

**“Coriolis was brilliant ... but he didn’t have a high-speed camera –  
Part V: massé shot aiming”**

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*Note: Supporting narrated video (NV) demonstrations, high-speed video (HSV) clips, and technical proofs (TP), and all of my past articles, can be accessed and viewed online at [billiards.colostate.edu](http://billiards.colostate.edu). The reference numbers used in the article help you locate the resources on the website. If you have a slow or inconvenient Internet connection, you might want to view the resources from a CD-ROM or DVD. Details can be found online at: [dr-dave-billiards.com](http://dr-dave-billiards.com).*

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This is the fifth article in a series I am writing about the pool physics book written in 1835 by the famous mathematician and physicist Coriolis. Three months ago, I described some high-speed camera work I've done and showed some examples that relate to some of Coriolis' conclusions. In the last two months, I presented principles dealing with the shape of the cue ball's path after hitting an object ball, the effect of spin and speed on the shape of the path, and how to achieve maximum English. FYI, all of my past articles can be viewed on my website in the instructional articles section.

This month, I look at the system Coriolis developed for aiming massé shots (e.g., see **NV 7.11** and **NV 7.12**). **Principle 25** summarizes Coriolis' system, which helps you visualize the final direction (angle) of the cue ball path based on the aim point on the table surface. **Diagram 1** illustrates how the system is applied. The final direction of the cue ball path is along line RA, which connects the original cue ball resting point (point R) to the aiming point on the cloth (point A). Using the letters shown in the diagram, with “B” indicating the cue ball contact point, the Coriolis massé aiming system can be referred to as the “BAR” method (“B” for ball, “A” for aim, and “R” for resting point). **TP A.19** presents the math and physics behind Coriolis' method and shows example cue ball trajectories for various cue stick elevations and shot speeds. **NV B.41** and **NV B.42** demonstrate how the method is used in practice.



[NV 7.11](#) – Large-curve massé shot

[NV 7.12](#) – Small-curve massé shot

[NV B.41](#) – Coriolis masse shot aiming method with a large-curve example

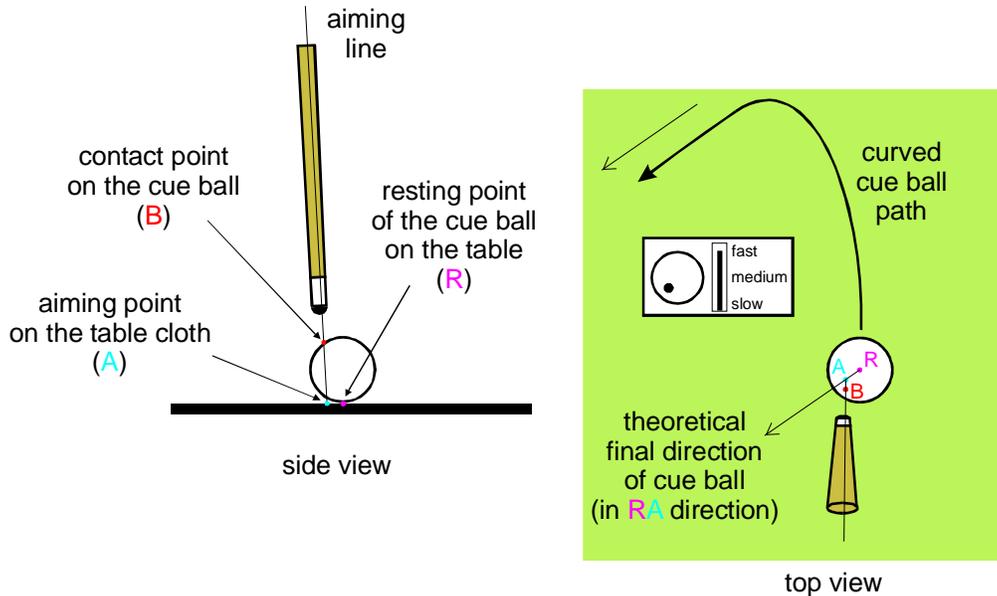
[NV B.42](#) – Coriolis masse shot aiming method small-curve example



[TP A.19](#) – Massé shot aiming method, and curved cue ball paths

### Principle 25 Coriolis' massé shot aiming system

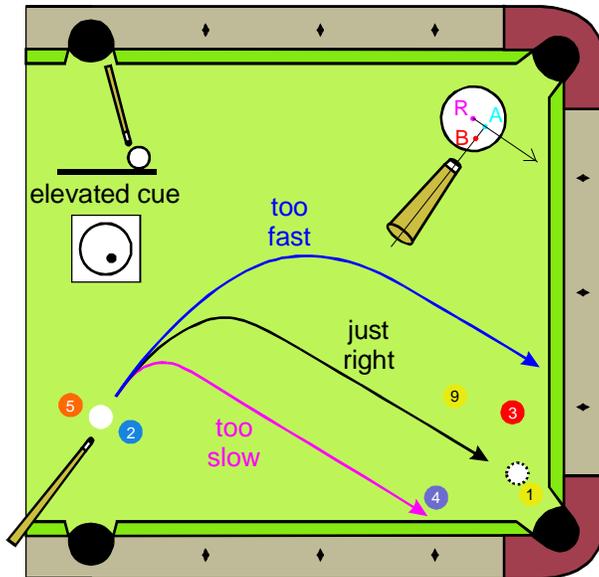
With a massé shot, the final path of the cue ball will be in a direction parallel to the line drawn between the initial base point of the cue ball and the aiming point on the table (see **Diagram 1**).



