ROBO-PONG

TRAINING

MANUAL

Third Edition

FOR TABLE TENNIS FUN, FITNESS, & SKILL DEVELOPMENT

Larry Thoman

This Manual Belongs To:

Name:	
Address:	
Phone #:	
My Robot Serial # Is:	
Purchase Date:	

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ACKNOWLEDGMENTS

One of my ambitions ever since I started playing table tennis competitively at age 15 was to write a book about the sport. I look at the sport not only as a fun, challenging game, but also as a rich field of learning. I derive great pleasure from it and wish to pass along the knowledge I have gained so others, like you, can reap the rewards from playing *the people's sport*, as it is called in China.

One of the greatest lessons I learned from table tennis is how important others are to my success. Some of the people I want to thank for helping me either to learn the sport or to create this book are:

Joseph E. Newgarden, Jr., the President of Newgy Industries and the inventor of Newgy table tennis robots, whose idea it was to write this book and who was the guiding force behind this literary effort. I admire him for his commitment and deep desire to popularize the sport of table tennis in the U. S..

All my practice partners, including **Bill Edwards, Mitch Stephens,** and **Danny Buren**, for pushing me to be my best and offering encouragement and advice.

Marsha Ogilvie, **Leta Newgarden, and Anne Tagg** for their assistance in proofreading and suggesting changes to this manual.

Dan Seemiller, 6 time U. S. Men's Champion, who was instrumental in teaching me the basics and the finer points of table tennis. His dedication to the sport, mastery of skills, and enthusiasm for sharing his knowledge and encouraging others to reach their full potentials has always been an inspiration to me.

Ron Williams, of Ron Williams Photography, for most of the photographs in this manual. He helped me recognize the importance of the visual image in learning a new skill. I thank him for the meticulous care to detail that can be seen in these unique photographs.

Heath Chitwood, of Images by Heath, for all the stroboscopic photos of **Eric Owens**. Heath helped me update this manual with photos of Eric demonstrating the loop strokes and a more modern version of the backhand counter. Eric is the 2001 US Men's Singles Champion and is a terrific model for correct form.

Dan Robbins, of Robbins Sport, the distributors of TSP table tennis equipment, for providing the clothing and the racket shown in most of the photographs (except ones of Eric Owens). Dan supported me for many years in my table tennis career by sponsoring the table tennis equipment and clothing I personally used.

ABOUT THE PHOTOGRAPHS

Traditionally, table tennis strokes have been shown as still or sequence photos or have been illustrated instead of photographed. Still pictures lack a sense of action. Sequence photos are better, but the action they convey is choppy, with little *flow* between the pictures. Illustrations convey flowing motion well but are impersonal and lack *realness*.

The photos I have chosen for this manual overcome these limitations. Called *stroboscopic* pictures, they are state of the art photographs made by exposing a single frame of film to multiple strobe flashes as an action is happening. The result is action captured in its entirety from start to finish, with several stop points so a movement can be analyzed at any phase. The pictures also reveal the almost imperceptible racket angle, timing, and acceleration changes during a stroke. They give a sense of flow from one phase of the action to the next. The pictures are the best I've seen at conveying a *feel* for a particular movement.

All stroboscopic pictures of the author were taken at one strobe setting, while the photos of Eric Owens were taken with a similar (but not the same) setting. The amount of time between one exposure and the next one remains constant. This allows you to compare racket acceleration between two different strokes. The longer the distance between two exposures of the racket, the faster the racket was moving in that phase of the stroke. If the images of the racket are almost overlapping each other, the racket was moving very slowly.

All the stroboscopic pictures have been graphically enhanced to help clarify the different phases of the stroke. Each image of the racket and the ball has been labeled. Racket image numbers are designated in plain style numbers (i.e. "1"), and ball images are in italicized small case letters (i.e. "*a*"). The images of the racket correspond with the ball images (i.e., racket image #1 and ball image "*a*" were both *captured* at the same time). Image #1 or "*a*" will always be at the start of the stroke and image #6 or "*f* " will always be at the end of the stroke. See the following page for an example of an enhanced stroboscopic picture.

The stripes down the right arm and leg were intentionally placed on the warm-up to help emphasize arm and leg action. Other parts of the warm-up were taped over in black to keep them from interfering with seeing the racket clearly. For the same reason, the left hand was sometimes wrapped in black cloth. To make the racket show up best, we wrapped it in white tape with only a small square of rubber exposed on one side. By watching for the small black square in the racket's center, you can tell which side of the racket was used for striking the ball and which was the nonstriking side.

Robo-Pong table tennis robots were created for anyone who enjoys the game, regardless of age or level of skill, to play anytime you want. Your robot was designed with multiple purposes in mind: for the beginner just learning to hit the ball, for serious players wanting to improve their games and win more often, for the professional as an always ready, always challenging practice partner, and for those who just want to have some healthy fun or exercise. Our product fits all these needs. It's a unique device that provides hours of fun, exercise, play, and practice for everyone.

The *Owner's Manual* provided with your robot shows how to setup, operate, take down, and troubleshoot the robot. This training manual goes one step further to show you how to get the most benefit from training on your robot.

For ease of learning, this manual is divided into lessons. A beginner will probably want to learn only one lesson at a time. A more experienced player may be able to take two or three lessons at a time. Learn at your own rate, but do not skip lessons, unless specifically indicated. Each lesson builds on the one before, creating a solid foundation on which the next lesson is based.

Before starting a new lesson, make sure you are consistent with the skills described in the preceding lesson. Being consistent means you can correctly execute 50 of the described movements in a row without missing (unless otherwise indicated) and you can place your return anywhere on the table. Strive to keep your returns low over the net.

This manual was initially written in 1992 for the first Newgy robot, Model 1929. It was updated in 1996 for Robo-Pong 2000. The 2005 revision includes updates for the current Robo-Pong models, 540, 1040, and 2040. Although the 540 and 1040 can be set up anywhere on the table surface, for the purposes of this book, it will be assumed that these models are placed at the center of the table's endline, similar to where the 2040 would be shooting from. Also, since the 500 series does not have oscillation, it will not be possible to use the 540 for drills that involve oscillation.

Table tennis has long been regarded as a sport for two people but you can't always find a partner when you get the urge to *hit a few*. Robo-Pong frees you from this inconvenience. The joys and challenges of table tennis are now available to you morning, noon, and night. We know that you will enjoy using your Newgy Robo-Pong Table Tennis Robot.

After setting up the robot according to the detailed instructions in the *Owner's Manual* or video and before beginning to play on the robot, check the following points to be sure your robot is set up correctly. **Figures and page numbers referred to in parentheses in this chapter are in your Robo-Pong 540/1040/ 2040 *Owner's Manual*** (8/02 version).

❑ (1) Is the support flange of the robot body fitted securely onto the locating tab and fastened in place with the wing-nuts and clip washer? (See Fig. 17, pg. 13.)

❑ (2) Do you have the collection net and ball return trays unfolded and centered on the end of the table tennis table? Be careful not to let the net get entangled as you carefully let the trays down (2040 only). For the 1040 & 540, is the robot positioned at the center of the table's endline (see position 1, Fig. 15, pg. 12)?

❑ (3) Have you run the connector cable from the robot to the control box? It's a good idea to drape this cable over the net post of your table to keep it off the floor, prevent damage from stepping on it, and keep it from interfering with ball pickup. (See Step 5, pg. 2 and either Step 8, pg. 3 or Step 6, pg. 4.)

❑ (4) Have you plugged the pin of the transformer into the control box and connected the other end to an electrical outlet? Please make sure the cord lies flat on the floor to prevent anyone from tripping on it. Use a UL approved extension cord if necessary. Check Chart A or B on page 20 of your *Owner's Manual* for correct transformer specifications.

❑ (5) Have you positioned the control box on the *side* of the table nearest your end? If right handed, place the controls at your left corner. If left handed, place the control box at the right corner. This will allow you to use your free hand to adjust the controls or turn the unit on or off while continuing to return balls back into the collection net with the racket in your other hand. (See Fig. 15, pg. 12.)

❑ (6) Have you rotated the robot head so "topspin" is at the top and the cord to the head hangs freely, not wrapped around the head? (See Fig. 7, pg. 8.)

❑ (7) Have you loosened, then tightened the angle adjustment knob on the robot so the pointer is positioned to the letter "C"? (See Fig. 5, pg. 7.)

❑ (8) Have you positioned the oscillator control levers at the number 3 and 4 positions so the robot head is free to sweep the entire width of the table (1040/2040 only)? (See Fig. 9, pg. 9.)

❑ (9) Have you placed enough balls into the ball return trays or ball bucket? Optimum amount for 540 is 85, 1040 is 190, and 2040 is 120 (40mm balls). Verify that you are using Newgy balls or a USATT or ITTF approved ball. Avoid unapproved

balls as they can cause erratic ball feed and ball bounce. As balls feed through the unit, weed out and replace any balls that are badly out of round, especially if they get stuck inside the robot.

If you suspect a ball is out of round and you have a 2040, check the roundness by inserting the ball in the corresponding hole of a Ball Dam (see *Ball Dams*, pg. 11). Once inserted, rotate the ball inside the hole. It should have equal clearance through the hole on all surfaces and it should barely fit through the hole without binding. It may also be possible that a ball is made too small. In this case, you will notice a considerable gap between the ball and the edge of the hole.

NOTE: If using brand new balls in your robot, be sure to wash the balls in soapy water before using. This removes the powder that is on the surface of a new ball. Failure to do so normally results in balls jamming and misfeeding. Dry the balls after washing and run them through the robot at top ball frequency to further "rub down" the balls.

❑ (10) Are *all* the balls the same size (either 38 or 40mm)? And are *both* Ball Size Switches set to the corresponding setting (see Photos 1 & 2, pg. 10)? Be sure *not* to mix ball sizes.

❑ (11) Adjust the knobs on the control box to these recommended settings.

    A. Turn ball speed to 2 and ball frequency and oscillator speed to 0.

    B. If power is off, turn power on. Then turn the oscillator speed to 3, leaving your finger and thumb on the knob (1040/2040 only).

    C. When the robot head sweeps to the middle of your forehand court, turn the oscillator speed to 0 to stop the sweeping action (1040/2040 only). For the 540, twist the robot until it is aimed at the middle of the forehand court.

    D. Turn the ball frequency knob to 3 to give yourself an easy shot at medium speed to the middle of your forehand court.

After you are accustomed to these settings, proceed to change the settings on the control box to get the response you want. (One side note about suggested control settings—all settings given are *estimates*. Settings vary from robot to robot so you may need to slightly adjust settings from the ones suggested.)

There are two instances when the setting of one control directly influences how another control is set. The first instance is selecting the correct head angle. When the robot is set to deliver the ball onto the player's side of the table first, *decrease* the head angle as the ball speed is *increased* to prevent the ball from being thrown off the end of the table or delivered too high (see Figures A and B, opposite page).

When the robot is set to serve onto its side of the table first, the head angle should be adjusted so the trajectory of the ball is relatively flat and the ball stays low to the net. The ball speed must be kept below 3–4; otherwise, the ball is delivered off the player's end of the table (see Figures C & D, opposite page). If higher ball speeds are desired, you must set the head angle so the ball is delivered onto the player's side of the table first.

The second instance is the setting of oscillator speed. When you adjust oscillator speed, you need to consider the ball frequency and oscillator range settings. Before turning on the oscillator speed, set

the frequency and range controls to your desired settings. Then experiment with the oscillator speed control to obtain good spacing between two consecutive balls. (See Fig. E, next page.) If the oscillator speed is not set correctly, consecutive balls will land too close to one another, nullifying most of the benefits of oscillation (see Fig. F, next page).

Once your robot is set-up correctly, make sure your playing space and equipment are also ready. For your own satisfaction and enjoyment, please make sure your
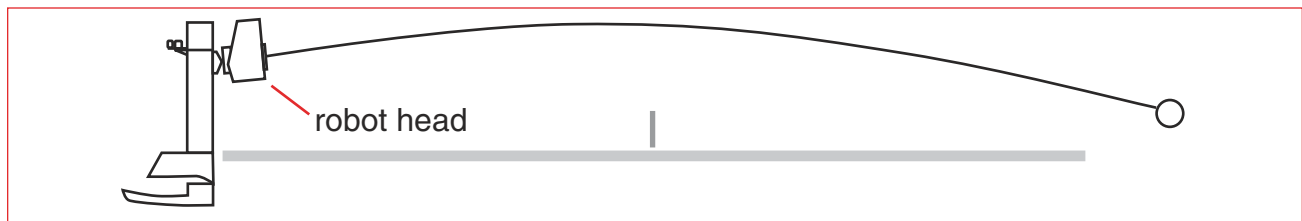
Figure A: Incorrect Robot Head Angle
Robot head is tilted too high resulting in ball being thrown off the end of the table.
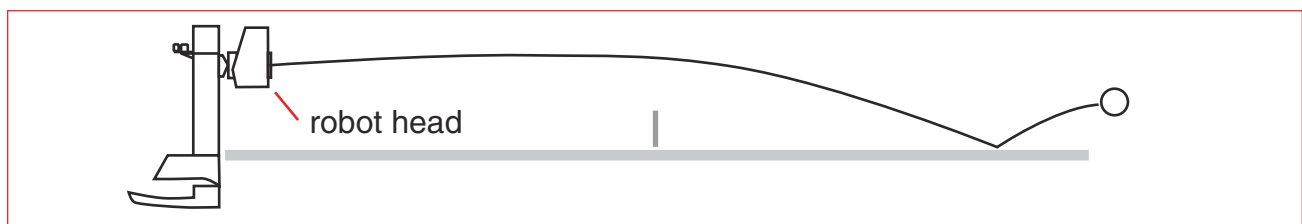
Figure B: Correct Robot Head Angle
Same ball speed as Figure A, but now robot head is tilted down so the ball lands on the table.
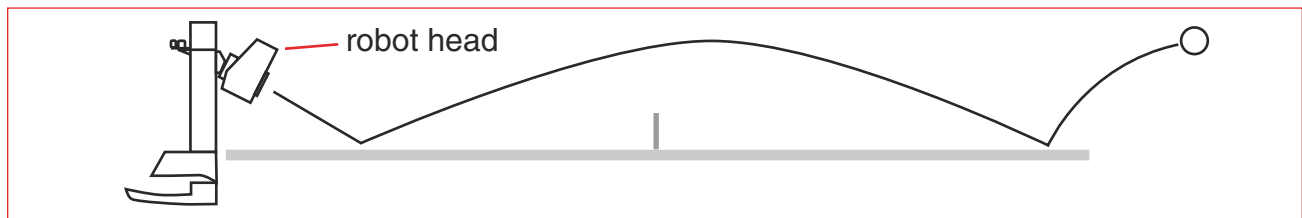
Figure C: Incorrect Robot Head Angle, Robot Serving
When robot is set to serve onto its side of the table first, and the head angle is too severe, the ball will rebound abnormally high.
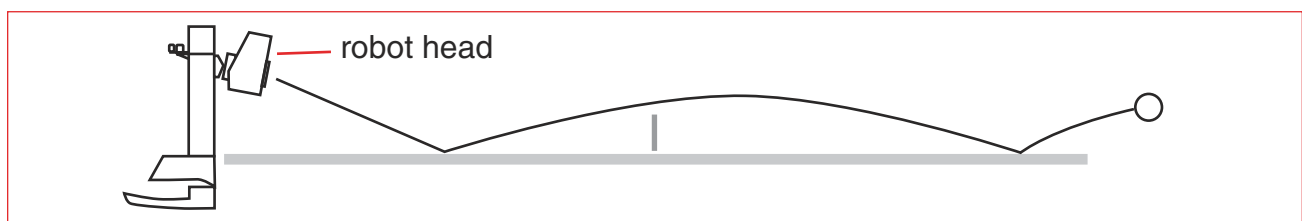
Figure D: Correct Robot Head Angle, Robot Serving
Same ball speed as Figure C, but the head angle is raised to approximately "C" or "D" so ball stays low to the net. Maximum ball speed is limited to 3–4 before ball is thrown off end of table. For higher speeds, head angle must be raised so robot delivers the ball onto the player's end of the table first (as in Figure B).

playing area is clean and free of objects that table tennis balls can hide under or inside of. Also be sure to allow yourself plenty of room at your end of the table so you have a feeling of unrestricted movement. You don't want to ram your racket into the wall when you obliterate the ball with your forehand smash!

After you finish using the robot, for safety reasons, unplug the transformer to prevent damage by a sudden voltage surge or lightening strike. When you're ready to take the robot off the table, follow the take down instructions on pages 16–17 in your *Owner's Manual* (2040 only). If

you have the optional Robo-Tote carrying case, place your 2040 in the case to protect it from dust and dirt and make it easier to transport. Robo-Pong was designed to be easy to take down, store, and transport.

If you don't have a Robo-Tote, be careful not to pick up the robot by the rubber Tray Strap. It was designed to only hold the two trays together, not to support the full weight of the robot. If you want to carry the robot by the strap, order the inexpensive Carrying Strap, which is much sturdier and can support the weight of the robot.
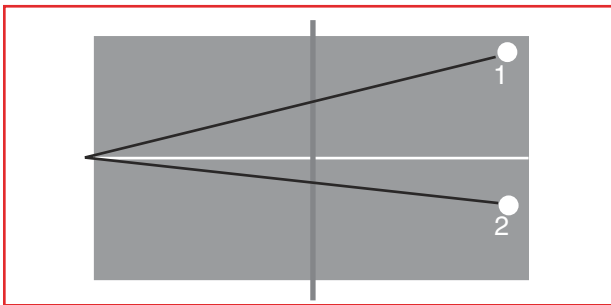
Figure E: Correct Oscillator Speed
Oscillator speed has been adjusted so the second ball is placed well away from the first ball. This makes the player move his/her feet a greater distance, resulting in better footwork and more exercise.
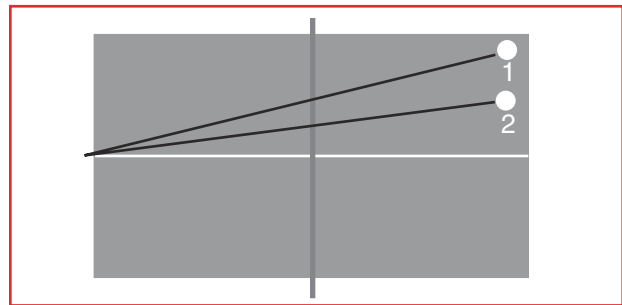
Figure F: Incorrect Oscillator Speed
Because the oscillator speed has not been set correctly, the second ball is placed too closely to the first ball. This results in not having to move the feet very much.

This chapter is designed specifically for those persons who can't wait to get started playing with their new toy and are notorious for not reading instruction manuals or watching set-up videotapes. Even if you're not ready to read the rest of this training manual, please read this short chapter. It shows you how to immediately start having fun with your Robo-Pong. It describes a few basic steps about how your new robot works and how to avoid the most common pitfalls when first getting started on the robot. If you want to get started on a detailed, step-by-step program for learning better table tennis, then skip this chapter and start with Chapter Three, *10 Quick Tips For Better Table Tennis.*

Please check that your robot is fully assembled, is set up correctly, and you understand how all the robot controls work. All these topics are thoroughly covered in your *Owner's Manual.* A short set-up checklist that gives you initial control settings appears in Chapter One (pages 1–4). Take a few minutes now to go down the checklist to make sure the robot is ready if you haven't already done so.

The most important equipment choice is the racket. All strokes described in this manual are written for a *sponge* rubber racket. Sponge is the rubber type used by 99% of all top players and is technologically superior to all other types. Hard rubber, sandpaper, and plain wood rackets cannot produce the required friction to use the strokes described in later chapters. These types of rackets limit your improvement and hinder proper stroke development. Do yourself a BIG favor—get yourself a good sponge rubber racket, one that is ITTF approved.

Remember, the robot contains many balls. If you miss one, don't stop to pick up that ball. There's another one coming. If a ball rolls by your feet or lands on the table directly in front of you, quickly brush or kick it away so it will not distract you from your practice.

Periodically, you will have to turn off the robot and pick up balls from the floor and reload them into the ball return trays or ball bucket. The more balls you have loaded, the less often you will have to stop and pick up balls. Pong-Pal (see pg. 106) is an accessory that makes ball pickup quick and easy. It even works when balls roll under your table or other objects or into other hard-to-reach places.

Another accessory that is very handy is the Ball Catch Net (see pg. 107), which can be used with Robo-Pong 540 or 1040. This net will catch your returns and funnel the balls into a collection bucket. Then it is a simple matter to pick up the bucket and re-fill your robot with balls.

The most common mistake when first using the robot is setting the controls too high. Start at low settings and progres-

sively build up to higher ones. Increase the settings only after you can consistently return at least 50 balls in a row at the lower setting.

Now, with these initial comments out of the way, let's play! Recheck that you have set the ball speed to 2, the spin control to "topspin," the head angle to "C" and that the robot head is directed to the middle of your forehand court. Pick up your racket (if you want more information about how to hold the racket, read *Shakehands Grip*, pages 17–18) and position yourself to use a forehand for returning a ball in the middle of your forehand court (the right court of a right-handed player). Turn the ball frequency knob on the control box to 3 and get ready!

Hold your racket out, perpendicular to the table, to meet the ball (Fig. G, pg. 22). Without swinging at the ball, let the ball bounce off the racket and watch what happens—the ball pops up high in the air. While continuing to use this *block* shot, experiment by angling the leading racket face down toward the table. Keep *closing* the racket angle until you make your return go back low (approximately 2–3 inches) over the net (Fig. H, pg. 22).

Experiment with the block shot until you feel comfortable. Keeping the same angle on the racket, start to gently stroke the ball by adding a small backswing and follow through. Gradually build up until you have a smooth, steady, and consistent counter stroke (see *Forehand Counter*, pages 33–34). If you start to miss regularly, simply go back to your block shot, set the proper angle with your racket and begin easily stroking the ball again.

Once you get a feel for returning topspin, try backspin. The idea is the same but the rules have changed somewhat. Change the spin by rotating the robot head so

the word "backspin" is at the top of the ball opening. Begin by blocking the ball as before with the racket perpendicular to the table. Oops! The ball goes right down into the table (Figure I, page 22). To remedy this, angle the leading racket face up toward the ceiling and make contact with the lower surface of the ball (Figure J, page 22). Unlike topspin, you must add a small amount of forward movement to your racket to make your return clear the net. Remember to keep the racket angle *open* throughout this forward *pushing* movement (see *The Push*, pages 49–51).

Should you need more help in returning either topspin or backspin or you simply want to practice or perfect your style, this manual has very detailed and precise instructions on all the basic table tennis strokes, techniques, and theories in subsequent chapters.

Your next exercise will be to repeat the same steps as above for both topspin and backspin, but this time with the balls being delivered to the middle of your backhand court. Use your backhand and experiment with maintaining the correct racket angle as you stroke the ball. (See *Backhand Counter*, pages 41–44 for a topspin stroke, and *The Push*, pages 49–51 for a backspin stroke.)

As your skill increases, you can turn up the ball speed (you'll usually have to adjust the head angle when you do this—see Figures A–D, page 3) and/or the ball frequency to match your new skill level. However, when the spin setting is "backspin," maximum ball speed setting should be 3½–4 and maximum ball feed setting should be 3–4. Higher settings would be unrealistic, taking into consideration that backspin makes the ball slow down and the usual pace for backspin rallies in a real game is slow.

Once you can return both topspin and backspin to either your forehand or backhand, you're ready to use the oscillator (1040/2040 only). Reset the spin setting to topspin and change the oscillator range levers to positions 2 & 4 if you're right-handed (3 & 5 for left-handers). Adjust the oscillator speed to 3, the ball speed to 2, and the ball frequency to 3.

Notice that at these settings, the robot head sweeps from your forehand corner to the middle of your backhand court. Stand behind the end of the table just to the left of the center line if you're right handed. (Left handers will need to substitute right for left and left for right in all subsequent directions. See pages 45–46 for more detail on the ready position.)

When you're ready, turn the power switch on. Keep your eyes on the sweeping robot head so you can tell where the next ball will land. The balls will be randomly delivered to both forehand and backhand. Be sure to return balls that land in your forehand court with your forehand and use your backhand to return balls that land in your backhand court. Be prepared to move your feet so you can cover balls delivered to your extreme forehand corner and then be able to move back to cover a ball to your backhand court.

When you're comfortable with this exercise, expand the oscillator range by moving the oscillator levers to positions 3 & 4, and the oscillator speed to 4. The robot will now sweep the entire table, from right corner to left corner. Adjust your position so you're behind the *middle* of your backhand court. Again be sure to return balls to your forehand court with your forehand and balls to your backhand court with your backhand.

A greater challenge is to use only your forehand to return all balls, even the

ones delivered to your backhand. This is a great aerobic workout, so don't be surprised if this wears you out in short order. Start with the oscillator range restricted to only your forehand court (positions 1 & 4 for right-handers, 3 & 6 for left-handers), expand to ¾ table (2 & 4 for right-handers, 3 & 5 for left-handers), and finally to full table (positions 3 & 4). To find more challenging levels, turn up the ball speed and/or frequency. Be sure to adjust the oscillator speed each time you change the oscillator levers (see Figures E & F, pg. 4).

Your last quick-start exercise is to work on your serve return. Select topspin or backspin and either turn the oscillator on for random delivery or turn it off for straight delivery (1040/2040 only). Experiment with returning short serves and long serves by adjusting the ball speed and/or the head angle. When you're consistent at returning topspin and backspin serves, add sidespin to the serve for a real challenge. Start by adding just a little sidespin to the topspin or backspin serve that you're already proficient at returning. Do this by rotating the robot head so the word "topspin" or "backspin" is not at top center, but rather, about 45° to the left or right of top center.

To return a combination spin, angle the racket either open or closed to compensate for the topspin or backspin *and* either left or right to compensate for the sidespin. Experiment with your racket angle until you find the right combination (see *Serve Receive*, pages 77–80).

When you finish a practice session, storing the 2040 is very simple. Turn the power switch off and unplug the transformer cord from the power outlet. Pull out the ball dams from their storage slots on the sides of the center trough, push the balls into the center trough, and insert

the ball dams into the slots at the top of the center trough. Be sure all the balls are contained within the center trough between the ball dams (see page 11 of the *Owner's Manual*).

Remove the control box from the table and disconnect both cords. Roll up the cords and place them on top of the balls and in front of the robot body. Place the control box on its storage tab face-up between the two front support legs, and fold the support legs back towards the robot. Fold up the ball return trays and strap them together. Detach the left and right net support tubes and place them in their storage holes at the top of the net support plate. All your robot components are together in one piece!

When lifting the robot be sure to put one hand *under* the center trough and firmly hold on to the net support tubes with your other hand. Do not pick up the robot by the rubber Tray Strap that comes standard with the 2040. This rubber strap is not designed to hold the weight of the robot and can break if used as a carrying handle. If you want to carry the robot by this strap, get our Carrying Strap (see pg. 107), which is made from nylon webbing and can support the full weight of the robot. If you purchased the optional Robo-Tote carrying case (see pg. 106), place the folded robot into the case for easier and safer transport and storage. (See pages 16–17 of the *Owner's Manual* for complete instructions.)

For the 1040 or 540, take-down is equally as easy, but the various parts do not fold up into one neat package. If your ball bucket is filled with balls, I suggest you have a small box or tray handy to hold the Control Box, Transformer and Connector Cable. If you purchased the optional Ball Catch Net II, it will fold up into a compact triangular shape for easy storage and handling.

These quick start instructions are easy and fun and will get you headed in the right direction. Read subsequent chapters for complete detailed instructions on strokes, spins, serves, training routines, fun games, and aerobic exercises.

10 QUICK TIPS TO BETTER TABLE TENNIS

This chapter can be used in conjunction with the two previous chapters for a complete *quick-start program*, or it can be used as a primer for the remaining chapters that explore the following topics in greater detail. These tips are universally accepted as standards that beginners must strive to learn and that experts strictly adhere to.

(1) **Know what spin is on the ball.** The key to acquiring this important skill is to carefully watch the opponent's racket at the moment it makes contact with the ball. If the opponent's racket moves from low to high, the spin is topspin; from high to low, backspin; from his/her left to right, right sidespin; and from his/her right to left, left sidespin.

(2) **Compensate for the spin with your racket angle.** If topspin, angle your leading racket face *down* and contact the ball *above* its center; if backspin, angle the leading racket face *up* and contact the ball *below* its center; if right sidespin, angle the leading racket face to the *right* and contact the ball to the *left* of its mid-line; if left sidespin, angle the leading racket face to the *left* and contact the ball to the *right* of its mid-line. While holding the racket at the suggested angle, stroke gently forward. Only after you have developed a *feel* for the spin should you stroke the ball with more force. (See *Understanding Spin,* pages 21–25.)

(3) **Use your whole body when you stroke your forehand.** Be sure that you rotate your hips and shoulders backwards during the backswing and then forward into the ball as you stroke your forehand. This motion is coordinated with a transfer of your body weight from the back foot to the front foot. The harder you hit your forehand, the more forceful your weight transfer must be. A common forehand mistake is to use only your arm to hit the ball, which severely limits your power and consistency. (See *Forehand Counter*, pages 33–34, *Forehand Smash*, pages 35–38, *Forehand Drive*, pages 53–54, and *Loops*, pages 55–66.)

(4) **Maintain a good ready position.** A good ready position is balanced and prepares your body to move instantly in any direction. Use it when preparing to return serves and between strokes. The basic sequence of a rally is as follows: (A) put yourself in a good ready position, (B) move to the ball with your feet, staying balanced, (C) stroke the ball, (D) return to ready position, and (E) repeat B, C, and D until the rally ends. (See *Ready Position*, pages 45–46.)

(5) **Train your strokes until they are automatic.** When first learning a new skill, a lot of mental energy is used to formulate a clear mental picture of how the stroke looks and feels. Once this mental picture is relatively accurate, that skill

should be practiced repeatedly until you no longer have to think about how to do it. This is your *automatic stage*. Your best performance will come when you operate on *automatic* and you do not analyze your skill. You just *let it happen*.

