

Be Part Of An Experiment

The first in a series of articles on the technical details of pool.

by Bob Jewett

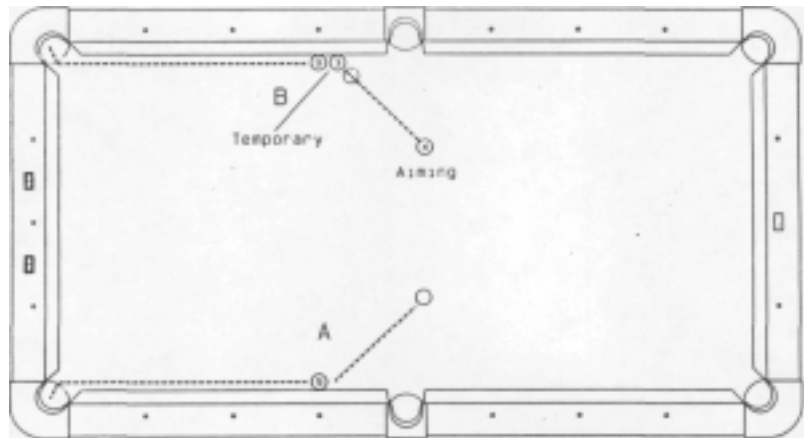
IF YOU WANT to know the best way to shoot a frozen ball down the rail, and ask an expert, you could be in trouble. Each "expert" will have his own slightly different best way to shoot the 9 ball into the corner pocket (shot A). About half of them will tell you to hit the ball and the rail at the same time, while the other half will say hit the rail first. There are people in each camp with impressive credentials. Which camp should you believe?

Don't believe either one. For now, let's ignore the expert advice and figure the problem out on our own. And we're not going to fall into the trap of believing the obvious or simple physics, since that's how at least one group of experts has gone wrong.

Instead, we're going to do an experiment. By we, I mean everybody reading this who is willing to spend an hour at the table to help get to the bottom of the controversy. I'm not going to do the experiment for you; get your cue, a set of balls, a notebook and a table and get to work. What I will do is organize and report here the results you send me. As an incentive, the five readers who send in the most complete results will receive a free one-year subscription to *Billiards Digest*.

In outline, the experiment is to try shooting the shot at several different distances up the rail and noting which one works best. Do not use draw, follow or English; hit the cue ball right in the center.

That sounds pretty simple, but here are some details, all intended to make sure the results are accurate and consistent: Make sure the table is level and all the balls are the same size. Place the nine on the rail as shown in shot B, even with the third diamond from target pocket. Place an object ball temporarily exactly where the cue ball is supposed to land on the rail for this particular shot. (This is like Ray Martin's phantom cue ball.) Put the cue ball about V^* inch from the temporary ball, and an aiming ball about two feet farther back, all at a 45 degree angle to the rail. Once the temporary, cue and aiming balls are perfectly in line, remove the temporary ball. Get in



position to shoot the shot, and make sure that you are not using any English and your warm up strokes stay directly over the aiming ball. Choose a slow, medium or hard stroke, and shoot the shot. Try five or six different distances up the rail for each speed, and take ten shots for each speed/distance combination. Write down the total made and missed for each case.

The speed of the stroke can be judged by how far the cue ball travels. Once across the table is slow, twice is medium and three times is hard.

The aiming ball is there to make sure the cue ball hits where the temporary ball was. It's hard to remember where the ball was once you have removed it. Few players have a perfectly straight stroke, and watching your warm ups go over the ball gives you a guide for alignment. More importantly, many players will try to subconsciously correct the aiming line. It goes against the grain to simply shoot along an artificially set line when all your experience tells you that just a little more to the left or right will pocket the ball. Have a friend watch to make sure your cue stays in line.

As for which exact distance to use, start with five, from 0 to 0.4 inches from the object ball. A convenient way to measure the gap is with a deck of playing cards. The deck of 52 cards is close to half an inch thick, so each card is about 0.01 inches. A stack of ten is a tenth of an inch. If you find

that the results are very different for two adjacent distances, try splitting the difference for another set of ten shots. If you find that a distance of zero (that is, hitting the ball and rail at the same time) pockets the ball often, they also try a negative distance by putting the phantom ball touching the object ball and maybe 0.1 inches off the rail.

