

GAME REVIEW

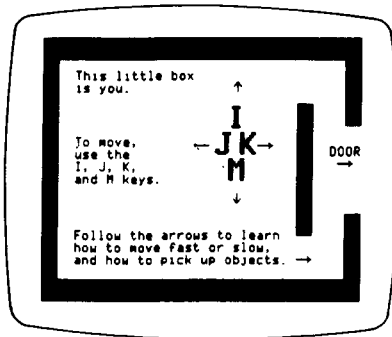
COMPUTER LEARNING GAMES by Anne Piestrup, The Learning Company, 4370 Alpine Road, Portola Valley, California 94025. Copyright 1982. \$40.00-\$75.00.

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It's easy to think of simulation games on boards, cards, or as sets of instructions in a book. More difficult to think of are the simulations on computer. There I often think of the big main frame *Dungeons and Dragons* or the new microcomputer games and simulations, *Lemonade Stand* and *Adventure*. Certainly these games are popular, as indicated by reviews and by how well they sell. But can any of the games on microcomputer really carry out the complex learning that we expect of good games? Must the simulations on microcomputers be considered pale imitations of more sophisticated main frame programs? Until now I had thought so—before I had a chance to work with two games that made the microcomputer an asset rather than a liability. Both programs use the full features of a microcomputer—color, sound, and movement with a joy stick. Each of these features is used for a reason and not just as bells and whistles attached for “more show than go.” One of the programs is so fascinating that as I wrote this review I found myself returning time after time to try new variations and even make up some of my own plays of the game. Surprisingly, you can make some of your own simulations with these programs—simulations that can be a challenge for others to solve.

Gertrude's Puzzles and *Rocky's Boots* seem unlikely names for games and simulations that may change the way microcomputer games and simulations are constructed and used. In addition to solid learning concepts, the skill and processes taught are those most usable in science, math, technology, and even philosophy. Even more, these games utilize reasoning and skills plus left and right brain functioning. Finally, these games are just plain fun. That seems like a lot for programs on a plain, ordinary, garden-variety Apple microcomputer, but you'll soon see.



Start here if you have never used this program before. You will learn how to move around, and how to pick up and drop objects.

When the program begins, this is what you will see.

Press the ESC key to leave the program at any time.

Figure 1: How To Move

Let's start out with the game *Gertrude's Puzzles*. Appropriate for students ages six and up, *Gertrude's Puzzles* illustrate the way in which new games may encourage students to use many coordinated skills. The game starts with a few simple instructions on the screen enclosed in a frame called a "room." The room has doors in one or more places and a box that can be moved about using keys on the keyboard or paddles or a joy stick. As the box is moved through a door a new room appears, along with new instructions or puzzles. The rooms are all connected in a real map (not like so many adventure games in which the rooms are not even logically connected). If you wish, you can draw a map and use such a drawing to assist in your future moves. A complete map is included in the centerfold of the manual provided with the puzzles, but as parents and/or teachers you may wish to use the construction of a map as an exercise as you or others discover the rooms.

The first frame provides instructions on how to move to other rooms. As you proceed through the rooms you learn how to pick up, carry, and put down objects. After you have mastered moving about the rooms using the keyboard, paddles, or joy stick you are ready for the puzzles. First, however, you must pick up a "key" and place it in a "lock," and when you are successful a door opens and you are ready to move through the 21 rooms that comprise *Gertrude's Puzzles*.

Three kinds of puzzles await you—box puzzles, loop puzzles, and network puzzles. The process for setting up the puzzles is the same for all. You pick up Gertrude (by now recognized as a swan or duck), take her to a puzzle room with the loops, boxes, or networks and let her go. For an

instant, disconcertingly, she flies off only to reappear with a set of puzzle pieces in tow. The pieces may be any of four colors—blue, pink, green, and orange—and four shapes—triangles, hexagons, squares, and diamonds. Not all of the colors or shapes will be used in every puzzle, but in at least one all will!

