

MAE 2250

About the course



Educational Objectives

- Get comfortable with advanced CAD tools
 - Parts & Assemblies
 - Drawings
 - Animation
 - Photorealistic Rendering
- Practice using CAD in context of a design
- Experience design tradeoffs

Requirements

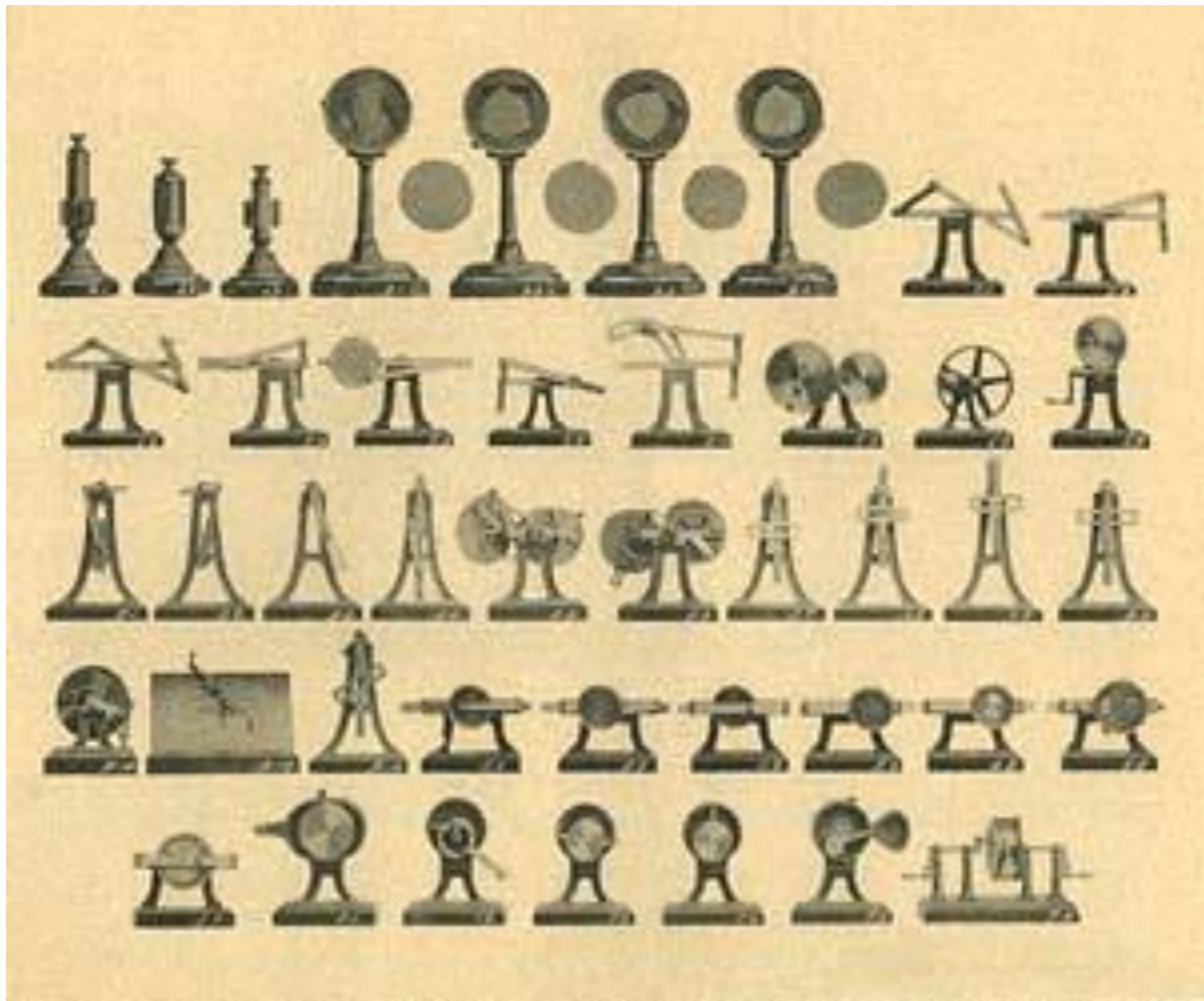
- Choose model from the Rouleaux collection
- Understand its structure and kinematics
- Create animated CAD model with similar form and kinematic behavior

Have you used a CAD before

- **A: Yes**
- **B: Never**

- **E: Whatever**









The Cornell
BILLYEUX
COLLECTION of
MECHANISMS

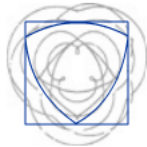


CHARLES PEIRCE

FATHER OF
DESIGN THEORY
OF MACHINES

Small text on a card or label, partially obscured and difficult to read.

32
52



KINEMATIC MODELS FOR DESIGN DIGITAL LIBRARY

an open access, multimedia resource for learning & teaching about kinematics and the history & theory of machines

Geometry of Pure Motion



search KMODDL

GO
Advanced Search | Help

KMODDL is a collection of mechanical models and related resources for teaching the principles of kinematics—the geometry of pure motion. The core of KMODDL is the Reuleaux Collection of Mechanisms and Machines, an important collection of 19th-century machine elements held by Cornell's Sibley School of Mechanical and Aerospace Engineering.

What is Kinematics?

Reuleaux Collection of Mechanisms at Cornell

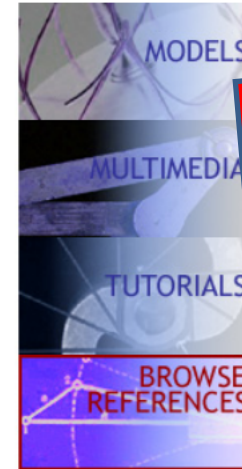
Clark Collection of Mechanical Movements, Museum of Science, Boston

Redtenbacher Collection of Mechanisms, University of Karlsruhe, Germany

Open Access E-Book Collection

NEW: Contribute to the KMODDL Collection at the Machines and Mechanisms Wiki.

Buy new paperback print editions of historical books in kinematics.



Browser window showing the KMODDL website. The address bar displays <http://kmoddl.library.cornell.edu/model.php?cat=C>. The page title is "KMODDL - Kinemat...".

