

Curriculum Units by Fellows of the Yale-New Haven Teachers Institute 2000 Volume V: Sound and Sensibility: Acoustics in Architecture, Music, and the Environment

Tuning the Instrument for Actors and Writers

Curriculum Unit 00.05.01 by Yel Hannon Brayton

About a year ago, while watching The Actors Studio on television (Bravo station), I saw Glenn Close in an interview. She spoke about the "chemistry" of acting. You're in the audience watching a play and you are moved to tears, or to joy, or even anger. Reason tells us that the actor is not the role he's playing; that the words he is saying are not his own and that he has probably said them a hundred times in rehearsal. Yet, we are caught in a moment when his performance belies reality, when we are swept away. According to Close, it's chemistry, it's molecular. The catalysis created by the actor on a stage generates energy to affect emotional reactions and physical manifestations in the audience. Behind that moment, we find not only actors, but playwrights, dramaturgs, directors, producers, designers of sets, costumes, sound, lighting an entire community of folks committed to the ideal production magicians of illusion, the alchemists of drama.

This unit begins to explore that alchemy with particular focus on the the actor's instrument and the inner voice of the writer. Theatre and Literature, however these arts may be qualified, have as there common denominator, communication: the exchange of information. Because communication is an exchange, it requires a sender and a receiver. On the sending end, we convey our thoughts in speech, signals, writing, and behavior. On the receiving end, our senses sight, hearing, smell, taste, and touch are the conveyors of such information. Each of our senses functions in a physically mechanical way in order to relay information to our brains. The eyes, the ears, the nose, the mouth and tongue, and the skin act as transmitters carrying various communications in the form of energy light, sound, chemicals in air and food, pressures and touches to a central receiver, the brain. The brain then interprets such signals analytically and emotionally.

Perhaps ironically, what sparked my interest in this particular seminar Professor Apfel's Sound and Sensibility: Acoustics in Architecture, Music, and the Environment was our school's mainstage production this past year of The Miracle Worker. For many of us, sound is something we take for granted. Through the course of a day, we respond to bells and alarms marking time, we make conversation, we listen to honking horns in traffic made in the vain attempt that such noise will somehow make cars and trucks move faster, we turn up the volume on our favorite songs, and for the most part, we don't give sound a second thought until something goes bump in the night What's that? But imagine a world without sound, as was the world of Helen Keller. Then this sense of hearing becomes far less ordinary and sound, even the cacophony of a school cafeteria at lunch time, becomes precious.

The ear is an extraordinary conduit for sound from its outer fleshy cup to its intricate interior. And for those of us lucky enough to have two of them in relatively good working order, sound not only enhances our lives, but

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our ability to hear and interpret sound, instinctively protects us as well. Therefore, understanding the "fundamental scientific principles underlying the behavior of sound," as well as "human responses to sound" (as stated in Professor Apfel's summary of the seminar), make up the spine of this curriculum unit upon which creative writing and theatre pedagogy are fleshed out in the areas of: voice, prose and poetry writing, and reading. Through the arts, which by their nature are interdisciplinary as they encompass history, language, science, and mathematics the unit focuses students on "real world" targets with "real world" activities, where students are given ample support to explore a variety of resources and to "experience" their learning. It is my hope that they will gain the kind of bone-marrow learning that results in critical as well as creative thinking, evocative and provocative exposition and persuasive and articulate speech.

Tuning the Instrument for Actors and Writers is designed for 7th and 8th grade Theatre and Creative Writing classes. As these are elective classes, topics are introduced yearly at my discretion. However, Science and Language Arts teachers may find some of the lessons useful as they relate to their curricula with regard to anatomy, and reading and writing respectively. Under Title II of the Goals 2000: Educate America Act which acknowledged the arts as core subjects comparable in importance to traditional content areas an arts program, such as ours at Betsy Ross Arts Magnet School, should be aligned to certain criteria as set forth in the document, National Standards for Arts Education (published in 1994). This unit covers four main sections: Hearing, Sound, Listening, and Voice in accordance with Connecticut Language Arts Content Standards: reading, writing, speaking, and viewing. Cultivating the whole child, building many kinds of literacy, developing intuition, reasoning, and imagination, are some of the aims of this unit that align with the arts program standards.

Children, like most of us, enjoy being entertained. More and more, teachers are met with the challenge of distilling the information age into a tantalizing elixir that can be swallowed easily and savored over time. It is our mission as educators, not only to build a strong foundation for knowledge by teaching students how to learn, but to help them to develop their innate talents so that they may bring their special gifts to the world. For Creative Writing and Theatre students, both writing and acting (as well as the arts in general) are activities that endeavor to establish intimate connections with people. In so doing, we come together in sharing our darkest moments and our brightest. It is this communion that reminds us how precious and fragile is our humanity.

HEARING

In this first section, anatomical study and sensory exercises are employed in order to help students understand the value of hearing.

The Ear

We will focus on the anatomy and function of the human ear, the instrument through which we hear. While most of us are capable of taking in a wide variety of sound, we also have the ability to selectively hear sound: identifying particular instrument sounds while listening to an orchestra or eavesdropping on a spicy conversation at a party. We can determine the direction of sound and we can even manage to block sound out, such as my son does most every morning when his alarm drones on for ten minutes or more. (Although this is probably my doing since we happened to live next door to a firehouse until he was eight years old.) In

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fact, our ability to block out sound makes one wonder whether the ancient Greeks were a more attentive audience than the audiences of today. I would imagine there was far less peripheral noise to intrude upon a Grecian amphitheater and therefore, perhaps far less need to tune out. For a teacher, beginning a class directly after lunch time, it generally takes several minutes to get students settled in. The residual noise from the cafeteria and subsequent alarm heralding students to their next class demands extra time, if not patience, to get them focused.

Where's The Sound? a listening exercise

WARM UP EXERCISE: Using voice and body percussion, students are asked to make up various types of sounds and to increase and lower the volume of these sounds.

OBJECTIVE: To demonstrate binaural hearing and localization of sound.

ACTIVITY: Students are seated in a circle, which should be away from the walls and other objects. A block or chair is placed in the center of the circle where each student will get a chance to determine the location of various sounds made by other students in the circle.

- The student sitting in the center of the circle is blindfolded.