(6) **Use only your own racket.** It's important to get your own racket and then to use it exclusively. Every racket has its own feel and playing characteristics, and you will benefit greatly by using only one racket so you're not always trying to adapt to a different one. Also, take good care of your racket; treat it with respect. Keep it in a case when you're not using it. If you're using inverted sponge rubber (smooth surface), you should wash it with soap and water or a special racket cleaner after every use.

(7) **Develop sidespin serves.** Few beginners use sidespin on their serves; whereas, top players use sidespin on almost every serve. Sidespin is almost always combined with either topspin or backspin; pure sidespin is extremely rare in table tennis. Particularly useful is a sidespin/backspin serve that is low to the net and bounces twice on the other side of the table. This type of serve will severely limit your opponent's serve return options. (See *Serves*, pages 67–75.)

(8) **Keep your returns low over the net.** In general, the lower over the net you place your shots, the less angle your opponent can use and the harder it is for him/her to hit it with power. The one exception to this rule is if you use lobs,

you will want to place the ball very high over the net (and as close to the end of the table as possible).

(9) **Practice more than you compete.** By practicing, I mean all the time you spend developing your game by concentrating on some aspect you want to strengthen. The primary object during *practice* is to develop your game. On the other hand, when you *compete*, your main object should be to win, *not* to work on some part of your game. It is advisable to play *practice* games where the object is to blend in a new skill or tactic into a match-like situation before you *compete*. The emphasis for these *practice* games is still on development, not winning. And when you do *compete*, even though your main emphasis is on winning, you can still learn a lot about your game (development) if you analyze your matches *after* they are over.

(10) **Join a table tennis club.** To really make progress with your game, it's important to find others with similar desires and interact with them. A table tennis club is the best place to do this. Most clubs have players of all different playing levels. Find someone of similar playing ability as yourself and make a commitment to each other to practice regularly. Periodically test your progress by competing with players of higher ability. Furthermore, most clubs have a coach who can help speed up your development. To find a club in your area, contact USA Table Tennis (see page 104).

WHY USE A TABLE TENNIS ROBOT

A table tennis robot is simply a tool that can be used in one's pursuit of learning this wonderful sport. A robot cannot, in and of itself, make you a great player. Many other components are necessary for a successful training program. These components include:

1. Coaching
2. 1 on 1 practice partner
3. Serve practice
4. Training aids, including robots
5. Fitness Training
6. Nutrition
7. Sports Psychology
8. Practice competition
9. Tournament competition
10. Videotape analysis

While it's possible to reach your full potential without every one of these components, the more of these components you incorporate into your training program, the greater your potential for improvement and the less time will be required to reach your goals.

There are certain things a robot does better than a human and other things a human does better or differently. Used intelligently, Robo-Pong can serve as an extremely useful aid to learning table tennis skills. The trick is to take advantage of its strengths and vary its settings and positioning to make it more *humanlike*.

What a Robot Does Better

First, let's list the robot's advantages:

(1) Non-threatening—the robot isn't trying to *beat* you or make you look bad. This is especially important to those who are first learning the sport or others who are self-conscious about their abilities.

(2) Consistency—the robot delivers balls with the same type of speed, spin, and placement. This makes it much easier to learn a new skill than if the ball's characteristics are constantly changing as they would with most human partners.

(3) Availability—the robot can be used anytime, from a few minutes to hours at a time. It may not always be possible to find a human partner or coach when you have the time to practice. The robot is ready whenever you are!

(4) Adjustability—the robot's controls can be set for different playing levels. It's very easy to adjust the robot to a level that will be challenging, no matter what your present skill level is. It may not always be possible to find a human that has the skills to challenge you.

(5) Accuracy—the robot can precisely aim the ball. If, for example, you aim the robot to shoot a ball just over the

net, there's a high probability that it will frequently hit the top of the net, for practicing against these awkward returns. A human is highly unlikely to have the skills to repeatedly hit such a shot.

(6) Durability—the robot can go a long time without stopping. It doesn't get tired or fatigued. The robot can keep going for as long as you're up for the challenge.

(7) Measurability—the robot's settings can function as a way to numerically gauge your progress. To develop a skill, it's necessary to start slowly, say at a ball speed of 2 and ball frequency of 2½. If after practice, you can consistently handle a speed of 5 and frequency of 6, you can measure your improvement based on the robot's settings. There's no similar way to numerically measure your progress against a human partner.

What A Human Does Differently

While training with a robot has many advantages, there are certain things that are different than when training with a human being:

(1) Racket swing and ball contact visual clues are missing. When a person hits a ball, much information can be gathered from the swing and how the racket makes contact with the ball. The robot does offer a few visual clues, but they are not the same as in actual table tennis.

(2) Single point ball projection—the robot delivers balls from one spot, unlike a person who will return balls from many different angles, heights, and depths.

(3) A human can produce a wider variety of shots than a robot can, particularly mis-hit balls and unusual strokes. No two humans stroke the ball exactly the same

and one of the challenges in this sport is learning how to play against different styles and ways of stroking the ball.

(4) In a real game, a human will make it as difficult as possible for you to return the ball by disguising or changing spins, speeds, and placements. With a robot, on the other hand, it is much easier to predict what shot is coming because you are responsible for setting the controls. While this makes it easier to learn a skill, it also can give the player a false sense of confidence unless he/she understands the differences between playing a robot and playing a human, particularly in a competitive match.

(5) A human can vary spin and speed separately. Newgy robots use a single wheel to produce both speed and spin, so they increase/decrease proportionally to one another. E.g., a human can stroke the ball with heavy spin but very little speed, or vice versa. With a Newgy robot, however; as the speed increases/decreases, so does the spin.

Also, while not something the robot does differently from a human, it's important to remember that training can ingrain bad habits as easily as it does good habits. Be sure to follow the instructions in this book or from a knowledgeable coach or player when you begin training, either with a human or a robot.

Using The Robot's Strengths And Making It More *Humanlike*

The key to getting the most out of your robot training is to use the robot's strengths to your advantage and learn how to design your practice sessions so the skills learned are similar to those needed to play against a human. Following are some useful tips for accomplishing this:

(1) Use the robot to learn *new* skills. The robot is more consistent than a human and will accelerate learning that skill.

(2) Don't use the oscillator until a stroke is consistent. Most lessons in this book start with the ball being delivered to one spot. Reasonable goals for judging consistency of that skill will be given. It's important to accomplish that goal before going on to the next step.

(3) Once you're consistent using a particular stroke with the ball in one spot, from that point forward, use the oscillator when practicing that stroke. Exceptions can be made for brief warm-up periods and drills where the ball is in one spot but the player moves between each shot.

(4) Use the robot's accuracy to place balls in a difficult location: e.g., balls that barely come off the end of the table or that are just over the top of the net and occasionally hit it, etc..

(5) Be sure to practice both soft and hard versions of a stroke and be able to do either at will. There's a lot more to this sport than simply hitting the ball hard. Soft touch shots, controlled placements, and changes of pace are all crucial elements to having a solid game.

(6) Always be gradual when increasing Ball Speed or Frequency. In general, only go up about ½ a point at a time. If consistency falters, stay at that level until consistency improves.

(7) Keep a log of your settings to track your progress and for reference when resetting the controls. Sample log sheets are provided on pages 96–97.

(8) Go back to slower speeds and frequencies on occasion. Remember, this sport is played at all speeds. Learn to slow down when conditions dictate. Take the pressure off for while—relax and enjoy the drills at a slower pace.

(9) Use the robot for extremely long drills. The robot is perfectly suited for long non-stop drills of 20 minutes or more, which develop aerobic conditioning and improve sport specific skills at the same time.

(10) The robot is available anytime you are, even if you only have a few minutes to spare. Or perhaps you want to play at a time when nobody is available. Play whenever you can—the more you play, the better you can get.

(11) Practice serves every practice session. Serves start every point in a real game. Do not neglect this important aspect!

(12) Place the robot in various positions around the table to better replicate shots that normally come from different angles, heights from the floor, or distances from the end of the table; e.g., chops. lobs, forehand serve from backhand corner, etc.. The Robo-Caddy is especially helpful in positioning the robot off-the-table (see *Positioning Your Robot And Controls* in your *Owner's Manual*).

(13) Strive to recover to a neutral position after every stroke. Set the frequency at a rate that allows sufficient time for getting back into a good neutral position.

(14) When practicing serve return, set Ball Frequency at the lowest level to better simulate the normal timing of serves. There should be a slight pause after every return so that you can get back into your normal serve return position.

(15) Occasionally increase the ball speed and frequency to uncomfortable levels

to acclimate yourself to the pressures of faster play. Do your best to maintain form for as long as possible, but stop when consistency drops dramatically.

(16) Use caution when practicing hard-hit shots. If you're uncertain about the correct form, consult a qualified coach. Injury can result from repetitive motions that are ergonomically incorrect, especially if they are explosive actions. Stop at the first hint of injury.

(17) Don't ever think that just because you can execute a skill against a robot that you can use that skill immediately in a competitive match. A robot is not trying to make you miss, a human is. Use multi-ball drills and one-on-one drills with a human partner to transition between the robot and using those skills in an actual competitive match.

(18) Use different ball colors to strengthen decision-making skills. E.g., designate orange balls to mean you smash the ball and white balls to mean you counter the ball. Or white balls mean hit down-the-line and orange balls mean hit cross court. This forces you to wait for a visual clue before deciding what stroke to use. This is similar to waiting for the opponent to contact the ball before deciding which stroke to use. Dyeing white balls can create ball colors other than white and orange for developing even more complex decision making skills.

(19) Experiment with new ways of stroking and serving the ball. Imitate skills of top players or skills of other players that are effective at winning points in a game. The robot won't laugh at your mistakes or become impatient with your misses.

(20) Try out *Effortless Table Tennis*. Not everyone likes competition. Some just enjoy the sport, learning new skills, and staying in shape. Instead of always trying to push yourself to go faster and harder, slow down and try for *perfection*. Make yourself feel and control every nuance of a stroke. The goal is not so much to win games, but rather to enter *the zone* where strokes are effortless and you're in tune with the ball.

TABLE TENNIS EQUIPMENT

There is a seemingly endless variety of rackets, blades, and rubber sheets available for purchase. It is beyond the scope of this manual to cover all the different kinds. Therefore I recommend getting a racket of good quality and medium price capable of producing all the strokes discussed in this manual.

A racket is composed of two main parts—the blade or wooden part, and the rubber covering on the face of the racket. Please look at Photos 1 & 2 on the next page. According to official table tennis rules, the rubber covering must be colored bright red on one side of the blade and black on the other side.

Plain wooden rackets with no rubber covering and sandpaper rackets are both prohibited. These types of rackets do not permit a player to perform the strokes described in later sections, so please use one of the recommended types.

If you have been using sandpaper, plain wood, or hard rubber, a sponge rubber racket feels heavy and uncontrollable at first. By following the instructions in this book, you'll soon learn how to angle your new racket to compensate for spin and how to apply your own spin to the ball. Robo-Pong simulates playing with inverted sponge rubber so it's the perfect practice companion to help you quickly adapt to your new racket.

It is important to have your own racket and take good care of it. Look for a racket that is comfortable in your hand and feels well-balanced and not too heavy or too light. The fit of the handle in your hand is important. Handles come in several shapes, so try out a variety of shapes and sizes before deciding on one. The wood from which the racket is made should be of medium stiffness, such as basswood, willow, or birch. The blade should be of 5-ply construction. A good starting blade would be the Newgy Applause (see page 107).

The rubber is the next item to select. The most versatile rubber, and therefore the one that I strongly recommend for learning the basics, is inverted rubber. Inverted (pips-in) rubber has a smooth, grippy surface on top of a layer of dense cellular sponge (see Photo 2 on the next page). The smooth, grippy outer surface (called the *topsheet*) is the best surface for applying spin to the ball. The underlying layer of sponge rubber gives a catapult action to the ball and increases the amount of speed that can be applied to the ball. This is the rubber choice of 95% of all top players.

The rubber should be rated medium in spin and speed, high in control, and be 1½–2 millimeters thick. If these ratings are not displayed on the package, you may need to ask the vendor for these

ratings. Look for the ITTF logo on the rubber surface to ensure that the rubber is manufactured to ITTF specifications.

Keep your rubber clean by washing with soap and water or special rubber cleaner after every use and storing it in a protective case. Dirty rubber does not play consistently. Dead rubber can sometimes be temporarily restored by using Rubber Drive Cleaner (see pg. 107).

Although you may buy pre-assembled rackets (blades with rubber already attached), it's better to select the blade and rubber separately and have the supplier glue the rubber onto the blade. This way, you may replace the rubber without also replacing the blade. The rubber on most pre-assembled rackets is all but impossible to remove. Rubber should be replaced when the tackiness of the surface is noticeably different between the center of the rubber where the ball is frequently struck and the edge of the rubber where it is infrequently struck. If you need additional help, contact the Newgy Customer Service Department.

When purchasing a table, look for a smooth, even surface of at least ¾″ thickness with a sturdy frame underneath. Your net set should have sturdy end supports with a net made of cord and a top string for adjusting the net tension. Since the side nets of Robo-Pong 2040 attach to your table net, having a good net set is crucial to having the side nets function correctly. Cheap plastic nets and flimsy net posts do not offer enough support for the attachment of the side nets.

When setting up your table, give yourself plenty of playing room at the player's end of the table. You need a lot of space so your strokes will not be hampered and to give yourself a sense of unrestricted movement. Also it is helpful to keep your playing area clean and free of objects that balls can roll under or into.
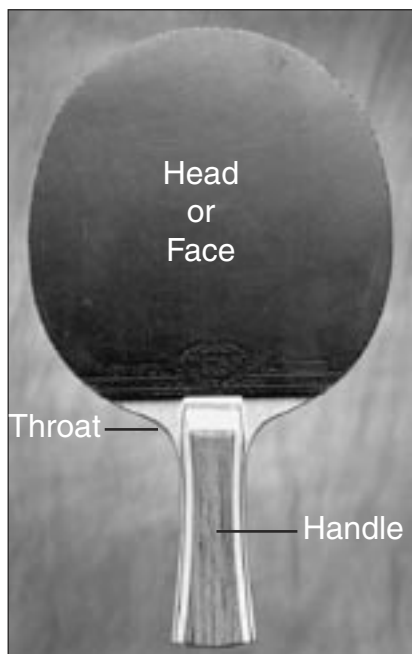
Photo 1: Table Tennis Racket, Front
Typical table tennis racket with inverted rubber, front view.
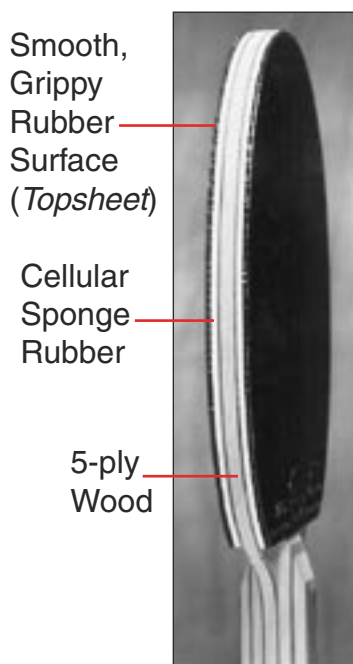
Photo 2: Table Tennis Racket, Side
Typical table tennis racket with inverted rubber, side view.

THE SHAKEHANDS GRIP

While there are many ways to hold a racket, the shakehands grip is the most versatile and universally used of all grips. Therefore, I recommend using it for learning table tennis. If you have not used this grip, it may initially feel awkward. Please persevere, as this grip will permit you to develop all the strokes this manual will discuss and illustrate. Other grips may hinder or limit your development.

Lesson 1: Learning the Shakehands Grip

To use this grip, you essentially *shake hands with the racket*. Fit the edge of the blade snugly in the "V" of your hand between your thumb and forefinger. Grip the handle with your middle, ring, and little fingers. Finally, place the forefinger flat on one side of the racket head close to the bottom and the thumb sideways on the other side of the racket head. See Photos 3 and 4 on the next page.

Hold the racket with just enough tension to keep it in place. Another person should be able to take the racket out of your hand and feel just a slight resistance while you maintain your grip. It is important not to grip too tightly. Too tight of a grip causes excess tension in the arm. The excess tension will, in turn, slow down your strokes and make it harder to adjust the racket angle to compensate for various spins and angles. This is not to say, however, that hand tension is constant, never changing. Hand tension should increase just before ball contact on a hard hit shot and it may decrease on soft touch shots or serves.

Hold the racket so the edge of the racket is perpendicular to the floor and tilt your wrist slightly down. The wrist should remain in this downward tilt position throughout all your strokes. Do not force this downward tilt, but rather let the racket naturally fall into this position by *relaxing* the hand muscles. While we're talking about the wrist, do not let the wrist flop back and forth or up and down as you stroke the ball. Letting the wrist flop is one of the most common causes of mis-hit shots.

**Photo 3:
Shakehands Grip,
Forehand Side**

Notice how the *side* (not the *front*) of the thumb lays across the top of the handle, and only three fingers wrap around the handle. Also notice the downward tilt of the wrist.

**Photo 4:
Shakehands Grip,
Backhand Side**

Notice how the knuckles lay on *top* of the handle, and the forefinger lays close to the *bottom* of the racket face.

HAND-EYE COORDINATION

Before attempting to learn a sport that involves hitting a ball with a racket or bat, it is a good idea to do some preliminary hand-eye coordination drills. These drills must be mastered before any progress can be made. For a beginner these drills should be practiced until perfected before hitting a moving ball. For someone who already plays, take a few minutes to be sure you can do these drills. An experienced player can do these drills in a minute or two.

Should you find these drills too difficult at first, you may use special 44mm or foam ping pong balls or even inflated balloons. These move slower and allow for more control. Be sure you can do the following three drills with a normal ping pong ball before moving on, however.

Lesson 2: Developing Basic Hand-Eye Coordination

- Drill One: Using the shakehands grip, bounce the ball repeatedly on the forehand side of the racket (the side your thumb is on) fifty times without missing or moving the feet. The bounce should be about 8–12 inches above the racket. See Photo 5 on the next page.

- Drill Two: Same as Drill One, but bounce the ball on the backhand side of the racket (the side with your forefinger). See Photo 6, next page.

- Drill Three: Bounce the ball repeatedly on the racket, first with the forehand side, then with the backhand side, alternating sides until 25 hits have been counted for each side without missing or moving your feet.

If these drills are easy to do, you should be ready to learn the basic strokes. However, if you have trouble with the basic strokes, more hand-eye coordination drills are called for. Several examples follow:

- Do any of the above listed drills but move your feet by walking forward or backward, or sideways, either to the left or right.

- Bounce the ball on the floor using your racket to dribble the ball.

- Hit the ball against a wall, let the ball rebound off the floor, then strike it again. (Just like practicing against a wall in tennis). Aim for a target.

- Have a partner stand about 10 feet away and hit the ball with your racket so the ball strikes the floor midway between you and your partner. Your partner will do the same. See if you can keep a rally going.

- Have a partner stand about 5 feet away and volley the ball back and forth without letting the ball touch the ground.

Photo 5: Basic Hand/Eye Coordination Drill (Forehand Side)

Notice that the racket is held with the shakehands grip in front of the stomach with the handle pointing toward the body. The ball is bounced only 12 inches or so above the racket, and the eyes follow the bouncing ball.

Photo 6: Basic Hand/Eye Coordination Drill (Backhand Side)

Same as Photo 5 except handle of the racket points sideways away from you, and the back of the hand is turned up, instead of down.

UNDERSTANDING SPIN

More so than any other sport, table tennis is a game of spin. In order to be successful at table tennis, you must learn about and understand the different types of spin and how to counteract the effects of these spins on your racket.

There are two general ways to contact a ball with a racket. The first is by using *force*; in other words, the racket is forced through the path of the ball in a manner similar to hitting a baseball with a bat. The primary result of *force* is forward direction or speed. This is often the only way that beginners and novice players have learned to contact a ball.

The second way to contact a ball is by using *friction*—to contact the ball with a brushing motion so the rubber grabs the ball and makes the ball rotate. The primary result of striking the ball using friction is spin. The type of spin produced depends on the racket angle and the direction the racket is traveling.

Top players primarily use friction to contact the ball. They apply spin to almost every shot, sometimes severe amounts of spin. Robo-Pong simulates the play of a top player—it produces spin on every shot it delivers. Untrained players often comment that the robot's spin seems unusually strong. While this is true for an untrained player, a trained, competitive player thinks the robot's spin is quite normal. So if the spin seems strong at

first, bear with it and you'll soon adjust by following the suggestions and lessons later in this manual. Table tennis is much more exciting and dynamic when you can produce your own spin and control your opponent's spin.

The figures on pages 22 and 24 are simple explanations of the four major types of spins—topspin, backspin, right sidespin, and left sidespin. Each type of spin has two figures. The first figure shows what happens when a particular spin contacts a vertical, still racket. The second figure shows how to correct your racket angle to compensate for the effect of the spin on your racket.

Topspin is normally produced by making your racket travel from low to high while brushing the upper surface of the ball. Topspin has a dipping effect on the flight of the ball. For this reason, a ball carrying topspin can be hit with full force because the spin will cause the ball to dip down and hit the table instead of going off the end of the table. When the ball hits the table, the topspin grabs on the table surface, which both compounds the dipping effect and slightly increases ball speed. Topspin is considered to be offensive in most cases.

When topspin strikes a vertical racket, the spin will grab on the rubber surface and rebound upward, usually quite high and off the far end of the table. To correct
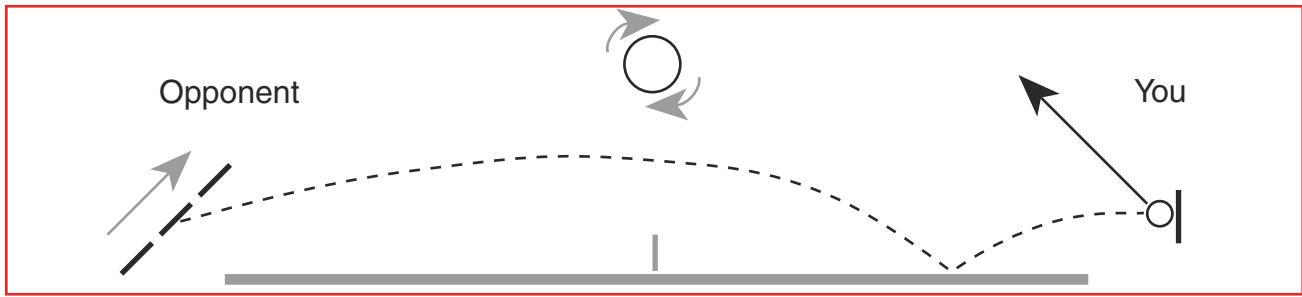
Figure G: Flight of Topspin Ball

Topspin is produced by racket traveling from low to high, striking the ball on its *upper surface*. Trajectory is *arched*. Ball *dips* after bouncing and rebounds *upward* after striking a vertical racket.
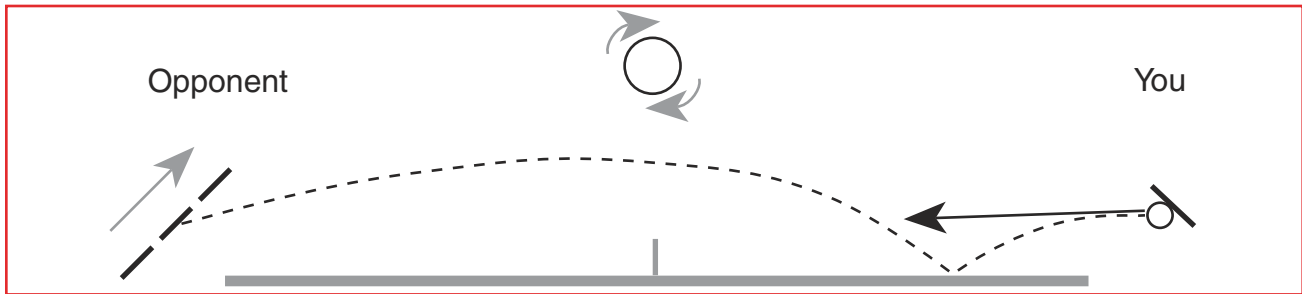
Figure H: Correction for Topspin

Since topspin causes the ball to rebound up after contacting a vertical racket, it is necessary to tilt the leading racket face down toward the table and contact the ball on its upper surface. The correct racket angle will send the ball back low to the net. It is not necessary to move the racket forward to make the ball go back across the net.
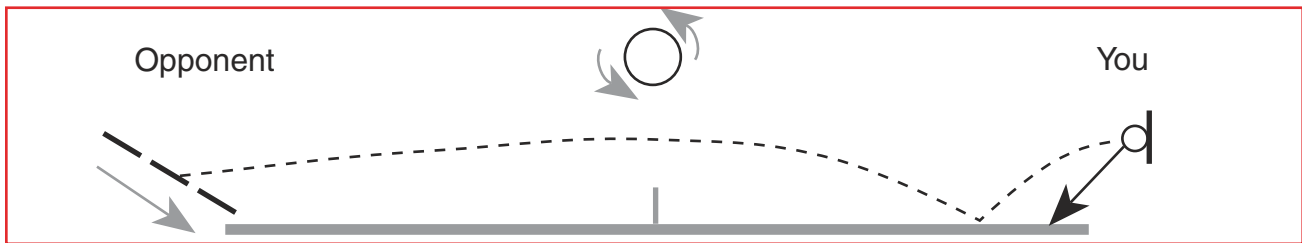
Figure I: Flight of Backspin Ball

Backspin is produced by racket traveling from high to low, striking the ball on its *lower surface*. Trajectory is *flat*. Ball *rises* slightly after bouncing and rebounds *downward* after striking a vertical racket.
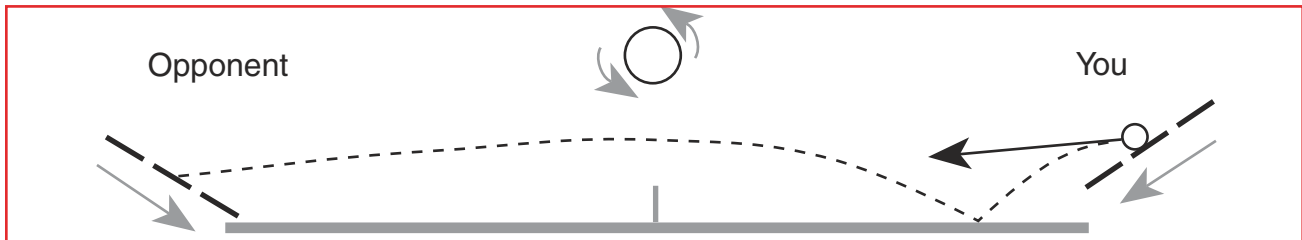
Figure J: Correction for Backspin

Since backspin causes the ball to rebound down when it strikes a vertical racket, it is necessary to tilt the leading racket face up toward the ceiling and contact the ball on its lower surface, sometimes actually on its bottom. It is also necessary to add some forward direction to your racket to make the ball go over the net.

for topspin and make the ball go back low over the net, tilt the leading racket face down toward the table and contact the ball on its upper surface. The more topspin on the ball, the more the racket needs to be tilted down. (See Figures G & H on the opposite page.)

An important fact to remember about topspin is it takes almost no effort to counteract its effect on the racket. You only need to angle the racket correctly. The topspin will cause the ball to go back across the net on its own. No force needs to be applied to your racket other than the effort it takes to tilt the racket.

Backspin is generated by making your racket travel from high to low and brushing the ball on its lower surface. Backspin has a floating or rising effect on the ball. When the ball hits the table, the backspin grabs on the table, slowing the ball and making it rise slightly. It's very difficult to use full force when doing a backspin return because the harder you hit it, the more it rises and it tends to sail off the far end of the table. Backspin is almost always considered defensive.

When backspin strikes a vertical racket, the spin grabs onto the rubber and the ball rebounds almost straight down. The ball seems to die and lose all of its speed and spin. To correct for backspin, and make the ball go back low over the net, tilt the racket face up toward the ceiling and contact the ball on its lower surface while pushing the racket gently forward. The more backspin, the more the racket must be tilted up and the more towards the bottom you must contact the ball. (See Figures I & J on the opposite page.)

Backspin is unlike topspin in that you must provide some forward momentum to make your return clear the net. It is

more difficult and takes more energy to attack a ball with backspin because the ball has a tendency to go down. The lifting action necessary to make the ball clear the net takes away from the amount of forward force you can apply when attacking a backspin ball. In general, topspin is easier to attack than backspin. If you're a defensive player, backspin should be your spin of choice because it makes it harder for your opponent to attack forcefully.

Right sidespin is created when your opponent brushes his racket across the ball from your right to your left. This spin has a curving effect on the flight of the ball. After leaving your opponent's racket, the ball will momentarily hook to your left, then curve to your right. When it hits the table, the spin grabs, and the ball jumps out and hooks to your right.

When right sidespin strikes a vertical racket, the spin grabs onto the rubber and jumps quickly to your left. To correct for right sidespin, the leading racket face must be angled to the right and you must contact the ball on its left surface. (See Figures K & L on the next page.)

Left sidespin is produced when your opponent brushes across the ball with his racket from your left to your right. Left sidespin is exactly like right sidespin, but in reverse. Left sidespin hooks to your right, then curves to your left. When left sidespin hits a vertical racket, it rebounds to the right. To correct for this spin, angle your racket to the left and contact the ball on its right surface. (See Figures M & N on the next page.)

Sidespins are seldom used in their pure form in table tennis. Normally they are combined with topspin or backspin to produce a combination spin such as right sidespin/topspin or left sidespin/back-

spin. Combining two spins produces the effects of both, but to a lesser degree than if they were in their pure forms.

