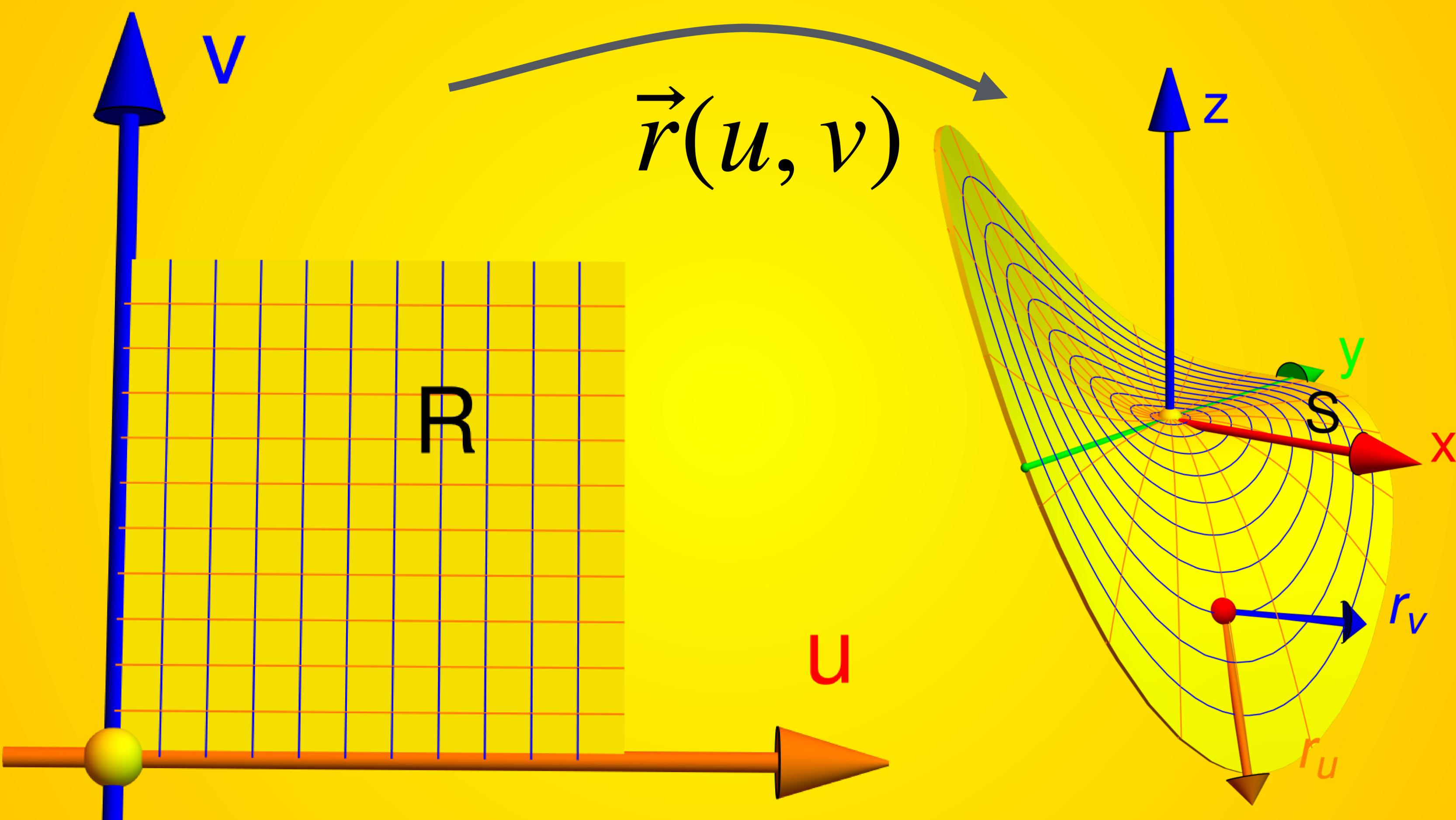
2) Planes Review

3) Graphs Review

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*Surfaces*

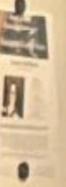
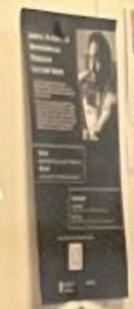


