Orchestra Conductors Would Make Good Porpoise Trainers

by Karen Pryor

With shrug, gesture, shout, and other rewards and punishments, orchestra leaders get the best from musicians. It's called genius. Porpoise trainers do the same thing, and call it operant conditioning.

At Lincoln Center's Juilliard Theater, Erich Leinsdorf, guest conductor, is leading a rehearsal of the New York Philharmonic Orchestra.

The music is monumental, demanding. Leinsdorf turns to the cellos on his right. The baton, in his right hand, beats time. His left hand flies up in front of his face in a warning gesture, and he says, "softly, softly," as the cellists begin a difficult passage. With his eyes and body still turned toward the cellos, he throws his left hand out almost behind him, fluttering his fingers to bring in the woodwinds, also softly. The cellists complete their passage. A fleeting look of satisfaction, almost a smile, crosses Leinsdorf's face as he turns to the whole orchestra, right hand marking the beat, left hand conveying, in a sweeping flow,
the mood and flavor of the music.

Now he scowls at the violins; they play in gorgeous unity and the scowl fades. A solo horn enters, above the orchestra, in a virtuoso plume of melody. On the horn’s last note, as Leinsdorf uses a swirl of the baton and a considerable amount of body English to bring the whole orchestra to a crescendo, he throws the horn player a thumbs-up gesture with his left hand, glares at the violas and shouts, “No, no!” He drops his hands and brings the music to a tumbling halt. “No, it is not right. We are not together. You must not sit on that dotted quarter note. Again. Please.”

In about 25 seconds of music Leinsdorf has given the orchestra perhaps a hundred signals. He has used at least nine different kinds of cues, ranging from spoken commands to a brief glance. He has clearly rewarded several actions, including the cello passage and the horn solo. He has used what psychologists call negative reinforcement by scowling at the violins until their sound was better, he has used punishment by scolding the violas and by stopping the music. His timing has been extremely effective. Every reward or punishment has occurred during the event it was meant to affect and not so much as a split second after.

Leinsdorf would make a great porpoise trainer.

Tricks of the trade. I first noticed the similarities between porpoise training and conducting when I, a porpoise trainer by trade, took up choral singing for a hobby. Our chorus was preparing to sing the Mahler Resurrection Symphony with the Honolulu Symphony Orchestra. One night the symphony’s conductor, Robert LaMarchina, came to rehearse us. I had never seen a proper conductor from the front before, and I was so fascinated I couldn’t sing. He was using every trick of the porpoise trainer’s trade.

I train my porpoises with techniques of psychology called operant conditioning, or behavior modification, or reinforcement theory, the laws of learning first codified by Harvard psychologist B.F. Skinner and his followers.

Here, with enormous rapidity and correct technique, LaMarchina was establishing discriminative stimuli, fading and transferring stimuli, chaining behavior, using successive approximation to shape behavior, and so on. All my jargon fit. LaMarchina was using the same clear-cut rules I followed to get my porpoises to throw balls, wear blindfolds, and jump through hoops to turn 60 amateur voices into one responsive instrument. In an hour.

We knew the music, and now we were learning, almost entirely without verbal instruction, how he wanted it sung. I had to admire the enormous amount of training accomplished in 60 minutes.

Early in that first rehearsal, LaMarchina gave a fine example of the trainer’s skill. Just as the men in the bass section were filling their lungs, preparing to make their usual booming entrance, the conductor crouched backwards, mimed an expression of wild alarm, and threw his hand, palm out, across his face as if to ward off a blow. This was something we’d never seen before in music—a neutral stimulus—but the meaning was clear, “it’s urgent that you don’t make too much noise,” and the astonished basses did their best to come in softly.

That combination of gestures became a stimulus for “sing the next part softly.” From then on, LaMarchina started “fading” the stimulus. “Fading” is lab jargon for replacing a big, obvious cue with a much smaller one, so as to elicit an action unobtrusively. LaMarchina used just the warning hand—not the whole crouch and pantomime—or just the crouch and a warning glance. We were conditioned and we responded correctly. Finally a mere flinch of the shoulder was enough to subdue volume in one part of the chorus, freeing both the conductor’s hands to raise the volume in another section.