For example, a ball with right sidespin/topspin will both dip and curve to your right as it comes toward you, particularly after it bounces on your side. To correct for this combination spin, it is neces-sary to contact the ball on its left upper surface by tilting the racket down *and* angling it to the right.

Understanding spin and its effects is cru-cial to a player's success in table tennis. The player with greater mastery of spin will almost always control the play. By using spin, you can limit the responses
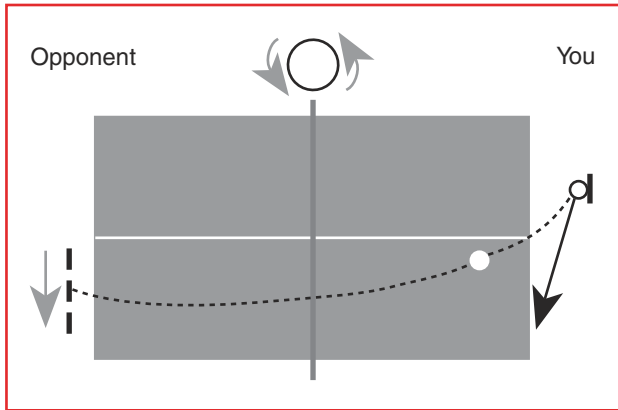
Figure K: Flight of Right Sidespin Ball

Right sidespin is produced by your opponent's racket traveling from *your right to your left*. Trajectory is *curved*. Ball *hooks to your right* after bouncing. Ball rebounds *to your left* after striking a vertical racket.
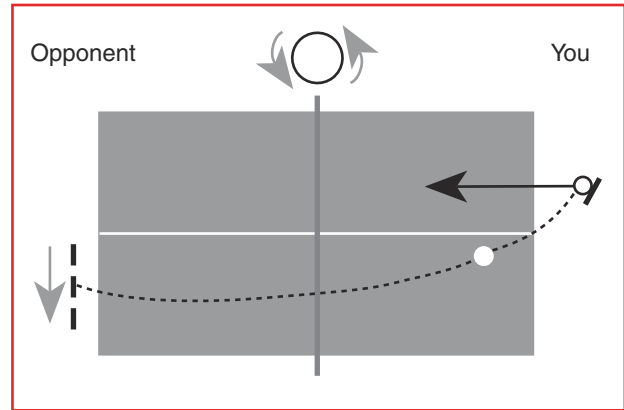
Figure L: Correction for Right Sidespin

Since right sidespin causes the ball to re-bound to the left when it strikes a vertical racket, it is necessary to tilt the leading racket face to the right and contact the ball to the left of its middle.
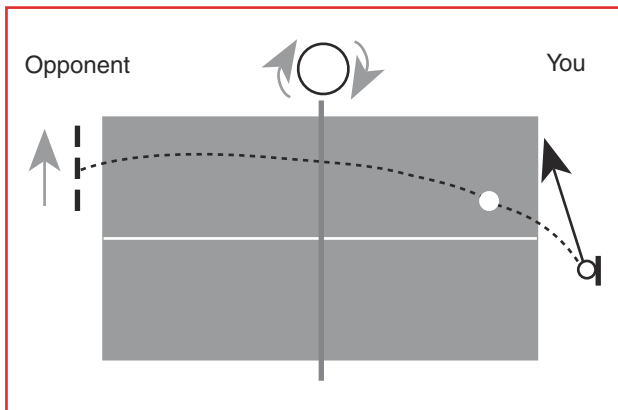
Figure M: Flight of Left Sidespin Ball

Left sidespin is produced by your opponent's racket traveling from *your left to your right*. Trajectory is *curved*. Ball *hooks to your left* after bouncing. Ball rebounds *to your right* after striking a vertical racket.
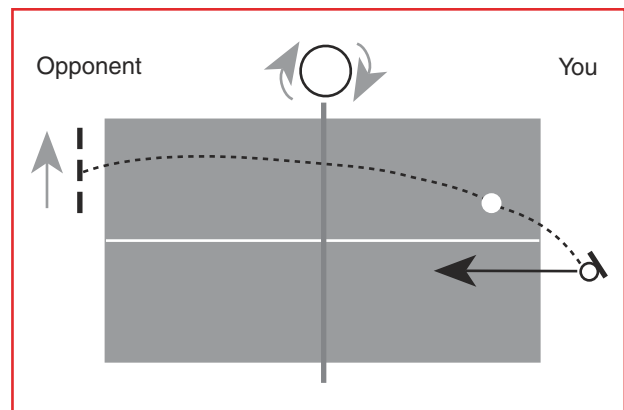
Figure N: Correction for Left Sidespin

Since left sidespin causes the ball to rebound to the right when it strikes a vertical racket, it is necessary to tilt the leading racket face to the left and contact the ball to the right of its middle.

of your opponent and make him/her play your game. Two important table tennis skills to develop are:

(1) Be able to instantly judge the type and amount of spin on the ball. Deduce the *type* of spin by carefully watching the *direction* your opponent's racket is traveling when it contacts the ball. Deduce the *amount* of spin from the *speed* of your opponent's racket at contact and the type of rubber being used. The faster your opponent's racket is going at contact and the finer the graze of the ball, the more spin that can be applied to the ball with that particular rubber.

Rubbers vary in their ability to spin the ball primarily because of the grippiness of their top surface. In general, inverted rubber is grippier and will produce more spin than pips-out rubbers. But even within these two broad categories of rubber, the spin producing capabilities of rubber will vary widely. If in doubt, test the grippiness of an unknown rubber by rubbing a ball across its surface and comparing it to your own rubber.

(2) Once you determine the type and amount of spin, be able to instantly adjust your racket angle to compensate for the spin's effect on the rubber. The tension of your grip, the looseness of your wrist, the flexibility of your forearm, and the position of your body all play major roles in developing this important skill.

BASIC STROKES AND SKILLS

The basic strokes are the *meat* of the sport. The majority of your practice time should be spent on developing your strokes until they are *grooved*. You want to do them by automatic response; not thinking about the individual components of the stroke, but rather *feeling* the entire motion. Once basic strokes are grooved, your time with the robot will be more fun and rewarding and you will be more successful against your opponents in a real match.

Robo-Pong is especially helpful in learning, then grooving strokes. Learn the strokes and skills in the order listed. For quickest improvement, acquire consistency with each stroke or skill before starting the next. This book first discusses strokes used to return topspin, then strokes used to return backspin. Loops are covered next as they are used for returning both topspin and backspin. These chapters are followed by ones discussing serve, serve receive, and footwork—all the basic skills you need to play well.

The learning process is greatly assisted when you start slowly and simply, then gradually build up your speed, power, and touch as you become more skilled. A common mistake of beginners is hitting the ball too hard. Take your time and learn consistency first, power second.

When you first attempt to hit the ball, your stroke should be very small. Your racket should not travel more than 12 to 18 inches. Only after you have gained control over this short stroke and are able to make the ball go in any direction that you choose, should you attempt to perform a longer stroke. Again, when first learning a stroke or skill, **START SLOWLY AND KEEP IT SIMPLE.**

A few helpful suggestions when you practice on the robot:

(1) The control settings given are estimates. Exact settings may vary from robot to robot. It may be necessary to slightly adjust the settings from the ones suggested in this book.

(2) All photos and illustrations represent a right handed player. If you're left handed, substitute left for right and right for left in all directions.

(3) Periodically, you'll need to turn off the robot and pick up balls from the floor to reload them into the ball return trays or ball bucket. The more balls you have loaded, the less often you will have to stop and pick up balls. Pong-Pal (see pg. 106) is an accessory that will make ball pickup quick and easy. It even works when balls roll under your table or other objects.

(4) Remember that another ball is always coming, so don't stop to pick up a ball that gets past you. If a ball rolls by your feet or lands on the table directly in front of you, quickly brush or kick it away so it won't distract you.

(5) It is important to learn how to adjust the robot to your skill level. Start with the robot adjusted to the suggested settings, or lower. When you acquire consistency at these initial settings, turn the ball frequency and/or ball speed controls up *slightly*. Practice at this higher speed until you feel comfortable and your strokes are consistent. Never turn the controls up to a level that causes you to lose good form. The idea is to increase the difficulty in such small increments that you hardly notice any difference. If a partner is available, have him/her turn up the controls for you very slowly until you begin to lose consistency.

(6) Keep a logbook with the date, skills practiced, maximum settings you were able to handle comfortably, and number of strokes or patterns you did without missing. By keeping a logbook such as this, you can accurately gauge your progress by looking at your previous maximum settings and comparing those to your current maximums. Sample charts can be found on pages 96 & 97. One note about maximum settings: It's unrealistic to set the ball speed or ball frequency higher than 3–4 when practicing against backspin because similar shots would never occur in a real game.

Chapter Ten
FOREHAND BLOCK

The first stroke to learn is the forehand block. It is called a block because you want to block the path of the ball with your racket. The block almost feels like no stroke at all. You do not swing at the ball, but merely intercept the ball with your racket—almost like a bunt in baseball. The block uses a ball's speed and spin to make your return go back over the net. The block does not add more speed or spin to the ball. It simply redirects the speed and spin back to your opponent. It is used to return topspin.

Intercept the ball with a still racket as the ball is rising and just before it reaches its peak. Angle the racket open or closed by rotating the forearm to make the ball return low over the net. If your return is too high, angle the racket more *closed* by tilting the face of the racket toward the table. Conversely, if your return is too low and doesn't clear the net, angle the racket more *open* by tilting the face of the racket closer to vertical.

One common mistake for beginners, when they are getting ready to hit a forehand, is to reach out and touch or lean on the table with their free hand. This is a direct violation of the rules and will cause you to lose a point in a match. So keep your free hand up and use it to counterbalance your racket hand, as shown in Photo 7 on the next page.

Lesson 3: Forehand Block With No Foot Movement

Now that you are ready to play against the robot, pick up your racket and hold it with a shakehands grip and with the racket face perpendicular to the floor and the wrist tilted down. (Review Chapter Six, *The Shakehands Grip*, pages 17–18, if necessary.) Position yourself very close to the end of the table, just to the *left* of the center line as shown in Photo 7. (Left-handers need to stand to the *right* of the center line and will have to substitute right for left and left for right in all further instructions.) Take up a slightly sideways stance so you can make contact with the ball to the side and slightly in front of your body. Place about 60% of your weight on your back leg.

With the robot controls set as suggested on pages 1 & 2, turn your robot on. After waiting for the balls to load up, prepare to block the ball back across the net with a still racket. **DO NOT SWING AT THE BALL**. Merely intercept the ball just before it reaches the peak of its trajectory after it has bounced on your side of the table. Experiment with tilting the racket angle downward until you can consistently place the ball back in a cross court direction and low (approximately 2–3″) over the net. Make the ball go back by redirecting the ball's speed and spin.

Photo 7: Forehand Block (Cross Court)

Note angle of the racket. It is tilted slightly down (to compensate for the topspin on the ball) and slightly to the left (to make the ball go cross court). About 60% of the weight is on the right leg. It would be better form if I had bent my legs more so that both shoulders were square to the floor and my elbow was at the same level as the ball at impact.

Do not add more speed to the ball with your stroke. Keep your wrist steady and tilted down. Do not allow it to flop around. Also keep your shoulders square to the floor and bend your knees. Move your racket very little throughout the stroke and keep it at the same height as the top of the ball bounce. Your goal is to correctly execute 50 cross court blocks in a row without missing.

Once you have gained consistency at blocking the ball back cross court and low, bend your wrist backward slightly so your return goes down-the-line, instead of cross court. Practice this down-the-line block until you can consistently place the ball back low over the net. Your goal is to correctly execute 50 down-the-line blocks without missing.

The next step is to alternate cross court blocks with down-the-line blocks. Practice until you successfully execute 25 patterns of one cross court block followed by one down-the-line block. When you can do this, you're ready to add more frequency and speed to your shots.

Turn the ball frequency off. Reset the ball speed setting to 3–3½ so each ball is delivered close to the end line on your side of the table. Turn the ball frequency to 4 and practice cross court blocks until you do 50 in a row without missing. Then practice down-the-line blocks until you do 50 in a row. Finally, practice alternating cross court and down-the-line blocks until you successfully do 25 patterns without missing.

Turn the ball frequency off and reset the ball speed to a higher setting. When you turn the frequency control back on, adjust to a setting higher than your previous setting. You do not necessarily have to turn up the ball speed and frequency to the same level, although this is usually the case with the block. You may also need to adjust the head angle to keep the ball on the table. When you turn the ball speed higher than 3–4, you have to raise the head angle so the ball doesn't bounce on the robot's side of the table first. Rather, the ball is delivered so it first bounces on the player's side.

Repeat the same sequence of cross court blocks, followed by down-the-line blocks, followed by alternating cross court and down-the-line blocks. It may be helpful to back off from the table slightly as you turn up the ball speed to allow more time to position your racket correctly.

NOTE: As you build up the ball speed, it becomes increasingly important <u>not</u> to swing at the ball. Be sure to attain consistency at each step before proceeding to the next step. Keep increasing the ball frequency and ball speed settings until you have reached the limit of your current ability and you begin to get erratic in your ball control and placement. Make note of the settings when you have reached your maximum limits.

Lesson 4:   Forehand Block With Foot Movement

When you have reached your current maximum limits, you are ready to combine movement with stroking. To add movement to the robot, with the power switch off, set the sweep control levers to the numbers 1 and 4 positions if you are right handed and to the numbers 3 and 6 positions if you are left handed. Set the ball speed and frequency controls to 1–2 points below your maximum rate, as determined in the preceding lesson.

Turn the main switch on and adjust the ball frequency to a comfortable level. The balls will be randomly fed to an area from your forehand corner to the center line of the table. Adjust the oscillator speed setting and head angle as described on pages 2–4. Practice blocking the ball back cross court with your forehand until you are consistent, then practice down-the-line blocks, and finally alternate cross court and down-the-line blocks, all with the ball moving to random positions at a slow speed. Once you complete this sequence at below maximum speed and frequency, gradually turn up the ball speed and ball frequency controls until you reach the upper limits of your current ability without losing consistency.

It will help if you watch the robot head to see which direction it is going to shoot so you can move into position *before* the ball is thrown. When moving sideways, it is important to move the feet to the ball, not to reach and lunge for the ball with the upper body. The torso should remain upright and bent slightly forward. The shoulders should remain square to the floor and the racket kept at top-of-bounce height. Remember to **move feet first, stroke second**. Avoid reaching for the ball. If you are having trouble moving, you might want to shadow practice table tennis footwork (refer to Chapter Twenty-One, *Footwork*, pages 81–82).

FOREHAND COUNTER

The forehand counter starts the same as the forehand block in the last chapter. Your stance and position to the table are the same and you contact the ball to the side and slightly in front of your body. You strike the ball at the top of its bounce. Unlike the block, which is executed with a relatively still racket, the counter has a medium-sized backswing and follow through. Do this by pulling your racket backward with your forearm and then pushing it forward and slightly upward. Maintain the correct racket angle throughout the stroke.

Stroke the ball mainly with the forearm, using your elbow as a pivot point. Hold your racket just below the height of the ball at the beginning of the stroke and finish with it at shoulder or head height. Stability in the stroke is achieved by making sure your racket is *at or slightly above the level of your elbow* at contact. Contact the ball at the top of its bounce. At the end of the stroke, the tip of your racket points forward or slightly to the left. Keep your wrist tilted down and do not let it flop back and forth.

Lesson 5: Forehand Counter With No Foot Movement

Aim the robot so it shoots balls to the middle of your forehand court and then turn off the oscillator. Starting at slow speed, forehand block the ball cross court. When you get a feel for the ball, take a quick step backward. At the same time take your racket back by twisting your waist and shoulders, and pulling back your forearm (not the upper arm). Timing your swing with the oncoming ball, swing forward into the ball so you contact it at the top of its bounce. Remember to swing primarily with your shoulders and waist, *not* with your arm.

Focus your eyes on the ball until just before contact. Keep your head steady and don't let it turn as you twist your torso. Time your twist so the ball goes cross court. Twisting too soon or too quickly makes the ball go wide to your left. Twist too late, too slowly, or not enough, and the ball goes down-the-line instead of cross court. Keep your wrist straight and tilted down. Your shoulders must stay square to the floor throughout this twisting motion. To place the ball down-the-line, bend your wrist slightly backward and time your twist the same as you did when you placed the ball cross court.

Follow the same procedure as you did with the forehand block to develop a forehand counter. First, at low speed and frequency cross court, then down-the-line, and finally alternating cross court and down-the-line. Gradually turn up ball speed and frequency until you have reached your upper limits. As you turn up the frequency and/or speed, remember to do a complete stroke. Don't turn up the speed to the point that you shorten your stroke. Your goal is 25 successful counters in a row at each stage.

Photo 8: Forehand Counter (Cross Court)

Notice how the whole right side of the body is twisted into the ball and how the forward swing and follow through are about the same length. **Images 1 & 2:** End of backswing. The racket is raised to the anticipated height of the ball and the racket angle is adjusted slightly. The backswing is chiefly a twisting back of the waist and shoulders and a pulling back of the forearm (not the upper arm, resulting in a *cocking* action). **Image 3:** Forward swing. Mainly a twisting forward of the shoulders & waist. **Image 4:** Just after ball contact. Ball is contacted at the top of the bounce. Notice the closed racket angle and the very quick acceleration from its position in Image 3. This was accomplished mainly by snapping the forearm forward and rotating the upper torso. The upper arm still has not moved very much.

Image 5: Follow through. The upper arm continues to move the racket forward and upward. **Image 6:** End of stroke. The racket ends up in front of the face in line with the center of the body. Weight transfer is 60–80% from right leg to left. The shoulders have been rotated parallel to the floor (no tilting or dipping of the shoulders).

Lesson 6: Forehand Counter With Foot Movement

Follow the same sequence as you did with the forehand block. Move the sweep control levers to the 1 and 4 positions for right-handers or to the 3 and 6 positions for left-handers. Practice your forehand counter in a cross court direction with the ball moving randomly within your forehand court. Then practice hitting the ball down-the-line, and finally alternate between cross court and down-the-line. Gradually build up the ball speed and frequency. Be sure to move your feet and get into good position *before* stroking the ball. Avoid reaching for the ball with your arm. Your goal is 25 successful counters in a row at each stage.

FOREHAND SMASH

When you're proficient at the forehand counter with foot movement at high frequency, it's time for the most fun stroke in the game—the forehand smash. The forehand smash is really an extended, more powerful version of the counter, just as the counter was an extended, more powerful version of the block.

Add a longer backswing and follow through to the counter and shift your weight harder from back leg to front. Accelerate your forearm quickly through the ball. Time your shoulder and hip turn to contact the ball at the peak of its bounce. After contact, allow your arm to swing up and over the left shoulder. It is also acceptable to let the racket follow through in a salute to the forehead instead of finishing over the left shoulder. Try both to see which feels better. And don't forget to keep your shoulders square to the floor throughout the stroke.

When done correctly, the forceful hip turn results in transferring all your weight from the right leg to the left leg. This provides you with tremendous power. Additional power can be generated by pulling back the left shoulder with your left arm as your right shoulder twists into the ball. Start at slow speed and frequency because the added backswing and longer follow through will take more time and you need the extra time to get ready for the next shot.

When first learning to smash, start with the robot delivering slow speed topspin balls that are 18–24 inches high (suggested settings—ball speed 2½, head angle "G"). As you get better at smashing, gradually lower the height of the ball and increase the ball speed until you can smash a ball only 6–10 inches high.

Lesson 7: Forehand Smash With No Foot Movement

Practice the smash using the same sequence as you have used for the other strokes learned so far. However, for the smash, your goal should be 15 consecutive strokes without missing. The forehand smash is quite tiring, so you may need to build up your stamina before you can do 15 consecutive smashes. Be aware that fatigue can drastically hamper your stroke, so take a break as soon as your consistency begins to falter. Also, because of the longer time it takes to execute the smash, you won't be able to turn the ball speed and frequency up as high as you could with the block or counter.

Another important skill to learn is how to forehand smash from the backhand corner. Set the robot to deliver balls to the middle of your backhand court. Step over until you are at the backhand corner and position yourself so your upper body is parallel to the sideline of the table. Now set the controls for low ball speed

and frequency and turn the machine on. Practice the forehand smash cross court, then down-the-line, and finally alternate between the two. Gradually build up the ball speed and frequency and lower the height of the shot.

Lesson 8: Forehand Smash With Foot Movement

Switch the oscillator control levers to positions 1 & 4 if you are right handed or to positions 3 & 6 if you are left handed. Set the ball speed and head angle for an easy, medium high topspin ball to the forehand. Keep the ball frequency slow, about 3–4. Adjust the oscillator speed as described on pages 2–4. Practice the forehand smash with the ball moving randomly within your forehand court. Place the ball cross court, then down-the-line, and finally alternate between the two. Gradually increase ball speed and frequency. Your goal is 15 successful smashes in a row at each stage.

The last step to learning the forehand smash is to expand your range of movement. The forehand smash is designed to finish off a point. Therefore, it's important to learn how to use the forehand smash across the entire table.

To practice this skill, set the sweep control levers to positions 2 & 4 if you're right handed (positions 3 & 6 if you're left handed). The ball will be placed from your forehand corner to the middle of your backhand court. Turn on the ball frequency and adjust the oscillator speed as suggested on pages 2–4. When you have it adjusted correctly, use your forehand smash to return all balls—do not use your backhand. You'll have to move quickly to cover this entire distance, and this drill is an exhausting one even for top players. Your goal is 15 consecutive smashes in each direction (cross court

and down-the-line). A further step would be to set oscillator levers to 3 & 4 and smash balls across the entire table.

Lesson 9: Combining Forehand Smash With Counter And Block

On page 38 you will see the three strokes you have learned so far—the Block, the Counter, and the Smash. In reality, these are not three separate strokes, but three phases of the same stroke. Look closely at Photo 9 and you will see that the smash incorporates all of the components found in both the counter and the block. Likewise, the counter incorporates all the elements of the block.

The contact point (both in relation to distance from the body and the flight of the ball), racket angle, and the upper arm to forearm angle are all essentially the same. The biggest differences among these three strokes are stroke length, amount of weight shift, and degree of racket acceleration.

The block has a very short swing with almost no backswing and very little follow through. The counter has a longer swing with a definite backswing and follow through. And the smash has a very big swing with a much longer backswing and follow through. The block has no weight shift from back leg to front, the counter has a 60–80% weight shift, and the smash has an almost complete 100% weight shift. Racket acceleration varies from very little in the block, to moderate acceleration in the counter, to very explosive acceleration in the smash.

In a game, the choice of which stroke to use is normally dictated by the amount of time you have to get ready for the shot and the amount of control you wish to maintain in the rally. If your opponent is attacking and you have little time to get

Photo 9: Forehand Smash (Cross Court)

Notice the very long swing, the rapid acceleration of the racket before ball contact, and the forceful twist of the shoulders, waist, and right leg. *Image 1:* End of backswing. Waist and shoulders have been rotated back as far as they can go and the forearm has been cocked back. At this point, 90% of the weight is on the right leg. The racket has been raised to the anticipated height of the ball at contact. *Image 2:* Forward swing. The waist and shoulders are being rotated into the ball as weight is being transferred to the left leg. The forearm is beginning to be uncocked. *Image 3:* Immediately after ball contact. Ball was contacted at the top of the bounce. Note the closed racket angle. The forearm has been rapidly snapped forward. The racket is at the level of or slightly above the level of the elbow. *Images 4 & 5:* Follow through. Shoulder and upper arm continue to push racket forward and slightly upward. Waist twist continues to transfer weight to the left leg. The right leg has twisted forward with a definite thrust at the knee. *Image 6:* End of stroke. The powerful momentum of the racket has taken it all the way across the body to finish on the left side of the head. The shoulders have rotated almost 180° during the stroke and are kept parallel to the ground throughout the stroke, The waist has rotated about 135°. Nearly 100% of the weight has been transferred to the left leg.

ready for a shot, the block is the correct choice. It takes little time to execute and the need for controlling your opponent's power is at a premium. In an average rally, where both players are jockeying for an opening, the counter is your best choice because it is a blend of power and control. When you get an easy slow ball, use the smash to end the point because you have plenty of time to get set and control is less of a factor.

To strengthen these three strokes and reduce the transitional time it takes to go from one stroke to the next, do the following drill. Set your robot to deliver a medium speed, medium height topspin ball to the middle of your forehand court. Start by blocking the first ball, countering the second ball, then smashing the third ball. Keep alternating from block to counter to smash and back to block for approximately 5 minutes. After blocking, take a quick step backward before you execute your counter. Likewise, take a quick step forward before doing the block. Do this drill often and concentrate on keeping the contact point, racket angle, and arm angle the same with each of these strokes. The transition from one stroke to the next should feel smooth and almost like you're practicing one stroke instead of three different ones. The length of the stroke and the amount of power you are generating should be the primary differences among these three strokes.

Photo 10: Comparing Forehand Block, Counter, & Smash

Look at the three photos below carefully. The photo of the block was taken just before ball contact while the fourth image of the counter and the third image of the smash were both captured just after ball contact. Note how the racket is at or slightly above the level of the elbow at contact and the forearm to upper arm angle and the racket angle are essentially the same in all three strokes. Compare the difference in weight shift between the counter (60–80%) and the smash (90–100%). This weight shift is evidenced by the amount of leg *kick*. Note the distance the racket travels between images 3 & 5 in the counter and 2 & 4 in the smash. Since the photo's flash timing between each image remains constant, this reveals that the racket is moving at a much faster pace in the smash than in the counter. The photo of the block is not stroboscopic because the racket moves so little that the images would have been indistinguishable.

BLOCK   **COUNTER**   **SMASH**

BACKHAND BLOCK

The backhand block, like the forehand block, uses the speed and spin that is already on the ball to return the ball back across the net. The biggest difference between the backhand and forehand block is the backhand block makes contact with the ball *directly in front* of the body; whereas, the forehand block makes contact with the ball *to the side and in front* of the body. The block is used to return topspin, especially fast topspin strokes like loops or smashes.

Stand about 12 inches in back of the center of your backhand court (the left court as you face the table, for right-handers) in a squared off stance as shown in Photo 11 on the next page. Do *not* turn your body sideways. Position your body so the ball would hit you squarely in the center of your body if you did not hit the ball. Distribute your weight equally between both legs. Tilt your upper body slightly forward so that your elbows hang down in front of the body.

Intercept the ball with a still racket as the ball is rising and just before it reaches its peak. Angle the racket open or closed by rotating the forearm to make the ball return low over the net. If your return is too high, you must angle the racket more closed by tilting the face of the racket toward the table. Conversely, if your return is too low and doesn't clear the net, you must open the racket angle slightly by tilting the face of the racket closer to vertical.

Lesson 10: Backhand Block With No Foot Movement

Adjust the robot to deliver topspin shots to the middle of your backhand court at a slow pace and speed. Practice your backhand block in the same manner and in the same sequence as you did the forehand block. Start slowly with no oscillation and blocking the ball back cross court, then down-the-line, and finally alternating shots in the two directions. Gradually build up the ball frequency and speed. Be sure that you can do, without missing, 50 cross court blocks, then 50 down-the-line blocks, and finally 50 patterns of alternating cross court and down-the-line blocks.

Remember *not* to swing at the ball. Merely block the path of the ball with your racket and let the ball's speed and spin make it rebound across the net. Experiment with tilting the racket angle until you can consistently place the ball back in the desired direction and low over the net.

Lesson 11: Backhand Block With Foot Movement

When you have reached your current maximum limits in Lesson 10, you're ready to combine movement with the

Photo 11: Backhand Block (Cross Court)

Notice angle of the racket. It is tilted slightly closed to compensate for the topspin on the ball and slightly to the right to make the ball return cross court. The upper body is square to the table and leaning forward. The right elbow is hanging down in front of the body. Left hand (almost hidden by the racket) counterbalances the racket hand. Weight is equally distributed on both legs.

backhand block. To add movement to the robot, turn the main switch off and move the sweep control levers to positions 3 & 6 if you're right handed or 1 & 4 if you're left handed. Set the ball frequency and ball speed controls to 1–2 points below your maximum rate, as determined in Lesson 10. Adjust the oscillator speed setting as described on pages 2–4.

The balls will be randomly delivered from the center line of the table to the backhand corner. Block the ball back cross court until you are consistent, then practice down-the-line blocks, and finally alternate cross court and down-the-line blocks, all with the ball moving to random positions within your backhand court at slow speed. Never increase the oscillation range to include the forehand court—it is better to use a forehand stroke whenever the ball lands in the forehand court.

Always move your body directly in front of the ball before the ball is thrown towards you. Avoid reaching for the ball with your arm—**MOVE YOUR FEET**! Keep your elbow out in front of your body; don't let it hang at your side. It helps to watch the robot head to see which direction it is going to shoot so you can move into position *before* the ball is thrown to you.

Once you complete this sequence at below maximum speed and frequency, gradually turn up the ball speed and ball frequency controls until you reach the upper limit of your current ability without losing consistency.

BACKHAND COUNTER

The next stroke to develop is a backhand counter. I will describe two ways of doing this stroke as technique has changed in recent years. The first description will be of the traditional method as shown in Photo 12A. This method incorporates a backswing, forward swing, and follow through. The stance is almost square to the table or perhaps even slightly turned left. The traditional method would be favored for backhand oriented players or when there is sufficient time and need to take a larger, more powerful stroke.

This stroke starts like the backhand block—your stance and position to the table are the same. Contact the ball as it is rising just before the top of its bounce about 1 to 1½ feet in front of you. Unlike the block, which is executed with a relatively still racket, the backhand counter has a small backswing and a longer follow through. Do this by pulling the racket back towards the left hip (about even with the elbow) and then pushing it forward and slightly upward. Be sure to keep the correct racket angle throughout the stroke.