The main content area displays a list of mechanisms under the "Reuleaux Collection, Cornell" category, specifically under "C. Simple Kinematic Chains". The list includes:

- C01 Four-bar Linkage
- C02 Slider Crank Mechanism
- C03 Spherical Four-bar Linkage
- C04 Slider Crank Mechanism with Higher Order Pair
- C05 Inversion of Slider-Crank Mechanism with Higher Pair Joints
- C06 Slider Crank Mechanism
- C07 Simple Spur Gear Mechanism
- C08 Simple Planet and Ring Gear Wheel Train
- C09 Endless Screw or Worm Drive Mechanism

Below the list, there are nine thumbnail images of mechanisms labeled C01 through C09. A red arrow points to the C03 thumbnail, and another red arrow points to the C05 text in the list.

The left sidebar shows a "hide browse tree" button and a list of categories:

- A. Lower Element Pairs
- B. Higher Element Pairs
- C. Simple Kinematic Chains
- D. Crank Mechanisms
- E. Eccentric Slider Cranks
- F. Crank Chamber Mechanisms
- G. Simple Gear Trains
- H. Model Support Pedestals
- I. Chamber Wheel Mechanisms
- K. Complex Slider Crank Mechanisms
- L. Positive Return Constant Breadth Cams
- M. Screw Mechanisms
- N. Ratchet Mechanisms
- O. Planetary Gear Trains
- P. Jointed Couplings
- Q. Gear Teeth Profiles
- R. Cycloid Rolling Models
- S. Straight-line Mechanisms
- T. Parallel Guide Mechanisms
- U. Rotating Arm Guide Mechanisms
- V. Belt Drive Mechanisms
- W. Friction Wheels
- X. Clock Escapements
- Y. Reversing and Shifting Belt and Gear Mechanisms

The bottom right corner shows a zoom level of 122%.



Search KMODDL

Models > Reuleaux > C Simple Kinematic Chains > C03

Model: C03 Spherical Four-bar Linkage.

image movie

This is a nonplanar mechanism. Imagine the four bar linkage on the surface of a sphere with all the rotary axes intersecting at the center of the sphere. In this model, (similar to C1), the linkage can be demounted and each of the four links can be fixed using the pedestal H2. In this way Reuleaux wanted the instructor to demonstrate four inversions of the linkage. The making of the four circular shaped links is a remarkable feat of 19th century machining. Reuleaux called this linkage a 'conic quadric crank chain'. He describes in his book Kinematics of Machinery, 24 variations of conic crank chains.

Francis Moon 2001-00-00

Reference :

Reuleaux, Kennedy : *Kinematics of Machinery* (p. 327, Art. 75., 1876)

Henderson, Taimina : *Experiencing Geometry* (ch. 21, 2005)

Resources :

CAD Model : [Reuleaux C.03 Spherical Four-Bar Linkage CAD Model](#)

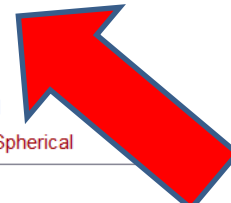
Movie : [Reuleaux C.03 Spherical Four-Bar Linkage CAD Movie](#)

Movie : [Reuleaux c3 swf](#)

Still Image : [Reuleaux C.03 Spherical Four-Bar Linkage CAD Picture](#)

Tutorials and Descriptions : [Four Different Positions \(Inversions\) of Model C01](#)

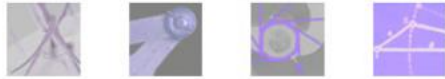
Tutorials and Descriptions : [Mathematics of Four Bar Linkages -- Planar and Spherical](#)



Full Metadata

- Reuleaux Collection, Cornell
 - A. Lower Element Pairs
 - B. Higher Element Pairs
 - C. Simple Kinematic Chains
 - C01 Four-bar Linkage
 - C02 Slider Crank Mechanism
 - C03 Spherical Four-bar Linkage.**
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Search KMODDL

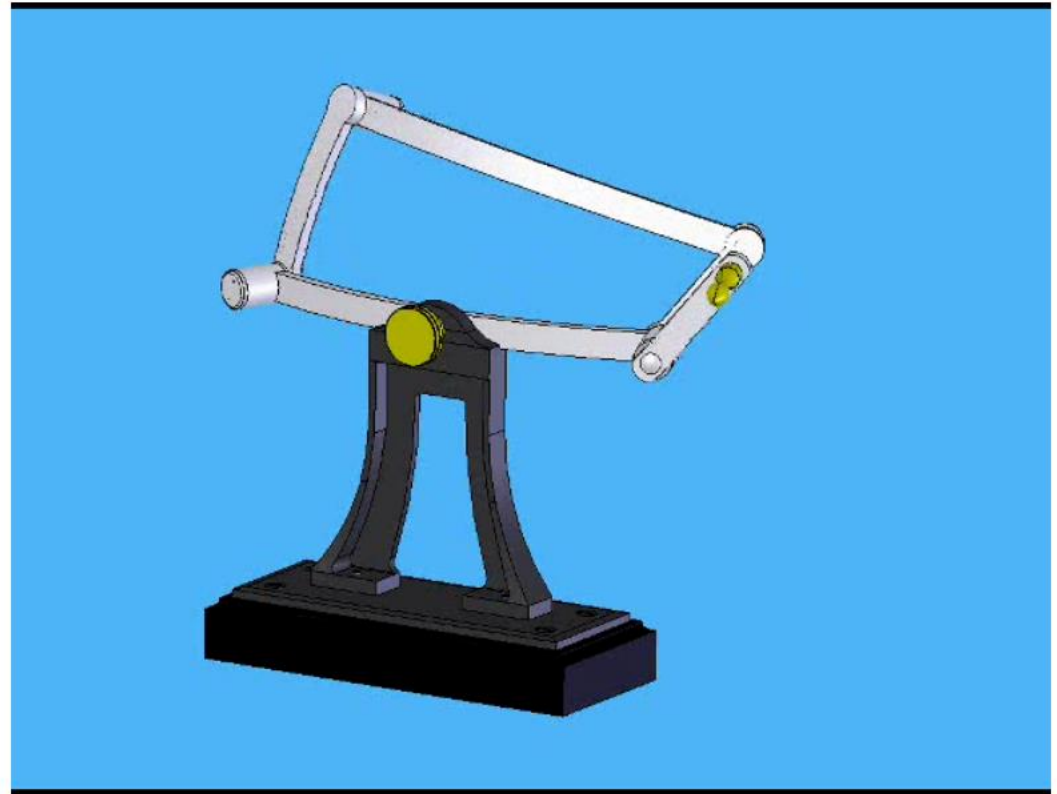
A CAD movie of C-03, Spherical Four-Bar Linkage. Modeled in Solidworks 2005-2006 by Neal Nisargand, Eliot Quon, Jane Leous, and Anna Liu. Edited by Pavel Popov. The model was obtained from the Reuleaux collection.

