LESSON 15
LEVEL C
TOYS

TOBOR, THE BACKWARD ROBOT

WHAT YOU WILL LEARN:
exercising imagination to design robots for the future, including yet-to-be-invented materials.

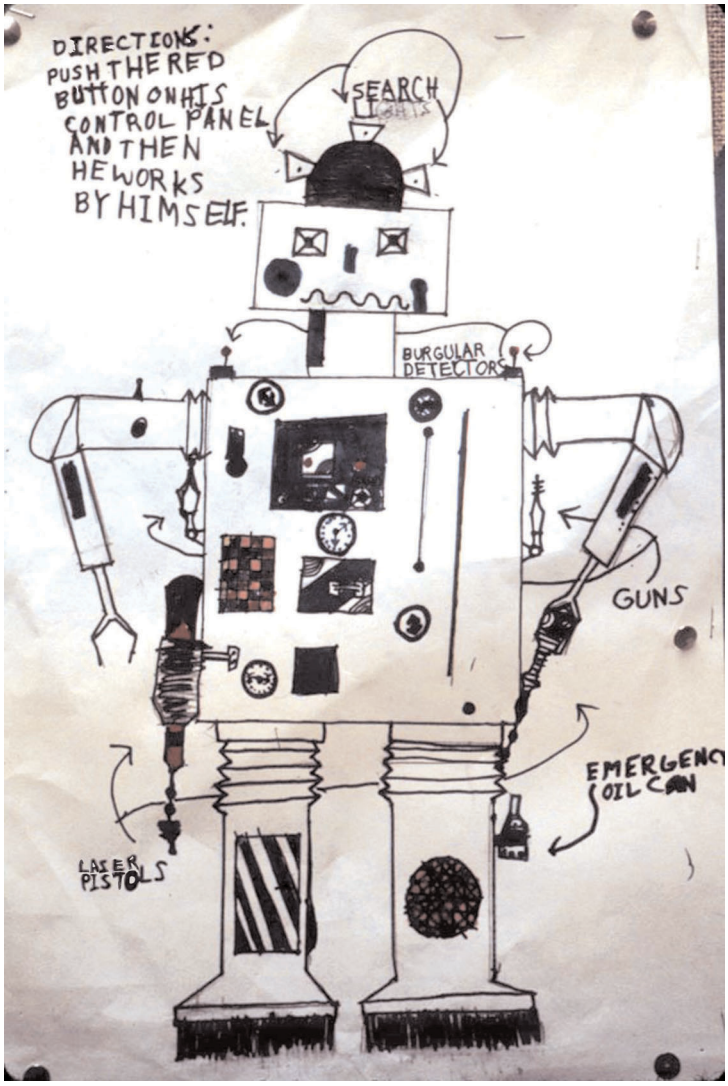
WHAT YOU WILL NEED:
pencils; art gum eraser; fine line pen; drawing paper; tracing paper; drafting aids (compass, straight edge, T-square, French curve, etc.); optional: a computer and design program.

TIPS: Study pictures of recent technical inventions. Look up subjects like robotics and automatons. Try:
http://robotikitsdirect.com/shop/history
Remember that many of our computer and other technological ideas were first thought of by inventors in their teens! (If you have the necessary software and know how to use it, you could do this whole lesson on your computer.) Once you have looked into the latest developments in robotics and other work-saving inventions, you are ready to start designing.

Robot from robotikitsdirect .com

GETTING STARTED: Rube Goldberg was a humorist who invented ridiculous contraptions to do everyday tasks such as swatting a fly or sharpening a pencil. His drawings became famous. To see them, go to the gallery at the Rube Goldberg official site: www.rubegoldberg.com
You may choose to be a serious designer and make a 'breakthrough' robotic design. You may create something totally new and different using your own imagination.
Or, you may decide to think up a whimsical invention, such as Tobor, the Backwards Robot. Tobor thinks and talks backwards. Therefore he may get into trouble. He may be the main character of a funny book or movie.
To get started, list some tiresome or repetitious jobs that you dislike doing.

Could a robot do the job? Brainstorm ideas with a friend or family member.



Gary Age 11

1. Use scratch paper to jot down thoughts. Make thumbnail sketches (small preliminary drawings) of several of your promising ideas. On scratch paper, sketch a machine that might be built to do a particular task. Remember, not all modern robots look like human beings or even the famous R2D2 from the movie *Star Wars.* Let your imagination run wild.

2. Now, refine your ideas. Consider the details of the task or tasks your robot will do. Have parts in your design that will take care of those details.

3. Think about the special materials that might be needed to make one of your best ideas work. The materials don't need to already exist. Again, use your imagination. For example, you may need a solid material that is lighter than air or one that stretches as thin as a balloon but won't 'pop'.

4. On larger paper, draw the appearance and dimensions of your robot. List other 'specs" (specifications) which a manufacturer might need to know, like the materials used, what makes it move, and the special features it has.

5. Make one or more tracings of your design on tracing paper, using a pencil and whatever drafting tools you have available. . .compass, straight edge, T-square, etc. If you do not have any special tools, draw free-hand. (Do not press the pencil so hard that it makes a dent in the paper. If you do, you will see the dents later, when you erase the pencil.)

6. Make your final drawing in ink. Start in the upper corner of the paper

opposite from the hand holding the pen. Work towards the bottom of the paper so the ink doesn't smear.

7. Let the ink dry very thoroughly. Unfortunately, almost everyone learns the hard way that erasing pencil from an inked drawing that isn't *quite* dry smears and ruins all the careful work you did. Go do something else for a half hour if you use ball point pen or for an hour if you use a felt tip. Then come back and lightly erase your pencil lines.

6. Label each part of your robot in your neatest printing. Add a brief description for operation, if necessary.

7. At the bottom, or on a separate piece of paper, write: a) the purpose your robot will serve; b) some directions for its manufacture, assembly, and maintenance, and c) possible problems or failures for which it may need further programming.

CLEAN UP: File your other ideas and sketches for another invention session. You may want to draw another robot. Return all equipment and tools to storage. (Or did you design a robot to put your things away for you?)

TALK ABOUT IT: Which was the most challenging for you? the research? coming up with ideas? designing? computer operation? writing label and directions? problem management? Could your design possibly be constructed, if you had the right materials and equipment? How clear are your design and descriptions. . .could a manufacturer use them? Maybe you're on your way to fame and fortune!

CONNECTIONS:

1. Find out about the expanding field of robotics by consulting books, magazines, video, TV and film, and the web. Note the increasing use of robotics in industry, engineering, medicine and elsewhere.

2. Some schools sponsor robotics competitions. Does yours? Sign up!

3. Write a creative story about an adventure involving your Tobor. Could he get into funny situations because of his backwards thinking?

4. Listen to some electronic music and imagine what a "robotic orchestra" would be like.