This stroke is done primarily with the forearm. The elbow and upper arm remain relatively stable and the forearm pivots around the elbow. Hold the racket slightly below the height of the ball at the beginning of the stroke and let it end just above the height of the ball at the finish. An indication of a complete stroke is the tip of the racket pointing forward or even slightly to the right (for right-handers) at the end of the stroke. Keep your wrist held in the down position and do not let it flop back and forth.

The second way to perform a backhand counter is what I call the modern backhand counter (see Photo 12B). It has evolved to become a very efficient stroke, capable of controlling and counter-attacking even powerful topspin attacks. There is almost no backswing at all—it is primarily a forward motion. It excels at re-directing the energy (both speed and spin) on the ball back to the opponent. Also, it is executed from a forehand stance; hence, it provides a quick transition from one side to the other and leaves the player in a foot position perfect for using the forehand.

Another advantage is that the start of the stroke is very similar to the ideal position for the backhand block. Therefore, the player has the option of controlling the shot with a block, or at the last second, adding a small backswing and longer follow through to add more pace and power. The modern stroke would be favored by players wanting a speedy forehand to backhand transition and/or a quick backhand counter-attack, especially against strong topspin.

The modern backhand counter starts by pulling the racket over to the left and to

a height the same as or slightly higher than the contact point with the ball. It is not taken back very much at all. The racket is always kept forward of the elbow. As the ball bounces off the table, the racket is pressed forward primarily by pulling the elbow in while at the same time turning the knuckles of the hand down. This results in the racket flopping over the top of the ball, producing topspin and forward speed. This flop is the most important element of the stroke and can be seen in images 1–3 of Photo 12B.

Although the weight shift for both strokes is fairly small, the traditional stroke shifts weight from the left leg to the right leg; whereas, the modern stroke transfers weight from right to left. With the modern stroke, the weight shift is always from right to left for both forehand and backhand (right handed players).

So which backhand counter should you use? My advice is to carefully consider your style and goals. If you predominately win points with your forehand, then the modern backhand is the obvious choice. If your ultimate goal is to compete at the national or international levels, then the modern backhand is essential. On the other hand, if you only desire to compete recreationally and/or you win the majority of points with your backhand, the traditional backhand is the way to go.

Photos 12A and 12B were taken under different circumstances so it is difficult to compare the actions. Due to the camera angle, it's hard to discern the forward motion or acceleration changes of the racket in the modern variant. Also there is only one image of the ball, so it is harder to ascertain the correct timing of the stroke in relation to the flight of the ball.

Lesson 12: Backhand Counter With No Foot Movement

Develop a backhand counter following the same procedure as all the other strokes. First, at low speed and frequency cross court, then down-the-line, and finally alternating cross court and down-the-line. Gradually build up the ball speed and ball frequency until you have reached your upper limits. As you turn up the ball frequency and/or speed, remember to do a complete stroke. Do not turn up the speed or frequency to the point that you start shortening your stroke. Your goal for each phase of this lesson is 25 consecutive counters in each direction.

Lesson 13: Backhand Counter With Foot Movement

Start with the ball moving randomly at slow speed within your backhand court (sweep control levers at the number 1 & 4 positions for right-handers, 3 & 6 for left-handers), then gradually increase settings to maximum. Remember not to reach for the ball with your arm, but rather move your feet so you are squarely in front of the ball *before* you stroke it.

Lesson 14: Combining Backhand Counter With Backhand Block

Similar like Lesson 9, it is important to learn a smooth transition from block to counter. When the opponent hits a powerful shot, and/or you are in a less than ideal position, the block is the correct answer in almost all cases. When you're in good position and your opponent gives you a slow to medium shot, the counter is normally the better stroke to choose. If you get an easy ball to your backhand, step out and smash it with your forehand

as you learned in Lesson 8. Although a backhand smash can certainly be learned it will not be discussed in this manual on basic skills.

To practice strengthening these two strokes and reduce the transitional time it takes to go from one stroke to the next, do the following drill. Set your robot to deliver a medium speed, medium height topspin ball to the middle of your backhand court. Alternate one backhand block with one backhand counter until the transition from one to the other feels smooth and effortless. Keep alternating from block to counter and back to block for approximately 5 minutes. Do this drill often and concentrate on keeping the contact point and racket angle the same with each of these strokes. The transition from one stroke to the next should feel almost like you're practicing one stroke instead of two different ones. The length of the stroke and the amount of power used should be the primary differences between these two strokes.

Photo 12A: Traditional Backhand Counter (Cross Court)

Notice that the stroke is done almost exclusively with the forearm. The rest of the body remains relatively still, including the upper arm. This is evidenced by the blurring of the face and the overlapping images of the stripes down the right leg. The upper body is square to the table and leaning forward. The right elbow is hanging down slightly in front of the body. Also notice the follow through is longer than the forward swing. *Image 1:* Racket is being taken back. *Image 2:* End of backswing. The racket has been raised to just below the anticipated height of the ball at contact and the racket angle adjusted for topspin. *Image 3:* Right before ball contact. Racket angle has not changed. Racket is approaching the peak of its acceleration. Contact is made at top of the bounce or slightly before. *Images 4–6:* Follow through. The forearm continues to rotate forward, pivoting around the elbow. Tip of racket points forward (Image 4), then to the right (Image 6). Although the left hand is shown at the side, in a normal stroke, it would be held up in front of the body with the arm bent.

Photo 12B: Modern Backhand Counter (Cross Court)

Notice that the racket remains at or above the height of the incoming ball at all times. Except the arm, the rest of the body remains relatively still with just a small weight shift. The upper body is square to the table and leaning forward, and the feet are angled with the right foot rearward of the left. The right elbow is hanging down in front of the body. Weight is distributed about 60% rear leg and 40% front leg. *Image 1:* End of backswing. Racket moves to the left, but still well forward of the elbow. The wrist is straight and racket is angled down to compensate for topspin. *Image 2:* Just after contact. As the ball is rising, the racket is *flopped* over the top of the ball by pulling the elbow inward while turning the knuckles down. *Image 3:* The *flop* is completed by turning the knuckles down. The racket tip points right. *Images 4–6:* Follow through. The racket continues to pivot around the elbow. The elbow is raised slightly and the upper arm extends forward. Additional power comes from shifting the weight from rear leg to front leg (30%/70%). At the end of the stroke the racket is forward and to the right of its starting position. For more controlled counters, use an abbreviated stroke (images 1–3).

Chapter Fifteen

COMBINING FOREHAND AND BACKHAND

Once you are proficient at forehand and backhand block and counter strokes, it is time to learn how to combine forehand and backhand strokes. Maintaining a good ready position is the most important aspect of combining strokes. A good ready position decreases reaction time, permits easy movement in any direction, and assists in making a smooth, flowing transition from one shot to the next.

Most of the drills described in this chapter require you to have good footwork. If you have trouble maintaining consistency when you have to move your feet, take time out to read Chapter Twenty-One *Footwork*, pages 81–82, and shadow practice the footwork until you feel comfortable with that kind of movement.

Lesson 15: Ready Position

To assume the ready position, look at Photo 13 and keep your:

(1) Feet apart, at least shoulder width or wider. Your right foot is slightly further back than your left foot. The taller you are the wider the feet should be apart.

(2) Weight on the balls of your feet with heels slightly off the ground and weight evenly distributed on both feet.

(3) Upper body square to the table and tilted slightly forward.

(4) Arms hanging down with the forearms bent at an approximate 90° angle to the upper arms. This places the elbows slightly *in front* of the body, not against the sides of your body.

(5) Knees bent according to your height. A tall person needs to bend his knees more than a short person. Avoid standing up straight with your knees locked.

(6) Racket pointed forward, not favoring forehand or backhand.

(7) Head tilted up with your eyes focused on the ball.

(8) Entire body balanced and relaxed.

(9) Mind clear and in a state of alert readiness, ready to jump start the body into action as soon as ball speed, spin, and trajectory are perceived.

The basic sequence of a rally is as follows: First, assume the ready position. Second, judge the trajectory of the ball. Third, move to the ball. Fourth, stroke the ball. Fifth, return to the ready position.

**Photo 13:
Typical Ready
Position.**
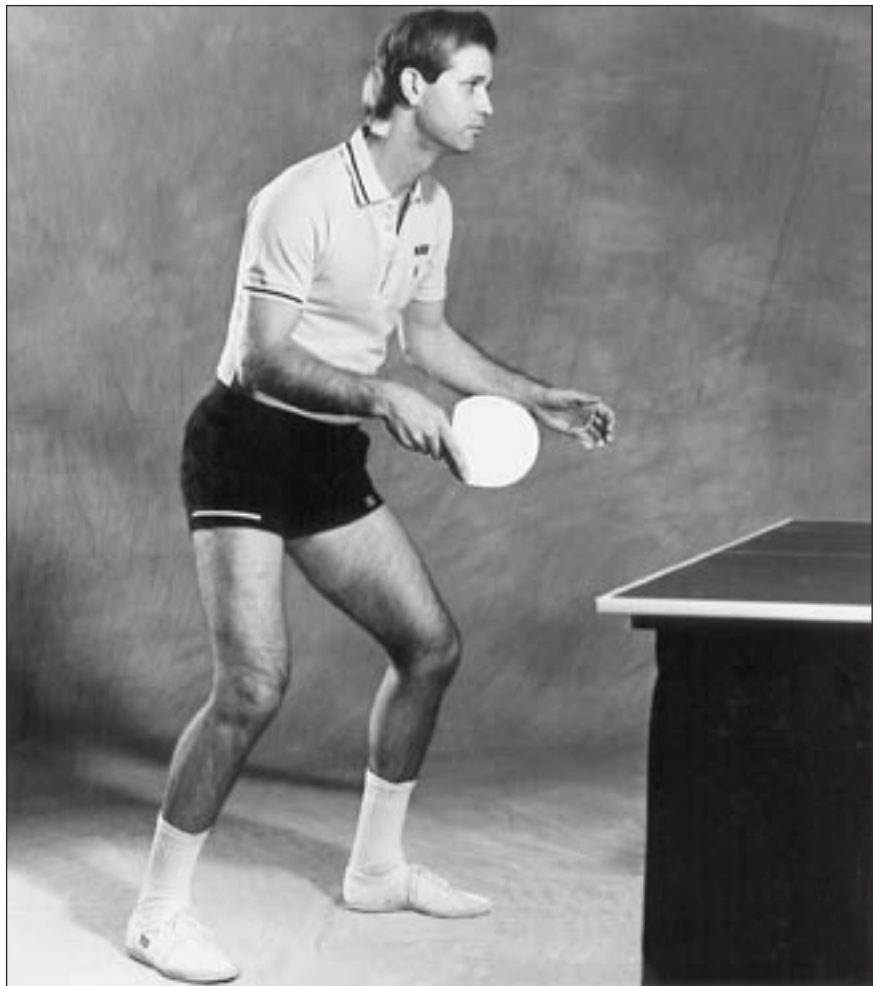
The ready position begins and ends every stroke and every rally. Practice this by: (1) assuming the ready position, (2) taking a quick two-step to the forehand (see *Footwork*, pgs. 81–82, for example of two-step footwork), (3) executing a shadow stroke forehand counter, (4) taking a two-step back to your original position, and (5) reassuming the ready position. Repeat this action until it feels comfortable.

The next drill will be to repeat the same drill as in the preceding paragraph except you add a backhand counter. For this drill you would: (1) start in the ready position, (2) take a quick two-step to the forehand, (3) shadow stroke a forehand counter, (4) take a two-step back to your original position, (5) reassume the ready

position, (6) shadow stroke a backhand counter, and (7) finish by reassuming the ready position once again. As before, repeat until it feels comfortable.

Lesson 16: Combination Block Strokes With The Ready Position

To practice forehand and backhand combinations, turn the robot off and set the sweep control levers to the numbers 2 and 5 positions. The ball will land from the middle of your forehand court to the middle of your backhand court.

Assume the ready position just to the left of the center line. Make sure your racket is pointed straight forward and that the racket and your forearm align with the

center line of the table. Turn the robot on at a slow speed and frequency and practice a backhand block when the ball lands to the left of the center line and a forehand block when it lands to the right of the center line. (Left-handers should use a forehand for balls to the left of the center line and a backhand for ones to the right.) After each stroke, make sure you assume the ready position before stroking the next shot. Do one drill by placing all blocks (both forehand and backhand) cross court, and a second drill by placing all blocks down-the-line.

Gradually build up your speed, but be careful not to go so fast that you forget to return to the ready position between strokes. Once you have reached your upper limits without losing good form, increase the range of oscillation by changing the sweep control levers to positions 2 and 4, if you're right handed, and 3 and 5, if you're left handed.

At these settings the ball will land randomly from your forehand corner to the middle of your backhand court. Repeat the above drills, but this time move whenever the ball goes to the wide forehand. Again, do one drill placing all blocks cross court, and a second drill placing all blocks down-the-line. Start at slow ball frequency and build up. Lastly, set the oscillator to sweep the entire width

of the table (oscillator lever positions 3 & 4) and repeat. Be sure to use a backhand block whenever the ball lands in your backhand court and a forehand block whenever the ball lands in your forehand court. Gradually build up ball speed and frequency. Your goal is 50 successful blocks in a row at each stage.

Lesson 17: Combination Counter Strokes With The Ready Position

Practice the drills described in the previous lesson, but use backhand and forehand counters instead of blocks. Then practice the drills using a backhand counter when the ball lands to the left of center and a forehand smash when it lands right of center. Remember, whenever you start a new drill, start *slowly*, and *gradually* build up your speed.

The next drill will be to set the robot to deliver balls to the middle of the backhand court with no oscillation. Practice hitting one backhand counter and then step out and hit one forehand counter. Keep alternating between the two strokes, placing the ball cross court at first, then down-the-line. Then practice hitting a backhand counter, followed by a forehand smash. Again, hit the ball cross court at first, then down-the-line. Your goal is 25 successful counter/smash combinations in a row at each stage.

Chapter Sixteen

THE PUSH

All the previous drills have been performed against topspin. Now you need to learn how to return backspin effectively. The easiest stroke to use to return a backspin shot is the push. The push, like the block, is a very simple and easy stroke. It is, however, a very important part of the game and must be mastered. Unlike the other strokes learned so far, which are *force strokes*, the push is a *friction stroke*. (See pg. 55 for an in-depth discussion on friction and force strokes.)

The push is typically used when the opponent gives you a backspin serve or return that is so well placed that you cannot attack it safely. The push is then used to keep the ball in play until a better opportunity for attacking comes along. The push should not be used to return topspin as your return will likely be high and easily attacked.

The main purpose of the push is not so much to win the point, but to return it accurately and safely. For this reason, concentrate on developing good touch and control on your pushes, and forget about power and speed.

A push stroke is performed using an open racket angle and contacting the ball somewhere between the center and the bottom. Stroke motion is from high to low in a forward direction. This motion and the open racket angle result in applying your own backspin to the ball.

The push is a relatively slow speed stroke with only a small amount of gentle acceleration. It is performed very close to, or often, actually over the table. The point of contact is *after* the top of the bounce, as the ball is falling.

Lesson 18: Backhand Push

To learn the push, change the spin setting of your robot to backspin. Decrease the ball speed to 2, the ball frequency to 3, and turn the oscillator off when the robot head lines up with the middle of your backhand court. The head angle should be set to "C".

Turn the robot on and practice pushing with your backhand. Stroke mainly with the forearm, keeping the elbow and upper arm relatively still. At first your returns will likely keep going into the net because of the effect of the backspin (see pages 21–23). Keep opening up your racket angle and aim for the bottom of the ball. Contact is light, almost like you are trying to slice the bottom off the ball. If the ball keeps going into the net it may be necessary to lift your elbow somewhat as you make contact with the ball.

When you get the ball to clear the net, keep the push as low over the net as you can. Don't push hard or fast. Rather, use a soft, guiding touch with your push so you can place it accurately. Regain the ready position after each stroke.
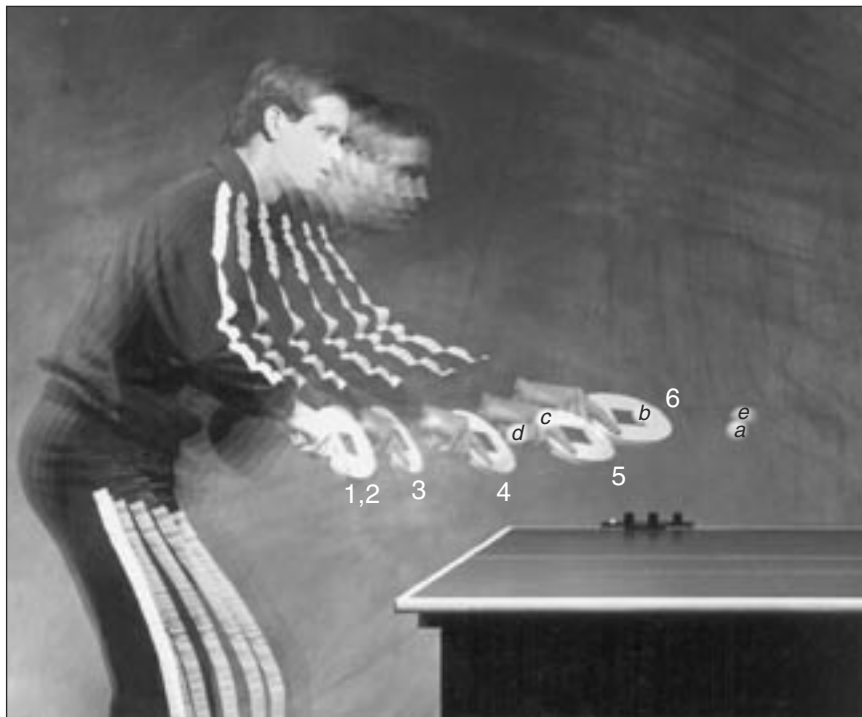
Photo 14: Backhand Push (Cross Court)

Notice that the speed of the racket is constant. The even spacing between images indicates a smooth, flowing stroke. Also note the small step forward with the right leg and how the upper body is tilted forward so the elbow hangs in front of the body. ***Images 1 & 2*** (almost completely overlapping): End of backswing. Racket was taken back by pulling the forearm toward the body. Racket angle is open. ***Image 3:*** Forward swing. Racket angle has not changed. Right leg begins to step forward at the same time as the forearm begins to push the racket forward. ***Image 4:*** Just after ball contact. Racket tip is starting to rotate forward. ***Image 5:*** Follow through. ***Image 6:*** End of stroke. Arm is almost completely extended forward. Right leg has stepped in about one foot. The whole body has been lowered slightly (as shown by face position). Racket tip is pointing forward.

When you get the feel for the push, practice until you can push 50 cross court, 50 down-the-line, and 25 patterns of alternating cross court and down-the-line pushes without missing. Gradually increase the frequency up to 4 and the ball speed up to 3 (speeds and frequencies higher than that are unlikely in a real game). After reaching your upper limit, turn the unit off and set the sweep control levers to sweep within the backhand court. Practice your backhand push with the ball moving around randomly and placing your returns to all parts of the opposite end of the table.

Lesson 19: Forehand Push

The forehand push is the next stroke to learn. Like the other forehand strokes, contact the ball to the *side of* and slightly *in front* of the body. Your stance is the same as the backhand push and your weight is evenly distributed on both legs. Push the racket towards the bottom of the ball by straightening the arm. At the
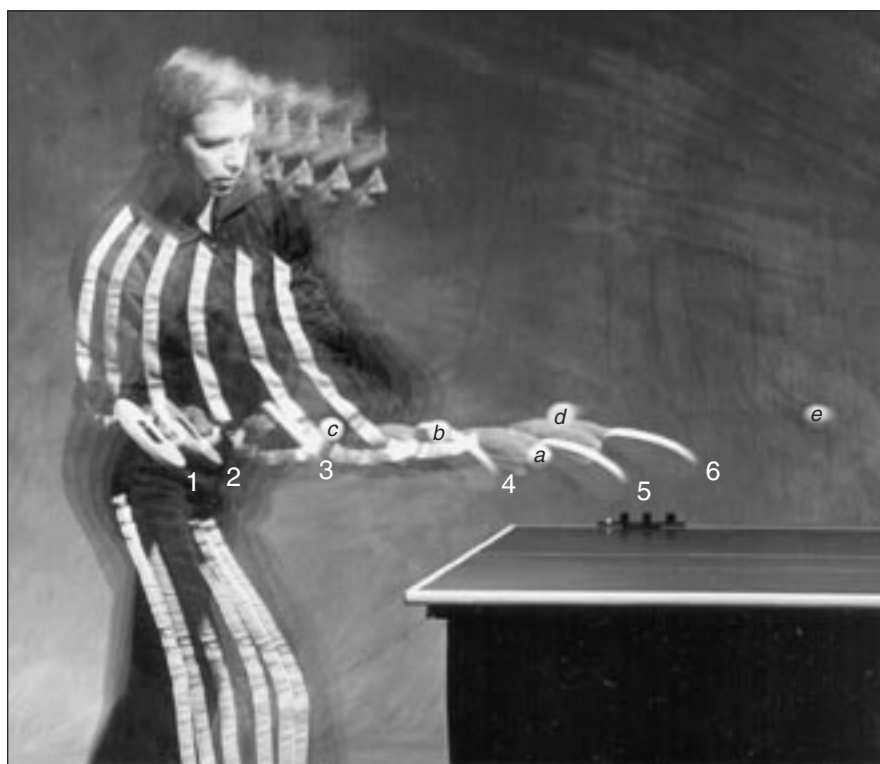
Photo 15: Forehand Push (Cross Court)

Notice the upper body has been tilted to the right and the right leg steps in as the ball is stroked. *Image 1:* End of backswing. Racket is taken back by pulling the forearm back. Racket angle is open. *Image 2:* Forward swing. Racket angle has not changed. Right leg steps forward at the same time as the forearm pushes the racket forward. *Image 3:* Just before ball contact. Racket tip starts to rotate forward. Contact is made as the ball is falling from the top of the bounce. *Image 4:* Follow through. Forearm and upper arm continue to push the racket forward and the racket tip continues to rotate around. *Images 5 &* *6:* End of stroke. Arm has been almost completely extended forward. Right leg has stepped in about one foot. The whole body has been lowered slightly (as shown by position of face). Racket tip is pointing forward. Stroke could actually have ended at Image 5. Racket movement between 5 and 6 is unnecessary.

same time, take a small step forward with your right leg, keeping your elbow close to your body until after ball contact.

The racket head should rotate around so it is pointing forward at the end of the stroke. It may help to bend your upper body slightly toward your forehand and dip your right shoulder so you can better see the bottom of the ball. Regain the ready position between each stroke.

Practice the forehand push at slow speed and frequency until you can consistently push 50 in a row cross court, then down-the-line, and finally, alternating cross court and down-the-line. Increase the frequency to 4 and the ball speed to 3. Next, practice the push with the robot set to sweep within the entire forehand court. Then change the control levers so the robot sweeps the entire table and practice combining forehand and backhand pushes. Recover to the ready position after each stroke and before moving to the next stroke. Your goal is 50 consecutive pushes without missing at each stage of this practice.

Chapter Seventeen
FOREHAND DRIVE

As your skills develop, you may want to learn how to attack a backspin return instead of just pushing it back, particularly if you like to be offensive. The forehand drive is one option for attacking backspin. This stroke is similar to the forehand smash with only minor differences. When driving backspin, contact the ball with a more open racket angle and stroke more upward than in the smash. At contact the racket face is almost perpendicular.

I use the term *drive* to describe a *force* attack against backspin; whereas, I use the term *smash* to describe a similar stroke used to attack topspin. Other authors may use *drive* to describe either stroke. Also, the smash and drive differ from the loop (described in the next chapter) by stroke energy being directed primarily toward the central core of the ball (a *force stroke*) instead of toward the outer shell of the ball (a *friction stroke*). More on this in the next chapter.

When first learning the forehand drive against backspin, it may be difficult to get the ball to clear the net. This is because the backspin causes the ball to rebound downward when it grabs into your rubber surface. To counteract this effect, it is necessary to stroke forcefully at high speed and/or open your racket angle even more, so you are actually striking the ball a little below center and driving the racket up through the ball. This will provide the necessary *lift* to get the ball

to clear the net. The less racket speed there is at contact (such as when you're first learning the stroke or when you're being cautious in a match), the more open the paddle angle needs to be.

This is not an easy stroke to learn, so don't get frustrated if it is difficult to execute with any consistency. It is OK to temporarily skip over the next lesson if you find it difficult to execute the forehand drive with consistency. In this case, do the remaining lessons and come back to Lesson 20 at the end.

Lesson 20: Forehand Drive

To learn this stroke, set the spin to backspin, the speed to 2, the frequency to 3, and turn the oscillator off when the robot head points to the middle of your forehand court. Practice the forehand drive first cross court, then down-the-line, and then alternate between the two directions. Next, turn on the oscillator and practice the forehand drive with the ball moving randomly inside your forehand court, then your whole backhand court, and finally ¾ of the whole table from the middle of your backhand court to your forehand corner. Lastly, combine your forehand drive with the backhand push by setting the oscillator to sweep the entire table and practice pushing on your backhand side and driving on your forehand side. Your goal is 15 successful drives in a row at each stage.

Another good drill is to adjust the robot to shoot balls to your backhand and practice pushing a backhand followed by stepping out and doing a forehand drive from your backhand court. This is a particularly useful drill because it develops a variety of skills: a backhand backspin defensive stroke (touch), a forehand topspin offensive stroke (power), and footwork (quickness). Do this drill using no oscillation, then gradually turn the ball frequency up to 4.

Photo 16: Forehand Drive (Cross Court)

Notice how the racket starts below the level of the ball at impact and the racket finishes high above the head. Also note the very rapid acceleration of the racket between images 2 and 4 and the almost vertical racket angle at contact. *Image 1:* End of backswing. Racket is taken back *and down* by rotating the waist and shoulders and pulling the forearm back. Note that the racket is *below* the level of the anticipated point of contact. *Image 2:* Forward swing. Racket is beginning to rapidly accelerate forward. This is achieved by rotating the waist and shoulders, twisting the right leg, and pushing the forearm forward. *Image 3:* Just after ball contact. The racket angle is almost vertical, and the racket has accelerated forward and upward. Notice how, just like the forehand smash, the racket is at the level of or slightly above the level of the elbow at time of contact. Contact is made at the top of the bounce. *Image 4:* Follow through. Racket travels upward by raising the upper arm. The waist and shoulders continue to rotate forward. *Images 5 & 6:* End of swing. Upper arm continues to raise racket until it finishes above the head. Shoulders and waist have rotated approximately 135°. The weight shift from the right leg to the left leg is so strong it has pulled the right leg forward.

Chapter Eighteen
LOOPS

When this book was originally written in 1992, loops were considered an *advanced* technique, so they were not included in this book on *basics*. Nowadays (2006), loops are considered an essential part of the game and need to be learned as soon as possible. In modern table tennis, strategy has evolved to where the first person to attack with a loop is usually the one who wins the point. The loop is now the most important shot in the game.

A loop is primarily a *friction* stroke. This means that stroke energy is directed at the outer shell of the ball in a grazing or brushing motion to make the ball rotate. This contrasts to the counter, block, smash, and drive that are considered *force* strokes. Energy in force strokes is directed at the inner core of the ball and results primarily in forward speed being applied to the ball (same as hitting a baseball with a bat).

All strokes are a blend of force and friction. To help conceptualize how much force or friction is necessary for a particular stroke, it is helpful to give percentages to these two components. For instance, a smash is typically about 95% force and 5% friction. A push, on the other hand is about 10% force and 90% friction.

The primary purpose of a loop is to put lots of topspin on the ball, therefore friction is essential. But the loop is unique among table tennis strokes in that it incorporates a much wider range of friction/force combinations than any other stroke. For ease of learning, loops are broken down into either a *spin loop*, where the emphasis is on heavy friction contact, or a *drive loop*, where the emphasis is on a more forceful contact. In actuality, though, loops incorporate the entire continuum of friction/force ratios from about 95/5 to 25/75, resulting in a full range of ball speeds from very slow to very fast, all carrying heavy topspin.

Spin loops are about 50–95% friction and 50–5% force. Spin loops carry the greatest amount of topspin. The stroke direction is about 45–80° forward (see Figure O, next page). Contact is typically made with the ball as it is falling (points *D* or *E*, Figure P, next page) and at or just above the center of the ball. The spin loop seeks to maximize the friction contact so the feeling on the rubber is a soft brushing or skimming action with primarily the topsheet of the rubber.

The drive loop is about 25–50% friction and 75–50% force. This loop is designed to end a point with explosive power. The stroke direction is about 10–45° forward (See Figure O). Contact is almost always made at or very close to the top of the bounce (point *C*, Figure P). The feeling of the racket contacting the ball is much harder than the spin loop as the ball is driven deep into the sponge layer and the hard feel of the wood is felt.
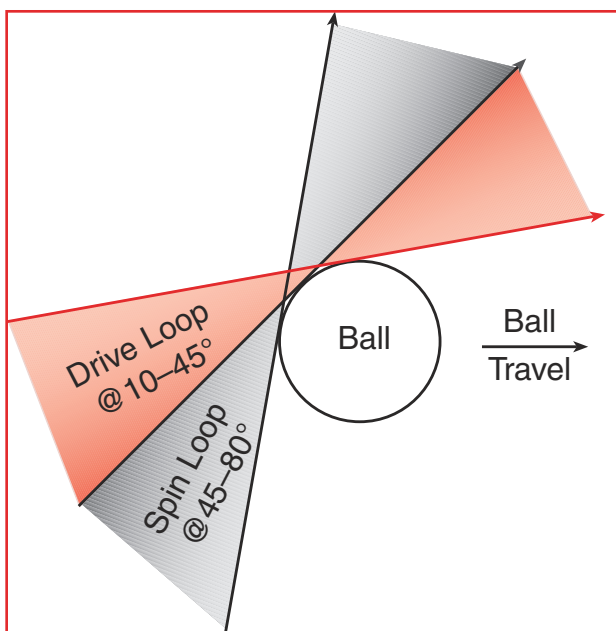
Figure O: Stroke Angles For Loops
The spin loop seeks to maximize the amount of spin so the stroke angle is inclined very sharply upward (@45–80°). The drive loop seeks to maximize the amount of speed, so its stroke angle is more forward (10–45°).