Models :

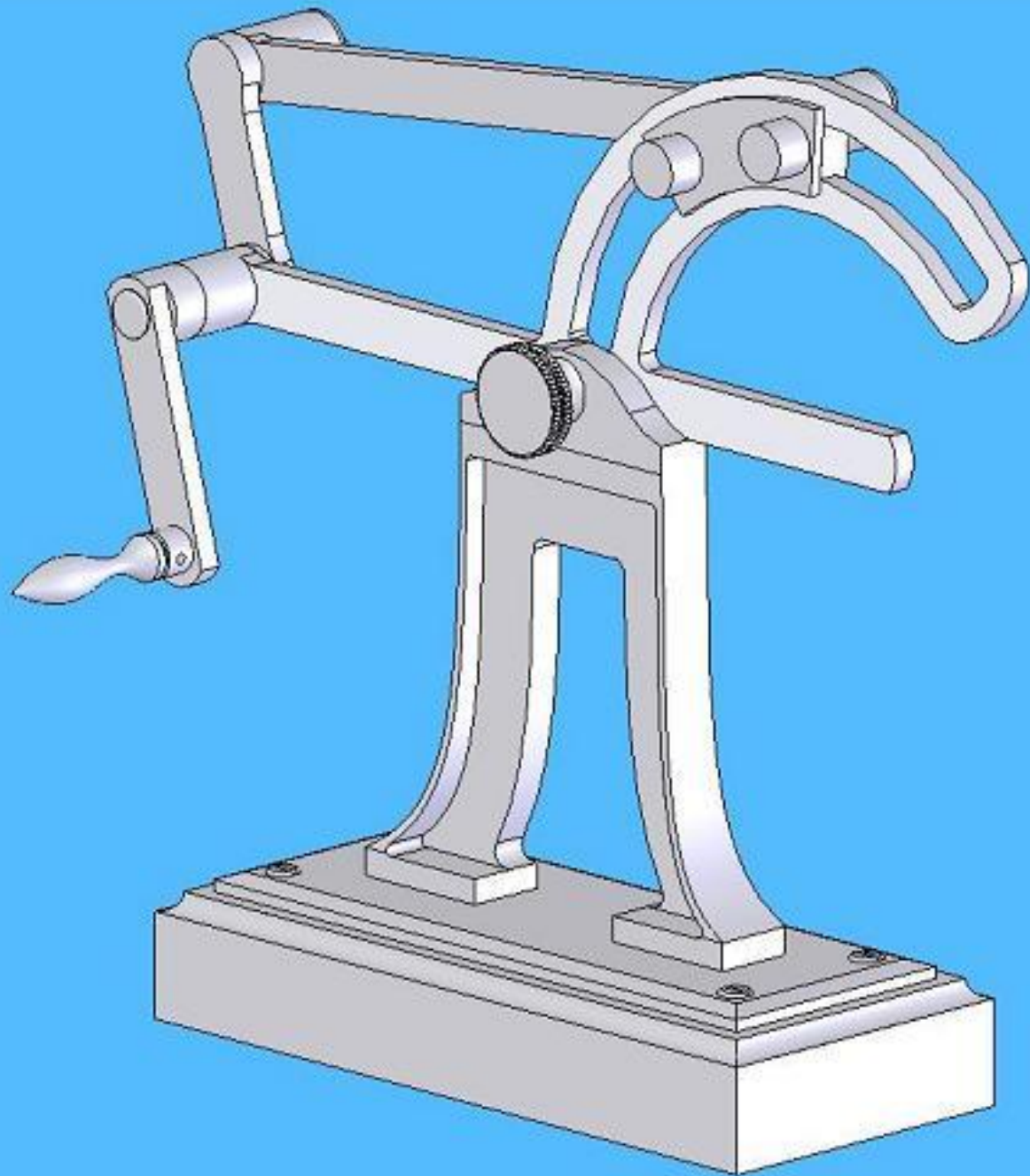
- Reuleaux : [Spherical Four-bar Linkage.](#)

Resources :

- CAD Model : [Reuleaux C.03 Spherical Four-Bar Linkage CAD Model](#)
- Still Image : [Reuleaux C.03 Spherical Four-Bar Linkage CAD Picture](#)