As an example, in one of two loop puzzle rooms there are two overlapping loops that make up a venn diagram. Your task, as you discover (or for the less adventurous as you read in the “How to play room”), is to find which pieces belong in which parts of the loop. In other words, to find the rules that govern the placement of the objects. As you pick up and place each object in a location in one of the loops, it will either stay or fall to the bottom of the room, depending on whether it has been placed correctly. These puzzles can be solved by trial and error, but a good strategy works best. For example, if you deduce that the blue objects belong in the left hand loop and the squares belong in the right hand loop, then the overlap must contain only those objects that are blue and square. As soon as all objects are in the right place, the walls of the room flash and Gertrude flies in with a treasure. As you continue plays of the game or finish new games, Gertrude stores the treasures for you in the Treasure Room.

Other puzzles also deal with rules that govern the relationship between the shape and color of objects. Even if you decide to play the same game again and again, the rules have been set at random, and you may find that you need orange diamonds or other combinations in the intersection of the two loops. With this example of perhaps the simplest puzzle, lets look at some of the deeper learning going on.

One of the most important concepts in science and mathematics is understanding the relationships of properties of objects. Games and simulations exist to teach these important concepts, but learners have little way of knowing if a rule arrived at is correct unless the rule maker informs them of their success. The knowledge of success comes in two forms with this set of puzzles: First, the pieces stay where they belong or fall to the floor; second, when all the pieces are in the correct places the walls flash and a bit of treasure is brought in. It may not be necessary to have the bit of treasure, for success can be its own reward, but the storing up of piece after piece of treasure can be the kind of reward that keeps some of us coming back time after time. (For instance, My job is great and is its own reward, but the paychecks!)

Another important type of learning is the use of coordinated right and left brain thinking. In these puzzles the use of reason and logic to

solve the puzzles (as a left brain function) is coupled with moving the pieces by joy stick (a right brain function). This process can produce a marvelous kind of synergy. There is joy in deftly handling the pieces and watching all the logic work before your eyes. This lesson could well be learned and used by producers of word processors. Some design their products to edit text using mnemonics. As an example, to move to the beginning of the text you type "b," and to move to the end you type "e." Unfortunately, you must do this at the same time you are trying to remember what to move where and what for (all left brain functions). Other word processors are geographically oriented. To move to the beginning of the text you press a key on the top of the keyboard and to move to the end you press a key at the bottom of the keyboard. Having used both kinds of word processors, I find it much easier to use the geographically oriented one after the initial learning is over. Perhaps the left and right brain are coordinating, and not all actions are left-brain oriented. Thus, by using both spatial and reasoning activities, the innate sense of joy of game playing can be increased.

One feature I haven't mentioned before is the creative properties in the program. If at any time you don't like the shapes you are moving you can go to the shape room and select one of six different shapes. They range from the simple geometric shapes that normally appear on the screen to pears, flowers, and—yes—even one that remotely resembles E.T.! If you don't like those shapes you can take one to the "shape-edit" room and modify a shape of your own. As you bring the tiny shape into the room and place it in the edit box it enlarges about five or six times, so the editing is very easy. At the same time, the shape you're working on appears in a tiny box below the shape editor box and lets you observe the shape in its proper size as you are working on it.

Let's now look at a few of the problems present in the game. First, the game works best when used with a joy stick, but the dexterity that is required is easily picked up by students of about age nine and less well by adults and younger students. Thus, you should probably use the keyboard to start, followed by a joy stick. Second, if one piece drops on top of another its color and/or shape may change. If the piece drops exactly on top of the other and you pick it up you may not have the same piece you just dropped! I suspect that the pieces are stored in an array in the computer so they don't come out in a "last-in, first-out" pattern. If so, whatever is stored nearest the front of the array comes out first. These are the only two drawbacks of the game and present little problem after you have once worked through them.