**Diagram 1** Coriolis' ("BAR") massé shot aiming system

With a massé shot, if the only thing you had to be concerned with was the final direction (angle) of the cue ball path, the Coriolis aiming system would be all you need. The aiming system does a fairly good job at predicting the final direction of the cue ball for a wide range of massé and small curve shots. Unfortunately, shot speed and the shape of the cue ball trajectory also play huge roles in massé shot aiming. If you don't have a good feel for speed and the effects of table conditions, you will not be very successful with massé shots. Like many things in pool, this can come only with a great deal of practice.

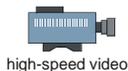
**Diagram 2** shows the effects of speed with an example shot. You must contact the 1-ball to avoid a foul; but unfortunately, the other balls on the table block any reasonable kick or jump shot possibilities. Other than playing a deliberate foul to try to tie up some balls in a cluster (e.g., by hitting the 2-ball towards the 4-ball), about the only option is a massé shot. The illustration in the top, left of the diagram shows the cue stick elevation and cue ball contact point, and the illustration in the top, right shows the final cue ball direction (line RA) as predicted by the Coriolis aiming system. With just the right amount of speed, you can pocket the 1-ball and maybe even get lucky enough to have a shot at the 2-ball (or at least be able to play a safety). However, as the diagram shows, speed is critical. If the speed is either too slow or too fast, you won't even come close to hitting the 1-ball. All three cue ball paths shown have the same final direction (i.e., the final straight-line motion is at the same angle), but only the center path points towards the 1-ball. This is one reason why massé shots are often so difficult and should be avoided when possible.



**Diagram 2** Example shot showing importance of speed

Massé shots are tough, and they require lots of practice. The Coriolis aiming system is not a silver bullet that will make you shoot massé shots like a trick-shot artist. However, it does provide a good aiming reference. As we have seen above, you need to have a good feel for speed to be effective. Here are some additional points to keep in mind when trying out the system:

- It is critical to have a stable bridge and accurate stroke to be confident with the contact point on the cue ball. If you can't stroke where you are aiming, no aiming system will help you predict the cue ball path.
- The final cue ball direction might come up a little short of the theoretical prediction. Coriolis made some assumptions in his analysis that aren't perfectly true on a real pool table. For example, he assumed that the force impulse provided from the cue stick is exactly in line with the cue stick. Unfortunately, due to squirt effects, this isn't perfectly true. When the cue ball is struck off center, the total impulse is not exactly in the cue stick direction. Also, the cue stick can deflect significant during impact. **HSV A.60** shows super-slow-motion video of the cue stick deflecting significantly during impact (see my August, '05 article for more details).
- The cue ball will jump and skip some, and the amount will vary with cue stick elevation and speed. This will affect the shape of the cue ball path; although, the final direction will not be affected much.
- The type of cloth can have a big impact on massé action. A high-friction ("sticky") cloth can make it difficult to get a big curve because the initial impact with the table cloth can limit the action of the cue stick.



[HSV A.60](#) – Massé draw shot with firm follow-through and good action

Like many things in pool and other sports, to excel at a difficult technique you need to practice a lot. Unfortunately, massé shot practice can be a little abusive to the table cloth, especially if your technique is not very good. So if you care about the table you are using, you should consider using a piece of spare cloth to limit cloth abuse (see **NV 7.11**).

I hope you are enjoying my series of articles about the work of Coriolis. In next month's article, I'll conclude the series, looking at Coriolis' conclusions concerning half-ball natural roll shots.

Good luck with your game, and practice hard,  
Dr. Dave

PS:

- If you want to refer back to any of my previous articles and resources, you can access them online at [billiards.colostate.edu](http://billiards.colostate.edu).
- I know other authors and I tend to use lots of terminology (e.g., squirt, throw, stun, impact line, etc.), and I know not all readers are totally familiar with these terms. If you ever come across a word or phrase you don't fully understand, please refer to the [online glossary](#) on my website.

*Dr. Dave is a mechanical engineering professor at Colorado State University in Fort Collins, CO. He is also author of the book, DVD, and CD-ROM: "[The Illustrated Principles of Pool and Billiards](#)," and the DVD: "[High-speed Video Magic](#)."*