Cornell

<http://kmoddl.library.cornell.edu>



Cornell

<http://kmoddl.library.cornell.edu>

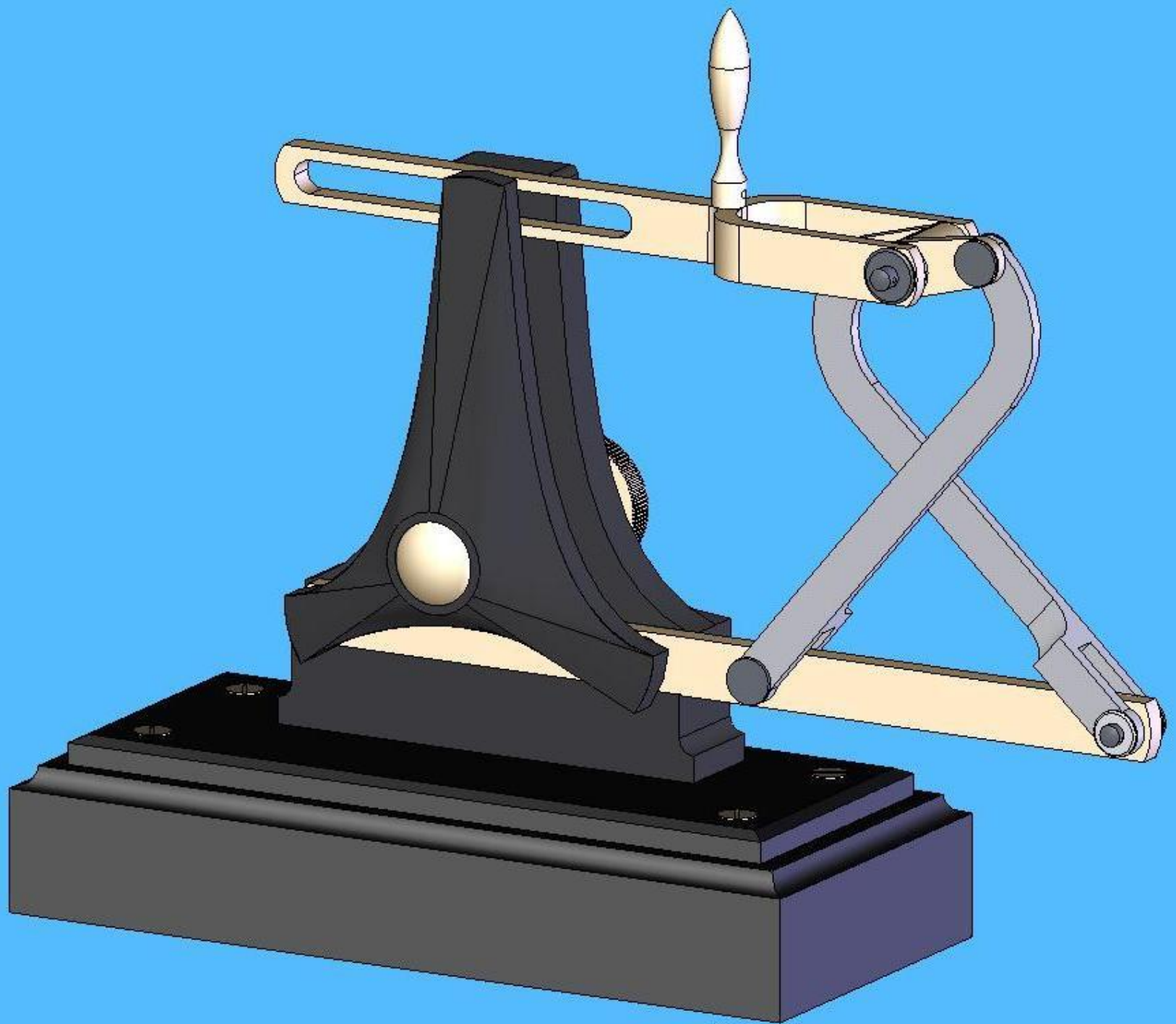




Cornell

<http://moddl.library.cornell.edu>



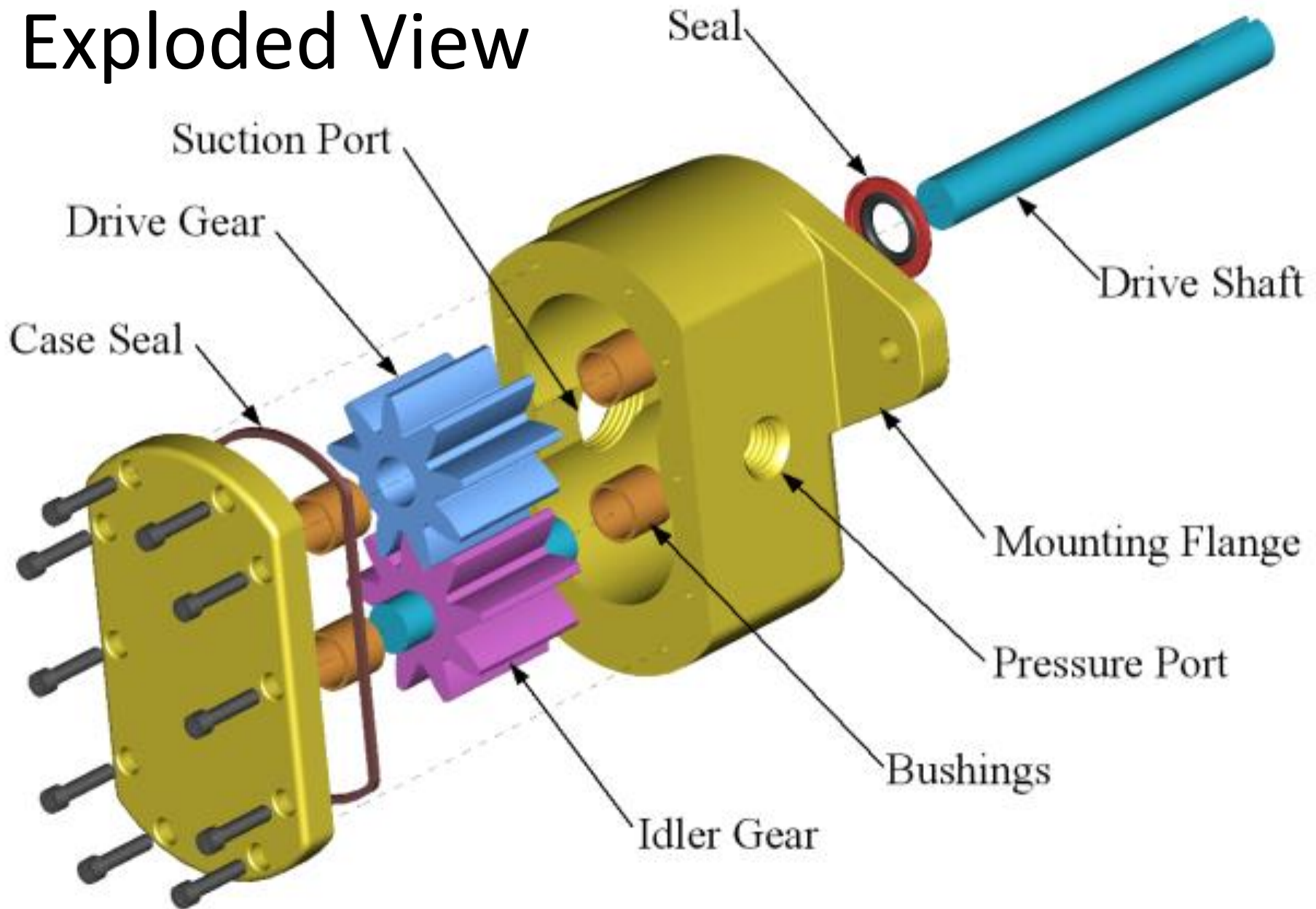


Deliverables

- Upload PDF with
 - Description & photo of original
 - Pictures of CAD assembly and exploded view
 - Dimensioned drawing of one part
 - Photorealistic rendering*
 - Frames from animation
 - Links to CAD model zip and movie file in Box