The spin loop is used to attack serves that are barely long (the ball is falling close to the edges of the table), to attack heavy backspin, to start a topspin rally, to retrieve returns that have fallen below table height, or whenever a player desires to mount a controlled heavy topspin attack. The drive loop is normally used against balls of any spin where the player is in good position and desires to end the point with a strong shot, particularly when the ball is higher than the net.

For either loop, the stroke angle will vary according to the type of spin. Against backspin, the angle is much sharper upward. This results in more *lift* to counteract the effect of backspin, which makes the ball rebound downward. Against topspin, the angle is more forward, producing *drive* that forces the ball downward, counteracting the topspin that causes the ball to rebound upward.

The amount of spin is another factor that affects the stroke angle. As the amount of backspin increases, the angle will need to increase proportionally. As the amount of topspin increases, the angle is decreased. It's even possible to loop the extreme topspin of another loop (called a *re-loop* or *counter-loop*), resulting in stroke angles of as little as 10° or so.

Intimately related to how the type and amount of spin effects the stroke angle is the *timing* of the racket's contact with the ball during its bounce (see Figure P). At point *C*, the top of the bounce, the stroke angle lessens. As *C* rises in height, the flatter the stroke angle becomes, making the drive loop easier, and conversely, the spin loop harder.

At point *D*, the ball is falling, but is still above table height. This is an intermediate point that in general, is a good point to contact the ball when looping. The stroke angle increases compared to *C*, but both drive and spin loops can be effective. This is the contact point recommended when learning to loop.

Balls that fall to point *E* or below require that the stroke angle be increased still
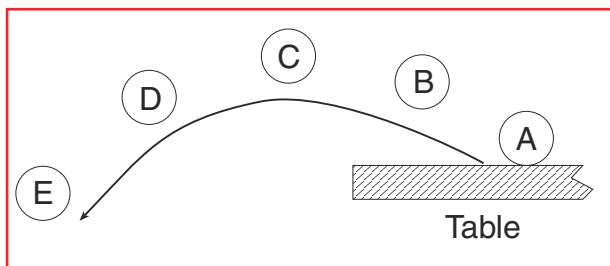
Figure P: Timing Of Ball Contact
Timing of ball contact refers to when the ball is contacted with the racket after it has bounced. *B* represents a rising ball, *C* a ball at the top of its bounce, *D* a ball that is falling, and *E* is a falling ball that is below table level. Of course, it would not be possible to contact the ball at *A* because it hasn't bounced up yet.

further. Spin loops are primarily used. It's virtually impossible to drive loop backspin balls, but for topspin balls, depending upon the amount of spin and the distance from the table, it is still possible to drive loop certain balls. However, the spin loop is normally more desirable in this situation.

Point *B* represents a ball that's rising but has not reached the top of its bounce. While it certainly is possible to loop balls at this point (and it's becoming increasingly common in high level play), this is an advanced tactic and will not be discussed in this book on the basics.

To sum up this discussion on stroke angle, the angle is decreased: (1) when the ball is contacted close to the top of its bounce, (2) as the amount of topspin increases or the amount of backspin decreases, and (3) as the ball height increases over net height. Conversely, the stroke angle is increased: (1) the further the ball falls from the top of its bounce, (2) as the amount of backspin increases or the amount of topspin decreases, and (3) as the ball height decreases below net height. Please see Chart 1 for a comparison of how stroke and racket angles change according to type of loop and spin.

With all loops, high racket speed is essential. Even with a spin loop that is executed with little forward speed (95%/5% friction/force), the actual racket speed is still very high. It is a different feel than the other strokes learned so far. It's rather peculiar that you can swing very fast at the ball, but the ball doesn't go flying off the end of the table. Also, with the other strokes, you can slow down when first learning how the stroke and your body feels during the motion. But with a loop, slowing down racket speed would prevent you from learning to loop.

You can see that the loop is a more complicated stroke than those described in previous chapters. Learning to loop requires many hours of practice. But once you can execute this stroke consistently in a game, your playing level will take a big leap forward, so it's well worth it.

The rest of this chapter is devoted to learning spin loops, both forehand and backhand. Due to space requirements, drive loops will not specifically be discussed. Once you can consistently execute a good spin loop, it is a natural progression of skill to learn a drive loop.

Because backspin is typically accompanied by slow ball speed, spin loops against backspin will be discussed first followed by spin loops against topspin. This order is important not only because it's easier to learn a new stroke against slower moving balls, but also because the spin loop is regarded as an easier way to attack backspin than the forehand

Type of Loop	Racket Angle	Stroke Angle
Spin Loop vs. Backspin	75°	55°
Drive Loop vs. Backspin	75°	45°
Spin Loop vs. Topspin	60°	50°
Drive Loop vs. Topspin	55°	30°

Chart 1: Sample Racket and Stroke Angles For Various Loops

Notice how there is less difference in racket angle than in stroke angle for spin and drive loops against the same spin. Also notice that for loops of the same type, the stroke and racket angles for the loop against backspin are always much sharper than for topspin. Data derived from informal analysis of several photographs of loops against medium high balls with light amounts of spin.

drive discussed in the previous chapter. So by learning the spin loop against backspin first, you will have a way to attack backspin shots with either forehand or backhand before you've learned the spin loop against topspin.

Lesson 21: Forehand Spin Loop Against Backspin

To learn this stroke (see Photo 17, next page), set the spin to backspin, ball speed to 2, ball frequency to 3, and turn the oscillator speed off when the robot head points to the middle of your forehand court. Adjust head angle to about "C" so the ball's second bounce is landing between the center of the court and the end line. Practice the forehand loop cross court, then down-the-line, and then alternate between the two directions.

Concentrate on creating a brushing contact just above the center of the ball as the ball is falling. Do not use any wrist action until the stroke is learned without using the wrist. Use high racket speed. Your racket speed must be fast enough and the stroke angle steep enough to overcome the downward rebound of the backspin. A good quality inverted rubber that still has a good grip is essential. Test by rubbing the ball across the rubber's surface. If the ball slides during this test, clean the rubber to restore the grip or replace the rubber with a new sheet.

Next, practice with the placement of the ball changing. Turn on the oscillator and practice the forehand spin loop with the ball moving randomly inside your forehand court, then your whole backhand court, and finally ¾ of the whole table from the middle of your backhand court to your forehand corner. Combine your forehand spin loop with the backhand push by setting the oscillator to sweep the entire table and practice pushing on

your backhand side and looping on your forehand side. Your goal is 25 successful loops in a row at each stage.

Next, adjust the robot to shoot balls to your backhand and practice pushing a backhand followed by stepping out and doing a forehand loop from your backhand court. Do this drill using no oscillation, and gradually turn the ball frequency up to 4.

At any stage, once you can loop against a ball with light backspin (ball speed 2), you can choose to increase the amount of backspin. With the robot in the serve position, maximum ball speed setting is about 3. Once you can handle a serve at 3, then place the robot's head in the return position so the ball lands first on your side of the table. Go back to about 2 on the ball speed control and raise the head angle to about "F". Maximum ball speed for backspin will be about $3\frac{1}{2}$. As you increase the ball speed and spin, your body action must become correspondingly stronger and/or the stroke and racket angles steeper.

Lesson 22: Backhand Spin Loop Against Backspin

In some ways the backhand loop (see Photo 18, page 60) is an easier stroke to learn than the forehand loop. If you've ever thrown a frisbee, you've already used a similar motion. Now you've just got to start a little lower, aim a little higher and hit a moving object in between. And, of course, be sure to keep a good grip on your paddle! You don't want it to go flying out of your hand away from you.

Just like a well-timed wrist snap can send a frisbee rotating away from you at high RPM's, the backhand loop incorporates a similar wrist snap to apply heavy RPM's in the form of topspin to the ball. Unlike

Photo 17: Forehand Spin Loop Against Backspin (Cross Court)

Notice how the racket starts below the level of the ball at impact and finishes high above the head. ***Image 1:*** End of backswing. Racket is taken back *and down* by rotating the waist and shoulders. The right shoulder is slightly dropped. The arm is straightened behind the rear leg. Almost imperceptible is a slight counter-clockwise rotation of the forearm to *pre-load* the arm for the explosive action to follow. The racket is well *below* the level of the anticipated point of contact. Nearly 100% of body weight is transferred to the rear leg. The torso is slightly bent over and balanced on the rear leg. ***Image 2–3:*** Forward swing. The left shoulder is pulled backward while the right shoulder is pulled upward and forward. The racket is starting to accelerate. ***Image 4:*** Ball contact. The racket angle has been adjusted for backspin. The racket has accelerated rapidly forward and upward. This was accomplished by a finely coordinated uncoiling motion created by transferring body weight to the left, twisting shoulders forward, straightening the torso, pulling up the right shoulder, slight straightening of the leg, and pulling up of the forearm. Ball contact is at the top of the bounce. ***Image 5:*** Follow through. The fast speed of the racket is evidenced by the long distance the racket has traveled from the previ-

ous image. The shoulders are still rotating forward, the right shoulder and right forearm are still being pulled upward. The right leg continues to be straightened. ***Image 6:*** End of swing. The shoulders have finished rotating forward almost 180°. Notice the straight line formed by the arm stripes of images 1 & 6. The body has finished straightening. The upward direction of the body

position is evidenced by the blurred images of the head. The body weight is never transferred completely to the left leg but rather is shifted into a more balanced position over both legs since this is a set-up stroke instead of a finishing stroke. Unseen is the left arm, which ended with the elbow at his side, the arm bent and the forearm in front of the body for balance.

Photo 18: Backhand Spin Loop Against Backspin (Cross Court)

This loop has a motion that is similar to that used to throw a frisbee except it starts lower and ends higher. Notice how the racket starts below the level of ball contact and finishes high above the head. Also note the extreme change in wrist positions between 1 & 4. **Images 1 & 2:** End of backswing. Racket is taken back to between the legs as the elbow is rotated to the front, pulling the right shoulder forward. The wrist is cocked sharply backward. This causes the arm to become *pre-loaded.* The torso is bent forward. The left hand and shoulder are pushed forward so the hand is approximately the same height and distance from the table as the right elbow. Weight has been shifted to the right leg (65%/35). Feet are wider than shoulders with the right foot slightly further back than the left. **Image 3:** Forward swing. Both shoulders are pulled back forcefully and the torso is straightened, whipping the racket hand forward and upward and the left hand backward and downward. The wrist has begun to uncock. **Image 4:** Just after ball contact. The racket angle is adjusted for backspin, and the racket has reached the peak of its acceleration. The wrist was straightened just before ball contact at the top of the bounce. This is analogous to the position of the wrist in a frisbee throw when the frisbee
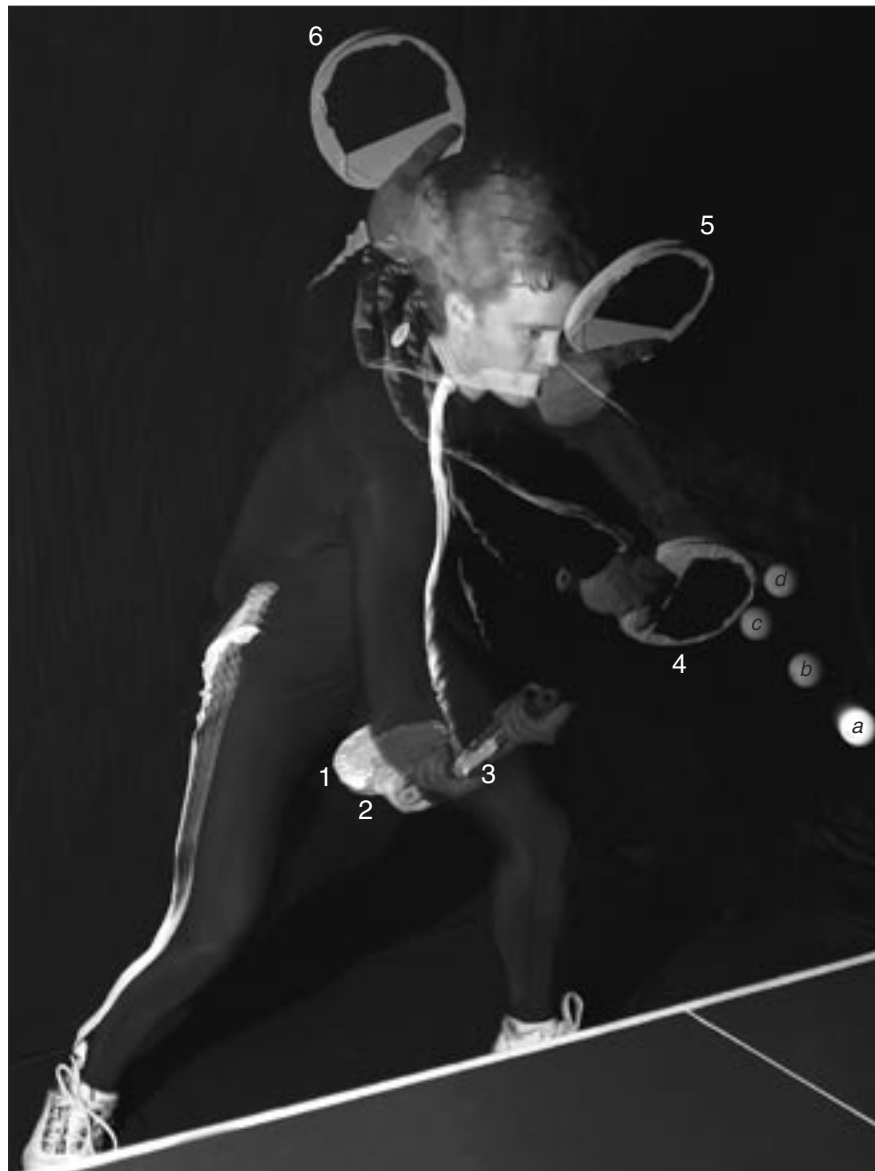
would be released. The left hand has been pulled back to be close to the waist. **Image 5:** Follow through. The shoulders continue to be pulled back as the torso is straightened. The racket continues to accelerate forward, whipping around the elbow, which acts as a pivot point. The left hand accentuates this whipping action as it is pulled back. **Image 6:** End of swing. The torso has finished straightening resulting in the right elbow being pulled

up to about shoulder level. The left shoulder has been pulled back slightly further than the right shoulder. The left hand has been whipped behind the body in a motion that counter-balances the right hand. The weight has finished transferring from right leg to left leg (35%/65%). Please note that weight can be shifted either left to right or right to left depending on position of ball and the desired ending body position.

all the other strokes learned so far, the backhand loop has the elbow of racket hand rotated out well in front of the body. It's important to keep the elbow out in front of the body until the follow through pulls the elbow back to beside the body. The elbow serves as a pivot point that needs to be kept in front of the body so the forearm can whip around it.

Learn the backhand loop using a similar sequence as used in Lesson 21. Set the robot to the same beginning settings but aim the robot to the middle of your backhand court. Practice the backhand loop first cross court, then down-the-line, and then alternate between the two.

Next, practice with the ball moving randomly in your backhand court. Unlike the forehand, however, do not practice the backhand loop with the oscillator range set wider than within your backhand half of the table. You do not want to get in the habit of taking a ball placed in your forehand court with your backhand.

Once you can loop the ball consistently with the ball moving around in the backhand court, start combining the backhand loop with other strokes. Begin with the ball aimed at the middle of your backhand court with light backspin. Push one ball cross court, take a quick hop backward and then do a backhand loop. Keep alternating these two strokes until the footwork feels smooth and you're consistently able to execute both strokes in succession. Then do this same drill, but with the ball moving randomly within your backhand court. In real games this is a potent one-two punch—push a ball low cross court and follow-up with a backhand loop of the return push.

The next step is to combine the backhand loop with the forehand loop. Once again, start out with the robot aimed to the middle of your backhand court. Backhand loop the first ball and then follow it by stepping over and forehand looping the second ball. Keep alternating backhand and forehand loops until you can do at least 15 sets without missing.

Lastly, set the oscillator levers to 3 & 4 and backhand loop any balls that land in your backhand court and forehand loop any balls that land in your forehand court. At first, loop all balls cross court, then loop all balls down-the-line, and finally direct your loops, in succession, to the backhand corner, the middle of the table, and then to the forehand corner, before repeating. This last drill provides excellent practice for deciding whether to use forehand or backhand, getting into proper position, executing a loop from a variety of oncoming trajectories, and placing your shot to any part of the table.

Lesson 23: Forehand Spin Loop Against Topspin

The forehand spin loop against topspin is similar to the one against backspin. The primary differences are that the stroke and racket angles are less and weight shift is more forward than upward. The racket starts higher and ends lower than against backspin. The right leg is thrust forward at the knee instead of being straightened and the torso remains bent forward at the end of the stroke.

When first learning the loop against topspin, especially after having learned the loop against backspin, the ball has a tendency to go flying high off the far end of the table. The key to overcoming this tendency is to make sure your weight goes more forward (and slightly down) and be sure to cover the top of the ball with your racket. At first, it will likely feel strange to have your racket travel forward and up while your body is going forward and

Photo 19: Forehand Spin Loop Against Topspin (Cross Court)

This loop is very similar to the forehand spin loop against backspin (Photo 17, pg. 59) except the ball is permitted to drop further and the stroke and racket angles are less. Also notice the big leg *kick,* which throws the weight forward and downward. ***Image 1:*** End of backswing. Feet are wide apart and weight has been shifted to the rear leg. Racket is taken back by rotating the waist and shoulders. The right shoulder and racket are not dropped as low as against backspin. The arm is straightened behind the rear leg, but there is a slight bend at the elbow. The forearm has been slightly twisted counterclockwise to *pre-load* the arm. The racket is just *below* the level of the anticipated point of contact. The torso is slightly bent over and balanced on the rear leg. Left hand is held in front of torso at stomach level. ***Image 2:*** Forward swing. Both shoulders are being rotated forward. The racket is starting to accelerate. ***Image 3:*** Just after ball contact. The racket angle has been adjusted for topspin. The racket has accelerated rapidly forward and upward. This was accomplished by a finely coordinated uncoiling motion created by transferring body weight forward and to the left, twisting the shoulders forward, pulling back the left elbow, thrusting the right knee forward, and pulling the

right forearm up slightly. Ball has fallen from the top of its bounce. ***Image 4:*** Follow through. The fast speed of the racket is evidenced by the long distance the racket has traveled from the previous image. The bend of the right arm can easily be seen. The shoulders are still rotating forward. The right knee continues to be thrust forward and slightly downward, making the right foot roll over on its inside edge. The left foot is pushed forward a little because of the weight transfer. ***Images 5 & 6:*** End of swing. The shoulders have finished

rotating forward almost 180°. Notice the straight line formed by the arm stripes of images 1 & 6. Unlike looping backspin, the torso is never straightened, but rather, remains bent forward. The forward and down body position can be seen in the blurred images of the face. The body weight is never transferred completely to the left leg but rather is shifted into a more centered position over both legs since this is a set-up stroke instead of a finishing stroke. Unseen is the left arm, which is kept bent and is pulled backward with the shoulders.

Photo 20: Backhand Spin Loop Against Topspin (Cross Court)

This loop is very similar to the spin loop against backspin Photo 18, pg. 60). The primary differences are a higher starting point, lower ending point, the torso remains bent forward, and the racket and stroke angles are less. **Image 1:** End of backswing. Racket is taken back to the left hip as the elbow is rotated to the front, pulling the right shoulder forward as the torso is bent forward slightly. The wrist is cocked sharply backward, causing the arm to become *pre-loaded*. The left hand and shoulder are pushed forward so the hand is approximately the same height and distance from table as the right elbow. Weight has been shifted to the right leg (65%/35). Feet are wider than shoulders with the right foot slightly further back than the left. **Image 2:** Forward swing. Both shoulders are pulled back forcefully and the torso is straightened, whipping the racket forward and upward and the left hand backward and downward. The wrist has begun to uncock. **Image 3:** Just after ball contact. The racket angle is adjusted for topspin, and the racket has reached its peak acceleration. The wrist was straightened just before ball contact at the top of the bounce. This is analogous to the position of the wrist in a frisbee throw when the frisbee would be released. The left hand is pulled back to be close to the waist. **Im-**

age 4: Follow through. The shoulders continue to be pulled back as the torso is straightened. The racket continues to accelerate forward, whipping around the elbow, which acts as a pivot point. The left hand accentuates this whipping action as it is pulled back. **Images 5 & 6:** End of swing. The torso has finished straightening resulting in the right elbow being pulled up to about shoulder level. The left shoulder has been pulled back slightly further than the right shoulder. The left hand was whipped behind the body in a motion that counter-balances the right hand. The weight has finished transferring from right leg to left leg (@35%/65%). There is a small clockwise hop with the feet at moment of ball contact. Note that, unlike the forehand, weight shift and foot position can vary depending on position of ball and the desired ending body position.

down. Against backspin, the torso, right shoulder, and legs are all straightened to some degree, but against topspin, none of them are. All of these body actions contribute to *lift*, needed to counteract the backspin that makes the ball rebound downward; whereas, against topspin, lift is unnecessary because topspin causes the ball to rebound upward.

To learn this stroke (see Photo 19, page 62), set the spin to topspin, the speed to $1\frac{1}{2}$, the frequency to $2\frac{1}{2}$, and turn the oscillator off when the robot head points to the middle of your forehand court. Adjust the head angle to about "C". Practice the forehand spin loop first cross court, then down-the-line, and then alternate between the two directions. Your goal is 25 consecutive good loops at each step.

Concentrate on creating a brushing contact close to the top of the ball as the ball is falling. Do not use wrist for forehand loops against topspin. If you are having a hard time getting the ball to come down on the opposite side, you can let the ball drop further from the top of its bounce by backing away from the table.

Next, practice with the placement of the ball changing. Turn on the oscillator and practice the forehand spin loop with the ball moving randomly inside your forehand court, then your whole backhand court, and finally ¾ of the whole table from the middle of your backhand court to your forehand corner.

Now, combine your forehand spin loop with the backhand counter by setting the oscillator to sweep the entire table and practice countering on your backhand side and looping on your forehand side. Next, adjust the robot to shoot balls to your backhand and practice countering a backhand followed by stepping out and

doing a forehand loop. Do this drill using no oscillation. Your goal is 25 successful loops in a row at each stage.

Similar to the lesson for forehand loop against backspin, once you can loop a ball with light topspin (ball speed $1\frac{1}{2}$), begin increasing the amount of spin. With topspin, you may increase the ball speed all the way to 10 as your loop becomes stronger. Back away further from the table as the speed is increased and reduce the stroke and racket angles.

Lesson 24: Backhand Spin Loop Against Topspin

The backhand spin loop against topspin (see Photo 20, previous page) is remarkably similar to the backhand spin loop against backspin. The biggest difference is the higher starting point at the right hip instead of between the legs for the looping backspin. This results in the torso being bent less forward and therefore it's straightened less during the stroke. Of course, the racket and stroke angles are less, which explains why the stroke typically ends at head height for topspin instead of above the head for backspin.

A unique quality of the backhand loop, either against topspin or backspin, is that the weight shift and foot position are very flexible. This stroke can be done by shifting the weight from either right to left or left to right. Foot position can vary from left foot forward, feet parallel to end line of the table, to right foot forward. Often times, the weight shift is accompanied by a small hop with both feet in the direction of the weight shift.

The deciding factor in determining which way to shift the weight is the position of the incoming ball in relation to the start-

ing body position. If the ball is coming towards the backhand corner, the left foot stays forward and the shift is from right to left. If the ball is close to the center line of the table, the right foot is usually forward and the shift is from left to right. This would also be true for the backhand loop against backspin.

An unusual exception to these rules is if the player is in an extreme backhand position with the body alongside the backhand sideline. In this position, the left foot is forward, but the weight shift is from left to right because this will move the body in the direction of the favored backhand corner position where a return can be more easily covered.

Learn the backhand loop against top-spin using the same sequence as used in Lesson 22. Set the robot to the same beginning settings, except use topspin in-stead of backspin. Practice the backhand loop cross court, then down-the-line, and then alternate between the two. Your goal is 25 consecutive loops without a miss before proceeding to the next step.

Next, practice with the ball moving randomly in your backhand court. Do not practice the backhand loop with the os-cillator range set wider than within your backhand half of the table. Be sure to practice the correct weight shift and foot position as explained above.

Once you can loop the ball consistently with the ball moving around in the back-hand court, begin to combine the back-hand loop with other strokes. Start out with the robot aimed to the middle of your backhand court. Backhand loop the first ball and then step over and forehand loop the second ball. Keep alternating back-hand and forehand loops until you can do at least 15 sets without missing.

Lastly, set the oscillator levers to 3 & 4 and backhand loop any balls that land in your backhand court and forehand loop any balls that land in your forehand court. At first, loop all balls cross court, then loop all balls down-the-line, and finally direct your loops, in succession, to the backhand corner, the middle of the table, and then to the forehand corner, before repeating the pattern.

Whenever you can loop consistently at any stage, you can further challenge yourself by increasing the topspin and speed of the ball and/or increasing the ball frequency. In a real game, topspin rallies can be quite fast so do increase speed and frequency gradually so that you become accustomed to a fast pace.

Lesson 25: Spin Loops Against Varying Spins

The last lesson in this chapter is to learn how to vary your loop stroke to match the type and severity of the spin on the oncoming ball. This is an important les-son because in a real game, you have to be prepared for any type of spin. While you can only select one type of spin at a time on a Newgy robot, by going back and forth between quick drills of topspin and then backspin, you can learn to make the necessary adjustments quickly.

The Pong-Master scoreboard is particu-larly helpful in this regard. Set it for a 1 minute game but do not plug in the tar-gets. Pong-Master will automatically cut off ball delivery at the end of 1 minute. Alternatively, you can also simply set a timer for 1 minute—but be sure to stop when the timer goes off!

The first drill will be to set the robot in the serve position to deliver a light topspin ball to the middle of your fore-

hand court. Practice forehand looping for one minute. Then stop, change the spin to backspin, and repeat the drill. Keep alternating between one minute drills against topspin and then against backspin.

You will likely find that upon switching to backspin, your first few loops will not make it over the net. And when you switch to topspin, your first loops will go flying off the far end of the table. The object is to keep switching back and forth until your first few loops land successfully.

Once you can do this on the forehand, switch to the backhand court and repeat with the backhand loop. Then adjust the robot to oscillate over the whole table. Repeat the sequence of alternating topspin and backspin drills, but now balls are delivered randomly across the entire table. Forehand loop balls in the forehand court and backhand loop balls in the backhand court. It's OK to use the forehand for any balls that are close to the center line in the backhand court. Another drill is to alternate forehand and backhand loops with the ball being delivered only to the backhand corner.

If you can adjust quickly using these 1 minute drills, then the next step is to do drills with a practice partner in which you mix up topspin and backspin. A simple drill illustrating this concept is to start with a backspin serve, have your partner push the ball back long, use a loop against backspin to attack that push, have your partner block the ball back, and continue using loops against topspin until the rally ends.

At first do this drill with the ball always going cross court and then change to all shots going down-the-line. Past this stage, you want to direct all of your shots to your partner's backhand or all of your shots to his forehand, but your partner can randomly change the direction of his/her returns. To make the drill even harder, both players can change direction randomly. Start slowly and gradually work up to game speed. Remember, you're trying to help each other learn these skills, so cooperate with each other at this stage. You can slowly turn these drills into competitive drills once the skills are *well-grooved*.

Another good drill would be for your partner to alternately serve long topspin and backspin serves to you. Start with the forehand, then the backhand, and finally randomly. Your partner will need a bucket of balls close by (the Robo-Caddy, pg. 107, is handy for this) and he/she does not attempt to return your loops.

Progressing even further, your partner can stand beside the table close to the table's net, and hit balls directly to you. This is called multi-ball and was the human precursor to Robo-Pong (Robo-Caddy serves as an excellent ball holder for multi-ball also). Multi-ball is a bit more flexible because spins, placement, and speed can all be mixed up from shot to shot. The server can either bounce the ball on the table first before striking it or throw the ball directly into the racket. The server then uses short, quick topspin and backspin strokes and times his/her delivery so that the next ball is delivered the instant you get back in a ready position. Many variations of multi-ball drills are possible. Multi-ball practice serves as a good transitional step between learning a skill on a robot and using that skill in an actual competitive match.

The robot's net system is also handy when practicing serves. Turn the machine off and put all the balls into a Robo-Caddy (see page 107) or similar tray. Place the tray at your end of the table and practice serving into the robot's net (owners with ball bucket robots can use the Ball Catch Net II and Side Nets, see page 107). By using the collection net to catch your serves, you won't have to pick up as many balls from the floor when you're ready to refill your serving tray.

Before beginning to practice serves, let's cover some of the most commonly misunderstood rules concerning the serve.

(1) The ball must be placed in the *stationary, open palm* of the free hand. This means the hand must be momentarily still and the ball placed in the open palm so that it is visible to the receiver.

(2) The ball must be thrown near *vertically upwards at least 6 inches* and then struck *as it is descending* from the peak of its trajectory.

(3) The ball must remain *above the level of the playing surface* and *behind the server's end line* from the time the hand is stationary to the time ball contact is made. The ball does not; however, have to remain between the two sidelines or their imaginary extensions.

(4) The server cannot hide the ball from the receiver with any part of the body or clothing. The free arm, after tossing up the ball, must immediately be removed from the space between the ball and the net, including the net's indefinite extension upward.