 Students in the circle are individually given an opportunity to make a sound. They should vary their positions in terms of height, i.e., sitting, crouching close to the floor, standing, or standing on the chair. They may also vary their positions with regard to distance by moving
- standing on the chair. They may also vary their positions with regard to distance by moving out from the perimeter of the circle.
- For each sound, the student seated in the center must determine two things: 1) What is the sound? 2) Where is the sound coming from? (Up, down, in front, in back, to the side, etc.)

DISCUSSION: Students will discuss why they think they were able to locate sounds and which directions were harder to locate than others. This will lead into an explanation of binaural hearing: sound coming from one side of the head is more readily noticeable in one ear than the other. As for the sounds coming from above and below, the outer ear with its fleshy loops and folds takes in sound in such a way that the brain can tell its vertical direction.

Using a diagram (or better, yet, a model), the anatomy of the human ear can be shown and described to students. The fleshy outer ear enhances hearing sensitivity and both ears guide a person in determining where sound is coming from. The small bones of the middle ear, commonly called the hammer, anvil, and stirrup, transmit sound pressure from the eardrum to the inner ear. In the inner ear, the snail shell-shaped cochlea changes sound to electrical signals that travel to the brain.

EAR ANATOMY Definition Sheet

Outer Ear

The part of the ear we see popping out of the side of our head is called the pinna (meatus). It collects sounds, which move into the auditory canal. This canal (or tube) helps to boost hearing sensitivity.

Middle Ear

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The eardrum (tympanum), like many musical drums, has a skin stretched tightly. This skin is kept taught by a muscle called the tensor tympani muscle. The eardrum vibrates (moves back and forth) from the sound collected by the outer ear and sends these vibrations to the three tiny bones, called ossicles.

The ossicles are often called the hammer, anvil, and stirrup. They work together to increase the pressure of the sound vibration coming through the eardrum. They transform sound energy by acting as a lever, pushing and increasing pressure to the oval window of the inner ear.

Inner Ear (+ auditory nerve and brain)

The inner ear is connected to the throat by way of the Eustachian tube, which equalizes pressure and is also common ground for ear infections. It has semicircular canals (curling tubes) and a snail shell-shaped part called the cochlea. The semicircular canals are not involved with hearing very much, but they help us to keep our balance.

Inside the snail shell shape of the cochlea there is liquid. Sound comes through the ear canal, vibrates the eardrum, which causes the inner ear bones to vibrate and increase pressure from the hammer to the anvil to the stirrup (stapes). The stapes vibrates against the oval window of the cochlea and the liquid inside sloshes like a wave moving back and forth. As the liquid sloshes, hair cells inside the cochlea get stretched and send electrical messages that travel through the auditory nerve to the brain. The brain understands the messages and tells us what sound we are hearing.

ACTIVITY: Students will form and describe a physical representation of the ear by sculpting their bodies into its various forms and narrating function. A prop, such as a slinky or cloth may also be used to represent sound waves.

- The definition sheet (above) will be given to students and read aloud and discussed in class.
- The class will be divided into three groups to represent the three main parts of the ear (outer, middle, inner) respectively.
- Each group will use their definition sheets and refer to the diagram (or model) in order to choreograph a moving presentation of the structure and function of the group's particular anatomical selection.
- One member of each group will act as narrator to describe the anatomy and function.

ACTIVITY: Students will expand on the work they have done by creating a rap song based on their narrations. They will be instructed to:

- Brainstorm rhyming couplets.
- Experiment with rhythm to find a beat.
- Work, revise, and fine tune the piece.
- Rehearse and fine tune as necessary.

PRESENTATION: Student groups will present their "machines" and raps to the class. Groups will then work

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together to fine tune a presentation for another class.

The human ear can normally hear in the range of 20 to 20,000 hertz (the number of vibrations per second Hz). Music usually covers a range of 50 to 1500 Hz. Yet, sound doesn't operate strictly by the numbers. We know the difference between the notes played on a piano and those same notes played on a trumpet. The frequency spectrum is the same, but the quality (or timbre) of sound is not. Most of us can speak fairly well, but there are particular voices we admire over other voices. What makes for a good radio announcer, for instance? Our ears seem to have a bias against low frequency sound, preferring higher frequency harmonics, which give an edge to speech.

Before we were born, we were introduced to sound. Much of what we learned from our infancy to our first recitation of the alphabet came by way of rhythm and rhyme, or as Robert Louis Stevenson said, "The pattern of sound in time." As we move on in the unit, we will focus not only on the mechanics of sound, but the subtly of how we hear: "The study of the relationships between stimuli and the subjective sensations they produce . . . the basis of 'psychophysics.'" (Thomas D. Rossing, referring to Fechner's law: "The Science of Sound, p. 77.) Referring to Professor Robert Apfel's chart (which he displayed in our seminar), hearing occurs both physically and psychologically.

HEARING

Stimulus Response (Physiology) (Psychology)

frequency pitch (highness and lowness)

sound pressure loudness (volume)

frequency spectrum timbre (quality or identity of sound)

SOUND

Having gained some understanding of how we hear, students will get an overview of what we hear sound energy vibrations audible to the human ear. Energy will be described as the capacity to do work and the power to make something move. (Work = Force times distance; Power = Work divided by time). Work, or the force to make something move, is measured in joules or newton meters (the force of one newton causing an object to move one meter = one joule). Power is measured by the rate at which work is done or watts (joules per second) and horsepower (a unit of power in the U.S. Customary System, equal to 745.7 watts or 33,000 foot-pounds per minute). Energy travels in vibrating systems from the seemingly infinite movement of the tides to the infinitesimal motions of atoms in a molecule of water. Simple vibrating systems, such as the swing of a pendulum, find energy moving from a single coordinate, which describes its motion. The longitudinal vibration of energy where the principal motion is in the direction of the longest dimension can result in the kind of sound we hear coming through a flute. Transverse vibration of energy where the principal motion is at right angles to the longest dimension creates the sound we hear from the beating of a drum.

Students will be told that sound is a kind of energy and much like light, it moves in waves that can flow smoothly until they are affected by something. Unlike light, sound energy needs a medium and the denser the medium, the more sound can travel: "... light travels in a vacuum for great distances (we see the stars)...

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an explosion in air might be heard a few miles away . . . an explosion in water can be heard hundreds, even thousands, of miles away." (Blind Architects & Deaf Acousticians, Robert Apfel, p. 7.)

In the following exercises, students will use some movements from the martial art of Tai Chi Chuan in order to physically represent the motions for a few aspects of wave phenomena: reflection, refraction, and diffraction.