A typical results sheet might start:

Slow Speed	Distance (In Cards)	Make	Miss
	-10	2	8
	0	6	4
	10	5	5
	20	0	10
	30	0	10

Send your results to Bob Jewett, in care of this magazine. If you give your distance in cards, tell me how thick the whole deck is. Foreigners can send results in millimeters. Also include general information, like thickness and wear of the cloth, how tight the pocket is, and so forth. If you have suggestions on how to improve this experiment, send those too.

In the next issue, I'll go over the results and discuss what others have written about this shot.

Bob Jewett was 1975 Association of College Unions — International champion and author of a book on artistic billiards. Jewett resides in Palo Alto, Calif, where he is a research scientist for Hewlett Packard Co.

An Experiment In Curve

by Bob Jewett

DO YOU REMEMBER the last time that the path of an object ball was just barely blocked by another ball? If you could make the object ball curve, even a little, the shot would be simple. Without any curve, you have to worry about cheating the pocket or trying some other difficult shot.

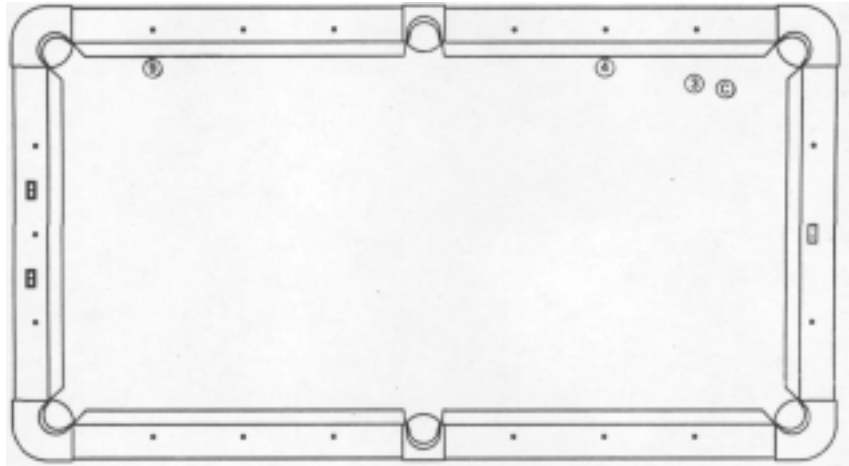
Shown in the diagram is a position from 9-ball. The 4 and 9 are both frozen to the rail and the 3 is exactly one ball off the rail. If the 3 is shot to just miss the 4, and it goes in a straight line, it will also miss the 9 and have no chance of going in the corner pocket. The 3-4-9 combo is possible, but playing rail-first to kick the 3 in the side is at least as likely. If you could make the 3 curve a little to the right, it could clear the 4 and drive the 9 straight into the corner.

To make the 3 curve, you have to get some *masse* on it. To get a feel for how much is needed, remove the cue ball and hit the 3 ball directly using right draw and a slightly elevated cue. Aim to just miss the 4 and shoot just hard enough to make the 9. To get the best slow curve, try using slightly more draw than right — what you might call 5 o'clock English. See how level you can keep your cue stick; it should be no more than 2 inches above the rail.

Before you get any further into the experiment, make sure that there is no significant table roll. If you shoot the 3 without English just hard enough to end even with the 9 ball, it should stay within half an inch of the line of aim. More roll will make the results hard to interpret, so you must level the table or find one that's already true enough.

Now it's time to start the actual experiment. You have to discover the best place for the cue ball and what English, elevation and speed to use. There are at least three plausible (if not necessarily accurate) approaches:

1. To get right *masse* on the object ball, you need to hit down on it so the cue ball makes a slight jump. Place the cue ball as shown and use left draw, with about 30 degrees of elevation.



2. Transferring right English to the 3 will be enough to make it curve. Use center left from the position shown with a level cue.
3. To transfer right *masse* to the object ball, use right *masse* on the cue ball. The cue and the 3 stick together a little at the instant of contact. Any rotation of the cue ball around their common axis (the line joining the centers of the two balls) will be transferred directly to the 3. This is just the opposite of normal transfer of English, which works like gears. Place the cue very close to the 3 and use right English with about 60 degrees of elevation.

Please note that I'm not saying how many of these techniques will work. At least two of them are very questionable. If you don't have immediate success, don't get frustrated. For each way you try, be careful to set up the shot consistently. Make sure the balls are clean because a spot of chalk on a ball can cause very bizarre spin. Adjust your aim, or the position of the cue ball, so the 3 barely misses the 4. Once you get the aim right, take five or 10 shots and note if there is any curve toward the 9. If there is curve, the 3 will hit the 9 — note how full.