* Preferably, also image in context of usage

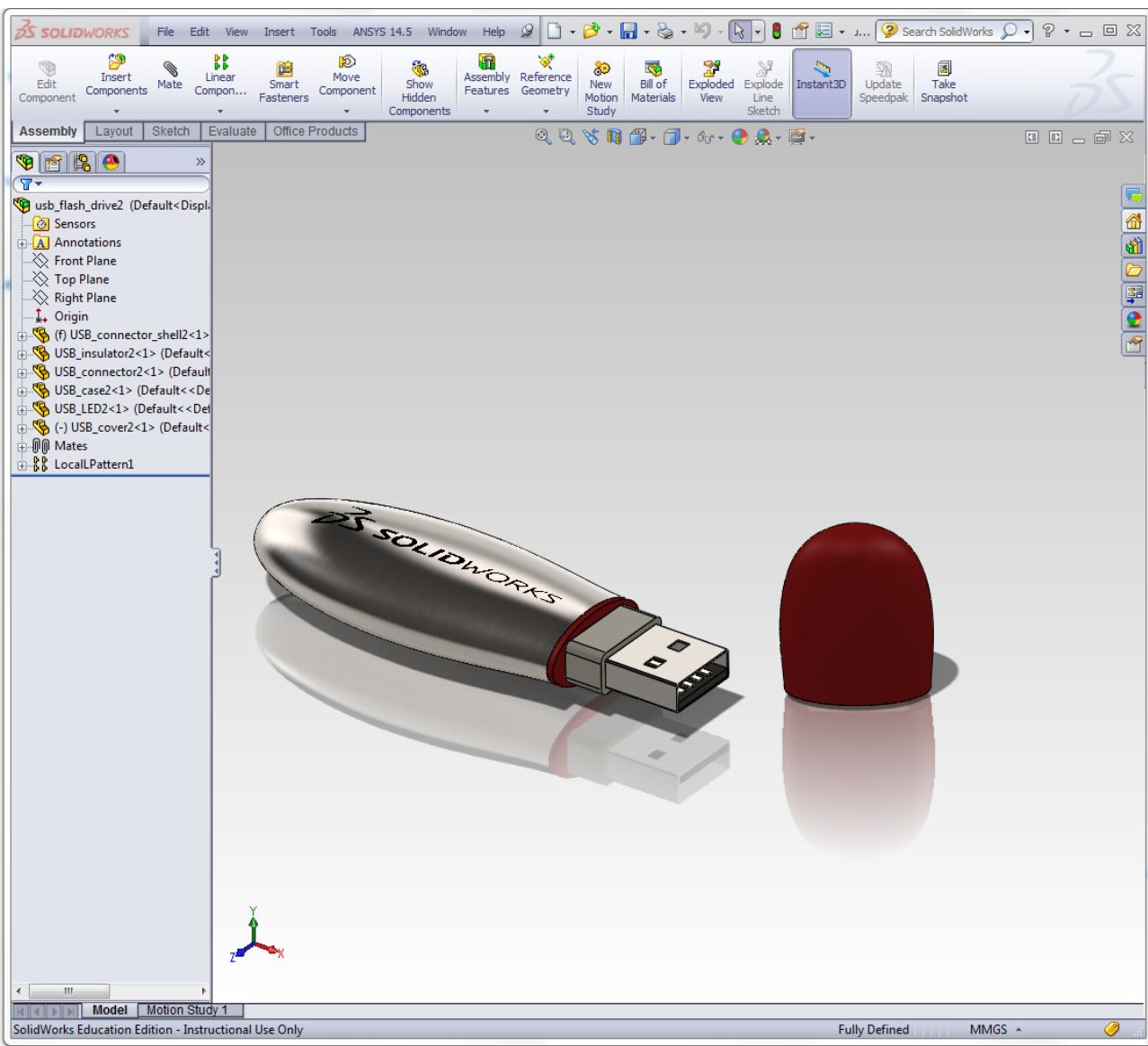
Exploded View











Opening the PhotoView 360 Preview Window

In this section, you use PhotoView 360 to preview your render. Previewing your render makes it easy to adjust cameras, scenes, lighting, and shadows before you create your final image.

1. [Click here](#) or browse to `<install_dir>\samples\tutorial\appearances\USB_flash_drive2.sldasm` to open the sample assembly.
 You can open an unfinished version of the assembly to practice working with appearances and decals. [Click here to learn how.](#)
2. To enable PhotoView 360, click **Tools > Add-Ins** and select **PhotoView 360**.
3. On the Render Tools tab in the CommandManager, click **Preview Window**.
 If a popup appears recommending perspective view, click **OK**.
 You can also preview renders in the SolidWorks graphics area by clicking **Integrated Preview** on the Render Tools tab.
4. Arrange or resize the Preview window so that you can see the graphics area.
 While it is open, the Preview window remains on top of the SolidWorks window.

What would you like to do?

- [Create a solid part.](#)
- [Create a 2D sketch.](#)
- [Create a sheet metal part.](#)