(5) The ball must first touch the server's end of the table, pass directly over or around the net and its supports, then touch the receiver's end of the table. In singles, the ball can touch anywhere on the server's or receiver's right or left courts, but in doubles, the ball must first touch the server's right court and then the receiver's right court.

(6) If the ball touches the net or its supports after having first landed on the server's side of the table and then landing on the receiver's side of the table or touching the receiver's racket without having touched anything else first, the serve is a *let* and is served over. There is no limit to the number of lets one can serve.

(7) Once the ball is tossed up, the ball is in play and the point continues. If the serve is stopped, even if there is no attempt to swing at the ball, the point is lost. Likewise, a point

Photo 21: Starting Position For Backhand Serves

This is the basic position from which all backhand serves discussed later in this book will start. Note that the ball is laying in the open palm of the left hand, which is placed about 8–10 inches in front of the stomach. The left forearm is parallel to the ground. The racket is placed directly behind the ball on top of the left wrist.

is lost if the server swings at the ball and does not contact the ball. Unlike (lawn) tennis, in table tennis, there is no *do-over* if the serve is stopped or second serve if the first serve is missed.

It is beyond the intent of this manual to cover all the different kinds of serves. Indeed, a whole book could be written on the many types of serves that are possible. We will divide our discussion into four types of basic serves: the backhand topspin serve, the forehand backspin serve, the backhand right sidespin serve, and the forehand left sidespin serve. These are the serves I have found to be the most effective and easily learned. When serving, remember that you should primarily use a friction contact and most serves will use a wrist snap at contact to increase racket speed and spin.

For all serves, you should be able to do both long and short versions. For long serves make sure you drive the ball down onto the back half of the table on your end (close to the endline). For short serves (that bounce twice on the opposite end of the table), strike the ball with a soft lifting motion so that its first bounce is on the front half of your end of the table (close to the table net).

Lesson 26: Ball Toss

Before beginning to serve, you should practice the ball toss. Place the ball in the open, stationary palm of your left hand. Your left forearm should be parallel to the floor, your wrist straight, and the left hand about 8–10 inches in front of the stomach (see Photo 21). Now practice tossing the ball up so it stays in line with the center of your body and rises at least

Photo 22: Backhand Top-spin Serve (Cross Court)

Notice the left facing stance, the bend of the upper body, and how the ball toss hand is lowered to get it out of the way of the racket coming forward. Stroke is performed mainly by rotating the forearm around the elbow from left to right. *Images 1 & 2 (overlapping):* End of backswing. From the basic starting position (Photo 21), the racket is taken back with the forearm until it barely touches the left upper arm. *Image 3:* Just before ball contact. Forearm pushes racket forward and slightly closes the racket angle. The ball is contacted 6–8 inches above the level of the table. *Image 4:* Follow through. Forearm continues forward, rotating at the elbow so the tip of the racket points

forward. *Images 5 & 6:* End of swing. Forearm continues to rotate at the elbow causing the racket tip to point to the right. Racket finishes at shoulder height. Notice how the upper arm and elbow have remained relatively still.

6 inches. Let your left hand return to its starting position and the ball should fall back down in your palm. Practice until you can do this without missing.

Lesson 27: Backhand Topspin Serve

Once you can consistently toss the ball up straight and have it come back down into your hand, it's time to learn the backhand topspin serve. Position yourself in a slightly sideways stance facing to your left behind the left corner of the table as shown in Photo 22. Now toss the ball up and after allowing it to begin descending from its peak, push your racket into the ball with your right forearm. Before impact close the racket angle enough to

direct the ball down into the table near the left corner on your side. Stop when the tip of the racket is pointing forward. This short stroke can be seen in images 3 & 4 in Photo 22. After you are proficient using this short stroke serve, you may use the entire motion shown in Photo 22 to increase the speed of the serve by taking a backswing and using a longer follow through.

Start slowly, serving the ball cross court, and build up your speed. Practice serving to all parts of the table but emphasize a cross court serve that travels from your left corner and lands deep in the receiver's left corner. Keep the serve low over the net. To this end, it will help if

Photo 23: Starting Position For Forehand Serves

This is the basic position from which all forehand serves discussed later in this book will start from. Note the ball laying flat in the open palm of the left hand, which is placed about 12 inches in front of the stomach. The left forearm is parallel to the ground. The racket is placed directly behind the ball with the bottom edge lightly touching the side of the left hand.
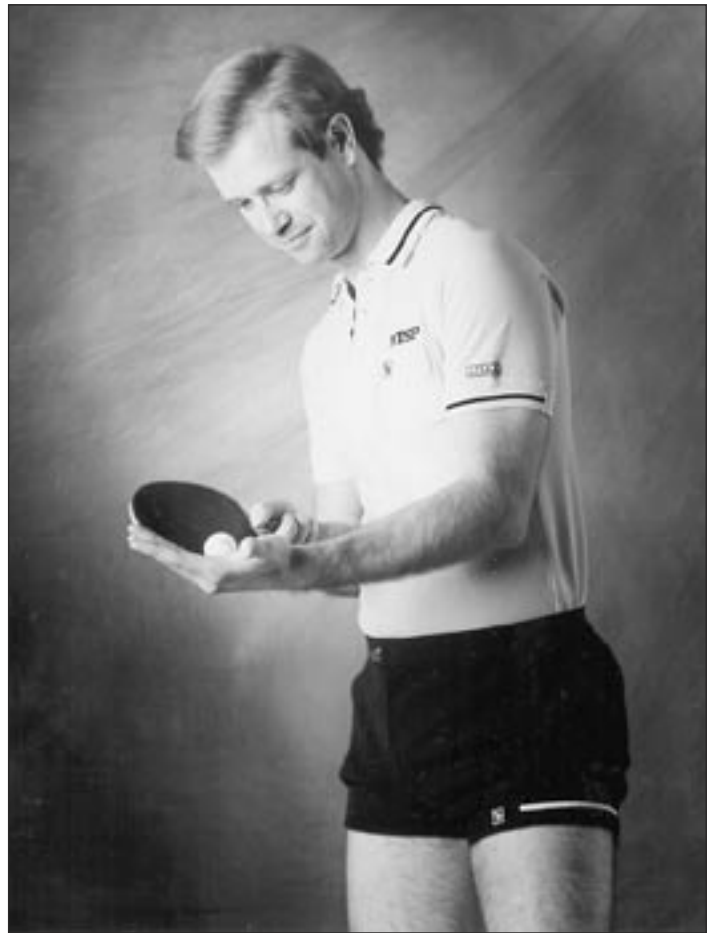
you contact the ball just above the level of the table. The higher above the table you contact the ball, the higher it will bounce and the less speed you can apply to your serve.

Once you can execute this backhand top-spin serve confidently, practice assuming the ready position immediately after you finish your service follow through. In particular, pull your right leg back around to assume the ready position, instead of remaining in your left facing stance. You want to get into the proper ready position rapidly in order to cover your exposed forehand corner. Make returning to the ready position a part of your service motion. Practice until you can do 25 in a row without missing.

Lesson 28: Forehand Backspin Serve

The next serve to learn is the forehand backspin serve. Take a sideways stance to the right about two feet in back of the middle of your forehand court. Assume the starting position for a forehand serve as shown in Photo 23. Toss the ball up and at the same time pull the right forearm back and up to about shoulder height. As the ball descends, release the forearm and let the racket slice into the ball about halfway between its center and bottom. Continue to follow through until the racket ends up in front of your left hip. This motion feels very similar to chopping a tree with a hatchet. As a matter of fact, some players refer to this serve as a *chop* serve.

Photo 24: Forehand Backspin Serve (Cross Court)

Notice the sideways stance facing to the right, how the weight is mainly on the right leg and how the upper torso is slightly bent forward with the right shoulder lower than the left shoulder. *Image 1:* End of backswing. Racket is taken back and up to shoulder level by raising the forearm and pulling it back. Note open racket angle. *Image 2*: Forward swing. Racket is taken down and forward by snapping the forearm and rotating the shoulders. *Image 3:* Just before ball contact. Racket angle is adjusted slightly. *Image 4:* Follow through. Note how rapidly the racket has accelerated from #3. Racket tip is now pointing forward. *Images 5 & 6:* End of swing. Racket tip ends up pointing to the left. Shoulder and waist have rotated forward approximately 45°. A small weight shift has occurred from the right leg to the left leg. The eyes have followed the ball intently throughout the entire motion.

After you get a feel for this serve, work on keeping it low to the net and short, so it bounces twice on the other side of the table. Strive to graze the ball very finely to produce good spin. To increase the amount of spin, add wrist motion to the forearm snap. This serve is seldom done fast and hard; but rather, slowly and well placed. Practice a return to ready position as part of your serve motion. Practice until you can do 25 in a row without missing when you serve long and 15 in a row when you serve short (so the ball bounces at least twice on the robot's side of the table).

Lesson 29: Backhand Right Sidespin Serve

The third serve to learn is the backhand right sidespin serve. This serve will be difficult to learn until you have mastered the two previous serves. Assume the starting position for a backhand serve (Photo 21, page 68) behind the middle of your backhand court. Stand square to the table. Now place your right forearm lightly across your left forearm so the racket is held to the left of the ball.

Toss the ball up, and as it descends, pull your elbow to the right, causing the racket

Photo 25: Backhand Right Sidespin/Backspin Serve (Cross Court)

Note how the racket brushes across the ball in a left to right direction. The left to right movement produces right sidespin and the downward movement of the racket at contact produces backspin. *Image 1:* End of backswing. Racket has been taken to the left of the ball by reaching across and above the top of the left arm as the ball is tossed up. *Image 2:* Forward swing. Racket is pulled to the right by pulling the elbow across the body and back. Just before impact the forearm begins to be released. *Image 3:* Just after contact. The racket continues to travel down after contact. Arm has straightened significantly. *Image 4:* Follow through. Elbow is pulled back hard and the forearm continues to be straightened. *Images 5 & 6:* End of stroke. Elbow has been pulled across the body and back so the racket ends up to the right of the body and below shoulder level.

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to slash across the back of the ball on its lower surface. Let your shoulders rotate as you pull the elbow to the right and then back. After you can perform this serve with the racket already to the left of the ball, practice starting this serve with the racket behind the ball as shown in Photo 21, and then take a backswing (sideswing?) as you toss the ball up. Using a backswing will increase the amount of spin you can generate.

You need to work on two variations of this serve. A combination sidespin/backspin serve, as shown in Photo 25, is produced by keeping the elbow *down* as you pull it to the right. Combination sidespin/topspin, as shown in Photo 26, is produced by pulling *up* on the elbow as you pull it to the right. Practice these serves while striving to keep the ball low over the net. Produce maximum spin by finely grazing across the ball at high speed. Be able to do sidespin/backspin or sidespin/topspin alternately with equal ease. After being able to serve long and with good spin, work on keeping the serve short, so it will bounce twice on the other side. A much finer graze and touch will be required to do so. When working on the short serve, try to maintain the same amount of spin as when you serve long. Practice until you can do 25 in a row without missing when you serve long or 15 in a row when you serve short.

Photo 26: Backhand Right Sidespin/Topspin Serve (Cross Court)

This serve is very similar to the previous serve except the racket is pulled *up* just before contact. *Image 1:* End of backswing. Racket has been taken to the left of the ball by reaching across and above the left arm as the ball is tossed up. *Image 2 (barely visible):* Forward swing. Racket is being pulled to the right by the elbow. *Image 3:* Just before contact. Forearm has been released slightly. *Image 4:* Just after contact. The tip of the racket rotated forward just before contact was made. Then the elbow was pulled sharply upward to apply topspin to the ball. Contact was made on the lower surface of the ball. *Image 5:* Follow through. The elbow is still being pulled sharply up-

ward. *Image 6:* End of stroke. Elbow has been pulled as high as possible and racket ends up shoulder height or above. Unlike the sidespin/backspin serve, the forearm never gets released all the way. Rather, it
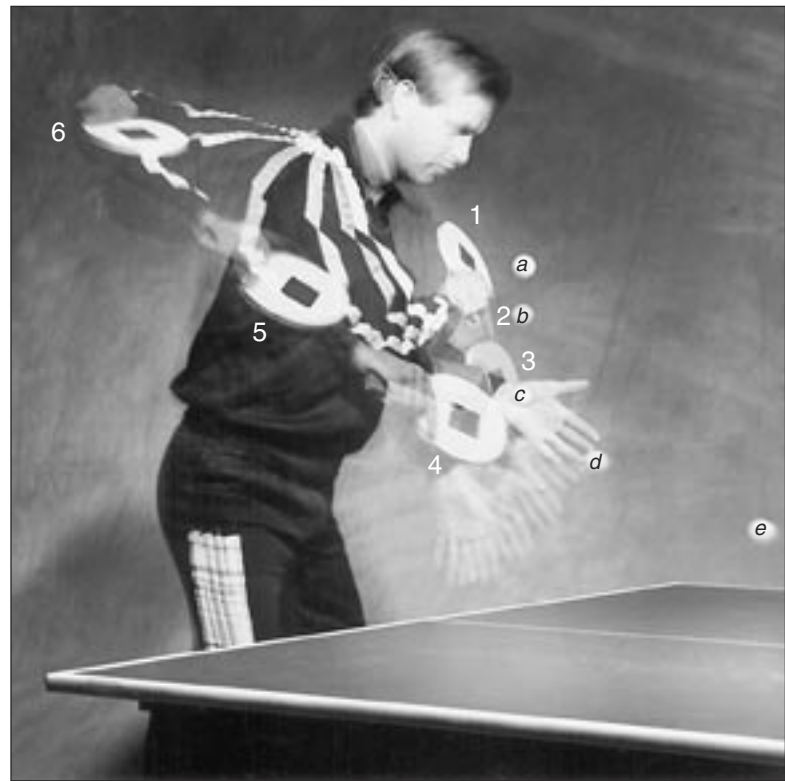
remains bent throughout the stroke. The sharp upward movement of the racket at contact puts topspin on the ball; the left to right movement puts right sidespin on it.

Finally, practice your serves so that you can serve to any location on the table. Strive to start from the same basic serve position and make your serves look as similar to one another as possible. This makes it harder on the opponent to anticipate your serve. For instance, your first serve could be a short sidespin/backspin serve down-the-line. The next serve could be a long sidespin/topspin serve cross court, followed by a short sidespin/topspin serve to the middle. A fourth serve could be a long sidespin/backspin serve down-the-line.

Mixing up your services like this is crucial to having a good service game.

By having at least 4-5 different serves that you can deliver from the same basic starting position, you can keep your opponent guessing what serve you will use next. Always vary the spin, speed, and/or placement of the ball from one serve to the next.

Lesson 30: Forehand Left Sidespin Serve

The last serve to learn is the forehand left sidespin serve. Your stance and position to the table are the same as for the forehand backspin serve (see Photo 23, page 70). This time, however, instead of placing the racket directly behind the ball, start with the racket to the right

Photo 27: Forehand Left Sidespin/Backspin Serve (Cross Court)

Notice the sideways stance to the right and how the weight is shifted to the back leg. ***Image 1:*** End of backswing. The right arm is extended out to the right with the racket tip pointing to the right. Racket is held at shoulder height. Note the modified (looser) grip on the handle. ***Image 2:*** Forward swing, just before contact. Forearm is pushed down towards the ball as the elbow is pulled towards the body. Shoulders and waist are rotated slightly forward. ***Image 3:*** Follow through. Racket continues to travel down and to the left and the racket tip is rotated forward. Wrist is snapped downward just before contact. ***Images 4–6:*** End of stroke. Upper arm continues to push the racket to the left and racket tip now points to the left. Shoulders and waist are rotated about 45°. Elbow and forearm are snug against the stomach.

of the ball. It will also help if you hold the racket mainly with your thumb and forefinger and allow your other three fingers to slip off the handle as shown in Image 1 of Photo 27. Toss the ball up, and as it descends, pull the right elbow to your side causing the racket to slash across the back of the ball on its lower surface in a sideways direction.

As with the backhand right sidespin service, you may combine topspin or backspin with the left sidespin. Photo 27 shows the sidespin/backspin serve.

Sidespin/topspin, as shown in Photo 28, is produced by pulling the forearm *up* just as contact is made. This may feel a bit awkward at first. Practice until you can do 25 in a row when you serve long or 15 in a row when you serve short.

Also practice this serve cross court from your backhand corner if you have a good forehand. This sidespin will tend to make the serve return go toward your backhand and if you're already there waiting to use your forehand, you'll often gain the advantage early in the point.

Photo 28: Forehand Left Sidespin/Topspin Serve (Cross Court)

Similar to the previous serve except racket is pulled upward as contact is made instead of continuing downward. *Image 1:* End of backswing. Racket is moved to the right of the ball by extending the right arm. Racket tip is pointing to the right. *Image 2:* Forward swing. Forearm is pushed down as the elbow is pulled toward the body. Shoulders and waist begin rotating forward. *Image 3:* Just before contact. Wrist is bent backward. Forearm continues to push racket down towards the ball. *Image 4:* Follow through. Forearm is pulled up just before contact. Wrist continues to be bent back. *Images 5 & 6:* End of swing. Racket is pulled up against the stomach by raising the forearm. Waist and shoulders are rotated only a little. Racket tip points mainly forward.

In a real game, the type of serve you use depends a lot on the kind of return you would like to get. If you like to play a fast paced game with quick exchanges, use mainly a fast backhand topspin serve. If you like to smash the ball, use short sidespin/topspin serves in an attempt to get the opponent to pop up the ball. If you like a slow paced game and/or you have a good push or good loop against backspin, serve mostly the short forehand backspin serve or short sidespin/backspin serves. Of course, if you discover a serve that the opponent has trouble with, use that serve more often, but not so much that the opponent gets used to it.

Chapter Twenty
SERVE RECEIVE

Perhaps the most difficult skill to master in table tennis is serve receive. You must be able to handle hundreds of different type of serves. Seldom will you encounter the same serves from player to player. Not only must you be able to get a serve back but you must also be ready to attack an easy serve to wrest the initiative away from the server. Fortunately, Robo-Pong is an excellent aid to learning this important skill. The robot is especially useful in learning to return sidespin serves.

Lesson 31: Returning Topspin Serves

To practice returning serves, tilt the head of the robot down so it shoots onto its side of the table (approximate head angle "C"). Turn the robot head to topspin. Set the ball speed to 3 and frequency to it lowest level. Turn off the oscillator when the robot head points to the middle of your backhand court. Turn the power switch on, and practice using your backhand block to return the ball to all parts of the table. In particular, work on placing your returns into either corner or angled wide off the side of the table. Strive to keep your returns low over the net. Progress to returning the serve with a backhand counter or loop instead of a block. Keep the frequency set to the lowest level possible to better simulate waiting for a serve in a real game. Return to the ready position after each serve receive.

Next, turn on the oscillator so that it shoots randomly inside your entire back-hand court. Practice your block first and then your counter or loop. Repeat the same learning pattern on the forehand side, starting with a serve to the middle of the forehand court and returning it with a forehand block. Progress to a forehand counter and occasionally use a forehand smash or loop. Then turn on the oscillator to sweep inside of the forehand court and practice forehand block, then counter, and occasionally a forehand smash or loop.

The last step is to have the robot sweep the entire width of the table and practice combining forehand and backhand returns. After you can consistently return this serve, pressure yourself to attack whenever you are completely set. At all stages of this training, be sure to return to the ready position before each serve is delivered. Pretend you are returning a real serve from a live opponent and you don't know what serve is coming next.

Lesson 32: Returning Backspin Serves

Backspin services are the next to learn to return. Keep the same control settings as in Lesson 31, except turn the robot head to backspin and aim the head to shoot balls to the middle of your backhand court. Turn the robot on and practice returning the serve with a backhand push to all parts of the table. Then turn the oscillator on and practice a backhand push return from anywhere inside the backhand court.
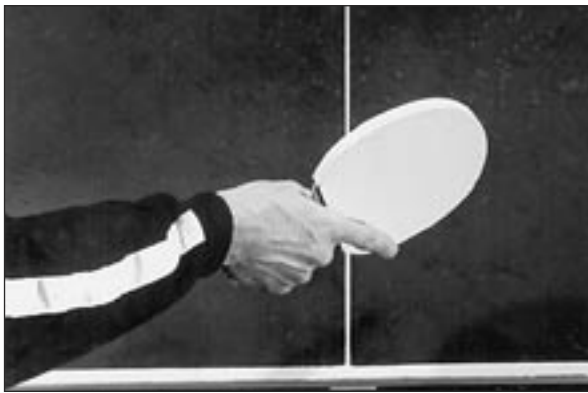
Photo 29: Correct Racket Angle For Returning Left Sidespin/Topspin

Racket should be tilted both to the *left and down* to return the ball straight down middle of the table.
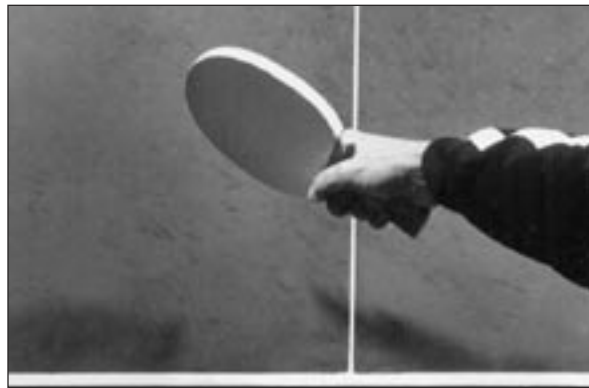
Photo 30: Correct Racket Angle For Returning Right Sidespin/Topspin

Racket should be tilted both to the *right and down* to return the ball straight down the middle of the table.

Repeat this on the forehand side using a forehand push and finally, set the oscillator to sweep the entire width of the table and practice combining forehand and backhand push returns. You may wish to throw in an occasional loop return if you've learned this skill.

Another good drill is to reduce the ball speed to approximately 1–1½ so the ball is served very short and close to the net. You will also need to adjust the head angle. To return this short serve effectively, it will be necessary to bend your knees deeply and take a long step with your right leg *under* the table. Let your upper torso bend over the top of the table and then reach forward with your racket. Use mainly your forearm and wrist to stroke the ball and be sure to use the correct racket angle when making contact. In particular, work on dropping the push short on the other end of the table or long to either corner or sideline.

Remember to return to the ready position after each stroke. Don't cheat by keeping your body position up close to the table. Pretend like a person is serving to you and you don't know whether the serve will

be short or long. Position yourself about two feet in back of the table. That way you will be in good position to return a long serve and all you have to do to return a short serve is take one good step forward. In almost all cases it is better to be back and move forward rather than be too close and have to move back.

Lesson 33: Returning Sidespin/Topspin Serves

After becoming proficient at returning straight topspin and backspin serves, it is time to learn how to return these spins when they are combined with side spin. Turn the robot head so the word "topspin" is about 45° to the *right* of top center (as you face the robot). The robot will deliver a serve with left sidespin/topspin. Set the ball speed to 3 and aim the robot head to the middle of your backhand court.

Turn on the machine and use a backhand block or counter to return the ball. You will notice the ball has a tendency to jump off your racket to your right. Counter act this effect by aiming down-the-line. Now even though you aim the ball down-the-line, the ball will go cross court because of

Photo 31: Correct Angle For Returning Left Sidespin/Backspin

Racket should be tilted both to the *left and up* to return the ball straight down the middle of the table. Racket also must travel forward a small amount.
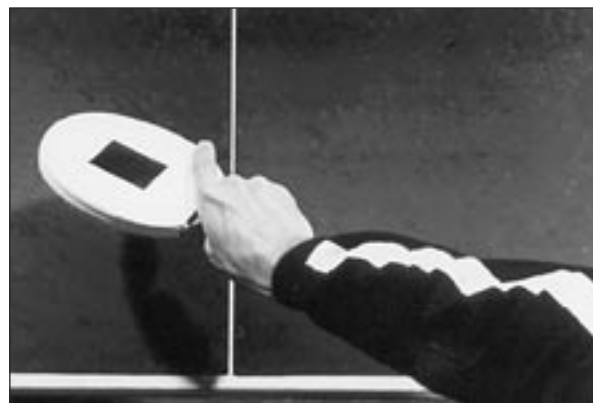
Photo 32: Correct Angle For Returning Right Sidespin/Backspin

Racket should be tilted both to the *right and up* to return the ball straight down the middle of the table. Racket also must travel forward a small amount.

the sidespin. Keep working until you can control the ball to make it go anywhere on the table. Contact the ball on its *top right* surface by angling your racket to the *left and down* (see Photo 29) and then moving your racket slightly sideways as you make contact. Both these strategies will help negate the effect of the sidespin. Also it helps to hold your racket softly so your wrist is free to make the necessary adjustments to the racket angle. And keep your elbow close to your body to permit better control of the stroke.

After you are able to handle this kind of serve, make the machine oscillate within the backhand court and practice some more. Then switch the machine to your forehand and practice your forehand return in a similar fashion, first without oscillation, then with oscillation. For variation, occasionally attempt a forehand smash or loop return. The last step is to set the robot to oscillate over the entire table and randomly return the serve with either forehand or backhand. Also practice returning *short* sidespin serves by changing the ball speed to

approximately 1½. Be sure to return to the ready position before each serve.

Turn the robot head so the word "topspin" is 45° to the *left* of top center. The robot will deliver right sidespin/topspin. Repeat the above sequence of steps to learn how to return this serve. Contact the ball on its *top left* surface by angling your racket to the *right and down* (see Photo 30) and moving your racket slightly sideways as you make contact. Start with your backhand, then use your forehand, and finally combine the two. If you become really good at this, increase the amount of sidespin by turning the robot head so the word "sidespin" is closer to top center. In general, you will find it easier to return left sidespin with your forehand and right sidespin with your backhand.

Lesson 34: Returning Sidespin/ Backspin Serves

To learn how to return sidespin/backspin, turn the robot head so the word "backspin" is 45° to the *left* of top center. The robot will now deliver a left sidespin/

backspin serve. Work with this spin as you did with the left sidespin/topspin previously, except use a push stroke instead of a block or counter stroke. Contact the *bottom right* surface of the ball by angling your racket to the *left and up* (see Photo 31) and then move your racket slightly sideways as you make contact. Then work on returning right sidespin/backspin by turning the robot head until the word "backspin" is just to the *right* of top center. You will need to contact the *bottom left* of the ball by angling your racket to the *right and up* (see Photo 32) and then moving your racket slightly sideways as you make contact with the ball.

As you get better at returning sidespin serves, start working at placing your returns instead of merely getting them back. Place your returns to areas of the table from which it would be difficult for your opponent to attack. If you receive a sidespin/backspin serve, see if you can place your return short and low just over the net. Or use the sidespin to your advantage by giving your opponent a severely angled return. Sidespin helps you to increase the possible angles on your receives because of its tendency to jump sideways off your racket.

You can also improve the quality of your service receives by attacking serves. Sidespin/topspin can often be attacked by rolling over the top of the ball with your racket, pushing the forearm forward, and pulling the elbow up as you contact the ball. You can also do this with sidespin/ backspin, although it's considerably more difficult. With sidespin/backspin, open the racket before contact (like you're getting ready to push the ball) and keep your elbow down as you thrust your forearm upward and forward.

Any serves that come long off the end of the table are probably best attacked by looping them. A loop's high racket speed overcomes much of the spin on a serve, so you don't have to be as exact with your racket angle. A looped serve return often gives the receiver control of the point and may win the point outright.

This chapter is intended for those who need assistance in moving to the ball. If you can perform a stroke well while keeping your feet in one spot, but you lose consistency when you start practicing the stroke with foot movement, then you need to improve your footwork. When learning footwork, slowly shadow practice several sets of the described footwork until you get the hang of it. Then combine footwork with a particular stroke or combination of strokes using the robot to deliver balls to different points on the table.

Having proper footwork greatly assists in executing good strokes. With proper footwork, a player will move into good position and then execute his/her strokes from a solid, balanced stance. This leads to consistency, quickness, and being able to use full power. Without good footwork, a player will reach, lean, and hit the ball from an unbalanced position. Strokes end up being jerky and erratic, more like slaps than strokes.

In table tennis, you won't have to cover a lot of ground, but you will have to move to a spot very quickly. Therefore, most table tennis footwork consists of one or two steps, usually fairly short. During all footwork, it is crucial to stay balanced. Always start your foot movement from the balanced ready position shown in Photo 13 on page 46.

When moving, keep your head up and the upper body tilted slightly forward. Bend your arms and hold them just in front of the body. Place your weight on the balls of your feet with your heels lightly touching the ground. Keep your shoulders parallel to the floor and centered over your knees. Eliminate any up and down movement. Move the instant the opponent has committed to his shot, not before. Move to where the ball will come *before* starting your stroke. Avoid stroking while moving—move first, stroke second. Strive to never cross your feet.

For side-to-side movement, you have three options (see Figure Q, next page). One-step footwork is normally used for short distances, two-step for medium distances, and three-step for long distances. One-step footwork is very common when moving left to cover a wide backhand. It is performed by simply shifting your weight to your right leg and pushing your left foot further to the left. Vice versa if you want to go to the right. A disadvantage of one-step footwork is that it can leave you in a *stretched out* position if you have to move more than a foot or two, making it difficult to get ready for the next shot.

The two-step footwork is the most common form of footwork. It is typically used to get into forehand position for balls to your wide forehand or for balls that are aimed directly at your body. To move to the right using two-step footwork, you lean on your right leg, pull your left foot toward your right foot, then quickly shift your right foot to the right. You end up

with your feet in the same relative position as when you started the movement except 2–3 feet further to the right. It is a side-skipping type of movement.

Three-step footwork is used to cover shots hit deep to the forehand corner, angled off the wide forehand sideline, or to step out wide on your backhand side to hit a forehand. It is very similar to the two-step except an additional small step is made before both feet are shifted. To move right, take a small step with your right foot to the right (6 to 8 inches), shift your weight to your right leg, then perform a two-step movement.