Tai Chi and The Wave energy movement exercises

WARM UP EXERCISE: Tai Chi, "Salutation." Students are instructed to stand with their feet shoulder-width apart; shoulders are relaxed and arms hang loose; an imaginary string is envisioned moving through the center of gravity and suspending the head as if the string were attached from above; knees are gently bent so that the hips and buttocks curl slightly toward a sitting position. Very gradually and slowly the wrists pull the arms up and outward (while students inhale), up to shoulder level where they are drawn in closer to the body and begin to make their descent (while students exhale) to the beginning position of the horse stance (with arms and hands hanging loosely at the sides). This circular waving motion is repeated several times.

OBJECTIVE: To introduce students to wave phenomena through movement exercises that give them visual awareness of how the motion of three types of waves, i.e., reflected, refracted, and diffracted, changes in direction.

ACTIVITY: Students stand in a semicircle, one behind the other so that each student (except for the first) will be facing the back of another student. They are then given the instructions below:

Do the Salutation movement to the count of eight beats four up and four down. (This is done in unison a few times.)

•	Count off down the line: "1, 2, 3, 4." (Each student should
	have a number, either "one, two, three," or "four.")

•	On the count of "one," all the ONEs will begin the salutation with four beats up and	down and will continue
		this motion.

four beats

- On the count of "two," all the TWOs will begin the salutation, etc.
- On the count of "three," all the THREEs will begin the salutation, etc.
- On the count of "four," all the FOURs will begin the salutation, etc.
- Students are apprised that a wave-like motion such as the one they have just done as a group is similar to the way all energy moves: light, sound, water, etc.

Reflection

Students are then told that we are going to be changing the motion and direction of our wave. Students are

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instructed to face forward and to loosely and slowly swing their left arms out from their sides, around and over their heads, and down across their right shoulders back to the beginning position (arms at left side). The following instructions are then given:

- TWOs and THREE's begin the motion. ONEs and FOURs stand still.
- (As arms begin the upward motion with the left arm extended to about shoulder height) All FOURs gently touch the hand to your right and give it a light push downward.
- TWOs and THREEs change your direction when you feel the push.
- (As arms swing downward and come up to the right shoulder) All ONEs gently touch the hand to your left and give it a light push downward.
- Again, TWOs and THREEs change direction when you feel the push.

SOUND EMPHASIS: This pendulum-like motion is repeated a couple of times and students are told that the wave motion has been reflected by the ONE's and FOUR's abruptly changing the direction of the initial movement. The reflection of sound can be demonstrated by making an echo. Students can be taken to the gym or auditorium and told to stand a distance away from one of the walls and clap. This will create an echo, a reflection of the sound an abrupt change in the direction of the wave that bounces back to the point of origin.

Refraction

Next, students are instructed in another Tai Chi movement called "Wave Hands Like Clouds." Again, students stand as directed above. They are told to place their right hands (palms down, facing the floor) in front of the forehead, and their left hands (palms up, facing the ceiling) in front of the pelvis. (Note: the hands are close to the body, but not touching the torso or head.) Then they will rotate their hips about 30° to the right, keeping the same hand/arm positions. At that point, the right hand descends as the left hand ascends (hands being drawn up and down from the wrists). Both hands pass each other in front of the chest. The left hand moves upward in front of the forehead (palms down); the right moves downward in front of the pelvis (palms up). Students rotate their hips about 30° to the left and bring the left hand down and the right hand up (mirroring the motion they just did when they turned toward the right). In this movement, the gentle side-to-side rotation of the hips (left to right and vice versa) propels both arms to move in circular motions across the body. After this instruction, students are then told to do the following:

- Follow a student leader (to be selected) in the motion of Wave Hands Like Clouds.
- The student leader is instructed to vary the pace at which the movement is done, first, very slowly, then gradually speeding up.
- The student leader is instructed to vary the pace of the movement randomly.

SOUND EMPHASIS: Students are apprised that waves of energy can be refracted or can bend when speed affects the movement. An example of refracted sound is yelling in the wind where the sound is affected by the speed of the air moving.

Diffraction

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Lastly, students will pair up and follow the instructions below:

- In each pair, one student will do the movement of Wave Hands Like Clouds, while the other student will intermittently block the motion. Both will take notice to what happens.
- Students in pairs will alternate doing the movement and blocking it.

SOUND EMPHASIS: Students will be told that waves of energy can be diffracted when they encounter a barrier and tend to bend around it; or pass through a narrow opening, in which case, they will spread out. Partitions used to separate office spaces bend sound to leak around or over the barrier. The sound waves of a whistle coming through pursed lips passes through the small aperture they make and then spreads out.

ACTIVITY: Students will be asked to reflect on the three exercises that they have just done. They will then be asked to once again do the Tai Chi movement of Wave Hands Like Clouds, this time with their eyes closed. As they are doing this movement, they will be asked to think about the following:

- What does this energy feel like?
- What does this make you think of?
- What images come to mind?
- Why do you think this is called: "Wave Hands Like Clouds?"

Afterwards, students are given these questions again and are asked to write down their impressions in brainstorming fashion, which they will share and discuss. (It is my experience that often this type of exercise leads into storytelling and poetry, which students may pursue as they wish.)

Applause, Applause The Sound of Two Hands Clapping

Sound is made up of vibrations of air, created by pressure and affected by temperature. Unlike light (as mentioned above), which can be be blocked and/or diffused by substances such as a brick wall or water, sound needs a medium wherein vibrations can be transmitted, either through an elastic material or a solid, liquid, or gas. Hence, there's no sound in outer space even though Hollywood would have us believe otherwise (so much for the blast of photon torpedoes and whooshing jumps to light speed). Sound travels mostly in longitudinal waves. As stated earlier, frequencies in the range of 20 to 20,000 Hz, are capable of being detected by human hearing.

To demonstrate the propagation of sound, students will be instructed to give a rousing applause and then asked: What makes the sound of clapping? They will be told that pressure created by their two hands coming together and the stop of air flow as their hands touched created the sound of a clap.

Noise

Hearing loss is the greatest disability in the U.S. While it costs approximately \$5,000 to \$6,000 per child to be educated in New Haven, perhaps as much as 20% of that money is lost due to poor acoustical design and noise pollution. Whether it's attention deficit as a result of the selective tuning out of sound or a threshold shift wherein hearing has been saturated and a temporary loss occurs that later recovers, our students aren't always hearing us.