Skinnerian maestros. During the rehearsal the conductor also transferred the stimulus for “sing softly” by combining the stimuli we knew with other new gestures and then using only the new gestures. Soon he could draw on a wide variety of well-understood signals. Once he even transferred the stimuli for both softer and louder to his left elbow.

Well, I became a rehearsal buff. I have watched a lot of conductors running rehearsals with choruses, with orchestras, with opera singers, with all three at once. Good conductors are all master porpoise trainers, Skinnerian maestros as well as musical maestros. Every device I know of manipulating behavior has become a part of the conductor’s repertoire.

Extinction, for example, is one way to get rid of behavior you don’t want. It might be a natural mistake, something learned incorrectly, or deliberate misbehavior, such as a porpoise splashing you from head to toe on purpose.

There are lots of ways to extinguish behavior. Ignoring it is one. If the action has no consequences, good or bad, it may disappear. Thomas Schippers, a ferocious conductor, walks to the podium for a rehearsal with the New York Philharmonic, a ferocious orchestra. A cellist behind Schippers makes an incredibly human “oh-oh!” on his instrument, and in the tumult of tuning up a woodwind warbles “I wish I were in Dixie.” Schippers ignores the horseplay and starts the work, and the cutting-up quickly stops.

Punishment or aversive control is another way to eliminate behavior. I sometimes slap the snout of a porpoise that is snapping at me. Conductors fine musicians, fire them, or throw things at them. Handel once tried to throw a misbehaving soprano out a second-story window. Humiliation in front of the rest of the orchestra is a common device of conductors.

A subtler way to eliminate behavior is to train an incompatible action, one that is impossible to perform while performing the other. In shows I ran in Hawaii, a large female bottlenosed porpoise named Wela took to hassling the girl who swam with little spinner porpoises in one part of the performance. We trained Wela to press a lever with her nose while the girl was swimming. The porpoise couldn’t do that and simultaneously boost the swimmer into the air with her tail. The same technique worked at an opera rehearsal when our
The conductor never telegraphs his punches. He waits patiently, like any good animal trainer, until a sin is committed—and then he explodes.

The occasional jackpot. Consistent, predictable praise leads to blasé, routine performance just as much punishment leads to sullen, mechanical performance. Both must be irregular and unpredictable, meted out sparingly with the apparent randomness that may seem unfair to players, but which keeps them motivated in the same way the occasional jackpot keeps people feeding quarters into slot machines.

Reinforcing his musicians one step at a time, the conductor shapes the orchestra toward that elusive perfect performance of his dreams just as foot by foot I shape a porpoise toward a 20-foot leap hardly imaginable from its first small bounce out of the water. The conductor never stops. With his own orchestra he will take every opportunity to introduce new complications, more difficult music, higher criteria. The players may describe this tendency subjectively, "the bastard is never satisfied," the audience poetically, "our conductor is a genius, always striving for greater beauty," the psychologists pragmatically, "continued raising of criteria, while reinforcing behavior, increases the quality of performance."

Do they know what they're doing, these conductors? Of course. Talk to La Marchina about shaping or to Leinsdorf about extinguishing and you'll get back an informal but accurate description of each process.

Anyone who must manage the behavior of others—school teacher, coach, horse trainer—incorporates reinforcement in his work. All but the very best of these make consistent training errors. They often fail to distinguish between what they do that is effective and what they do by habit that is ineffective or even detrimental. They must often spend time tomorrow repairing the mistraining of today.

The symphony conductor cannot afford to be ineffective. He is faced with a task of immense complexity and extreme time limitations. Sometimes rehearsal time barely exceeds performance time. Through experience and intuition a top-rank conductor must develop almost perfect Skinnerian techniques. Conducting is the most elaborately use of these techniques that I have seen in real life, and conductors use them because they work.