*are everywhere...)*



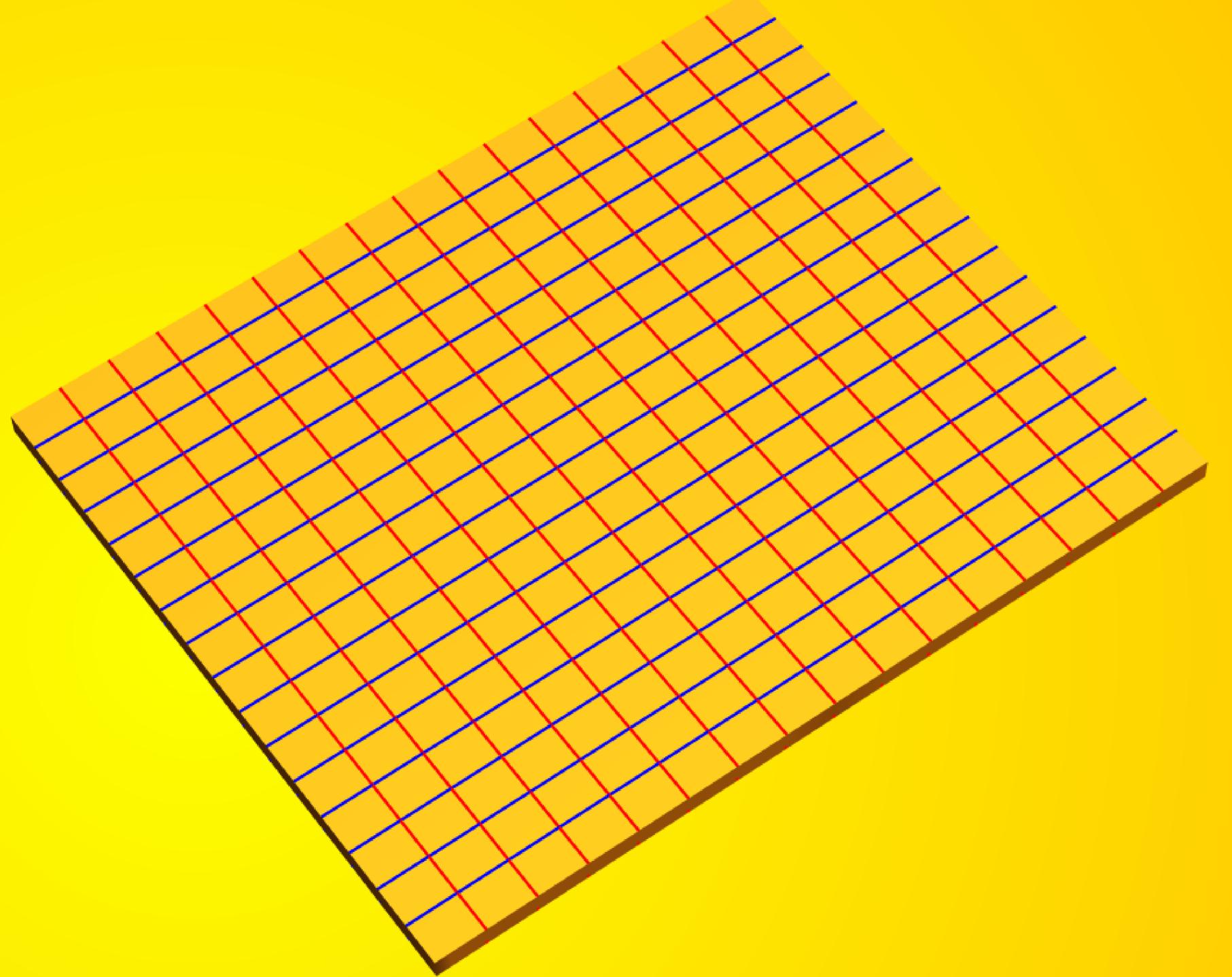
AUSTINE & CHILTON McDONNELL  
COMMON ROOM



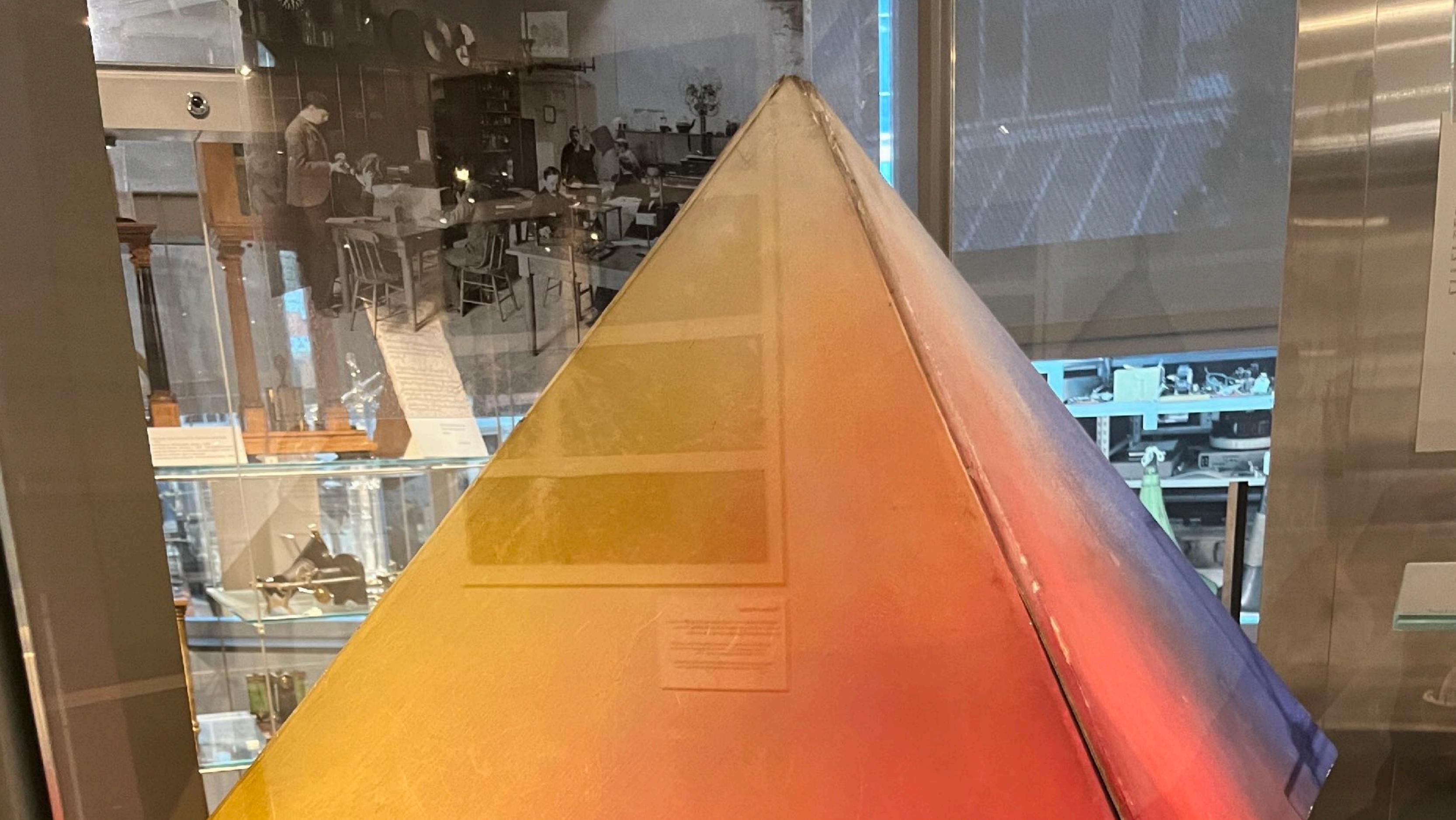


*Review: Four Classes*

Here,  
 $u, v$  are  
parameters.  
We often have  
taken  $s$  and  $t$ .