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Students will explore the sound we call "noise" by using a digital sound level meter that measures decibels (a unit of measurement that expresses the relative difference in power or intensity of sound). After we measure sounds in the classroom, we will measure various sounds in the school, such as: cafeteria at lunch time, hallway noise during class change, school bells, intercom announcements, etc. (Measuring decibel levels of music played on a boom-box at the average student's preferred volume setting might also be interesting to include.) Referring to Professor Apfel's chart below (presented in our seminar), we will see how our readings relate to noise pollution.

CRITERIA FOR NOISE CONTROL

3 Regimes

Deafness More than 80 dBA

Speech Interference 55-80 dBA

Annoyance Less than 55 dBA

We will then discuss the effects of such noise on the students, as well as which spaces in school seem the most restful and quiet and how concentration is affected.

LISTENING

At the beginning of this unit, I spoke about communication being a two-way process of sending and receiving. Of the four sections herein, three (including this one) have to do largely with the reception of sound: "Hearing, Sound," and "Listening." While this may seem a little top heavy, for the actor or the writer to originate sound either in speech or by the written word the ability to truly listen is essential in both of those endeavors. In fact, listening (in my opinion, at least) is probably one of the kindest, if not healthiest, things we can do for one another as human beings. And yet, how often do we tune out, or calculate or judge, or get distracted, or selfcentered, or worse yet, bored, failing to find interest and appreciation in another person? How many of us create the time and space to listen openly, unconditionally? As a teacher, I try to speak as little as possible in the classroom. I learn so much more by listening to my students than I do from following any pedagogical material, even such as this unit I've written. (Although, the older I get, the less true to form I stay with this maxim.) Ironically enough, while it has at times been difficult to get students settled in and receptive to instruction (a common complaint among teachers and parents), the most difficult thing I've ever experienced in the classroom is the morgue-like atmosphere engendered by the sentences: "So, what do you think?" or "How do you feel about that?" For most of my students, education has mainly consisted of textbooks, computers, and lectures, and the parroting of information from such sources in the form of worksheets and reports. And while this is not a bad way to download information into our brains, unless we can evaluate it, think with it, use it, create with it what purpose does it serve other than to make us wonderful contestants on game shows or Trivia Pursuit players, par excellence?

In this section, the focus is on listening, especially listening to the inner voice. Most classes have their share of daydreamers, class clowns, and disruptive students. Yet, each one of these character types might actually be motivated by a strong inner voice that begs to be heard: the visionary voice of the daydreamer; the humorous exploitation of life's paradoxes by the class clown; the creative tension in the actions of the malcontent. These

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types are of course obvious, and in a theatre or creative writing class, they often turn out to be the most energetic, if not creative, as there appears to be more grist for the mill. But it is my feeling that all students have these capabilities; that they can learn to appreciate their inner voices to the degree that we as teachers are willing to provide the space and time to listen. From those inner voices students can create form and structure. They can begin to wonder, to discover, to feel, and eventually, to know what they know. And in the process, they will begin to define themselves. Through understanding resulting from intimate contact with their own sensory and emotional awareness their inner voices they can explore the confusion that affects their inner and outer worlds. They can be taught the fundamentals of speech and writing in order to give shape to their experiences, but only in the hope that they will transcend those mechanics into unique expression.

Students, now aware of hearing and sound, will begin to focus on the value of listening, intuition, and the inner voice, which is covered in the next exercises.

Rhythm Counting

This is a warmup exercise that I use to focus class attention. I do this for most every class, so that students know what to expect when they enter my classroom. The students assemble in a circle (sitting in chairs) and begin a rhythm by slapping the thighs, clapping the hands, and then snapping with the right-hand fingers, then left. Once the slap, clap, snap, snap rhythm is established, one student will begin counting "on the snaps" "one, one." (Either the students can self-select a leader or the teacher can assign one student to lead.) The next student (to the left of the leader) continues on the next double-snap beat with "two, two." This rhythmic counting is carried through to the last student (sitting to the right of the leader). Should a student miss the beat or forget to say his or her number, the rhythm starts back again with the leader with "one, one." To add a variation to this exercise, we will count in unison from one to ten in Spanish, Japanese, French, Russian, and German (or any other language), in which case I will say each double number, e.g., "ichi, ichi" (Japanese for "one"), on the "clap" beat and students will repeat the same on the "snap, snap" beats.

Intuitive Counting

The warmup exercise above can be followed by this next one. Students count off "one, two, three" and so on. When we have the total number of students, we will begin counting backwards (in descending order) intuitively. That is, each student may say one number, but we will not decide the order in which each student will speak. If two or more students say the same number, we start over with the highest number. In order to do this exercise, each student must intuit when it will be all right to say a number. If two or more students become competitive in repeating the same number over and over, the teacher can instruct them that they are not permitted to say that particular number again. This warmup does not have to continue until the counting can be done smoothly. Depending on the group, the teacher may choose to give a certain number of tries in order to see what lowest number can be reached. (Although, I have had classes of over twenty that were able to do this flawlessly over the course of a marking period.)

Labyrinth a listening exercise

WARM UP EXERCISE: Simon Says. (For Theatre class, this is usually done with stage directions: Simon says step stage left, etc.)

OBJECTIVE: To fine tune listening skills when following instructions.

ACTIVITY: Students are given ten minutes to set up the room in a labyrinth in which they will work in pairs to guide blindfolded partners through.

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- The labyrinth can be set up with chairs and other furniture in the room in order to set a pathway with twists and turns and obstacles.
- After the labyrinth is set up, students walk single-file through the maze in order to understand its pathway.
 - Students then work in pairs with one person blindfolded and the other acting as a guide. The
- first time through the labyrinth, guides direct their partners by touch, i.e., holding an arm or shoulder; protecting the head if there are places where a student must duck down.
 - The second time through the labyrinth, guides direct partners strictly with speech. Guides
- must stand a couple of feet away from their partners. (In both tours through the labyrinth, pairs take turns guiding and following instructions.)

DISCUSSION: Students will discuss their experiences going through the labyrinth as both guide and follower: How did it feel? Did you trust your partner? Did you feel safe and comfortable? Did you feel responsible for your partner's welfare? What was difficult? What was easy? This will lead to a discussion on the value of listening, especially when following instructions.