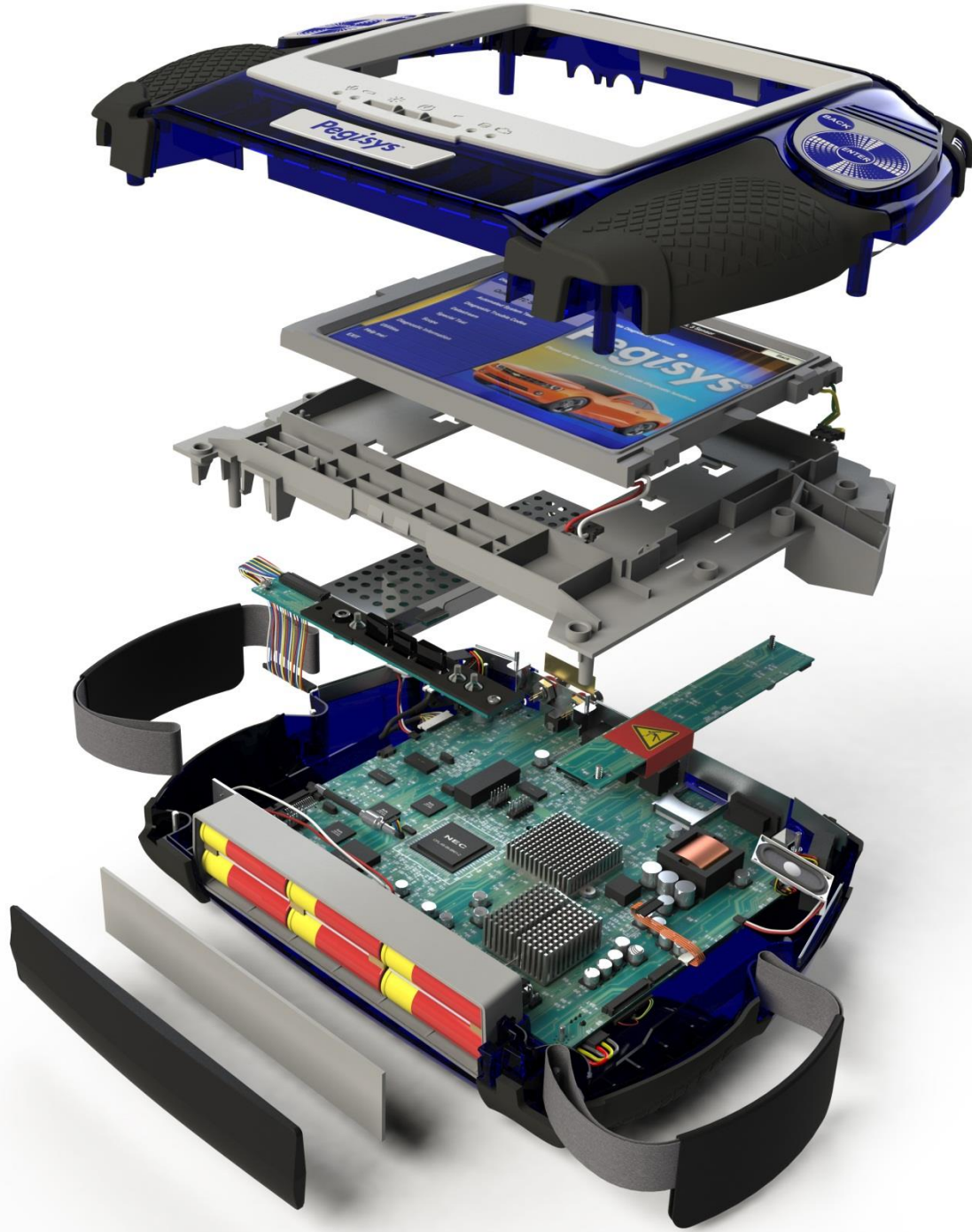
[How do I close this window?](#)

PREVIOUS TOPIC
PhotoView 360

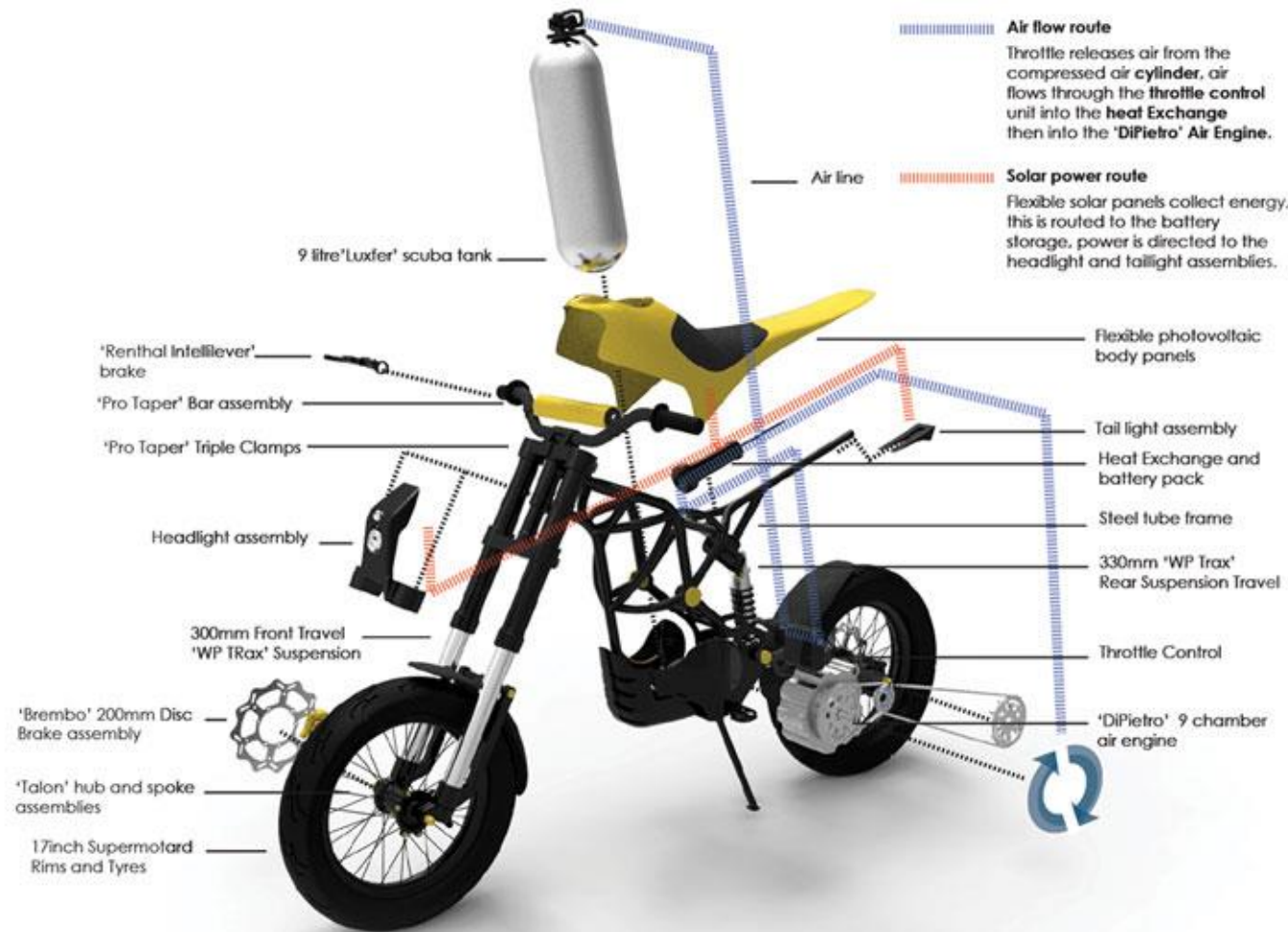
NEXT TOPIC
Working with Cameras







O₂ pursuit



Specs:

