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# Sound

The key to good sound planning is listening and keeping an open mind. If your day to day life is filled with classes, pop music, traffic, television and the normal din that occurs as you walk to school, be brave and take a walk on the wild side for a change. Attend live concerts, amplified and unplugged. See if you can pick out the individual instruments. Can you tell what they are playing? Can you hear the difference between two guitars? Two violins? Two singers? Does the sound change as you move around the room? Once you are more attentive to sound, you'll realize how it can change based on the smallest decision.

# Introduction

In almost all productions, some sort of audio direction is needed. The minor exceptions may be for unplugged concerts, plays and the like. For the most part though, assemblies and shows will require at least one person to set up audio. To fully understand audio, please read up on different websites. The web is also a great help in this area, as are professionals in the field. L'Am's Science department may also be willing to provide you with the fundamentals of sound and acoustics. I will not go into great detail here as you might not make it to the end.

# Sound to Electricity

When you talk, or hit a note on a piano or hit a drum, air vibrates in a series of waves of higher and lower air pressures. These waves travel outward from the sound source by bumping their neighbouring molecules until the molecules by your eardrum are moved. The sound travels down your ear and eventually gets converted to electricity which then stimulates your brain and you “hear” sound. Because we can't hear what everyone else does, we use another method for converting sound into electricity. It's called, a microphone. A microphone works by converting acoustic or sound energy into electrical energy. Once it is in this form, we can treat it in different ways. We can make it louder or softer or make it sound as if it is in an empty cave. When you deal with sound equipment, you're really dealing with electricity. Once you know that, you can think your way through most problems and implement a good sound plan.

A microphone's output or its level is not strong enough to drive a loudspeaker. In between the two, an amplifier can accomplish the job of making the electrical signal strong enough to move the loudspeaker back and forth so we hear it as sound. This is a very crude and simple PA system. A microphone, amplifier and speaker. In a small assembly, this is what you will be setting up. If I introduce a control on the amplifier that lets me increase or decrease the level going to the loudspeakers, I've just created a level or volume control. Now, I can let the audience hear more or less of what is coming out of the speaker. Keep in mind that all sound we deal with in our equipment is actually electricity.

# Microphones

People know what a microphone is, what it looks like and generally speaking, how to use one. (This last point is often debatable). Microphones convert sound into electricity, and send that signal via a balanced or unbalanced line Balanced mics always have a three pin XLR connector at the back.

Microphones come in many varieties. What you should be aware of are microphone pickup patterns. A pickup pattern determines how well the mic can “hear” from a given direction. Pickup patterns generally come in two flavours: directional and non-directional. Directional microphones pick up the sound in a heart shaped pattern at the front of the microphone. They reject sound coming from the back of the mic and pick up a little at the side. To illustrate this, take a microphone and press it into the top of a balloon. (Blow it up first). Non directional microphones pick up sound well in all directions. This is great for picking up the sound of a crowd or many people talking, but is terrible in a PA system, especially if the main speakers are situated in a circle as in the Market Square. Generally, you will always want to use directional microphones as your main mics for talent in a performance. Non directional mics should be used in situations where the sound source is going to be far away from a loudspeaker. The two main types of microphones you will most likely use are dynamic microphones (passive electronics) and electrostatic or condenser microphones (active electronics). Don't worry about the passive and active part. Just know that condenser microphones require a power supply, while dynamic microphones don't. If you are using a condenser, be sure that you have its associated batteries or that you can send it phantom power; a DC voltage that powers the microphone directly from a mixer. Microphones can either be wired or wireless. If you are using a wireless microphone, be sure that it transmits on a frequency that won't interfere with other radio traffic in the school. The school is primarily made of steel and concrete, so a lot of radio signals can be interrupted if the transmitter is out of range or behind a heavy wall. Though many microphones are rugged and can handle all types of weather and handling, treat all of your microphones with care. Never drop them or blow directly into the microphone capsule. If you have them, put wind screens and pop filters on all of the mics that will be used for vocal performances. Keep mics in their respective cases when not in use, and be sure that the mics are kept in a safe place. If using a microphone with an on/off switch, leave it in the “on” position after you've set it up (got that RADIO L’AM?). Tape the switch so no one accidentally turns it off, It can be pretty embarrassing if your talent forgets to turn on the switch.

I had too much written about microphones, so I've decided to move them to a seperate page Microphones.