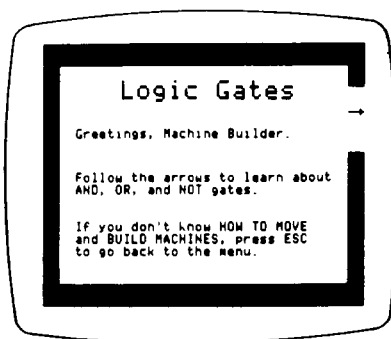
For *Gertrude's Puzzles*, the combination of all of the features in one game is unique and can provide children and adults alike many uses of the program—unlike so many other games in which one play is sufficient (or even if different more plays are boring). For these reasons I highly recommend *Gertrude's Puzzles*.

While *Gertrude's Puzzles* provides solid understanding of basic concepts of properties, *Rocky's Boots* is a raccoon of a different color. Though this program is recommended for kids aged seven and older, the concepts presented are appropriate for college students. I know of one professor of philosophy who uses *Rocky's Boots* for his introductory logic classes at the university. How's that for a program that is designed to help students understand the basis for circuits in a computer? *Rocky's Boots* is a series of games based on simulations of wires, AND-gates, NOT-gates, OR-gates, clocks, flipflops, and delay loops.

Using the same format as *Gertrude's Puzzles*, *Rocky's Boots* is even more creative and imaginative. The program starts with a menu of the following titles: (1) How To Move, (2) Building Machines, (3) Logic Gates, (4) Rocky's Boots, (5) Flipflops, (6) Rocky's Challenge, and (7) End.

How To Move is similar to the beginning of *Gertrude's Puzzles*. However, Building Machines introduces you to a whole new level of microcomputer interaction. When you select Building Machines from the menu, you realize the box you are moving is a source of electricity. Using wires, you can connect and disconnect circuits that sense when objects of a certain color or shape move by. By connecting the sensor to a "clacker" you can, for example, set the clacker to clacking when a purple object passes through a purple sensor. Incidentally, you may discover that it takes time for the simulated electricity to flow through wires. (Later you'll make use of this fact to develop delay circuits and solve glitches.)

Next, you are introduced to Logic Gates. In this simulation you learn the function of NOT, AND, and OR gates by observing the action of symbols shown below. Using these symbols you can construct a simulated circuit that will react to an alligator that is trying to eat your electric source. (I knew all those alligators on shirts were up to no good!) You can construct circuits that will sense and react when purple or orange objects (or any other combinations of colors or shapes) pass through. You can construct as many creative circuits as can be created by the pieces of circuit parts that you have available.



Start here to learn how to build machines using AND, OR, and NOT logic gates. This program ends with two rooms where you can collect lots of parts, and practice building machines.

(If your cursor gets completely "eaten" in the secret room, you can reincarnate. To do this you must get out of the room. Press the spacebar or either joystick button to see the cursor halo. Then get out in the usual way.)



This is a **NOT** gate. Its output is on when its input is **not** on and vice versa.



This is an **OR** gate. Its output is on when either the top input **or** the bottom input is on.



This is an **AND** gate. Its output is on only when the top **and** the bottom inputs are on.

Figure 2: Logic Gates

Rocky's Boots is a game in which you kick shapes, and in so doing you achieve points. Positive and negative points are attached to shapes. Points are scored if you can design a circuit that will cause shapes related to positive points to be booted as the shapes pass by sensors. Shapes have positive or negative points assigned to them for each play of the game, and as the plays progress you must build more complex circuits to score the maximum points. At each play of the game if you score the maximum points (24), Rocky himself will appear to dance a jig accompanied by music. The names of the plays of the game may give you some idea of the kinds of circuits that might be built: The Blues, Circles, Un-green, Blue triangles, Diamonds or circles, Blue crosses, Diamond or green, and Non-circles. Now on to more advanced play with Rocky's tune ringing in your ear (hopefully).