$$\vec{r}(u, v) = \langle 1 + u - v, 2 - v, 3 + 2u \rangle$$

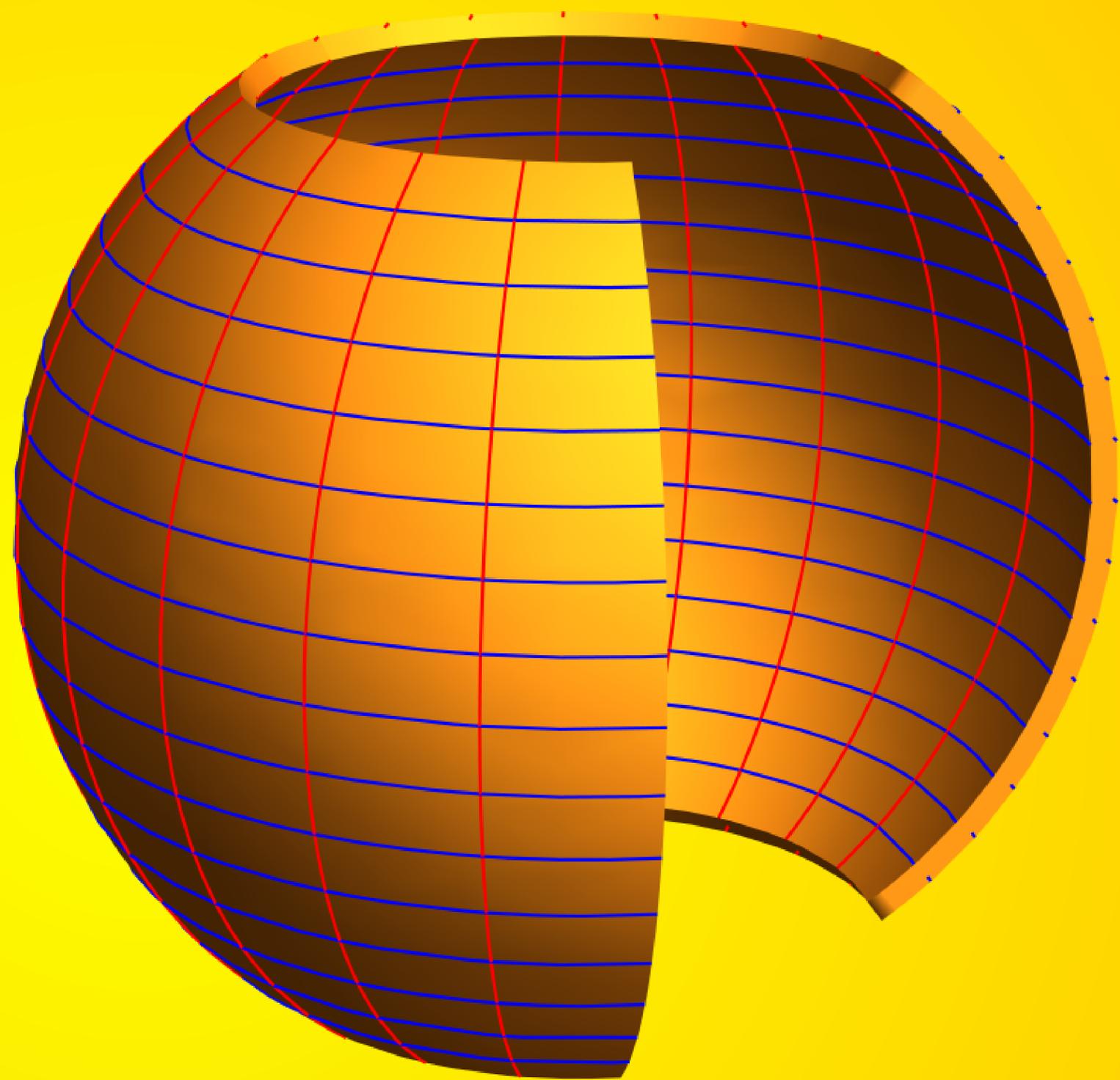


# Euler angles

$$u = \theta$$

$$v = \phi$$

$$r = \sin(\phi)$$



$$\vec{r}(u, v) = \langle \sin(v)\cos(u), \sin(v)\sin(u), \cos(v) \rangle$$



#### Politics in the Heavens

During the early modern period, astronomers decorated new constellations among the stars. Many "horror" or "grotesque" figures that the mapmaker wanted to impress. This English globe was made for King Charles I and II.

Collected from John Smith, before 1660, with addition by Benjamin Martin, London, 1712.  
Engraving on Benjamin Massé, The Young Geographer & Lany's History (London, 1717).