In any creative endeavor, the artist has to be able to hear his or her inner voice in order to bring it forth. This next exercise introduces pitch and timbre as qualities of sound and involves students in listening to instrumental music and listing the images and sensations engendered by it. As noted earlier in Professor Apfel's "Hearing" chart with regard to psychophysics, the frequency of the vibrations of sound is perceived in the mind as pitch, or the highness or lowness of the sound. With less frequency, pitch is lower; with greater frequency, pitch is higher. Timbre is the perception of the frequency spectrum (or order of sound frequencies); it is the quality of tone in distinguishing similar sounds, i.e, a note played on a trumpet sounds different than the same note played on a piano.

See The Sound a visualization and writing exercise

WARM UP EXERCISE: Silence. Students simply sit without talking or making noise for 60 seconds. Any noise generated by a student stops the clock and we start over.

OBJECTIVE: To gain an appreciation for listening and the response to sound through music. To use music to visualize ideas. To present those ideas in writing prose or poetry.

ACTIVITY: Students are instructed to find a comfortable place in the room. They may lie down on a mat or prop their feet up on a desk. They are told that they will be listening to different kinds of music, which they will be writing about.

The Enchanted Forest (The Enchanted Forest, Melodies of Japan, James Galway) will be played. Students are instructed to listen. (Please note that the selections I've chosen have to do with my preferences. They can certainly be substituted with other music.)

The music is played again and students are instructed beforehand to write

down the types of sound they hear. They can name instruments, or aspects of nature or other sounds that seem similar to what they are listening to.

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- Students are also instructed to write down whatever images the music

 brings to mind and how changes in pitch and/or volume affect what they

 see
- Student impressions are then shared in class. (These impressions may be represented

as a shopping list of ideas or brainstorming that leads into a story.)

Ride of The Valkyries (Wagner) is the next instrumental selection, much more intense than the first selection. Students again listen once, then a second time with the same instructions as above. Afterward, impressions are shared.

DISCUSSION: Students will discuss comparisons between the two pieces of music in terms of loudness and softness, fastness, slowness, types of instruments used and the quality of sounds they made. We will then review their written pieces to see how each song evoked different kinds of emotion and how these writings are expressions of their inner voices.

VOICE

Both actors and writers include voice as part of their creative instrument. While the actor's voice is audible and the writer's voice is expressed in words on a page, the quality of sound that both spoken and written words convey is essential to the efficacy of each artist's performance. In this section, we will focus on how the actor uses voice to: articulate, enunciate, inflect, and ultimately, bring life to the words he or she speaks; and how the writer follows many of these same ideas in order to bring rhythm and dimension to the written word. To introduce students to speech, we will begin by examining the vocal tract.

The Vocal Tract

The anatomy of the vocal tract will be introduced to students by displaying an anatomical rendering and reading the definition sheet below. Afterwards, students will have a read-through and discussion of a mini play titled: You Know How to Whistle, Don't You?

VOICE ANATOMY Definition Sheet

Lungs

Two spongy, saclike organs that are set in the chest cavity together with the heart. Their job is to remove carbon dioxide from the blood and provide it with oxygen. With the help of chest, abdomen and back muscles, air is taken into and pushed out of the lungs. Air being pushed out from the lungs and into the vocal tract creates the energy source for sound.

Larynx

The voice box. You can feel the larynx by putting your fingers against your Adam's Apple. The toughness you feel is the thyroid cartilage (a tough, stretchable, connective tissue). This cartilage along with other cartilages, make the covering of the voice box.

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Vocal Folds (cords)

What we usually call "vocal cords" are really folds of ligament (or bands of tough, fibrous tissue.) They stretch from the thyroid cartilage at the front of the throat to the arytenoid cartilages at the back. The arytenoid cartilages are movable and work to control the size of the V-shape opening between the vocal cords. This opening is called the glottis. The arytenoid cartilages are usually positioned well apart for the purpose of breathing. But when we make sound with our voices, they come together. The function of the vocal cords is to adjust and/or regulate the air flow (coming up from the lungs) by rapidly opening and closing. This rapid vibration (opening and closing) makes a "buzzing" sound. Later, we will see how that "buzz" turns into speech.

Oral Cavity

The mouth, which includes the tongue, lips, teeth, and palate. The hard palate is the roof of the mouth. In back of the hard palate is the soft palate, which can interact with the pharynx and the nasal cavity as we will see shortly.

Nasal Cavity

Air-filled chambers in the bones of the skull that are connected to the nostrils. Unlike the oral cavity where size and shape can change depending on what the lips, teeth (jaw), and tongue are doing, the nasal cavity has fixed dimensions. However, the soft palate (which is movable) can interact with the nasal cavity. It serves as a valve to control air flow. When the soft palate is lowered, we can make nasal sounds. If we also block off the mouth, we can make a humming sound.

Pharynx

A mucous membrane-lined tube inside the throat that extends from the mouth and nasal cavities to the larynx, where it becomes continuous with the esophagus (the tube used for the passage of food).

Tongue

The fleshy, movable, muscular organ, attached to the floor of the mouth. It is the main organ of taste and it helps us to chew and swallow. It is also an important organ of speech. If you make the sound "T," you will notice that the tongue lifts up toward the front of your top teeth. On the other hand, if you make the sound "A," your tongue is lowered and resting on the floor of your mouth.

Lips

Two fleshy folds that surround the opening of the mouth. The lips and other muscles control the opening and closing of the mouth, as well as the shape of the opening. Sound comes through the lips.

Teeth

Hard, bonelike structures rooted in the jaw.

Voice

The idea to make a sound starts in the brain (in the speech area in the temporal cerebral cortex). The

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message from the brain to make a sound is sent to the larynx by way of the brain's voice area (in the motor strip of the precentral gyrus), which transmits the message through various nerves to the larynx. As the chest, abdomen, and back muscles manipulate the lungs to produce a high pressure air stream, which flows to the larynx (voice box), the vocal cords of the larynx interrupt that flow of air and vibrate to make a "buzzing" sound as the air passes through. The buzz travels through the pharynx into the nasal and oral cavities. As the buzz does this, the sound resonates, which means that the vibrations (or back and forth motion) creating the buzz are intensified and made to last longer. When the sound comes strictly through the nasal cavity (when the mouth is closed and with the help of the soft palate), we hear a hum. When the sound comes through the oral cavity as well, it can be shaped by the palate, tongue, teeth, and lips to make vowel and consonant sounds. When those vowel and consonant sounds are organized into patterns of sound that we call "words," we have speech.