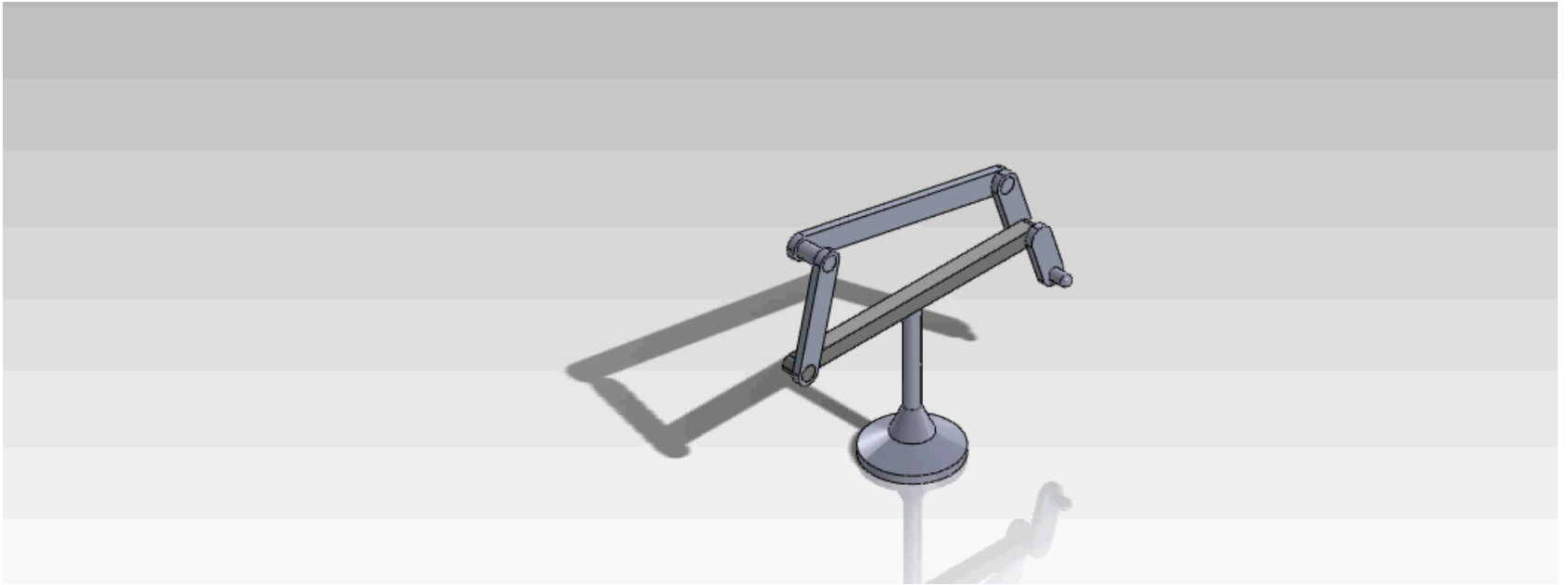
Weight: Less than 100kg
Performance: 3 hours approx riding time at 60kph

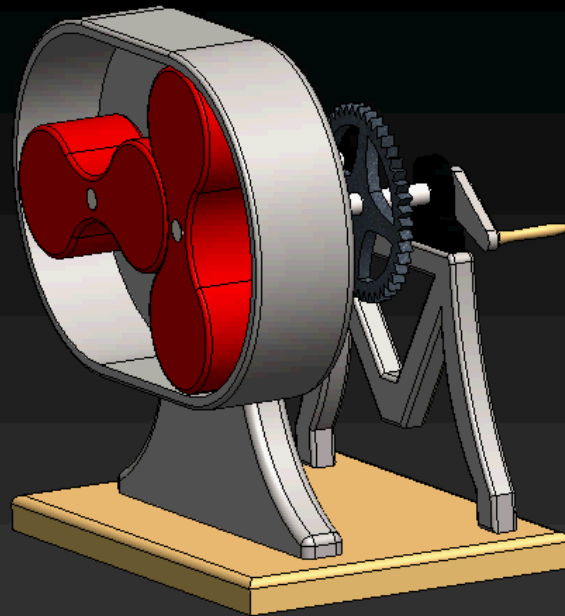
Engine: 'DiPietro' 9 chamber air engine
Weight: 10kg
Material: Aluminium
Developed: Melbourne

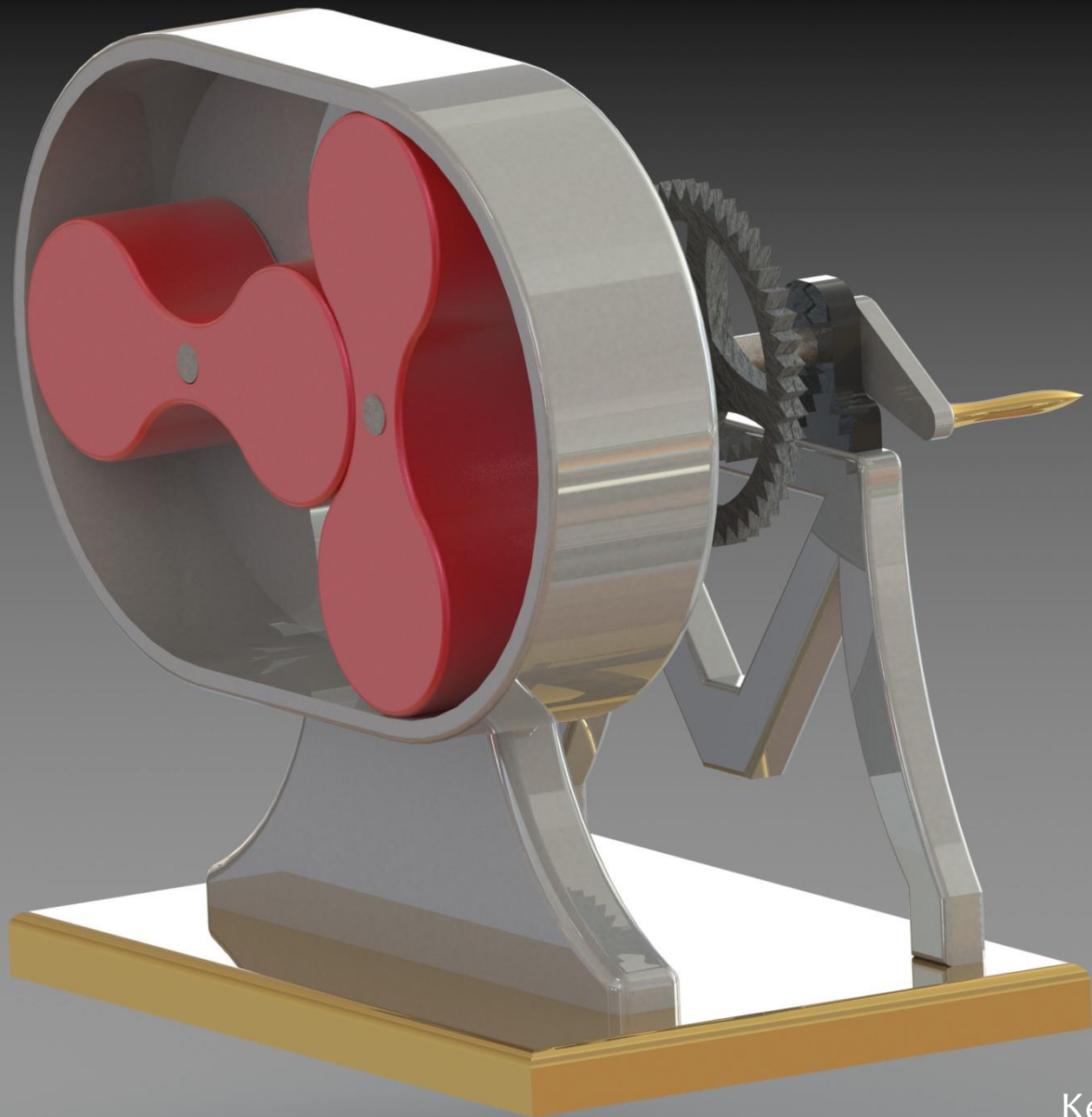
"Motor speed and torque are simply controlled by throttling the volume or pressure of air into the motor. The Di Pietro motor gives instant torque at zero RPM and can be precisely controlled to give soft start and acceleration control."