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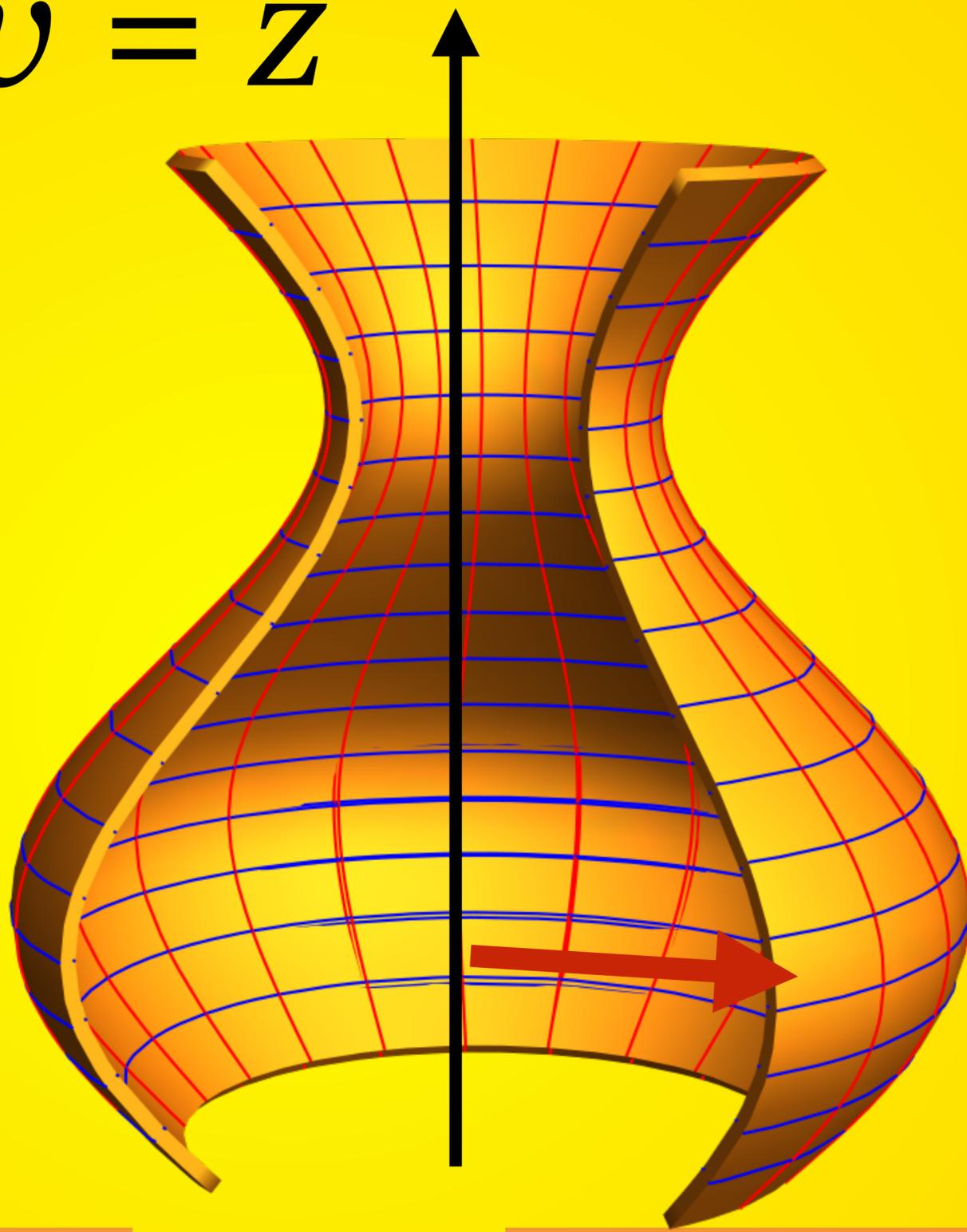
The H  
demon  
would

1. G  
2. P  
3. L  
4. T  
5. O  
6. P

$$v = z$$

$$u = \theta$$

rotation angle

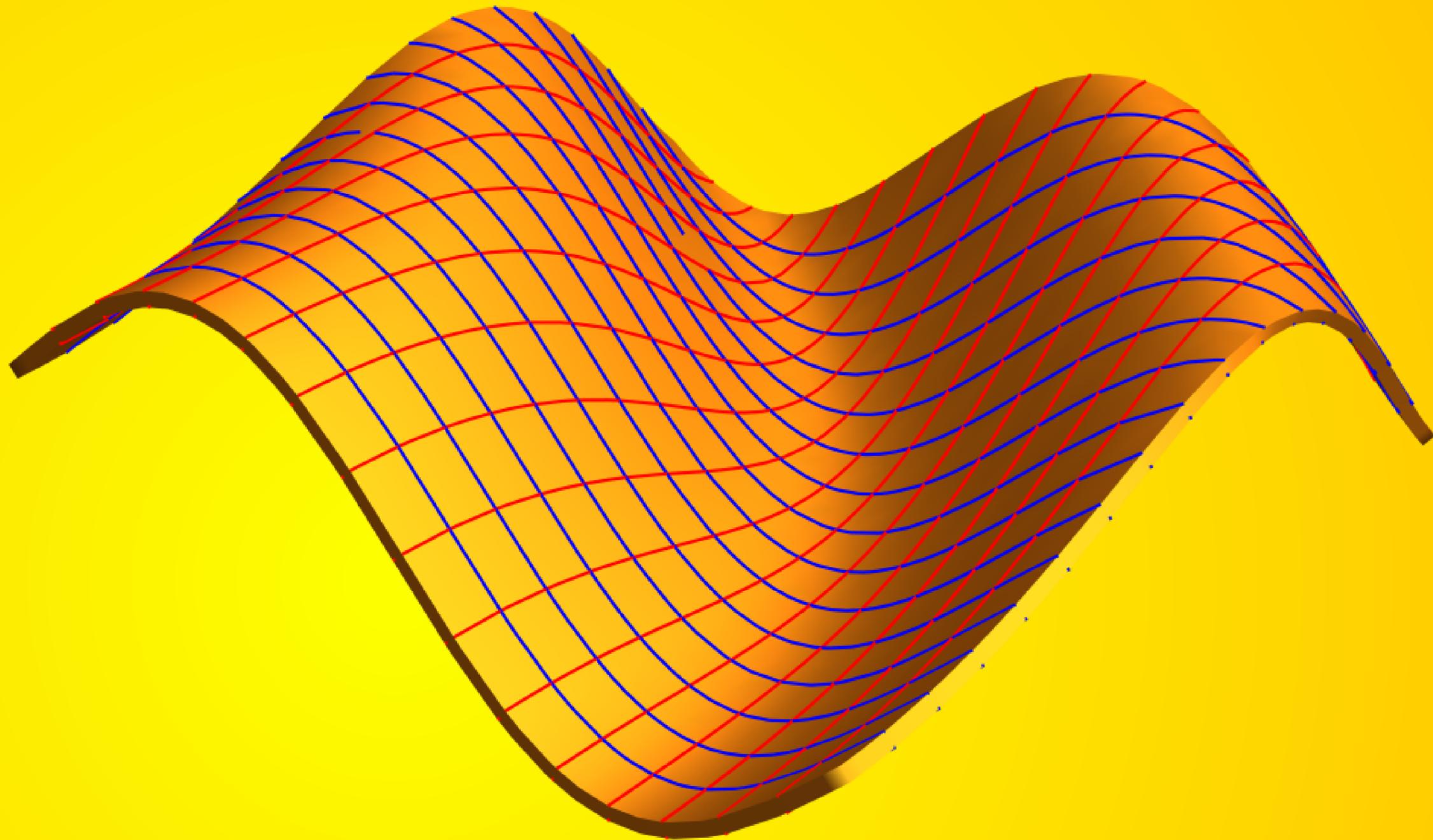


$$r(z)$$

$$\vec{r}(u, v) = \langle (2 + \sin(v))\cos(u), (2 + \sin(v))\sin(u), v \rangle$$



