

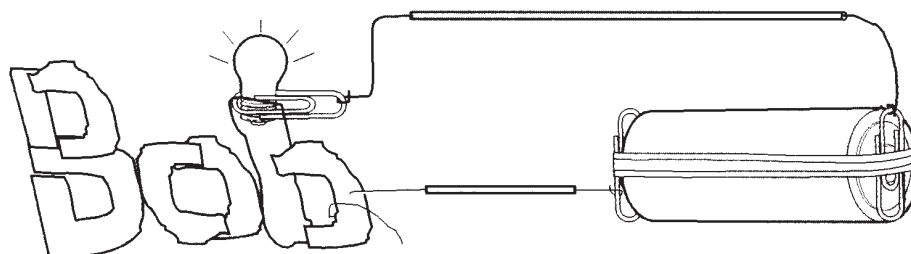
Table of Contents

Introduction—About the Book	3
Roller Derby—motion, momentum, and friction	6
Tallest Towers—strength of geometric shapes	10
Boats and Barges—buoyancy and water displacement	14
Whirlybirds—gravity, air resistance, and slipstreaming	18
Flying Circus—properties of flight	22
Gleaming Gliders—properties of flight	26
Bold Bridges—strength of geometric shapes	30
The Best Bubble Maker—properties of soap (detergent) film	34
Circuit Cities—electricity and circuits	38
Centripetal Spinners—centripetal force	42
Flying Saucers—principles of flight	46
Phone Fun—vibrations and sound travel	50
Amazing Mazes—testing animal intelligence	54
Dicey Numbers—probability	58
Meniscus Matches—surface tension of water	62
Roller Coasters—motion, momentum, and friction	66
Evaporation Derby—processes of evaporation	70
Pendulum Power—how pendulums work	74
Illuminating Illusions—retinal retention and spectrum of colors	78
Chutes Away—air resistance and air taking up space	82
Blast Off!—propulsion and trajectory	86
Kites Aflight—air pressure and principles of flight	90
Geometric Kites—air pressure and principles of flight	94
Crystal Gardens—properties of crystals	98
Super Siphons—how siphons work and the physics of water	102
Testing Towels—osmosis and capillary action	106
Wind Wheels—moving molecules and air resistance	110
Card Houses—balance and center of gravity	114
Super Sound-Off—how sound is created	118
Eye-Popping Emulsions—properties of emulsions	122
Rivers on a String—surface tension of water and gravity	126
Dirty Water—water filtration	130
Total Telegraphy—electricity and circuits	134
Vivaria for Life—habitat needs for living things	138
Conclusion—Contraption Carnival	142

Circuit Cities *(cont.)*

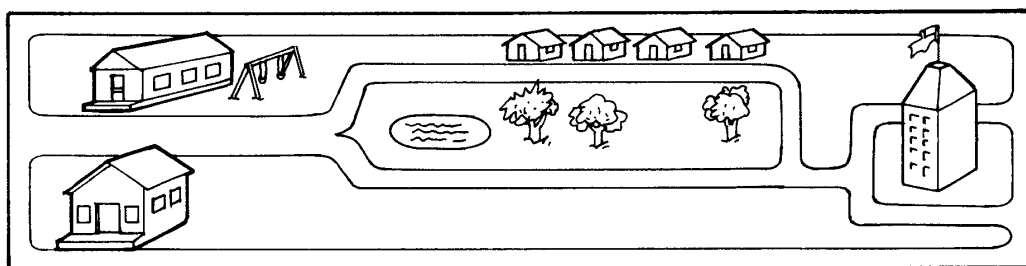
Your Name in Lights

1. Cut long strips of aluminum foil. Use the strips to spell your name in foil on a large sheet of construction paper or on a folder.
2. Bend the strips and arrange them so that each letter of your name is connected.
3. Carefully use clear tape along the edges of the foil to attach the strips to the paper or folder. Leave a strip of untaped foil along the center of every letter.
4. Connect one wire from the battery holder to the strips of foil. Place the bare end securely under and against the foil as shown in the illustration.
5. Connect the second wire from the battery to a large paper clip. Make sure the bare end of the wire is wrapped several times around the clip. Insert the bulb into the open end of the clip.
6. Hold the paper clip and bulb on the foil and trace the name. The bulb should remain lit as long as it travels over the foil which is not covered with tape.
7. Find two other arrangements using the socket, battery, and bulb that will keep the bulb lit.