You Know How to Whistle, Don't You?

a mini play about the vocal tract by Yel Hannon Brayton

A "Fantastic Voyage" of sorts, only set in a 40's Raymond Chandler-esque milieu. The play takes place inside a human body in the vocal tract. The characters are personifications of various aspects of this anatomy.

(Note: Phrases that appear in quotation marks are taken from a metaphor in The Little Sister and the famous or infamous "whistle" line from The Big Sleep by Raymond Chandler.)

@2H(after1H):CAST OF CHARACTERS

Larry Nix middle manager for the Head office, stationed near the larynx

Lips Larry's girlfriend

Betty Larry's nervy receptionist

Flex & Tex body builders who work the muscles of the chest, abdomen, and back

Buzz floor manager in charge of the vocal cords
Vinney The Nose gang leader in control of the nasal cavity
Mouth Moynehan gang leader in charge of the oral cavity

Non-speaking roles: The Head office (the brain), Tony The Tongue, Choppers (teeth), Softy (soft

palate), and Roofus (hard palate)

Larry Nix's office somewhere inside the vocal tract near the larynx.

LARRY. (On the telephone) OK, boss. Yeah, yeah, yeah. I got it already. You want a whistle. I'm right on it.

LIPS. What's the matter, Larry? Big boys on your case again?

LARRY. Yeah, doll face. Isn't enough I gotta put vowels and consonants together for the Head office. Now they want a whistle.

LIPS. A whistle?

LARRY. Yeah, sugar-plum, a whistle.

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LIPS. Seems simple enough.

LARRY. Maybe to you, honey bun, but for me it's like trying to do the Cat's Cradle with a bent yo-yo hanging from a busted string. I'm about as likely to succeed "as a ballet dancer with a wooden leg."

LIPS. C'mon, Larry. "You know how to whistle, don't you? You just put your two lips together and blow."

LARRY. It's not that easy, cupcake. But stick around. I'll be needing you soon. (Buzzes receptionist on the intercom) Betty, get Flex and Tex up here on the double.

BETTY. (Sarcastic voice through the intercom) Why certainly, Mr. Nix. It's what I live for.

LIPS. She's got a lot of nerve. Is she always that rude.

LARRY. (Shrugs) She has to deal with a lot of messages. Guess it gets on her nerves. She's as "dizzy as a dervish," as pleasant as athlete's foot, as efficient as rush-hour traffic, as calm as a frayed electrical cord plugged into a faulty outlet . . .

FLEX & TEX. (Enter, flexing their muscles and striking poses) At your service, Larry!

LARRY. Down boys. This one's a little tricky. We need a whistle this time.

FLEX. A whistle?

TEX. You know, good buddy. You just put your two lips together . . .

LARRY. Yeah, yeah. OK, now listen. When I get the signal from the Head office, I'll have Betty pass it on to you guys. We're gonna need a nice steady stream of air. Can't be sloppy this time. You got it?

FLEX. Duh, what did he say?

TEX. Don't you worry little fella. We are set to go. (They both flex and strike a pose.)

LARRY. Not like the last time, guys you know, when you sent all that dust up in the air so that the vocal cords just shut up tight as a drum and all we wound up with was uncontrollable coughing? It was like the Fourth of July with flak instead of fireworks, like peanut butter and jelly sandwiches, only instead of jelly, it's jam with all those icky little seeds . . .

LIPS. (Cutting him off) Larry!

TEX. Think we get the picture, cow-poke. Right, Flex?

FLEX. Huh? Oh-oh, yeah, yeah. No more dust.

TEX. Clean as a whistle! (To Flex) Get it?

FLEX. Uh, uh ... a whistle! That's a funny one, Tex! (Flex and Tex chuckle.)

LARRY. Get serious, guys.

TEX. OK, Larry, keep your shirt on. We'll get those lungs working smooth as silk.

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FLEX. You betcha!

LARRY. OK. Back to your stations. (Buzzes receptionist on the intercom) Betty, get Buzz in here.

BETTY. (Voice through the intercom) In a few. (Sighs) My nails ain't dry.

LARRY. (Annoyed) Betty . . .

BETTY. (Huffy voice through the intercom) Oh, all right!

LIPS. Jeeze Louise! Why don't you just fire her?

LARRY. Can't. She's the nerve center of the whole operation. Besides, she's in tight with the Head office. Think her uncle's in charge of the Speech Center.

LIPS. Oh.

BUZZ. (Enters, shaking his head as if his ears are clogged) Hey, Nixie. What's the skinny?

LARRY. What's the matter with you?

BUZZ. The usual. Day in, day out constant buzzing blasted vocal cords. Doc says it's work-related. I'm putting in for a transfer. Maybe something cushy in soft tissue.

LARRY. Not today, Buzz. I need you.

BUZZ. So what's the low-down, boss?

LARRY. A whistle.

BUZZ. A whistle.

BETTY. (Voice through the intercom) You know, stupid. You just put your two . . .

LARRY. (Cuts her off) Enough already!

LIPS. (Protective) Lawrence your blood pressure.

LARRY. Yeah, OK, sweetheart. (To Buzz) Gotta a ticker "as weak as a worn-out washer," as strong as Silly Putty, as regular as a grandfather's clock with a busted pendulum

LIPS. (Sighs.)

BUZZ. (Ignoring Larry; thinking) It's doable. Let's see We'll need a nice steady stream of air.

LARRY. Already set up.

BUZZ. Flex and Tex?

LARRY, Yeah.

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BUZZ. You warned them? No more nonsense?

LARRY. Yup.

LIPS. That'll be the day.

BUZZ. Oh boy. Well all right. Let's see, a whistle. Now we don't want the cords completely shut.

LARRY. No, we're not looking for another coughing spell.

BUZZ. And we don't want them completely open.

LIPS. Nope, even though a whistle does sound a little like "ssssssssss."

BUZZ. A little, but not quite. I think we'll go for an intermediate position so that the stream of air can gently interact with the cords as it passes between them. Then my job's done and it's onward and upward.

BETTY. (Playful voice through the intercom) Boss, looks like you got trouble. (Exaggerating his name) Vinnneeee-y's here to see you.

VINNEY. (Swaggers into Larry's office. Commenting on Betty's voice, which sounds nasal when it comes through the intercom) Nice voice, that Betty. (To Larry) So, I hear you got some action going on down here, Nix.