We often also  
take just  $x, y$  as  
parameters  
instead of  $u, v$



$$\vec{r}(u, v) = \langle u, v, \sin(u + v^2) \rangle$$



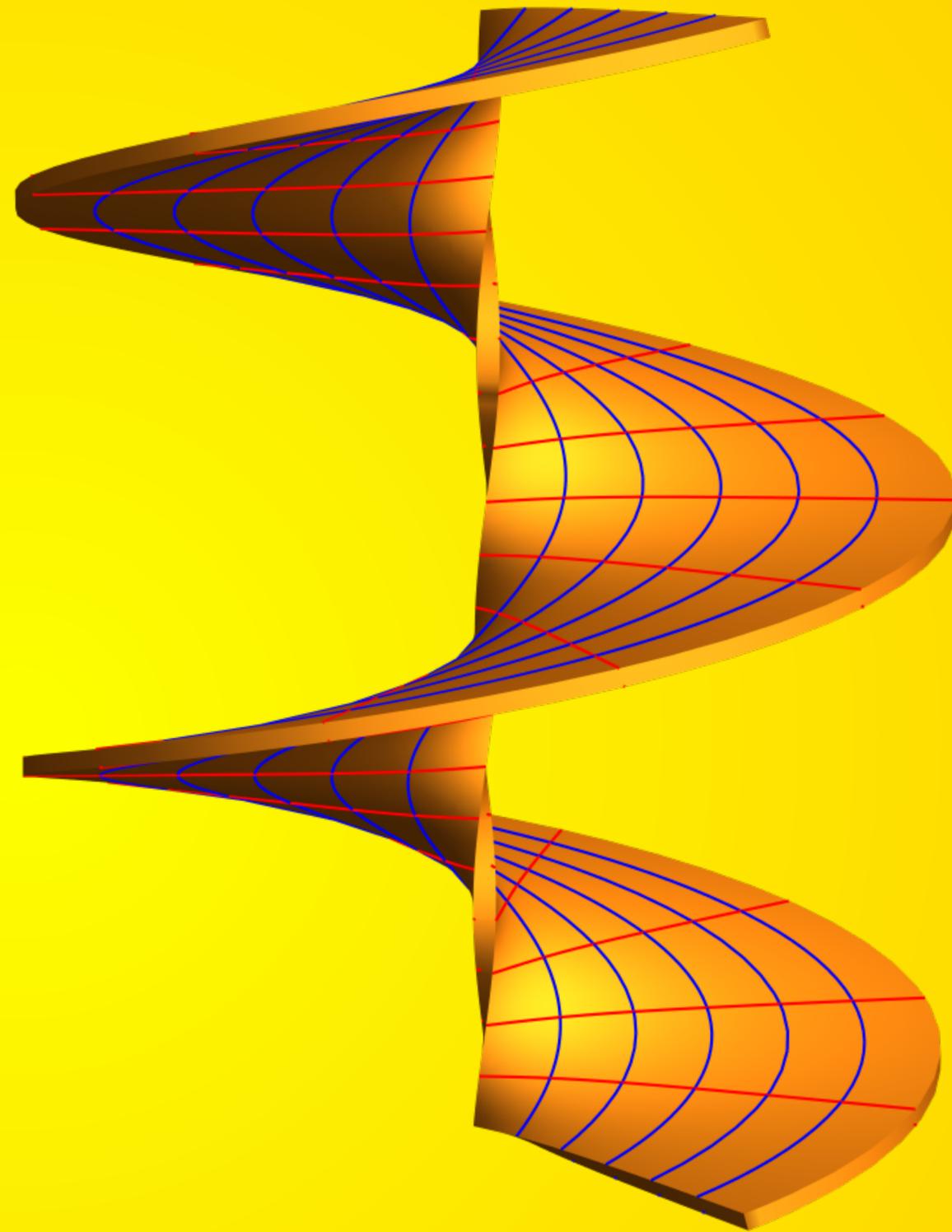
### **Théodore Olivier Models**

Circa 1856

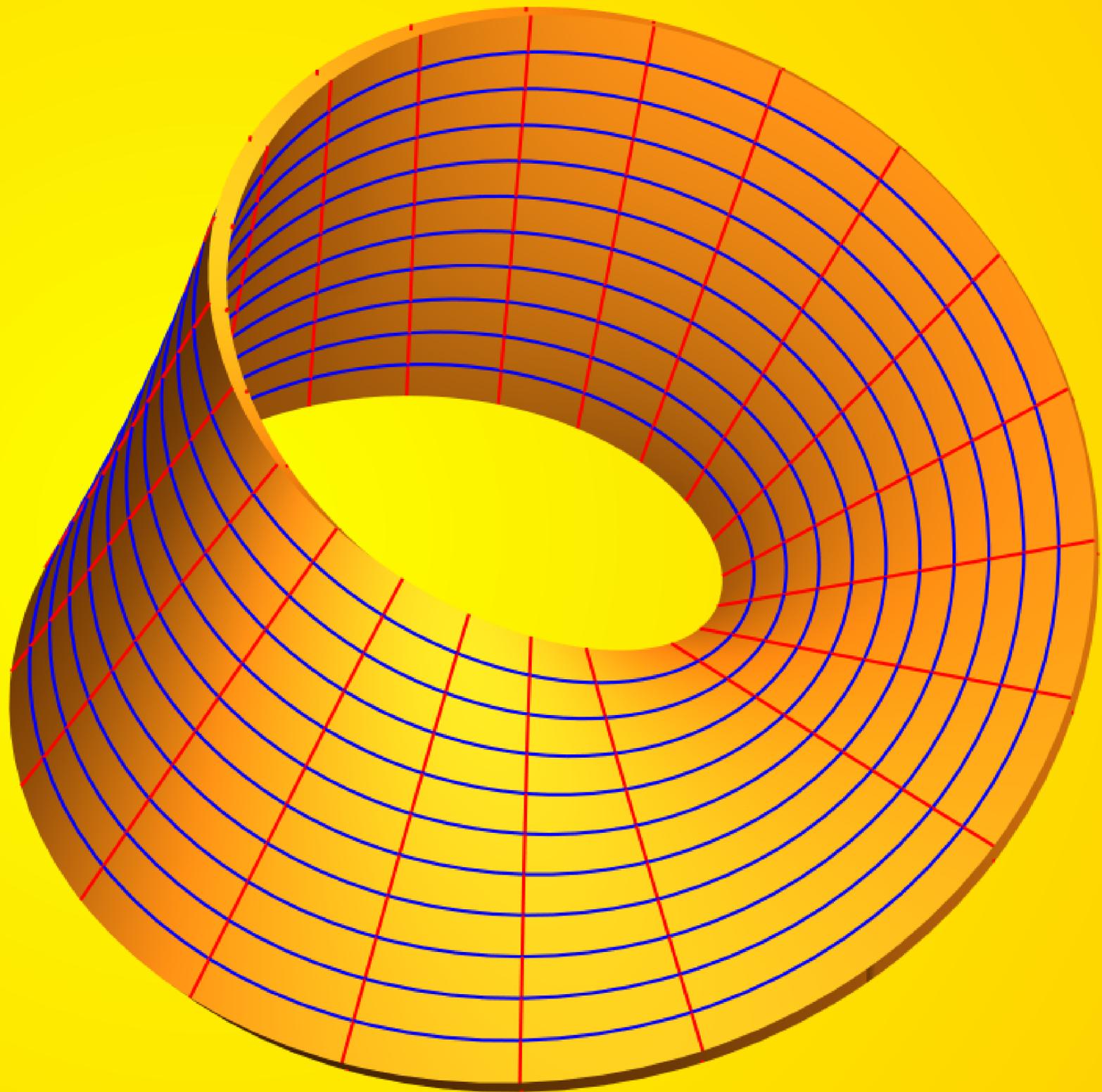
The fine strings of these figures depict the surfaces and intersections of