- Constant high torque
- Low number of moving parts
- Virtually no friction
- Smooth speed control characteristics
- No vibration
- 1 PSI overcomes engine friction



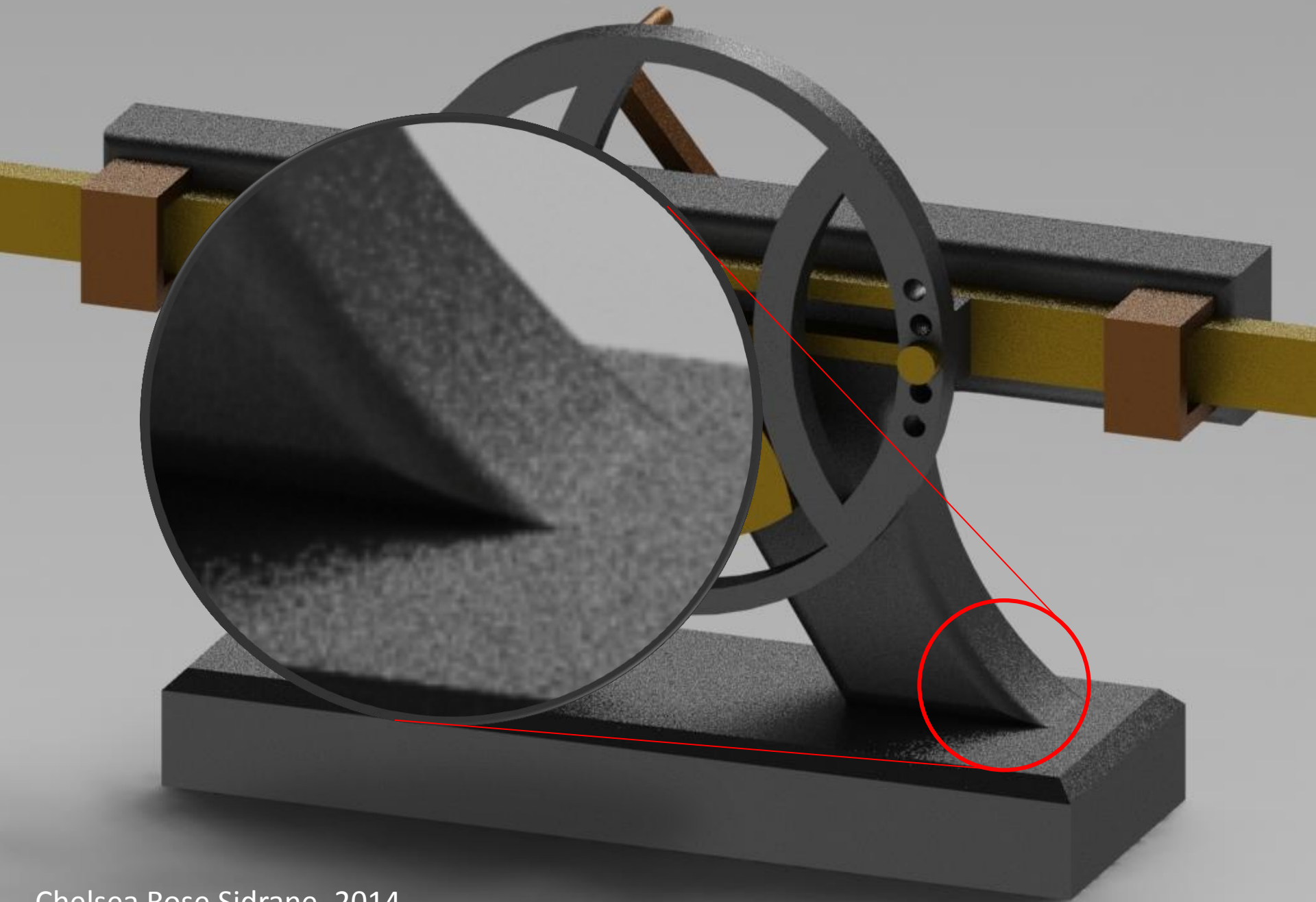






Kent Esslinger
Cornell University | Class of 2015





Chelsea Rose Sidrane, 2014

Lots of online Tips, Tricks & Traps

E.g. Threads, Revolutions, Face edits:



SolidWorker.com

MODELING A BOTTLE

Wed, Apr 23, 2008 [SolidWorker.com](#)



In today's video we draw a blow-molded style plastic bottle. We use a revolve to create the body of the bottle and shell it hollow. A thread is then swept along a helical path and finished with attractive filleting. A few other tricks and tips are explored along the way.

Download SolidWorks Part: [Bottle.SLDPRT](#)

<http://www.solidworker.com/21/modeling-a-bottle/>