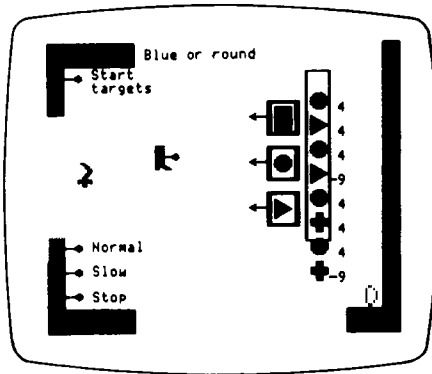
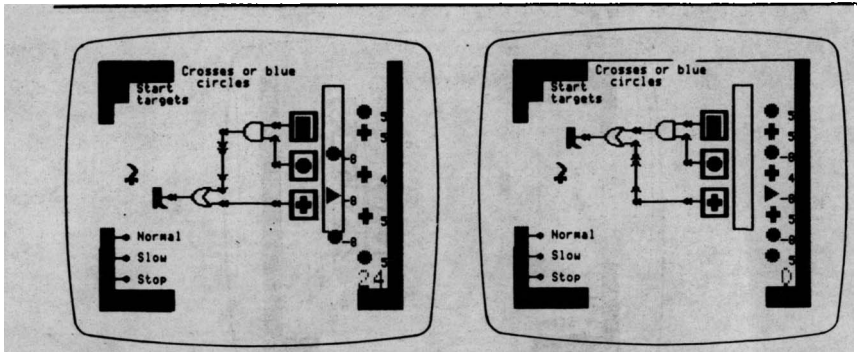


Figure 3: Rocky's Challenge

Flipflops introduces the advanced concepts of a flipflop, a clock, and a delay. If you have worked with electronic circuits you will recognize the parts as common integrated circuit elements. Here, however, you get to watch them work in seconds rather than microseconds, and for the first time I was able to get a clear analog in my mind about the operation of circuits I had built in years past.

Finally the Ultimate—Rocky's Challenge. Starting with simple circuits like those you have constructed before, and using the same format as *Rocky's Boots*, you can test your logic skill by building circuits from simple "Purples" to "Ann's Enigma"—the latter using shapes that are alike, and the negative point shapes seem to have no unique properties to tell them apart from the positive points. Wait—maybe it's a time delay coupled with a green sensor and a purple sensor. A few moments please while I test that. . . . It didn't work but I've got an idea.

Such are the exciting attractions of this simulation for persons of all levels of expertise. About the only persons to solve the problems with seeming ease are eighth-grade gamers—Ah well. The end of *Rocky's Boots* comes when you have solved the problems (a special prize is shown on the screen) or when you have given up and wish to try the most creative part of the game called Make Your Own. I gasp to think of such a capability in the hands of that certain eighth-grade student. Yes, even more diabolical plays of the game can be constructed from shapes, colors, and point values!



This machine will work.

This machine should work but will not because of a glitch.

Figure 4: Watch Out For Glitches

In all, this simulation is one of the most advanced of all microcomputer simulations, and its playful title hides the learning of logic and circuits.

As with *Gertrude's Puzzles*, there are a few problems. Some problems have been cleverly included in the program. (Smart, these California programmers, to make a glitch a GLITCH!) Two equivalent circuits having a slightly different configuration will not perform the same way. At first I thought it was a timing problem—that is, that the electricity did not reach the point of the circuit when it should; but analysis of the circuits indicated that the electricity went faster through some gates than through a single set of wires—a true glitch. By making it part of the program and alerting the person working through the program that a glitch may occur, the programmers and authors have turned a liability into an asset. Somewhat more serious is the conceptual idea that electricity flows from energy source to energy receiver only. In each circuit throughout *Rocky's Boots* the flow of electricity is only one way, whereas in actual electricity flow there must be a flow back to the source. Try lighting a flashlight bulb with just a single wire and a battery. I realize that the extra graphics would be difficult, but it would have helped to dispel a common misconception rather than reinforcing it. Given this one problem, *Rocky's Boots* is a delight providing a feast for the eyes, ears, and brain—again, both right and left sides. In all, the games in this simulation can provide months of enjoyment, plus the delight of discovery of the workings of digital circuits and even the laws and rules of formal logic.