Please send me your results in care of *Billiards Digest* at 200 S. Michigan Ave., Suite 1430, Chicago, IL 60604,

or fax (312) 341-1469. For each technique you try, give the position of the cue ball and speed, elevation and English used, and how much, if any, of the 9 you managed to hit. A negative result is still useful, since it shows which technique doesn't work. In a future column, I'll summarize the results. The two readers who send in the most complete results will get a free one-year subscription to this magazine.

One last point: There is a way to shoot the shot without curve. If the cloth has lots of bounce, the 3 can jump over the 4 with a hard, slightly elevated stroke. The cue ball needs to be in a straight line with the 3 and the 9, or it may jump the rail.

(EDITOR'S NOTE: Bob Jewett is still receiving data from the experiment he described in the last issue and wishes to postpone publishing the results until he has all the information. If you performed the experiment and haven't sent in your results, there may still be time for Jewett to use them if you hurry. His discussion of the results is scheduled for a future issue. Thanks to everyone who participated.)

Bob Jewett was 1975 Association of College Unions — International champion and is the author of a book on artistic billiards. Jewett currently resides in Palo Alto, Calif, where he is a research scientist for Hewlett Packard Co.

The Truth At Last

by Bob Jewett

IN THE APRIL issue, I posed the question: If the 9 ball is frozen to the rail three diamonds from the pocket and you have a 45 degree cut shot without English, is it better to hit the ball and the rail at the same time or should you hit up the rail a little?

I outlined an experiment to find an answer — carefully set up shots with the cue landing measured distances from the object ball and see what percentage of each group goes in.

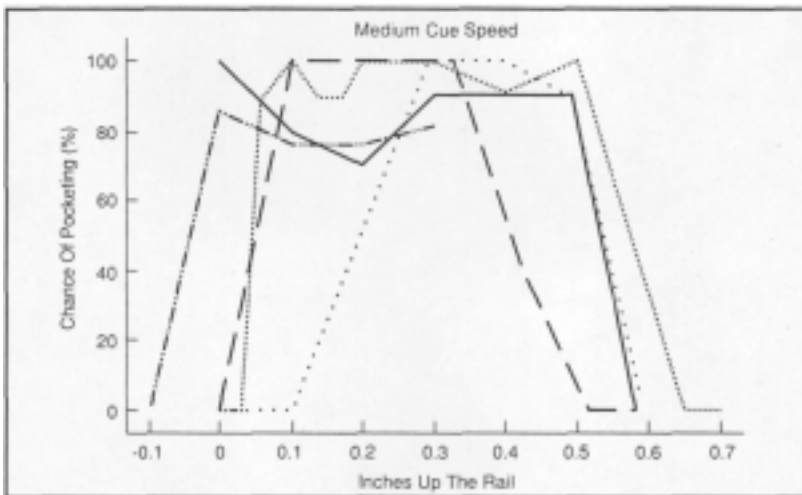
Ten readers responded and the five best sets of measurements are summarized below. Free one-year subscriptions to *Billiards Digest* go to Jeff Pass, Eli J. Beals, John C. Withey, Robert G. Royal and John Bellamy.

I was delighted to see such a good response. In total, over 2000 shots were executed which amounts to over 50 hours of time at the table.

The experiment was done at slow, medium and fast speed. Let's concentrate on the results for medium cue speed, which means that the cue ball went twice across the table after hitting the nine. The plots pocketing percentage against distance up the rail from the object ball that the cue ball lands. Zero distance means that the cue ball hits the nine and the rail simultaneously, and a negative distance means the ball is hit before the rail. I have plotted each of the five sets of results with a different line.

There is quite a lot of variation between the different experimenters, which is likely due to differences in equipment or maybe experimental technique. There are several interesting things to note. Three out of five made none of the shots when they hit the ball and the rail at the same time. All of the experimenters had a good percentage if they shot up the rail by about a third of an inch, and most still had good results at half an inch up the rail. What conclusions can we draw from these results?

The first is that hitting the ball and the rail at the same time is a very bad idea. If you do manage to make a simultaneous hit, the shot won't go in for most speeds and on most tables. If your aim is slightly off, and you hit the ball first, you have two chances, slim and none, and Slim just left town.



A much better approach which works reasonably well for all speeds, is to aim to hit a quarter inch away from the ball. For most tables and speeds this will allow a little aiming error in either direction.