## Feedback

If I take a microphone, amplify its signal and feed a speaker, I get a PA system. If I stand in front of the speaker with the microphone, I get feedback. Feedback occurs when the signal from a microphone is fed to a loudspeaker and back into the microphone. It gets amplified again and returns to the loudspeaker where the cycle continues. It gets louder and louder and then produces that familiar shriek which has adorned all high school auditoriums and assemblies since the beginning of time. Be aware of feedback when you are placing monitor speakers and microphones in close proximity to each other. Some ways of dealing with feedback are: using sound baffles between speakers and microphones, using equalisation to

null out the feedback frequencies, switching microphones, moving microphones and speakers further apart and reversing the phase of the microphones. If you are using a microphone and you hear feedback, resist the temptation to cover it with your hand. Encourage your talent not to do this. This makes the problem worse. Turn the microphone's level down and tell your talent to speak closer to the microphone. (Ideally, talent should be 6 to 8 inches away from the microphone, speaking across it rather than directly into it. For this, a 45 degree angle works). Work with your FD or SM and the talent to establish a way of cueing the talent to move closer or further from the microphone.

# Phase

For a detailed description of phase wave theory, consult the Science department and speak to a Physics teacher, or visit your library and rend tip. Phasing problems can occur either acoustically, or electrically, depending on what you're doing. Ile aware that when two sound waves combine, they can either reinforce each other, or cancel each other. This goes for waves of electricity too. Let's say you mic up three speakers for a panel discussion. You use three microphones and realise that the sound from al I three sounds hollow or like it. is sweeping back and forth. You check each mic individually and don't hear anything wrong. You check all three and the same problem collies up. You most in 1 I likely have a problem with phase. Each mic picks up the sound of its associated panel member. But it also picks up the sound of the member that is sitting nearby. Because all three mics are picking up direct and indirect sounds at slightly different times (a matter 01 milliseconds) the combined sound waves do a little bit of reinforcing, and a lot of cancelling. This explains the hollow or empty sound. To get rid of it, follow the 3 to 1 rule. The 3 to 1 rule states that two microphones must. be three times the distance from each other as one microphone is to its source. It sounds confusing but it is quite easy to understand. If two people are talking into microphones that are… let's say 10 cm away from their mouths, that means that my two microphones must be no less than 30 cm away from each other. (10 x 3 = 30). You will not have to worry about phasing problems if the distances are big, such as across a room or on opposite sides of a table. Electronically, phase problems can occur if two of the same signals arrive at slightly different times, or if the wiring is incorrect. Some cancelling will occur, and the audio will sound tinny or hollow. This shows up when you have a stereo source (such as a CD player) and you get a separate left and right feed for each channel. Now, if someone is talking on both the left. and right channels, and they arrive at slightly different times, the end result is cheap and very bad sounding karaoke background music. Sometimes the problem is a result of one connecting cable being much longer than another. Other times, the polarity of one of the channels may be reversed. Be sure that your cable runs for stereo sources are the same length. Try not to use ridiculously long cables for short runs either. As a suggestion, it would be a good idea to purchase phase reversal connectors or cables. These look like redundant XLR connectors with a male and female end. They work by flipping the polarities of the two main conductors. Be careful though, one incorrectly placed phase reversal cable could throw your audio system out of whack.

# Audio Signals

In some shows you will be required to use more than just mics for your talent. CD players, audio from VCRs, cassettes, effects devices, mixers and musical instruments all produce electrical signals that may

have to be routed and used in a mix for your show. Be aware of the two types of signals that are the most common in audio. Low level, and high level signals. Low level or mic level signals are very low. So low in fact that they have to be amplified loud enough so we can hear them, modify them and mix them with our other elements. High level or line level signals don't require amplification, and are the most common output for playback devices and musical instruments. All periphery audio gear such as equalizers and effects machines use line level signals to interface with all other audio gear. This means that microphones must be amplified before they are processed with equalisation or level control. On a mixer, the amplification occurs as soon as you plug the microphone in and select “mic” on your input strip. If you are planning to use something before the mixer such as a compressor (see the compressor page for more information), you will most likely use a microphone pre-amplifier or mic pre-amp for short, which is usually built into the mixer or sound board.

# Mixers

Now that you are well versed in miking things up and eliminating phase and feedback problems, you're ready to put everything together in a final mix that either gets heard by an audience. For this task, you will require a mixer L'Am does not have terribly sophisticated mixers, but our larger Yorkville AP812 is usually enough for larger shows. I'll briefly discuss what they do and how you can use them in a show. A mixer basically takes a number of audio signals, combines and processes them, sometimes routes them and finally spits everything out as a final mix which is just one or two signals. (Mono and stereo respectively). Each mixer has inputs, a control area or strip and an output section where we can send our mixed signal to the house (speakers) or other amplifiers.

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