Figure Q: Footwork Diagrams

Below are diagrams showing how to place and move the feet for one-step, two-step, and three-step footwork. The diagrams are for a right-handed player. You should practice these patterns until they become second nature. When practicing, remember to stay balanced and in a good ready position. Strive to keep your shoulders level and on the same plane (no up and down movement of the body and no dipping or raising of one shoulder).

To Move Left **To Move Right**

One-Step Footwork
Big Step · Drag · Drag · Big Step

Two-Step Footwork
Side Skip · Side Skip · Side Skip · Side Skip

Three-Step Footwork
Side Skip · Small Step · Side Skip · Side Skip · Small Step · Side Skip
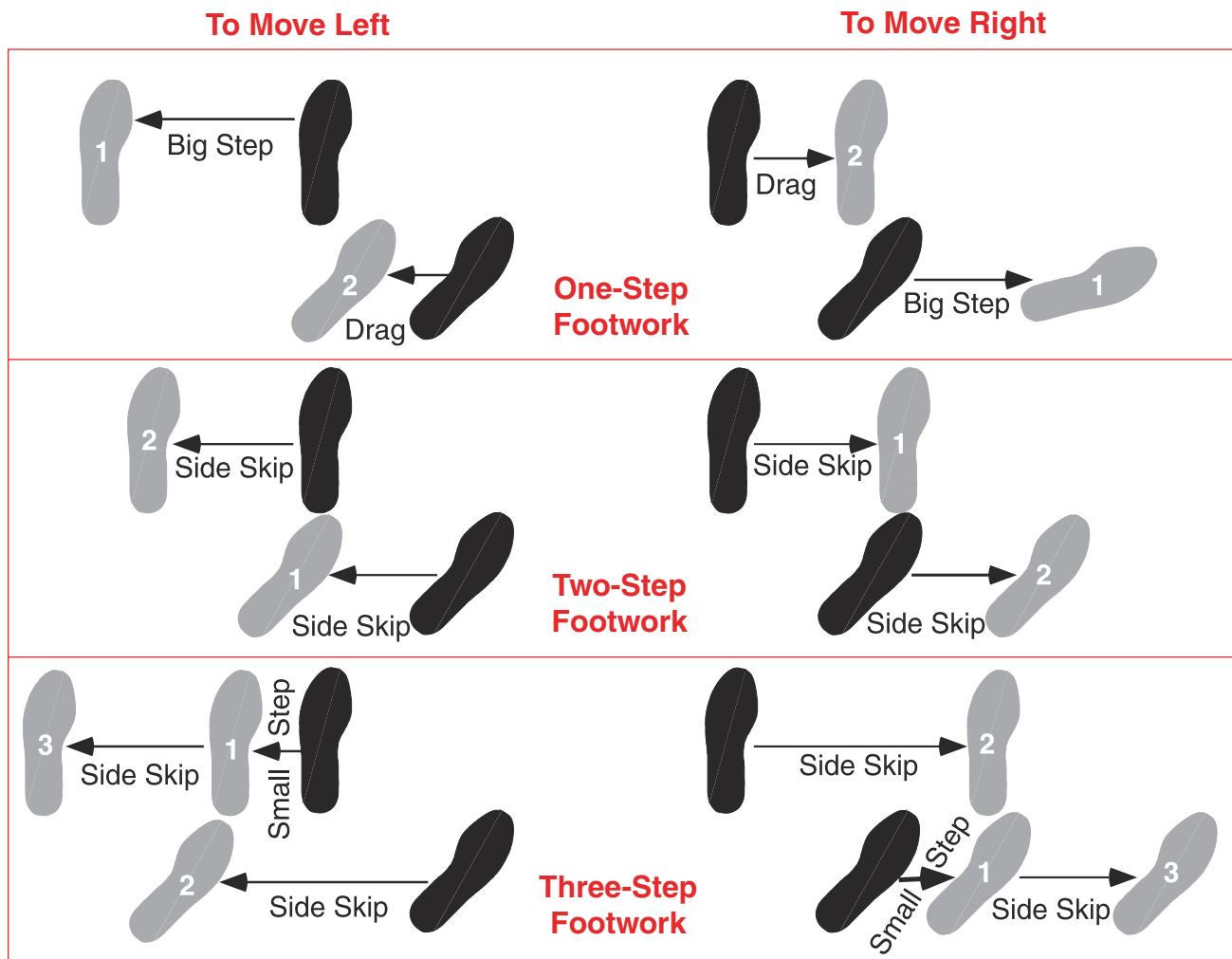
NEWGY FITNESS PROGRAM

Besides being a terrific aid in learning and developing table tennis skills, Robo-Pong is perfect as a fitness trainer, even if your goal is not to develop table tennis skills. With the robot, you can set up a fun exercise program that will improve your cardiovascular fitness and muscular endurance. As long as you can hit the ball back into the net and can move your feet, you can get an excellent workout with the robot. This exercise program can help you improve coordination, lose weight, and look fit and trim!

If you're serious about the sport, being fit is essential to your ultimate success. Robot training is a great way to enhance your fitness level because it is sport specific. Instead of improving your aerobic and anaerobic conditioning by running, for instance, you will develop the same benefits by using table tennis movements. The big advantage is that you develop sport specific skills at the same time as you develop your physical conditioning!

Note: Before beginning any exercise program, please consult with your personal health care professional, especially if you have recently had physical problems or surgery, or if you have been inactive or sedentary for some time.

Set-Up

Be sure you have plenty of balls loaded in your robot. We recommend the use of about 120 balls (in Robo-Pong 2040) for best performance. The exercise program requires that you hit balls for a long, sustained period of time. You won't realize many of the benefits if you have to stop and pick up balls every few minutes.

Most of the exercises in this chapter cannot be done if you are using robots in ball buckets (540 & 1040 models). You will run out of balls before the exercise is completed. To do these drills with a ball bucket robot, you will need an assistant to pick up the balls and reload the ball bucket to prevent the robot from running out of balls. A Ball Catch Net and set of Side Nets (see page 107) will help in quickly refilling your ball bucket.

Fitness Basics

The Newgy Fitness Program is designed to primarily develop cardiovascular fitness. Cardiovascular fitness is the body's ability for its heart and circulation system to carry oxygen to the cells, for the cells to process that oxygen, and for the blood to carry away carbon dioxide and other waste products over a sustained period of time and physical activity. It is the foundation of all fitness programs.

The desired result of cardiovascular training is to strengthen the heart to work more efficiently in delivering blood and oxygen throughout the body. As your heart gets stronger, it pumps more blood per beat. An easy indicator of the strength

of your heart is to measure your heart rate. The more cardiovascular fit you are, the lower your resting heart rate is.

For an average adult, the resting heart rate is 70–75 beats/minute with some sedentary individuals as high as 80–85. After training, the resting heart rate should drop to around 60–65, perhaps even as low as 55. Besides your heart having to beat several thousand times less every day, you'll be able to sustain activity longer without getting tired and recover more quickly from exertion.

To completely train your cardiovascular system, it is necessary to first train your *aerobic* energy pathway and then your *anaerobic* energy pathway. Your aerobic energy pathway provides energy to your body during long, sustained periods of below maximal activity. The anaerobic pathway provides energy during short term, maximal bursts of activity.

The best results from cardiovascular training are achieved when you exercise 15–60 minutes a day and 3–5 days a week. Furthermore, it's important to train with consideration to your *training heart rate* (THR), which is a percentage of your *maximum heart rate* (MHR).

Determine your MHR by subtracting your age from 220. To train aerobically, keep your THR between 70–85% of your MHR and train for 15–60 minutes nonstop. To train anaerobically, keep your THR between 85–100% of your MHR and train in 1–5 minute bursts of intense activity. Follow these short bursts by equal amounts of rest. Repeat these short burst/rest cycles 4–12 times.

For example, to determine the MHR for Bob, a 40 year old man, subtract 40 from 220 to get 180. Bob trains aerobically

when he elevates and sustains his THR to between 126 and 153 beats per minute (70–85% of his MHR). Anaerobic conditioning occurs when he keeps his THR between 153 and 180 beats per minute (85%–100% of his MHR). Now take a few minutes to figure your own MHR and THR ranges by completing the formulas in Chart 2 on the next page.

To recognize your different THR levels, a heart rate monitor is recommended. The best monitor for table tennis workouts would be a talking monitor, but these are difficult to find anymore. The talking monitor verbally reports your heart rate every 20–60 seconds (you choose the interval) via a tiny set of earphones. This makes it ideal for table tennis where you need to keep your eye on the ball. The other monitors use a wristwatch which require you to glance at the watch face to see your heart rate. This is not an easy thing to do when you're constantly moving into position, striking a moving target, and keeping your eyes on the ball.

Without one of these monitors, you would have to stop exercising to take your pulse, which would lessen the benefits of your exercise. When using either method; however, become aware of how your body *feels* while you are at a certain heart rate. Once you can accurately judge your heart rate, all you need is a stopwatch or timer to keep track of your time.

Two indicators of the correct THR for aerobic exercise are a steady, slow sweat and being able to carry on a conversation without shortness of breath. When breathing becomes difficult and thoughts of *how much longer can I keep this up* occur, you are probably approaching anaerobic conditioning. You're definitely into anaerobic conditioning when you sweat profusely and you feel hot, out of breath,

MHR and upper limit of anaerobic THR

220 − _____ = _____
　　　　　　age　　　　　　　　MHR

Lower limit of aerobic THR

.70 x _____ = _____
　　　　　　MHR

Upper limit of aerobic THR and lower limit of anaerobic THR

.85 x _____ = _____
　　　　　　MHR

Chart 2: Calculate Training Heart Rate

Figure your maximum heart rate (MHR), aerobic training heart rate (THR), and anaerobic THR by filling in the blanks in this chart.

and like you're pressing the upper limits of your current abilities.

When you start your fitness program, remember that fitness is a long term proposition, not an overnight transformation. Press too hard at first, or expect too much too soon, and you are very likely to quit before any measurable benefits are attained. Exercise should not be *painful*, although at times it may be *uncomfortable*. Do not exercise to the point of becoming sore.

To maintain interest in exercising, vary your routines so you're not doing the same exercise day after day. Keep a chart or diary of your training to track your progress and keep yourself motivated. Sample fitness progress charts are included at the end of this chapter.

Two very important principles of fitness training are *overload* and *progression*. Overload means that as your body adapts to one level of fitness, you must increase the workout to obtain further benefits.

You may use overload by increasing the frequency, the intensity, and/or the duration of your workout. Progression, which goes hand in hand with overload, means that the overload is systematically amplified in small steps to achieve an ever increasing state of fitness.

Don't be misled into thinking you must always increase the load *every* time you workout. On the contrary, for quickest and safest results, periodically *decrease* the level of your workout so your body can adapt to the changes being demanded of it. This helps prevent injury and reduces the mental pressure of always having to do better than the time before, a leading cause of burnout and dropout.

A good progression of training would be to increase overload weekly for 3 weeks, then decrease load slightly on the fourth week. The fifth week you would go back to the level of week 3 and continue this cycle of progressive overload for 3 weeks followed by trimming back on the load on the fourth week.

The other aspects of fitness beside cardiovascular fitness are muscular strength, muscular endurance, and flexibility. Muscular strength is the amount of force a muscle can exert in one effort. Muscular endurance is the muscle's ability to perform repeated muscular contractions in quick succession. Flexibility is the ability of the joints to move through their full range of motion.

The Newgy Fitness Program is not designed to increase muscular strength, although it will greatly improve muscle tone. Muscular strength is best improved by using weights or resistance equipment or doing calisthenics such as push ups, pull ups, and sit ups. Flexibility is a part of the Newgy Fitness Program and will be

addressed by the use of stretching during warm-up and cool-down. Muscular endurance will definitely be developed by the repeated use of muscles in the legs, back, shoulders, and arms.

Warm-Up

The first part of the Newgy Fitness Program is the warm-up. Proper warm-up is very important. Before vigorous exercise, get your blood pumping to the muscles and stretch the muscle fibers to encourage freer and easier movement and help prevent overextension of the muscles. When stretching, take it easy. Stretching should feel good and invigorate you. Don't bounce as you stretch; just maintain an easy, continual stretch.

If a stretch feels painful, STOP! Back up and do it again but don't stretch quite so far. Breath slowly and regularly and exhale your tensions away with each breath. Stretching is noncompetitive. It is not necessary to stretch further each time you workout. Forcing a stretch is contradictory to your intended purpose. Relax as you stretch and enjoy!

The stretches shown on pages 88 & 89 should take approximately 12–15 minutes to do. If desired, use other stretches, but be sure all major muscle groups (legs, arms, back, shoulders) are stretched.

Aerobic Training

The next phase is aerobic training with the robot. Set your robot to deliver an easy topspin shot to your forehand about 15–18 inches high. Set the oscillator to 1 & 4 for right-handers and 3 & 6 for left-handers so balls are randomly delivered inside your forehand court. Adjust frequency to 4 and oscillator speed so balls are spaced far apart (see pages 2–4).

When you're ready to begin, use an easy forehand counter (see pages 33–34) to return the ball. If you haven't already learned a forehand counter, just make sure that you take a controlled, easy swing at the ball with your forehand and that you use your whole upper body to make the swing, not just your arm. As soon as you finish one stroke, quickly move your feet into position for the next shot and stroke again. Keep stroking and moving until you feel you've reached the lower limit of your THR.

If you have a heart monitor and the monitor signals that you're within your THR, start your stopwatch and keep stroking and moving. If you don't have a heart monitor, then you will have to stop momentarily to take your pulse to see if it has risen to within your THR. When it has risen to the proper rate, then immediately start your stopwatch and resume play. After you've done this a few times, you'll get a sense of when you are in your THR and you won't have to stop to take your pulse. You may also choose to time yourself to see how long it takes you to reach your THR and then just add that length of time to your workout.

Your goal should be to keep stroking and moving for 15 straight minutes without stopping. Your heart rate should stay within the range of your aerobic THR during the entire 15 minutes. If your heart rate falls below your THR, stroke a little harder and/or turn up the ball frequency slightly. If you're starting to push into your anaerobic range, stroke more easily and/or decrease the ball frequency. Whatever you do, though, don't stop moving those feet!

If you have trouble maintaining your THR for 15 minutes, do what you can and gradually work up to 15 minutes.

Training Wk.	Duration
1	15 min.
2	17 min.
3	19 min.
4	17 min.
5	19 min.
6	21 min.
7	23 min.
8	21 min.
9	23 min.
10	25 min.
11	28 min.
12	25 min.

Chart 3: Sample of Initial 12 Week Training Program For Newcomer

Week	Duration	Osc. Range	Ball Freq
1	28 min.	½ table	4
2	28 min.	¾ table	4
3	28 min.	¾ table	4½
4	28 min.	¾ table	4
5	28 min.	¾ table	4½
6	28 min.	¾ table	5
7	28 min.	¾ table	5½
8	28 min.	¾ table	5
9	28 min.	¾ table	5½
10	28 min.	Full table	5½
11	28 min.	Full table	6
12	28 min.	Full table	5½

Chart 4: Sample Second 12 Week Training Program

Each week overload is increased by adding 10% to the duration of the workout (rounded to the nearest minute). Every fourth week the load is decreased to allow time for the body to adjust to the demands of the training and prevent burnout.

When you can easily do 15 minutes of robot play within your THR, you're ready to begin using overload and progression. Set up a schedule for yourself and plan out a twelve week training program.

There are many ways to incorporate overload into your program. The simplest way is to progressively increase the amount of time you exercise within your THR. The increase should be limited to 10% for those just getting started on an exercise program and 20% for those already in good shape. An example of a 3 times a week, 12 week long training program is shown in Chart 3 for Bob, a newcomer to fitness training.

At the end of this sample twelve week program, Bob will be in much better shape and he can decide on his next 12 week program. He could choose to continue lengthening the *duration* of his workout or adding to the *frequency* of his workouts.

Overload is increased by increasing the distance moved (oscillator range) and the number of balls hit per minute (ball frequency). The duration remains the same.

But because Bob is a busy man and his time is limited, he chooses instead to increase his overload by magnifying the *intensity* of the workout.

Among his options are: (1) increasing the range of oscillation from ½ table to ¾ or even full table; (2) increasing the ball frequency so that more balls are hit in a given amount of time; (3) stroking with more force; and/or (4) changing the spin to backspin so some lift has to be added to his stroke in order for the ball to clear the net (using either the forehand drive or forehand loop against backspin).

Since his first two options are easily measurable, he chooses to use a combination of them. Chart 4 shows Bob's second 12 week program. His first week is the same as the 11th week of his previous 12 week program.

As you can see, there are many ways to keep your workout varied and to systematically use overload and progression.

1

10 seconds/arm

2

10 seconds/side

3

10 seconds

4

20 seconds

5

25 seconds/leg

6

15 seconds/leg

7

15 seconds/side

8

30 Seconds

9

20 seconds each leg

10

15 seconds
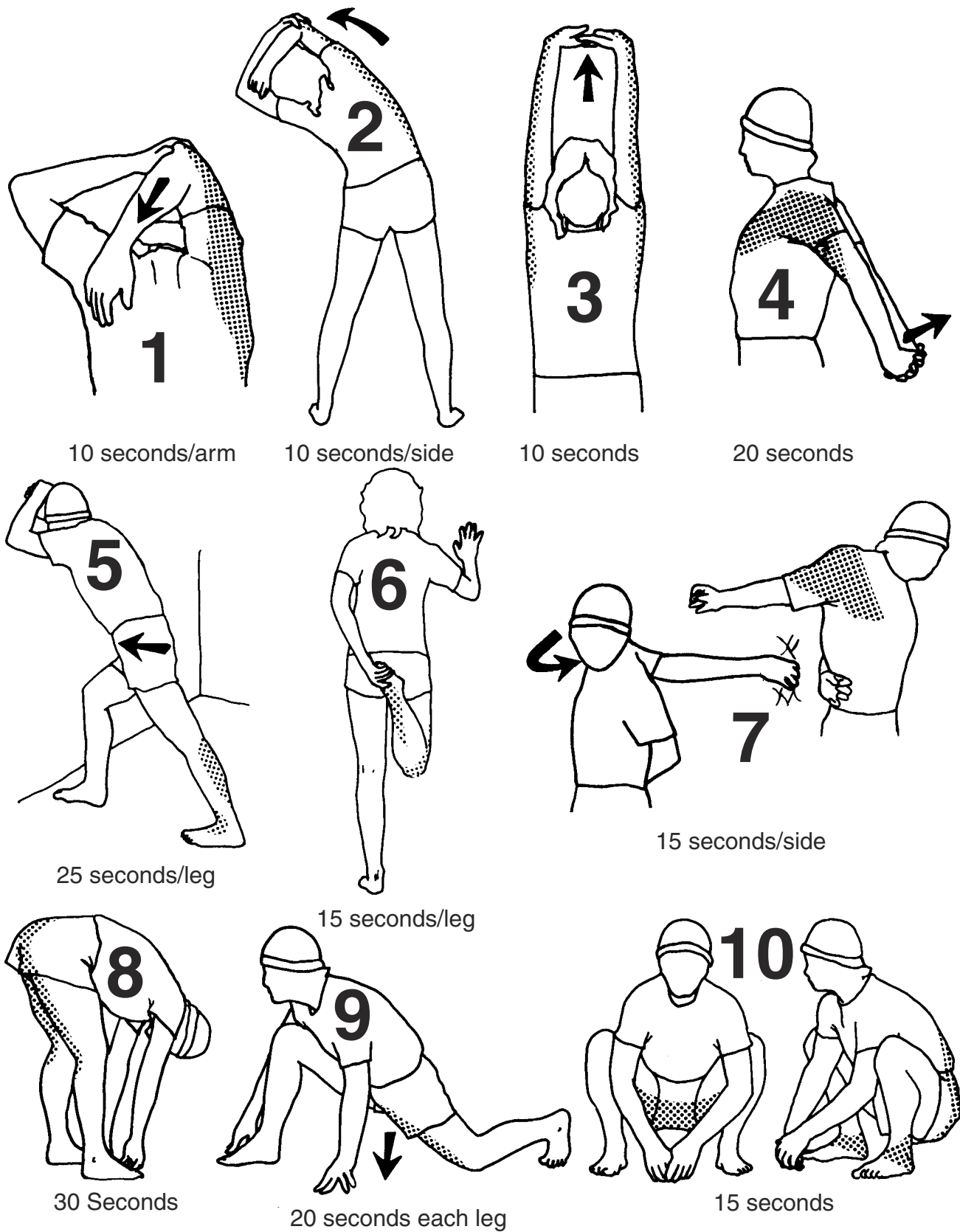
Figure R: Stretches For Table Tennis

Note: From *Stretching*, ©1980 by Bob and Jean Anderson. Shelter Publications, Bolinas, California. Distributed in bookstores by Random House. Adapted with permission. For a free catalog, contact: (mail) Stretching, Inc., P. O. Box 767, Palmer Lake, CO 80133, (phone) 800-333-1307, (fax) 719-481-9058, (e-mail) office@stretching.com, (internet) www.stretching.com.

11
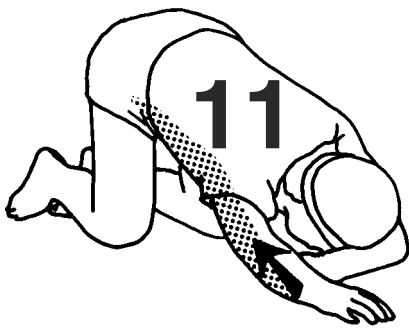
15 seconds/arm
(Grab object with hand, lean back)

12

20 seconds

13

10 seconds/leg

14

30 seconds

15

30 seconds

16

10 seconds/side

17
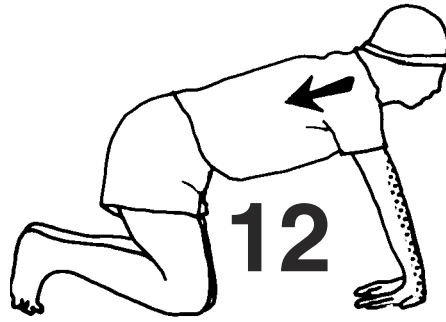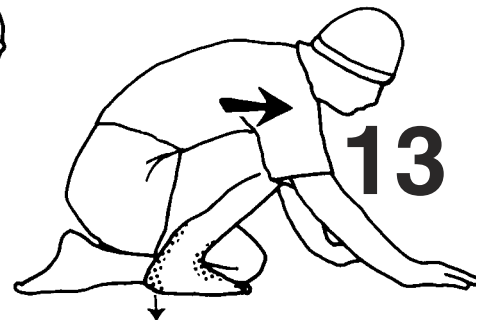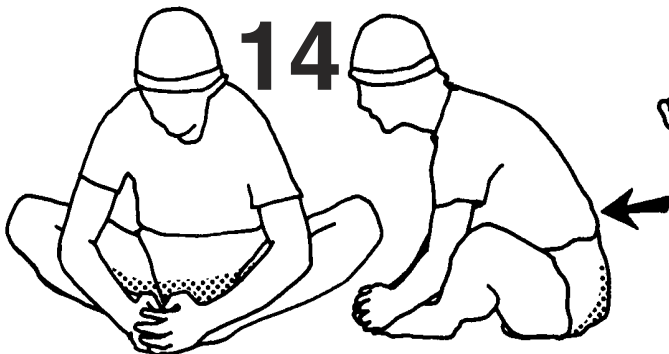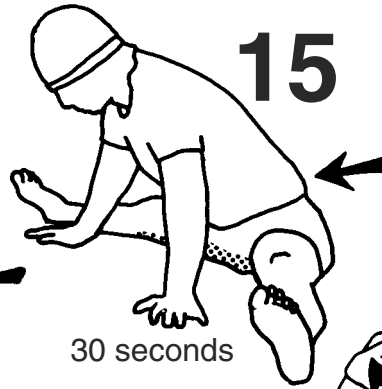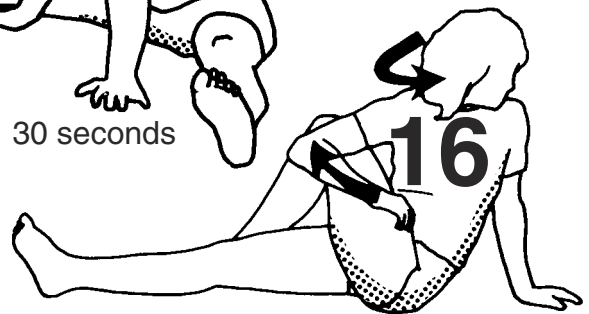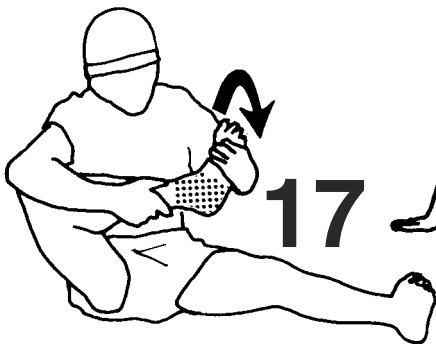
15 times each direction, each foot

18

20 seconds/leg

19

25 seconds/leg

20

20 seconds/side

21

20 seconds/leg

22
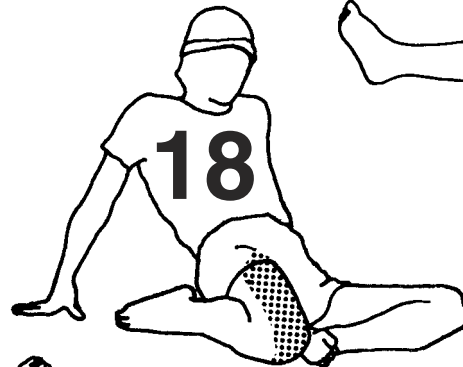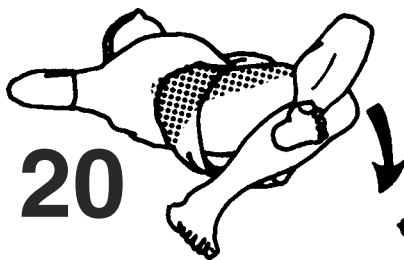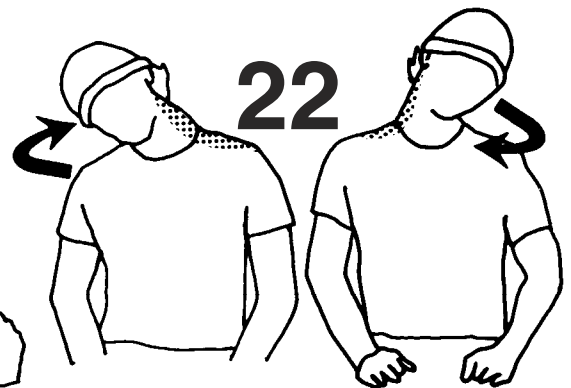
5 times each direction

Plan your workout and keep a diary to track your progress. Set goals and give yourself a fixed amount of time to reach those goals. If your overload criteria isn't measurable (like stroking the ball with greater force), you'll have to trust how it feels and describe it by using a percentage of maximum (such as *forehand counter at 60% maximum force*).

In these examples, Bob planned out two 12 week programs with measurable guideposts along the way. He also may have included in his training program a goal to lose 10 pounds or some other side benefit of becoming fitter.

You do not necessarily have to plan out a 12 week program. A 4 week program might be an easier chunk for you to bite off. You must make up your own plan, individualizing it to your own unique needs. Just be sure to use the principles of overload, progression, and variation and keep your heart rate within the ranges of your aerobic THR.

Following is a list of different table tennis drills you can do to exercise aerobically. Try them all. You'll find some more interesting and easier to execute than others. By selecting different drills, you can work on many different parts of your game and keep your workouts interesting.

The following drills are performed with the robot set to topspin. You could do these same drills by changing the spin to backspin and substituting a drive, push, or loop for a counter. The drive or loop will be a little more strenuous than a counter and the push a little less strenuous. You may find it more difficult to keep going for a long period of time when using backspin because when you miss, the ball often does not make it back into the collection net. When returning backspin, many misses will hit the table net and then roll off your end of the table, ending up around your feet. When returning topspin, on the other hand, misses often go long off the robot's end of the table and are caught by the collection net or end up on the floor away from your feet.

A few of these drills may be too strenuous for your current aerobic condition. If you cannot sustain a certain drill for longer than 15 minutes, postpone doing that drill until you have improved your aerobic condition. Besides improving these table tennis movements, additional benefit is gained when you work on placement by aiming your returns to specific parts of the table as you stroke the ball.

- All forehand counters and/or loops with balls delivered within your forehand court (oscillator range 1 & 4; for left handers, 3 & 6).

- All forehand counters and/or loops with balls delivered within your backhand court (oscillator range 3 & 6; for left handers, 1 & 4).

- All forehand counters and/or loops with balls delivered from forehand corner to middle of backhand court (oscillator range 2 & 4; for left handers, 3 & 5).

- All forehand counters and/or loops with balls delivered to all areas of the table (oscillator range 3 & 4).

- Alternate forehand and backhand counters or loops with balls delivered to the backhand court (no oscillation).

- All forehand counters and/or loops with balls delivered to middle of forehand court (no oscillation) and

using forward-backward footwork. When stroking from the forward position, contact the ball at the top of its bounce. When stroking from the backward position, contact the ball as it drops from the top of its bounce. It would be considered better form to counter the forward ball and loop the rearward ball, although it is certainly possible to counter or loop either ball.

- All forehand counters and/or loops with balls sent randomly to the forehand court (oscillator range 1 & 4; for left handers, 3 & 6) and using forward-backward footwork.

- All forehand counters and/or loops with balls delivered to the backhand corner (no oscillation) and using forward-backward footwork.

- All forehand counters and/or loops with balls sent randomly to the backhand court (oscillator range 3 & 6; for left handers, 1 & 4) and using forward-backward footwork.