shapes that were important to the new discipline of Descriptive Geometry. Théodore Olivier and other proponents of Descriptive Geometry wanted to develop

*More Examples*

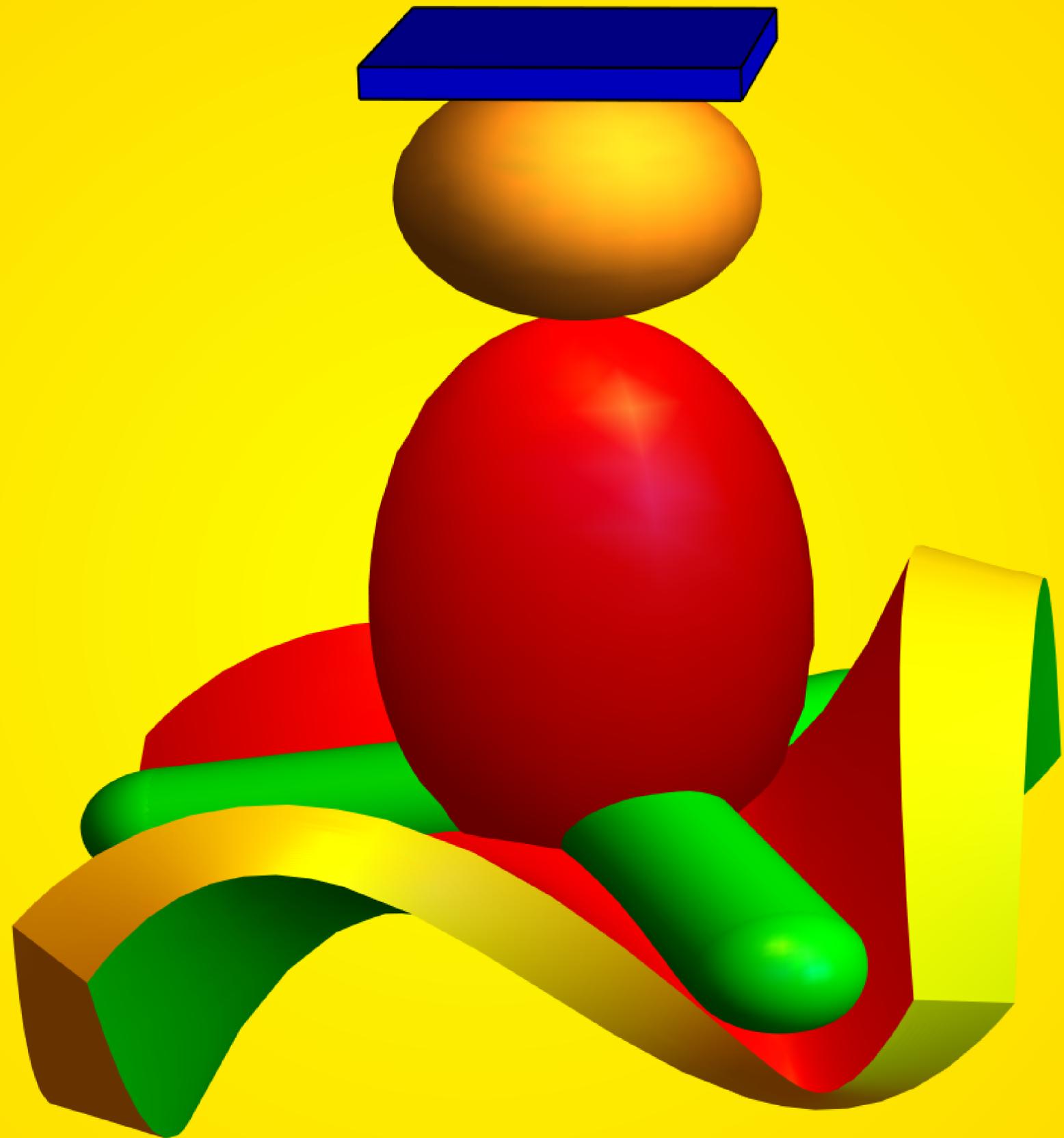
Look at grid curves! For  $s=1$ , we see a helix  $r(t,1)$   
 $\langle s \cos(t), s \sin(t), s \rangle$   
would be a cone.