Of course to really fold these results into your own game, your job has just begun. You have to get on your table and learn how it works for various speeds, angles and amounts of English.

You may want to look up what some other pool authors have said about this shot. I won't cover what each of them has said; it's your homework exercise to find out. You'll be surprised and maybe outraged.

The most complete printed discussion of this shot is in Jack Koehler's book, *The Science of Billiards*, which has a whole chapter on "Rail Shots." Koehler covers the use of both rail-side and ball-side English, adjustment for distance from the pocket, and the effect of cut angle, which is far more detail than I can go into here. Two interesting quotes from the book:

"However, if shot properly, the rail shot can be relatively easy. As a matter of fact, the permissible error of most rail shots is greater than similar shots away from the cushion."

"The target point is always on the cushion side."

If you don't believe all of this yet, I

can sympathize. I grew up believing "ball and rail at the same time" was an eternal truth. The situation where this gave me the most trouble was in straight pool when a ball was frozen to the middle of the foot rail for a break shot. I'd chant to myself, "Same time. Same time." My sight and stroke were true enough that I'd actually hit the ball and the rail at the same time, the object ball would rattle and miss, the cue ball would open the rack, and my opponent would run the table. It took me more than a few years to suspect that "ball and rail at the same time" might look good on paper, but it was expensively wrong on the table.

To some people, a simultaneous hit looks like ball first: there's a kind of optical illusion. Try this very quick experiment: Freeze the cue ball and the object ball together on the rail. Now very carefully move the cue ball along a 45 degree angle away from the object ball by about a quarter inch. Get down in shooting position, aiming back along that 45 degree angle, which we know must give a simultaneous hit. Does it look like a ball-first hit to you? It does to some people.

If you suffer from the optical illusion, try the quick experiment on someone who has never played pool to see if they see it the same way.

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Progressive Practice

Permits precise pocketing percentage predictions.

THE "PROGRESSIVE PRACTICE" method described below has big advantages over standard drills. The usual way to practice spot shots is to play from the same position over and over with the dangers of boredom and grooving the aim to a single specific shot. The shots under progressive practice continuously change and force you to aim anew each time. It automatically adjusts the difficulty of the shots to match your improvement and lets you measure your percentage for each kind of shot without any bookkeeping. You can easily compare your performance on a particular table or day with previous practice sessions. It's adaptable to many kinds of aiming and position drills.

Let's start with a draw drill in Diagram 1. The object ball is near the long rail just out of the pocket jaws. Start with the cue ball in position 1, one diamond from the corner. The goal is to draw the cue ball back at least to 1. Each time you get enough draw, move the cue ball a diamond further back. For example, if you make the shot from 1, the next shot is from 2 and you have to draw the cue ball back at least to 2. If you do 2, try 3 next.

When you miss either the shot or the draw, the cue ball goes a diamond closer to the object ball. If you miss at 3, your next shot is from 2. Continue adjusting the distance after each shot until you've pocketed all 15 balls. Note your final position.

Let's grade the result. If you ended at 1 or 2, you get a B for "beginner." A few minutes of instruction from the local pool professor should be beneficial. If you ended between 3 and 5, you get an A for "average." That's enough draw for most draw situations. If you ended between 6 and the end rail, chalk up an E for "enough" for nearly all draw shots.

Because you make each shot a diamond easier or harder if you miss or make the shot, the final position is close to your 50 percent success point. Shorter distances are better than even money for you, while at longer distances the odds are against you.

A somewhat easier progressive drill

using the same position progression is a stop-shot drill. The goal is to pocket the object ball and leave the cue ball within a diamond of the pocket.

If you need a harder drill, draw the cue ball back to within a hand span of its starting position. You lose for too much or too little draw or wandering away from the rail. Very tough to get to 6.

Diagram 2 shows a pure aiming drill. The object ball starts on the spot, and the cue ball is a diamond from the rail. Above-average players will be able to turn the corner at position 5.

If you want to know your 50-50 point more accurately, redo the drill starting from your last position but change the distance only a quarter of a

diamond each time. The smaller changes result in a smaller error in the measurement. The 50-50 point gives a good mix of challenge and reward which results in rapid improvement, but the system can be modified to find other percentages. To find the point at which you make two out of three, simply make the position two notches easier when you miss and one notch tougher when you make. When you've reached your 67 percent distance, you'll have no net change in position. Note: If you tried the curving object ball experiment (June 1992), but had no success, send in a write-up anyway.

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