LARRY. Well, if it isn't Vinney the Nose. Have a seat Vinney. Take a load off.

VINNEY. Don't mind if I do. (Looking at Lips) You in on this, too, Legs?

LIPS. In on what? And it's "Lips," thank you very much.

VINNEY. Heard something about a whistle and I'm just here to tell you I want a piece of the action I want in, see?

LIPS. But of course you're in, Vinney. Why do you have to always act so paranoid?

VINNEY. (Thinking out loud) "Paranoid." Good sounding word. My territory gets a lot of mileage out of nasal sounds like that.

MOUTH. (Mouth Moynehan bursts into the room) Well you're not going to step in on my turf, Nose!

BETTY. (Angry voice through the intercom) Tell that loud mouth he ain't got no right to just bust in here like he owns the place! And if you don't do something about it . . .

LARRY. (Shuts off intercom cutting Betty off. To Mouth) Now listen, Mouth, we don't want any trouble around here. The Head office wants a whistle and that's what we're going to give them. So, both you and Vinney cooperate, open up your territories, and we ain't got no problems, see? Everything's copacetic.

MOUTH. Yeah, OK, Nix. Just so long as The Nose here stays outta my business.

VINNEY. Hey, I'm a nice guy. What do ya' think I'm gonna do?

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MOUTH. Don't give me that line of baloney. You know what you did the last time.

LIPS. You mean when the Head office wanted a song? What was that song? LARRY. On Top of Spaghetti.

LIPS. Yeah, that's it: (singing) "On top of spaghetti, all covered with cheese" . . .

VINNEY. "I lost my poor meatball when somebody sneezed." Dumb song. It sounded better the way I did it.

LARRY. That was a tough one lots of meetings and preparation and then . . .

MOUTH. And then Softy messed up big time.

VINNEY. Ah give the kid a break.

MOUTH. You put him up to it, didn't you, Vinney?

VINNEY. Hey, I don't have to sit here and listen to these accusations!

LIPS. Well let's face it, Vinney. Softy did put the kibosh on the whole gig by lowering the soft palate. Then he told me to sit tight. You know, "loose lips sink ships" and all.

LARRY. So, instead of a song, we had a hum. Everything went straight to your territory. When the Head office called me, I felt "as low as a badger's belly, as timid as a titmouse" ...

VINNEY. (Cutting him off) All right, all right. (To Lips) Does he always have to do that? (To Larry) Big tragedy. Like I said, it sounded better the way I did it.

LARRY. Well, it's not gonna happen again. You just mind your own business. No more playing around. You mess up this time and the Head office is gonna come down on me and then I'm gonna come down on you! Now, on to the business at hand. (Talking into the intercom) Betty, check with Buzz to see if all's clear in the tunnel. (There's no response) Betty, Betty? . . . C'mon Betty, give me a break!

BETTY. (Voice through the intercom) You can't give me enough money to do this lousy job. Besides, what tunnel are you talking about?

LARRY. The Pharynx Tunnel. You know, the one that connects the voice box to the nasal and oral cavities Vinney and Mouth's territories.

BETTY. Oh, that tunnel.

LARRY. (To Mouth) You got your people in place: Tony The Tongue, Choppers, Softy, and Roofus?

MOUTH. (Looking at Lips) Don't forget the skirt.

LIPS. It's "Lips," if you please, Mr. Moynehan.

LARRY. (To Lips) You ready, Dumpling?

LIPS. Larry, stop calling me all those stupid names. I mean once in a while is OK, but too much is enough! It's humiliating . . . (sighs, pauses, puts on her lipstick) . . . OK, I'm ready.

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LARRY. (To the intercom) Betty, get Flex and Tex and Buzz on the horn and plug 'em through.

BETTY. (Voice through the intercom) Say, "please."

LARRY, et al. PLEASE!

FLEX & TEX. (Through the intercom) Here Larry.

BUZZ. (Through the intercom) All set, Nixie.

LARRY. OK folks, this is how it's going down. Flex and Tex, you guys get those lungs pumping and send up a nice steady stream of air. No dust this time!

FLEX. Send up nice steady stream of air, yup.

TEX. No dust. Check.

LARRY. Buzz, you get the vocal cords vibrating. We're looking for an intermediate position; not fully closed or fully open, right?

BUZZ. Right. This will make a buzzing sound, which I'll send through the pharynx to the nasal and oral cavities.

VINNEY. My territory?

MOUTH. No. mine!

LARRY. Vinney, this time you just sit tight, OK? We're going to be reciting a poem in French pretty soon, so there's a whole lot of action coming your way, (sounding very nasal) comprenez-vous? (To Mouth) Now Mouth, you've got some work to do.

MOUTH. Yeah, I get the picture.

LARRY. When the buzzing sound reaches your territory, I want Tony The Tongue low to the floor and curled up like a taco. Tell Choppers and Roofus that the upper and lower teeth are gonna get pretty close, not a bite, but close. Then Lips, honey I mean, Lips the rest is up to you.

LIPS. I know, Larry. I just put my two lips together and blow.

@Text:After reading through and discussing how the play relates to actual anatomical features of the vocal tract, students will be instructed to write an epilogue in narrative voice. How do things turn out? Is there a twist, a turn of events prompted by the foreshadowing of Flex and Tex's initial mess up? Does Softy (once again in cahoots with Vinney The Nose) put another kibosh on the action? Does Lips turn into a die-hard feminist? Does Larry Nix offer any more colorful metaphors? Do we ever get to hear a whistle? Breathing

Sound created by voice emanates from the breath, which vibrates the vocal cords. Learning to breathe properly and fully expands control of the voice and the more can be done with it. The next three exercises are designed to help students to view the mouth, throat, and lungs as a great cavern in which they can manipulate air to the vocal cords in order to create sound.

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Aaaaaah! a voice exercise

WARM UP EXERCISE: Isometric Relaxation. Students may either stand, sit, or lie down, if possible. Focusing on one muscle at a time, students tense the muscle, then release it starting with curled toes and moving up the body to calves, thighs, hands, buttocks, hands, arms, chest, shoulders, neck, and face. (Since a tense body makes for a tense voice, this warm up is designed to help students relax.)

OBJECTIVE: Learning to breathe deeply and save breath.