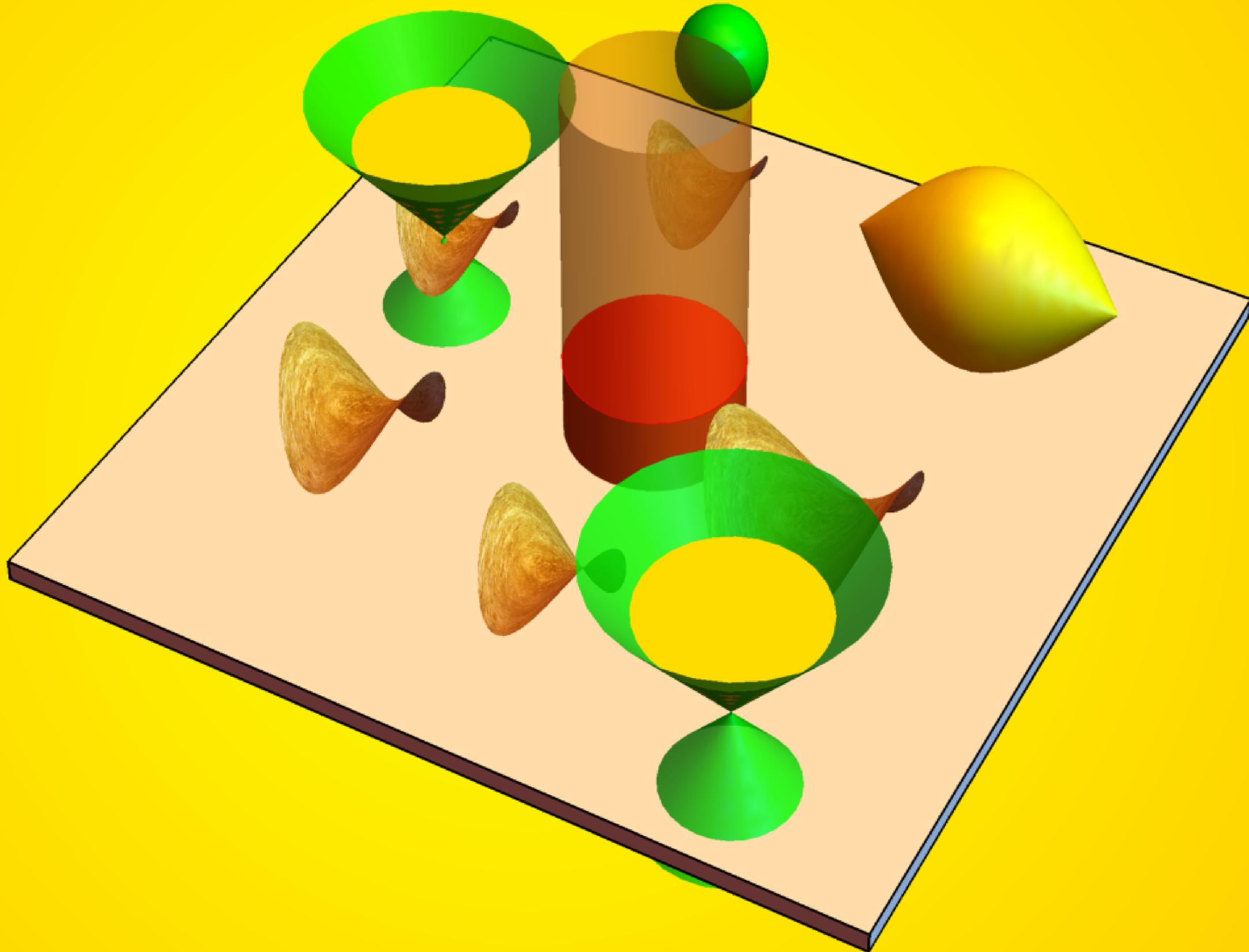


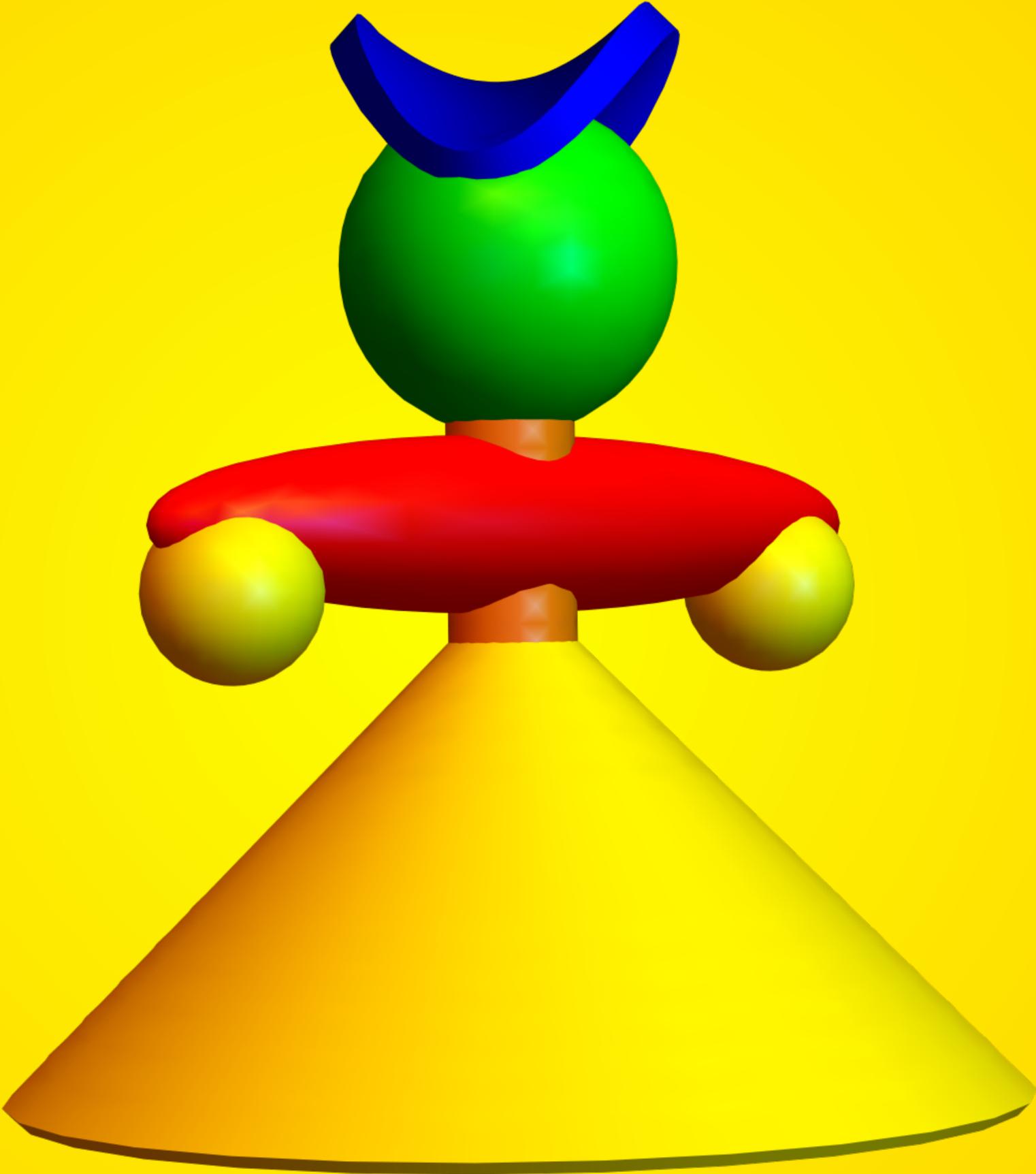
$$\vec{r}(\theta, z) = \langle