There are three considerations to keep in mind when using the robot for aerobic training. One is to use the forehand as much as possible. The forehand uses more muscles than the backhand and it is better form to use the forehand to cover a large part of the table than the backhand. Using only the forehand also encourages you to move your feet before every stroke. Don't use a backhand while training aerobically unless you are pressing the upper limits of your aerobic THR and you need to slow down for a few seconds to reduce your heart rate. The other exception would be to do a drill specifically calling for a backhand stroke.

The second is to use slow ball speed settings on your robot. The faster the ball is

delivered, the less effort it takes to make the ball go back across the net. You want to apply your own speed to the ball, not rely on the speed already on the ball.

The third is to use easy to medium force strokes that you're confident in. Softer strokes afford better ball control so more balls are returned into the collection net. Harder strokes are more difficult to control and increase the risk of not returning the ball into the collection net. The object of aerobic conditioning is to keep going for an extended period of time. The more balls that end up on the floor, the shorter your exercise period will last.

As your skill increases, you can use faster ball speeds and more forceful strokes as long as you can hit enough of your returns back into the net to keep going for the required 15 or more minutes. Likewise, using your backhand will not detract from your aerobic training if your backhand is a powerful shot and you're using the proper weight transfer.

Anaerobic Training

When you have built up your aerobic energy pathway to a high level, you may choose to work on your anaerobic pathway. Don't work on your anaerobic pathway until you have a solid aerobic foundation. You'll be ready for anaerobic training when you can work out comfortably at the upper limits of your aerobic THR (80–85% of MHR).

Anaerobic training is much tougher than aerobic training and many people skip it altogether. If you're using the Newgy Fitness Program just as a way to stay in shape and you are not a competitive player, it's not necessary to go any further. But if you want to get in super shape or you want to attain peak performance in a sport that consists of a series of short

bursts of intense action, like table tennis, anaerobic training is a must. We will divide our anaerobic training into *power training* and *speed training*.

For power training, it is necessary to have a reasonably accurate forehand smash stroke (see pages 35–38) or loop stroke (see pages 61–64). Begin by doing one of the aerobic drills on the previous two pages for about 5 minutes to completely warm up and get a little sweat going. When you're ready to begin anaerobic training, set the robot to deliver a slow, high topspin shot at slow frequency to the middle of your forehand court.

Start your stopwatch and begin smashing the ball at about 80–90% maximum force. Be sure to take a good backswing and use your whole body, not just your arm. Quickly recover from one stroke in order to be ready for the next stroke. Adjust the ball frequency to allow just enough time to do a complete, powerful stroke before the next ball is delivered.

Continue smashing for 2–5 minutes or until you run out of breath. Stop, note the elapsed time, and check to see if your heart rate is within the lower ranges of your anaerobic THR (85–90% of MHR). If it is at the desired level, rest for the same amount of time as you were able to do continuous smashes. Then check your heart rate to be sure it has recovered to 125 or fewer beats per minute and continue your workout by doing 4–6 repetitions of smashing, followed by an equal amount of rest.

Check your heart rate at the start and end of each rest period and use the rest period to pick up any balls that are on the ground. **Warning:** Don't start the next active segment until your heart rate has recovered to 125 or less. Stop if you cannot maintain good form.

Anaerobic workouts are tough, so work them into your schedule gradually. Alternate anaerobic workouts with aerobic workouts. Never schedule more than two anaerobic workouts per week and plan no more than 4–6 weeks of anaerobic training at a time. And make sure you are *thoroughly* warmed up before starting *any* anaerobic conditioning.

When your body has strengthened to the point you can do 6 repetitions of continuous smashing and resting of 5 minutes each and at 80–90% maximum effort, it's time to go to the next phase. Phase two has shorter but more intense workouts followed by longer periods of rest.

Your active component should last 1–1½ minutes with your rest component being twice as long as your active one. You want to use 90–100% of maximum force on your smashes and your target heart rate is 90–95% maximum. You should be able to do 8–12 repetitions of work/rest.

If you want to press further, the last phase is speed training. In this phase, your active component will be between 30 and 60 seconds and your rest component will be three times as long as the active segment. The force you use will be 70–80% maximum and your target heart rate will be 95–100% maximum. You want to be able to do 15–20 sets.

The big difference from power training is that now you will turn up the ball frequency to the point where it definitely feels uncomfortable and you know you will be unable to keep pace with it for very long. You will also want to turn up the ball speed to about 5 and lower the head angle so a medium height and speed shot is delivered to the middle of your forehand court. Your strokes should have little backswing or follow through and you should concentrate on using a

quick, explosive snap of your forearm, almost as if it were a rubber band.

One of the keys to doing well at this phase is to immediately relax the muscles in the arm, shoulder, and back as soon as the ball is struck. In *Maximum Performance*, Laurence Morehouse and Leonard Gross explain the secret of speed: *Speed results not so much from the swiftness with which you can contract your muscles, but the swiftness with which you can relax them so that they don't act as brakes on your acceleration…The concept of relaxation applies to any motion. The more relaxed your antagonistic muscles, the faster—and paradoxically more powerful—that motion.*

One of the objectives of anaerobic training is to become familiar with fatigue and overload. The more time you spend in such an uncomfortable situation, the more familiar with it you become and the less it bothers you. Another benefit of the unusually high demands of anaerobic workouts is that they promote better efficiency in your strokes and movements. It also assists you in learning how to *play through* fatigue and adversity.

Cool Down

After any workout, whether aerobic or anaerobic, be sure to allow a 5–10 minute period to allow the body to cool down, stop sweating, and the heart rate to return to normal. This would be a good time to walk around and pick balls up off the floor. Walk around and/or stretch. You can use some of the same stretches as you did in the warm-up. Don't sit or lie down until you cool down properly. The cool down is designed to help the circulatory system start clearing out the waste products created by your vigorous exercise. This, in turn, will help prevent muscle stiffness and soreness.

Good Health And Nutrition

What you do between workouts can have as great an impact on your health as the workouts themselves. Your health depends as much on good eating and sleeping habits, moderation of indulgences, and a positive outlook on life as it does on proper exercise.

A leading cause of poor health in America and other parts of the world is poor eating habits. In America, it's eating too much in general, and specifically, too much fat, cholesterol, refined sugar, and salt and too little fiber, unprocessed natural foods, and water. The average female needs between 1,800 and 2,200 calories a day and the average male needs 2,500–3,000 calories a day. If you have an hour of vigorous exercise, you will need to add 400–800 calories to the daily amount.

It's important to balance caloric intake of food with expending calories on exercise and daily activities. Eat more calories than you burn, and you gain weight. Eat fewer calories than you burn and your body converts fat and glycogen stores to energy, causing you to lose weight.

In rare cases, if your body's reserves of fat and glycogen are low, your body will convert muscle protein to energy. If this happens, you are actually breaking down your muscle instead of building it up. One way to prevent this from happening is to monitor your percentage of body fat.

Locate your ideal range of body fat percentage in Chart 5 on the next page for your age and sex. In no case should you ever allow your percentage of body fat to drop below 4–5% for males or 10–12% for females. If you approach these lower limits, you need to consume more calories daily so your body will not convert any more fat reserves to energy. Your body

Age	Up to 30	30–50	50+
Females	14–21%	15–23%	16–25%
Males	9–15%	11–17%	12–19%

Chart 5: Body Fat Percentages By Age

Locate your age and sex to find the ideal range for your percentage of body fat. This chart shows the ideal ranges for an adult. Keep your fat percentage within these ranges.

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requires a certain percentage of body fat for essential bodily functions.

On the other hand, any amount above the averages indicates that diet and exercise are called for. The use of body fat percentage, instead of weight, as a guideline for weight control is strongly recommended. An easy way to determine your body fat percentage is to get a special device that optically or electronically measures your body fat. It is quick and easy and claims to be as accurate as the water immersion method which is the standard way to measure body fat. There are numerous such devices on the market today. The easiest that I've found to use is a scale that measures weight and body fat at the same time simply by standing on it in your bare feet.

Your diet should ideally be composed of 55–60% carbohydrates, 15–20 protein, and less than 30% fat. Foods high in complex carbohydrates and fiber, such as fruits, vegetables, grains, and legumes, should make up the majority of your diet. Cut back on fat by choosing fish, lean cuts of meat, skinless poultry, and reducing your intake of butter, vegetable oils, and fried foods. Eat a variety of foods to ensure proper vitamin and mineral intake.

If despite all these *shoulds* and *should nots*, you feel that on some days you don't eat a wide variety or sufficient quantities of certain foods, you may want to take nutritional supplements. The subject of supplementation is controversial. Some authorities say that supplementation is unnecessary for most people. Other authorities promote supplementation for almost everyone.

Therefore, the next four paragraphs are presented as personal experience and not as being supported by any scientific fact. And as stated at the beginning of this chapter, please consult with your personal health care practitioner before starting any exercise or nutritional program.

I have followed a program of *nutritional insurance* for many years. I find it mentally reassuring to know that every day, I'm getting at least the Recommended Dietary Allowances (RDA's) of all important vitamins and minerals despite my eating habits on a given day. Since starting my nutritional supplementation program, I feel healthier and I get sick less often than before I started it.

I realize, however, that it's easy to go overboard with nutritional supplementation. I don't intend for supplementation to replace healthy eating habits. I only wish to insure a minimum standard of nutrition every day. If I take supplements, I won't question or doubt whether I have eaten correctly to fulfill my body's needs for vitamins and minerals.

Again moderation is the key. I take a balanced multivitamin/mineral supplement that provides 100% of the RDA for most all vitamins and minerals that have RDAs set for them. I avoid nutritional supplements that are unbalanced, incomplete, or provide excessive amounts of any vitamin or mineral. I do not want to risk any potential harm to my body from, or waste my money on, megadoses of any

nutritional supplement. My two exceptions are that I take additional Vitamin C and Vitamin E mainly because so much research supports the health benefits of their antioxidant capabilities.

I also believe it's better to take natural vitamins than synthetic ones. I recall an experiment with seawater. In this experiment, seawater was analyzed down to it's tiniest component. The scientist then mixed up a batch of *synthetic seawater* using all the components and in the same ratio as in natural seawater. When fish were placed in this artificial seawater, the fish died. Only after a small amount of real seawater was placed in the tank did the fish live. This tells me there was something in the real seawater that wasn't in the artificial seawater. Something that couldn't be identified, measured, and defined. So I believe it is with vitamins. Natural vitamins have other, perhaps still unidentified, substances or properties along with the main compound. Synthetic vitamins, on the other hand, come out of sterile vats and test tubes and don't have the accompanying synergistic substances that natural vitamins do.

The importance of drinking plenty of water cannot be stated enough. During vigorous exercise your body can lose a quart or more in one hour, especially in hot weather. Such substantial fluid loss can have a detrimental effect on your performance, and if fluid loss is severe, life threatening heat exhaustion or heat stroke can result. Drink liberally before, during, and after your workout. Do not rely on feeling thirsty before drinking. Drink lots of water!

Summary

Working out with the robot can be a fun way to get in shape. The main idea to keep in mind at all times is to *be successful.* Start with wherever your present physical condition is. Accept it and commit to changing it a little at a time. Increase the demands on yourself so gradually that you hardly notice the change. Set it up so there's no way to fail. Know that you are going to win!

Keep a diary so as the months go by, you can look back and appreciate how much progress you've made. Sample fitness charts are included at the end of this chapter. Page 96 has a chart vertically oriented and permits you to record a whole months worth of entries. The chart on page 97 is oriented horizontally and features more space for each entry but only 3 weeks worth of entries. You should copy one of these pages and include the copies as part of your fitness diary.

When you do go overboard and press too much, it's not failure. You're merely pushing at the limits of your current abilities. No need to quit; just back up a bit and do it again, but this time a little slower. Given time and gradual progression, that limit will disappear and a new one will take its place. Good luck and stay fit!

PROGRESS CHART FOR
NEWGY FITNESS PROGRAM

Name: _____ Beginning Weight: _____ Ending Weight _____

% Body Fat, Begin_____ % Body Fat, End_____ Age: _____ Max. Heart Rate (220-age) _____

Aerobic Range (70–85 max.)_____Anaerobic Range (85–100% max.) _____

Date	Dura-tion	Ball Speed	Ball Feed	Osc. Speed	Osc. Range	Heart Rate	Comments

**PROGRESS CHART FOR
NEWGY FITNESS PROGRAM**

Name: _____ Ending Weight _____

% Body Fat, Begin: _____ Beginning Weight: _____ Age: _____ Max. Heart Rate (220-age): _____

% Body Fat, End: _____

Aerobic Range (70–85 max.): _____ Anaerobic Range (85–100% max.): _____

Date	Dura-tion	Ball Speed	Ball Feed	Osc. Speed	Osc. Range	Heart Rate	Comments

Chapter Twenty-Three

FUN GAMES TO PLAY WITH THE ROBOT

Your multi-talented Robo-Pong can be fun and entertaining when you make up games to play with it. Kids seem to enjoy just swatting at the ball and seeing how hard they can hit it with no regard to whether the ball strikes the opposite side of the table or not. This can be unsettling to adults, but the kids sure seem to have fun! For most people, however, a little structure adds to the enjoyment of the game. The following are a few suggestions on playing games with the robot. And, of course, all activities involving children should have parental supervision.

Target Practice

Cut out some cardboard objects of real life or comic book villains and add a little support to the back so they can stand upright. Make up several targets of various sizes from the size of a pack of gum to a DVD case. Set up the targets at various points on the robot's side of the table. Gather all the players together, set the robot to deliver an easy shot to the middle of the table and take turns knocking down the targets.

You need to have one of the players act as timekeeper. There are two ways to determine a winner. One is whomever can knock down a complete set of targets the quickest. The second is to give each player one minute (or some other set amount of time) and see how many targets can be knocked down in that amount of time. In this variation, two other players are

needed (one on each side) to set up targets as they are knocked down. Also do not use the side nets to permit easy access to the targets when setting them back up. It would be fairest to give double or triple points for smaller targets so players are rewarded for knocking down the more difficult to hit targets.

Ring Around The Rosy

You need 2 or more players for this game. Set up the robot to deliver an easy shot to the middle of the table. Make sure each player has a racket and line them up in single file off to the side of the table. When ready to begin, Player 1 steps up to the table and turns on the robot. He/she returns the shot across the net so it strikes the opposite end of the table. Then he/she immediately moves out of the way by turning away from line of players and going to the end of the line. Player 2 steps up to return the next shot, and if successful, immediately moves out of the way by circling around to the end of the line. Player 3 must return the next shot and so on, alternating players until everyone has had a chance to return a ball.

When someone misses, he/she is *out* and the other players keep playing without him/her. Continue the game until there's only one person who hasn't missed any shots. He/she is the *winner.*

To make things more interesting, you can turn on the oscillator so the ball is

moving around and/or speed it up by turning up the ball frequency. If done correctly, there is barely enough time to hit a ball before the player striking the ball must move out of the way for the next player. As you can imagine, things can get a bit frantic with 4 or 5 players all running around in a circle, the robot shooting balls all over the table, and everyone trying to avoid getting in each other's way! This is a really fun game and a great party pleaser!

If you have a lot of people to entertain, divide them up into equal groups of 3–5 people and have a Ring Around The Rosy tournament. Each group will play an individual game and then the winners of each individual game will play a finals game to determine the overall winner.

Pong-Master

This game is like an electronic version of Target Practice. It's a fun, interactive game that develops stroke accuracy, consistency, and the ability to relax under pressure while at the same time having fun attempting to *beat the robot*.

Pong-Master (see page 106) can interface with either Robo-Pong 2040 or 1040. However, with the 1040, the game length is limited to the number of balls in the Ball Bucket and the Ball Frequency rate. For example, if you have 180 balls in the robot and the frequency is set at 60 balls per minute, a Pong-Master game cannot be continued when the balls have emptied from the bucket at the 3 minute mark. To overcome this limitation, you can have an assistant reload balls into the bucket so the robot does not run out of balls.

Pong-Master cannot be hooked up to the Robo-Pong 540 Control Box. It is possible to use Pong-Master with a 540, but you would not be able to use Pong-Master's automatic start and finish features. It would be necessary to manually start and end the game by turning the control box on and then off. And like the 1040, game length would be limited by the number of balls in the Ball Bucket.

Setup is quick and easy. Connect the Pong-Master scoreboard to your Robo-Pong control box. Attach the sensor targets to the scoreboard. Select the difficulty of the game by choosing number of targets (1, 2, or all 3 targets), size of targets (large, medium, or small), points scored for each target hit (1, 2, or 3 points per hit), length of game (11 or 21 points), and time to complete the game (1–10 minutes). Press start and go! The scoreboard automatically keeps the score and time of the game in large, easy to read LED numerals. Every target hit is recorded on the scoreboard and signaled by a beep.

The robot is awarded 1 point every few seconds so that at the end of playing time, the robot will have scored 21 points (or 11 if selected). The player races the robot to be the first to score 21 points by hitting the targets. Get to 21 points first and you win! Pong-Master will play you a victory song. If the robot reaches 21 first, it chides you with an antagonistic ditty.

If the player and robot each have 20 points at the end of regulation time, the pressure mounts as sudden death begins. The game goes on (no time limit) until either the player or the robot is 2 points ahead, just like a real deuce game!

Beside the options you have to set the Pong-Master controls, you may also adjust the difficulty of a game by selecting the type of shot Robo-Pong delivers. The various parameters are the type of spin, ball speed, ball height, ball frequency, and turning oscillation on or off.

Backspin shots are the easiest to aim because the ball travels slowly and in a straight line. Topspin is a little more difficult because the ball can travel much faster. Attempting to use the opposite spin of your return (i.e., topspinning a backspin shot or backspinning a topspin shot) will be very difficult. Sidespin is the most difficult to return accurately because it causes the ball to jump sideways off your racket and is therefore hard to control and aim accurately.

Ball speed and ball height are easier to understand. The faster the speed of the ball, the harder it is to direct the ball to a particular spot. The higher the ball is, up to shoulder height, the more possible angles you have to hit a target.

Ball frequency has a variety of effects on the difficulty. If the frequency is set too low, you can aim your shots more accurately, but you have fewer chances to score. If frequency is set too high, your aim is diminished, but you have more chances to score. The frequency is best set to the highest level at which your aim is reasonably accurate.

Turning oscillation on makes it more difficult to hit your targets because the ball is delivered to a different spot every time. You must not only have an accurate stroke, but you also must move quickly to a new position and get steady before the ball arrives. Turning oscillation off simplifies the game tremendously because you can stand in one spot to wait for the ball and you can concentrate more fully on your stroke technique.

Once you've developed some prowess at this game, you're ready to throw a Pong-Master Party! Gather your family around the table tennis table or invite some of your friends over for a good time. Have

Robo-Pong and Pong-Master set up at a fairly simple level. You go first to show how easy it is to win and how to play the game. Then everyone else takes a turn. Record everyone's score. After everyone has had a turn, whoever got the best score wins that round!

After each round, handicap the better players by making them play with smaller targets or with less time. Keep things moving by changing the robot settings occasionally. Show your family or friends how to return different spins. If the players are getting good, turn up the ball speed and/or frequency. For a real challenge, make the robot oscillate while playing a Pong-Master game. The variations are almost endless.

Another alternative is a Pong-Master tournament. There are three rounds. Each round is progressively more difficult. The first two rounds are *cuts*; i.e., you must beat the robot to go to the next round. Your exact score against the robot doesn't matter, only if you win or lose a game. The third round is the finals and the best score wins. If there is a tie in the third round, you play a tie-breaker among the contestants who are tied by increasing the difficulty of the settings.

Use the large target for the first round and adjust the robot to deliver a easy topspin *serve* (ball speed 3, ball frequency 5 with the ball bouncing first on the robot's side of the table) to the forehand. Set Pong-Master for a one minute, 21 point game. Give everybody one practice game and then three chances to beat the robot at Pong-Master. If they win any game (except the practice game, of course), they go on to round 2; if not, they drop out.

In round 2, use the medium size target and allow one practice game and then

only two chances (games) to beat the robot. Keep the robot and Pong-Master settings the same. Again, if they win, they go on; if they lose, they drop out.

Those making it to the third round play against the small target and have only one practice game and one real game. The best score wins. If there is a tie (each contestant has the same score or in the case of a deuce game, they both lost or won in deuce), go to a tiebreaker and increase the difficulty by speeding up the ball, turning on oscillation, or adding sidespin. As long as there is a tie, keep going to another game and increasing the difficulty until you have a champion!

If done right, the finals are exciting and are sure to draw a crowd.

Of course, the above settings and rules of play are merely suggestions on how to setup and run a Pong-Master tournament. The settings and rules should be flexible to accommodate the skill levels of your contestants. The above rules were formulated for tournament level players. For children or recreational players, you may wish to allow more time per game, award 2 points for each target hit, or even play an 11 point game. Just make sure that the settings for each round are the same for each contestant.

Photo 33: A Pong-Master Party!

Can you beat Robo-Pong? Have a contest with all your friends to see who can get the best score against the ultimate opponent. A great party pleaser!

CONCLUSION

This manual will greatly assist you in learning the basics of table tennis using Robo-Pong as a teaching aid. While the use of the robot is probably the quickest way to learn strokes and skills, it is not in itself the complete answer.

You still need to find a willing practice partner and/or coach to use these same strokes and skills against a live opponent. This is particularly true with service receive because although the robot can simulate most service spins, it cannot simulate the deception and fake movements that a good server will use.

Please remember that robot training is only a part of a total training program. Robot training, 1-on-1 training, multi-ball training, fitness training, practice competition, tournaments, and having a good coach are all necessary for a complete training program. Using a robot will indeed accelerate development of a number of skills if used properly.

The robot's biggest strength is in developing strokes and footwork. For fastest improvement, particularly in the early learning stages, it is very important to have a consistent ball to practice a new stroke against. This is exactly what the robot affords. It would be extremely difficult to learn a new stroke if every ball had a different combination of spin, speed, and placement, which is what typically happens when two un-trained humans get together to play this game.

This is what I suggest: Learn a stroke on the robot until you feel very consistent against a variety of spins, speeds, and angles, practicing them one at a time. When you can handle a variety of different returns from the robot, then start working with your practice partner or coach to work in controlled drills that vary returns from shot to shot. These drills will help you learn how to modify each stroke to accommodate the type of return. This is a skill that must be practiced in a controlled practice type environment. Do not mislead yourself to think that you can practice this skill in a game or other competitive environment where your focus should be on winning points, not on developing a new skill.

Once you can modify your strokes *on the fly* to accommodate varying controlled returns, then it's time to start working the skill into *practice* games, where the object is to use this skill as much as possible in the game, win or lose. The last step is using this skill in actual competition. Skipping one of these steps will lead to poor results. Real improvement takes not only hard work, but working smart as well. Used wisely, Robo-Pong can greatly accelerate your development.

A good source for additional table tennis information is USA Table Tennis, the official governing body for table tennis in America. They publish USA Table Tennis Magazine, which always contains several coaching articles and lots of other interesting information for the table tennis aficionado. You can also obtain copies of table tennis rules and a listing of clubs in your area. Contact them at:

> USA Table Tennis
> One Olympic Plaza
> Colorado Springs, CO 80909
> www.usatt.org (web site)
> usatt@usatt.org (E-mail)
> (719) 866-4583 (phone)
> (719) 632-6071 (fax)

There are many more skills and strokes to learn than are described in this manual. I highly suggest that you visit the Coaching Forum on the Newgy web site (http://www.newgy.com/TTCommunity/CoachingForum.html). There you will find many articles by a variety of authors on nearly every conceivable subject regarding table tennis skills, coaching, and tips for using your robot. Many articles contain video clips, photos, and/or graphics to help explain the subject matter. Videos and books can also be ordered from that web site.

Have fun and enjoy learning table tennis with Robo-Pong. If you have any questions concerning this manual, the robot, or any of our other equipment or services, please contact us at:

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> Gallatin, TN 37066, USA
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Play pong and live long!

ABOUT THE AUTHOR

Larry Thoman is the General Manager of Newgy Industries, the manufacturer of Robo-Pong. He has been involved in table tennis as a competitive player and organizer for over 34 years. He is certified by USA Table Tennis as a Regional Level Certifying Coach and Club Level Umpire. In 1982–1983, Larry served as National Coaching Director for the USATT. He has been certified by the American Coaching Effectiveness Program (ACEP) as a Leader Level Instructor. The 1996 Olympics in Atlanta chose him to be their Assistant Manager of Training Sites for Table Tennis.

Larry has been the Tennessee State Men's Singles Champion ten times and Doubles Champion nine times and was ranked within the top 50 in the U. S.. While in college, he was twice the Regional Collegiate Champion and was ranked 5th nationally in American colleges in 1977.

As an organizer, he has directed over 50 sanctioned tournaments, is the founder of the former Fortune Table Tennis Club and the current Nashville Table Tennis Club. Newgy Table Tennis Center hired Larry as their Head Pro from 1993–1995. He was instrumental in the inclusion of table tennis as a sport in the Tennessee Sportsfest (a multi-sport state games competition) and received a Certificate of Appreciation in this regard from former Tennessee Governor Ned McWherter. He founded the Volunteer Cup League, formerly the largest intercity table tennis league in the country, and was elected to be its League Commissioner four times. He also served as Commissioner for the Sumner County High School Table Tennis League three times.

In 1979, Larry self-published a training manual for table tennis. He is author of *Newgy Robo-Pong Training Manual*, which was copyrighted and published in 1992. He has contributed numerous coaching articles, league summaries, and tournament reports to *Table Tennis Topics*, (now called *USA Table Tennis Magazine*) the official magazine of USA Table Tennis You may read more of his coaching advice at the Coaching Forum of the Newgy web site (http://www.newgy.com/TTCommunity/CoachingForum.html).

NEWGY™ Upgrades & Accessories

RECYCLING NET

UPGRADE KIT

Transforms your Robo-Pong 1040 into a 2040. Get ready for non-stop action. Play until you drop! Get true aerobic conditioning from your robot. Includes full net system, video, instructional manual, Collector Plate, and Side Net Extenders. Simple instructions make the conversion quick and easy.

ROBO-PONG 540

UPGRADE KIT

Converts your Robo-Pong 540 into a 1040! More than doubles ball capacity and increases ball speed and frequency. Adds oscillation for side-to-side delivery. Includes Bucket Extender, full-size Control Box, oscillator controls, and more powerful transformer. Bucket Extender available separately.

40mm

UPGRADE KIT

Easily and quickly retrofit your Robo-Pong 2000 to accept 40mm balls. Convenient ball switch lets you use either the traditional 38mm ball or the new international standard 40mm ball. Includes Wedge Filler for im-proved ball feed. No trade in required – you keep your old robot body.

Pong-Master

Interactive Electronic Game

Plug Pong-Master in, and your robot becomes a Nintendo® style entertainment machine. Can you beat the robot at Pong-Master? It's tough. Vary the settings from beginner to world-class to test your accuracy, consistency, and ability to relax under pressure. Use it with the supplied targets for a fun, entertaining game or without the targets as a workout timer.

Robo-Tote

Carrying Case

Fit your model 2040 or 2000 robot into this carrying case and take it with you wherever you go. Protects your robot from dust or scratches. Will not fit other Newgy robot models. Includes adjustable carry-ing strap and pocket for Pong-Master targets or other items.

Pong-Pal

"The Quicker Ball Picker Upper"®

Pick up balls easier and quicker with Pong-Pal. Even retrieve balls under tables or in other hard-to-reach places. Its unique two-piece design lets you carry it in your sport bag or Robo-Tote. Works with either 38mm or 40mm balls.

Robo-Caddy

Easily control the robot's height, distance from table, and angle. Remarkable simulation of away-from-table shots like loops, lobs, and chops. Also use as a ball holder for multi-ball or serve practice. Fits all robot models. Connector Extension Cable is available separately and lengthens Connector Cable from 10 to 20 feet and is highly recommended.

Ball Catch Net II

Ball Catch Net II captures and collects your returns for quick and easy manual ball recycling. Use it with Newgy robots that have a ball bucket or for service practice. Captures and then funnels balls into a collection bucket (not supplied); does not enable automatic recycling of returns.

Tray Liners

These custom-fitted liners absorb ball impact and soften ball impact sound when attached to your model 2000 or 2040 ball trays. Also helps reduce effects of static. Priced per pair.
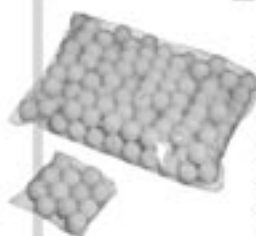
Robo-Balls

Selected especially for use with Newgy Table Tennis Robots. Ideal for recreational play or multi-ball training. Durable. Long-lasting. Available by the gross (144) or dozen (12), in orange or white, and in 38mm (1-Star) or 40mm (2-Star).

Side Net Extender

Gives 1 to 2 inches of forward-backward adjustability in the length of the side nets on models 2040 and 2000. Prevents fraying of your table net. Allows quicker attachment to or removal from your table's net. Now included with all 2040's!

Carrying Strap

This sturdy nylon strap replaces the standard rubber strap on models 2000 & 2040. Assures adequate strength to support the entire weight of your robot. Essential if you pick up your robot by the tray strap.

Barrier

Use wherever you want to block table tennis balls from going, to separate a large room into individual courts, or to create aisles and queue lines. Easy to assemble and are 7' 8" long and 27" high. Made with a sturdy snap-together steel frame with fully enclosed end legs and reinforced corners for long-lasting durability. Feet rotate 90° for compact storage and transport.

Applause Paddle

This paddle excels at touch and control and is perfect for all-round play. Its elastic inverted topsheet affords good spin for learning and executing high spin shots like loops and serves. The 1.5mm sponge rubber is designed for good speed and high control.

Drive Cleaner

Special cleaning solution for the Ball Discharge Wheel and Friction Block in all Newgy robots. Increases grip and restores consistency to ball trajectory. Used and highly recommended by the Newgy Service Department. Can also be used as an excellent cleaner and grip restorer for rubber on your racket.

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NEWGY — BUILDING TOMORROW'S CHAMPIONS