ACTIVITY: Students can be seated for this activity. They are instructed to sit quietly (for about ten seconds) and focus their attention solely on their breathing. They are then told to place one hand over the throat (where the heal of the hand touches the collar bone) and to make a low sound: "Aaaah."

When asked what did they feel, the answer should be "a vibration." The voice is then described as air vibrating their vocal cords; that the part of their throats where they felt vibrations indicates the voice box in which the vocal cords are housed. Students are further instructed to do the following:

- Put one hand on your chest. Breathe slowly and deeply.
- Feel your hand rise and fall.
- Put your other hand just below your rib cage.
- Breathe in. Once you feel your chest begin to rise, try to make your other hand rise. (Repeat this step several times.)
- Draw in a slow deep breath.
- Exhale the "Aaaah" sound and hold the sound as long as you can.
- Inhale and exhale the "Aaaah" sound several times until the sound lasts longer and fades more smoothly.

Articulation

Speech sounds are made by vibrations caused by air pressure against the vocal cords, or the constriction of air flow. As discussed earlier, a buzzing sound is produced by the vocal cords and further filtered in the vocal tract, then radiated through the lips and nose. English speech sounds are called "phonemes," which consist of vowels and consonants. Resonances of sound within the vocal tract determine vowel sounds (formants). Diphthongs are a combination of two or more vowels into one phoneme, such as the "oi" sound in "toil" or "spoil." Consonant sounds are created by the rapid changes of sound made by a constriction somewhere in the vocal tract. Fricative consonants f, th, s, sh are the result of turbulent air flow through a constriction. Plosives p, t, k happen due to a sudden release of pressure. In the next exercise, students will be apprised of the above and will experience making vowel and consonant sounds.

Sounding Good a voice exercise

WARM UP EXERCISE: Face Movement. Students exaggerate the vowel sounds and take notice of how each exaggerated sound contorts the face.

OBJECTIVE: To understand how the lips and tongue shape the voice; to learn how sounds are made; to speak clearly.

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ACTIVITY: Students are instructed to do the following:

- Breathing deeply, yawn and make the yawning noise continue throughout your exhale.
- Yawn again, but change the noise by changing your mouth to an "o" shape. Notice how this changes the sound.
- Repeat the step just above with various changes in the shape of the mouth: a wide smile, a wide frown, etc.
- Say the following lines and think about where your tongue and lips go to make each one: beh. teh. deh

.

neh, leh, deh

neh, peh

beh, meh

DISCUSSION: Students will discuss their observations about how the lips and tongue help to create types of sound.

A Sound Play a voice exercise

WARM UP EXERCISE: Making it Rain. Students are divided into six groups with each group being given a particular type of sound to make, i.e., snapping, soft-cupped-hand clapping, "whooshing" voice sound, clapping the hands loudly, slapping the thighs, and stamping the feet. These various sounds are orchestrated by a leader (first the teacher, then individual students). Starting with the snapping group sound, each group sound will follow in succession. The overall effect mirrors the sound of a downpour. This orchestration done in reverse will mirror the sound of the cessation of a rain storm.

OBJECTIVE: To create a scenario with sound only (no words).

ACTIVITY: The following scenario is told to the class and students are asked to contribute sound effects with their voices.

Kisha woke up to the sound of her (alarm).

She stretched and (yawned), then got out of bed and (walked, ran, hopped) to the bathroom. She went in, (shut) the door, and turned on the (shower). Just as she was about to get in, the phone (rang). She turned off the (shower), put on her bathrobe, (opened) the bathroom door and (ran) to the (phone). She picked up the receiver, but no one was there. All she heard was a (dial tone). She (walked) back to the bathroom and (closed, slammed) the door and turned on the (shower). Just then, the doorbell (rang). She turned off the (shower), put on her bathrobe again, (opened) the bathroom door, and (ran, stomped) to the front door, which she (opened). There was her friend, Jennifer who greeted her with a big smile and a snowball, which (hit) Kisha's shoulder. "Hey, I tried to call you, but you didn't answer" Jennifer said. "It's a snow day! No school!"

Students are then grouped in threes and fours.

Each group does the following:

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- Decide on a simple scenario or set of actions, e.g., making a camp fire, driving a racing car, baking a cake.
- Develop sound effects to describe the action.
- Present the scenario to the class. Listening students will also keep their eyes closed and will be asked to describe what is happening after each presentation.

DISCUSSION: Students will discuss how sound helps to paint a picture of a story.

Prosodic Features in Speech

Prosodic features are characteristics of speech that give meaning, emphasis, and emotion to sound without altering phonemes. Through pitch, rhythm, and accent (as well as volume), sentences and phrases can be interpreted in different ways and felt in different moods. Perhaps one of the most well-known, humorous examples of prosodic speech is the Abbott and Costello comedy sketch, Who's On First? which students will read aloud in class. The sketch revolves around three uniquely named baseball players: Who (the first baseman), What (the second baseman), and I Don't Know (the third baseman). While Bud Abbot is aware of these players, Lou Costello isn't. So, when Lou asks: "Who's on first?" Bud replies in the affirmative: "Who."

On a more serious note, when Hamlet, the young Prince of Denmark ponders "To be or not to be, that is the question," the cadence set by the metered line (iambic pentameter) actually mirrors the human heart beat, which adds a visceral dimension to the spoken word. Additionally, the alliteration of the "t" sound, affects the listener rhythmically. Poetry in Motion

While the distinctive quality of sound may be more discernible when listening to music, it certainly takes a vital role in the recitation (as well as the writing) of poetry or any form of speech for that matter. For those of us who have experienced a bromidic teacher who put our brains to sleep with her monotone allocution, this is very clear. While we do not hear the high contrast of the notes sung in an aria when listening to poetry, intonation conveys meaning and mood. The syntactical structure of a poem is designed rhythmically (whether or not the poem actually rhymes) and thus the listener (or reader) experiences not only words, but subtle waves of sound (aurally or internally). These words carried on waves can rivet like a jack hammer or undulate like the ocean. In either case, they are empowered to move us by sound.

Metered sound reflected in poetic form and the impact of prosodic speech with regard to poetry is the focus of this last lesson. Several poetic forms taken from The Teachers & Writers Handbook of Poetic Forms will be introduced and students will read and write poems in each form. They will be guided in aural presentations as well as in writing their own pieces wherein they will rely on their inner voices. Edited work will be presented in a poetry reading and published in our school's anthology, The Poets' Posse, which I produce every year.

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