

# Kansas City Maker Faire Projects, 2011

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## Contents

<b>1</b>	<b>Kansas City Maker Faire STEM Society Projects</b>	<b>1</b>
1.1	The Ellipse Machine . . . . .	1
1.2	Inversive Geometry and the World Famous Straight Line Peaucellier-Lipkin Linkage. . . . .	2
1.3	The Penrose Tribar, Impossible Figures, Symmetry Groups, and Physics . . . . .	2
1.4	An Op Amp Circuit Increasing the the Small Thermocouple voltage From a Copper-Iron Thermocouple, Ways of Generating Electricity . . . . .	3
1.5	Creating Sculpture Using a Three-Dimensional Pantograph . .	3
1.6	Fibonacci Numbers, The Golden Rectangle, Drawing a Pentagon Using the Golden ratio, Phyllotaxis . . . . .	3
1.7	Mathematical Puzzles: Tribar, Pathagorean Theorem . . . . .	3

## 1 Kansas City Maker Faire STEM Society Projects

The Kansas City Maker Faire will be held at Union Station on the 25th and 26th of June, 2011.

### 1.1 The Ellipse Machine

An ellipse machine draws an ellipse using a rod that is connected to sliding blocks that are constrained to move in two perpendicular slots that are lo-

cated along the two axes of the ellipse. The end of the rod contains a pen or pencil that draws the ellipse. The distance  $b$  to the closest block is the minor axis of the ellipse. The distance  $a$  to the second block is the major axis of the ellipse. See

[www.stem2.org/je/ellipseengine.pdf](http://www.stem2.org/je/ellipseengine.pdf)

## **1.2 Inversive Geometry and the World Famous Straight Line Peaucellier-Lipkin Linkage.**

This version of the linkage is made from steel bars and pivot pins and is mounted on a board. See

[www.stem2.org/je/inversivegeometry.pdf](http://www.stem2.org/je/inversivegeometry.pdf)

## **1.3 The Penrose Tribar, Impossible Figures, Symmetry Groups, and Physics**

This figure has a three-fold rotational symmetry. A sketch and a painting show the tribar.

A full image of the Tribar will appear when one third of the figure is mounted on a rotating disk and the disk illuminated with a stroboscope. A rotating plastic bottle with strips of black plastic tape was meant to demonstrate the first primitive attempt to demonstrate a mechanical stroboscope before the age of electricity. This was a bit of a failure, so back to the drawing board.

Bob Williams suggested a simple commutator switch mounted on the rotating shaft driving LEDs This should work. Another idea is to use an old ignition coil, a distributor, and a timing light. We shall try this because it also demonstrates an interesting electrical circuit.

Eventually, we will create an adjustable stroboscope, perhaps using a 555 timer, and an FET connected to bright LEDs.

The tribar figure consists of three trapazoids, and two sets of three parallelograms. A puzzle problem consists of the task of assembling these nine wooden figures to build the tribar.

See

[www.stem2.org/je/tribar.pdf](http://www.stem2.org/je/tribar.pdf)

## **1.4 An Op Amp Circuit Increasing the the Small Thermocouple voltage From a Copper-Iron Thermocouple, Ways of Generating Electricity**

I showed the +15 volt, -15 volt, and +5 volt power supply I am using for this, as well as a proposed circuit diagram. This is part of a proposed display of ways of generating electricity.

## **1.5 Creating Sculpture Using a Three-Dimensional Pantograph**

See

[www.stem2.org/je/pantograph.pdf](http://www.stem2.org/je/pantograph.pdf)

## **1.6 Fibonacci Numbers, The Golden Rectangle, Drawing a Pentagon Using the Golden ratio, Phyllotaxis**

See

[www.stem2.org/je/fibonacci.pdf](http://www.stem2.org/je/fibonacci.pdf)

## **1.7 Mathematical Puzzles: Tribar, Pathagorean Theorem**

Children love to play with puzzles. And they like the Pathagorean Theorem puzzle. This consists of a set of four right triangle blocks and a rectangle block, and a frame with two empty regions. By filling the two regions with the blocks one proves the pathagorean Theorem. Children like the puzzle, but most probably don't fully understand it. An explanation of the Pathagorean Theorem puzzle is in the following document:

[www.stem2.org/je/zeus.pdf](http://www.stem2.org/je/zeus.pdf)