s \cos(t), s \sin(t), t \rangle$$



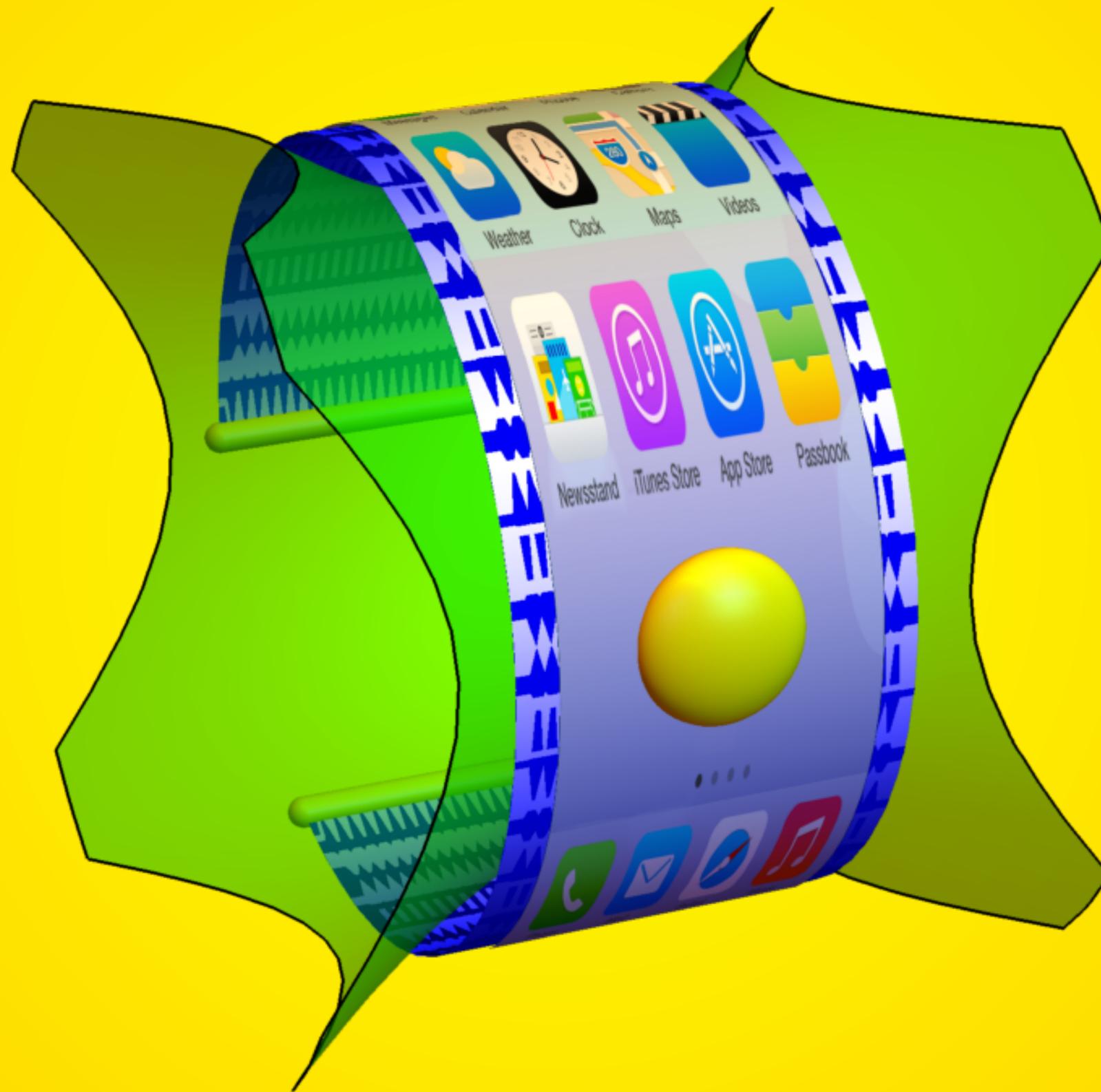
*Building worlds*











*THE END*