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**The bicylinder or birdcage or móuhéfang gài. Combining a cultural approach with many other goals of mathematics education**

**Abstract**

As participants in this Summer University, we are convinced of the importance of the use of history in our mathematics courses and we want to introduce our students into some mathematical ‘culture’. This noble goal, however, has many competitors in the form of other important goals of mathematics education, and time is finite. We also want to (and have to) teach calculus methods and train the students’ algebraic skills. We want to show them that different methods can solve the same problem. We want to show the utility of mathematics in architecture, technology and even knitting. We want to stimulate the students’ spatial insight and their ability to make sketches of spatial situations. We want to show them the relationships between different parts of mathematics. We would like to make them critical of manipulation by the media or the internet.

In this workshop I will present an object that allows combining all these goals. It is a solid figure that challenges the spatial imagination. *“It takes an unusual gift of imagination to visualize this shape clearly.”* (S. Strogatz). The calculation of its volume and surface area is a good exercise in integral calculus, but other methods are also possible and have been used in history. It appears in technology when two tubes meet, and in the architecture of cross vaults. And last but not least, it has a very rich history, from Archimedes via Liú Huī and Zǔ Chōngzhī to C.P. Steinmetz and others. It even plays a role in a bit of ‘fake news’ on a French website. Several historical mathematicians have given it different names: bicylinder, móuhéfanggài, birdcage, equidomoid, Steinmetz’ solid...

We will discuss how the bicylinder can play an interesting role in mathematics courses for students between the ages of 15 and 18, in order to combine various goals and to make the mathematics courses more cultural and versatile without spending much extra time.

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