Circuit Cities

1. Create an outline of a city street somewhat like the one illustrated below. Use your own town or make up a city arrangement of your own.
2. Cut long strips of foil and use them to make the road in your city. Carefully tape them down so that the center of the road is not covered with tape and leaves a clear trail for the bulb to follow.
3. Use the battery and bulb arrangement you used with your name or one of the others you discovered to follow the road along your city as you followed the name above.



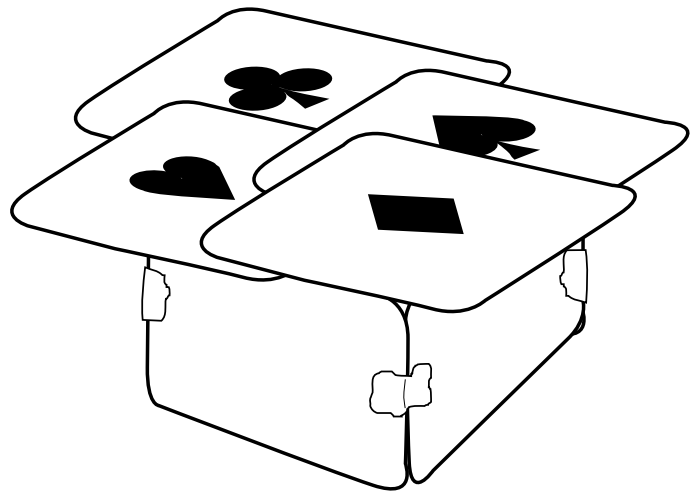
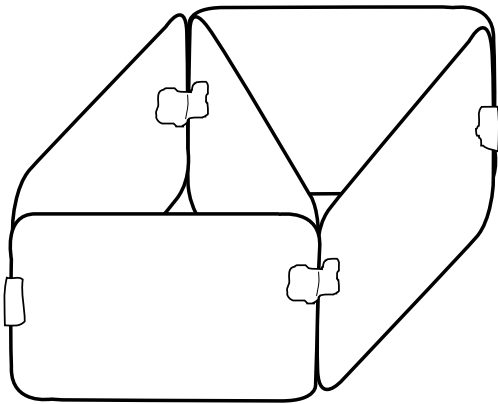
- Can you turn the paper clip/bulb holder into a model car using small pieces of paper and other materials?
4. Add a long road around the outside of your city.
 5. Create a more complicated city with detours, roadblocks, dead ends, and other complications.

Card Houses *(cont.)*

Three-Sided Structures

Build a three-sided house with the cards leaning against each other and two cards on the roof. Test this house and see if it falls easily.

- How does the shape seem to help this house remain stable?
- Rebuild the triangular house if it collapsed.
- Use two more cards to make another triangular house next to the original house. Use the bits of clay for reinforcement. Place cards on the roof. Test this house by blowing and shaking the desk.



Triangular Condominiums

Use the triangular house shape to build a series of connected card houses. Cover as much of the desk as you can. Use triangular figures that are interconnected but of different shapes and sizes. Cover the houses with cards. Reinforce the cards where needed.

Try not to have several houses leaning on just one card wall.

Test these structures.

- Will they stand under gentle shaking?
- How hard do you have to shake before they collapse?
- How could you reinforce the structure to make it sturdier?

Square Condos

Build a single card house with four walls and a two-card roof.

Reinforce the walls with bits of clay. Notice where the clay is most effective in supporting the wall.

- Does it work better at corners or in the middle of the card wall?