

SOUND NOTES from Bill Cress 10/26/13

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Welcome to Film Sound Sessions with Clinton Harn. Film Sound Sessions is a collection of articles designed to educate and inform filmmakers on how to record exceptional audio for film and video.

Clinton Harn has been working as a record producer, filmmaker, session musician, drummer and recording engineer for the past 15 years. He has been a lecturer at JMC academy for the last 10 years, where he teaches things like sound for film, music production analysis to effective business practices and copyright law. Clinton also runs his own production company specializing in music videos, documentaries, short feature films and sound for post and pre-production. The man knows his stuff.

Check out the short videos below and his articles, all on getting the best sound.

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VIDEOS ON LINE; ARTICLES FOLLOW:

Sound Perspectives 101 ~ Clinton Harn



CLINTON HARN

Sound. It's the most elusive element that seems to plague filmmakers so very often. We commonly hear filmmakers saying things like, "sound is 2/3 film" or "sound will make or break a production." The list goes on. Yes, we have been able to get that "picture" quality to a "pseudo" Hollywood look, but sound is difficult. Or is it?

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Sound is generally an afterthought for most filmmakers. Most people assume that sound is something you get audio engineers, sound designers, editors or mixers to look after.

In part, this is because film doesn't have the capacity to record sound and audiotape can't capture images. 35mm & 16mm film doesn't capture audio, but the impact of digital camcorders changed all that.

Today, filmmaking is literally becoming more affordable, scaled down, budget conscious and more accessible. Hence, what follows are several people's attempt to do everything themselves without adequate training, knowledge or information.

Until recently, film and sound were separate "departments." Now with the advent of independent filmmaking, these two elements are now equally important.

Over two years ago, in a video titled *Advanced Sound for DSLRs*, Steve Weiss of Zacuto asked a very legitimate question, "Why is sound always the bastard child to video people?" What ensued was a very informative and educational 13 minute supplement. Here, I will attempt to provide a simple yet comprehensive guide to sound recording for picture.

In the next series of articles, I will attempt to dispel any fallacies or misconceptions regarding sound recording for film, simplify some basic fundamentals, which is paramount to getting great sound for all your projects, large or small, and most importantly, make it an easy, fun and enjoyable process.

Various topics will include:

- 1) Microphone fundamentals: selection, placement, application and audio comparisons.
- 2) Recording devices and mediums. Equipment selection. AB test.
- 3) Capturing sound on location and studio controlled environments.
- 4) Processing and editing sound in post, including ADR, foley, sync, etc.
- 5) What is that "Hollywood" sound?

With plenty more to come.....

As a tertiary educator, I often get the following questions, just to name a few:

- 1) What is the best equipment to use for general location recording?
- 2) What is the best software for sound editing?
- 3) What types of mics are best for different scenarios?

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OK. Let's start with observations in digital fundamentals. In the audio industry, there was a time when analog tape was the coveted means of professional audio capture in sound recording. To some extent, it still is, though subjective. However, this method is expensive and cumbersome. Enter hard disk based formats and solid-state drives; we can now record, edit and mix sound without breaking the bank balance.

Much like film stock compares to audiotape, today picture can be recorded to a digital storage medium. So now audio can be recorded to very small, portable and affordable devices. A 16mm Bolex camera and a Nagra reel-to-reel audio tape recorder may have epitomized the concept of portability in the 1960's, but now the HD SLR and the Zoom H4N have revolutionized filmmaking in the 21st century.

Is it hard to comprehend audio in theory? Not if you look at the similarities between digital filmmaking and digital audio. In this first article, I want to bring your attention to these terms. In later articles, we will go into more detail.

Clipping:

Where the term "blown out" is utilized in analog photography, clipping in digital photography occurs when incorrect exposure causes image highlights to lose detail and ultimately be rendered useless.

Clipping in digital audio is similar when levels are set too high during the input stage. Digital distortion occurs and renders the audio unusable because sonic fidelity and detail are lost.

Clipping in audio can also occur at the pre-amp stage, mic stage and analog to conversion stage. Hence it's not just a simple adjustment of exposure when comparing to image capture. We will look at these problems in later articles.

Resolution:

In film, this generally refers to the horizontal resolution of an image, its size and its ability to contain as much information as possible. Hence relative pixel dimension comparisons and common digital cinema formats include 720p, 1080p, 2k and 4k.

Resolution in digital audio similarly refers to the ability of capturing audio at higher resolutions (sample rates) 44.1k, 48k, 96k and 192k, being the most common. This aspect is commonly misunderstood in digital video editing as well as an area where most mistakes occur when syncing audio with visual. Further explanation will be given in an article devoted to this topic.

Compression:

Compression is used in digital cinema to manage large amounts of data. Due to limitations in human visual perception, compression is utilized to remove redundant information from a signal.

Where prosumer cameras use higher compression ratios, high-end cameras generally use lower ones or none at all.

Compression in audio and video are similar in terms of data management. Both utilize Lossy & Lossless compression, which again removes redundant information in our ability to hear lower or higher frequencies.

Using inferior compressed audio formats such as mp3, meant for consumer use, usually results in less than desirable results.

Compression in audio is also used to normalize audio to make fluctuating levels in speech or signals sound more coherent and consistent.

Dynamic Range:

In film, dynamic range refers to the darkest point within which a camera can capture to the lightest. Where darker images might sometimes contain more "noise," highlights can also clip.

In audio, dynamic range refers to a similar principle of recording audio within an optimum latitude range that goes from inaudibility to distortion. Recording a sound too low and playing back at an audible level will introduce extraneous noise, raising the noise floor and therefore increasing the signal to noise ratio.

When recording a sound too loud in analogue, tape saturation occurs and compression kicks in which gives the audio's dynamic range a bit more latitude. However, in digital audio, clipping occurs and you end up with digital distortion.

Conclusion for now:

I won't carry on with the endless comparisons. One can clearly see the similarities between audio and visual theory.

I would like to leave you with a thought though. While we spend good money on cameras, what do we really expect when we only spend a fraction of that cost on very little equipment coupled with limited knowledge on sound?

When I was embarking on completing my masters of audio design at university, we were required to conduct research on hardware components versus audio software generated algorithms. In the audio world, we call this ABX testing and much to my amazement, the results were negligible and miniscule. As I have always stipulated, you pay for what you get. So again, while people are willing to part with a few thousand dollars on a camera, why would they only spend a couple of hundred bucks on a small consumer type field recorder? That being said, it all comes down to the individual behind the instrument. With proper information and knowledge, you'll be able to determine what constitutes great sound, irrespective of price. Rest assured, the folks at Zacuto are committed to education. Stay tuned for more articles on sound.

Compression in audio is also used to normalize audio to make fluctuating levels in speech or signals sound more coherent and consistent.

Tools of the Trade, Part 1 ~Clinton Harn



CLINTON HARN

OK, so you want to know what sound gear and equipment makes great sound for film? Well, before we look at the various "tools of the trade", I'd like to discuss a few key words that will give you more fundamental knowledge pertaining to capturing pristine audio for all your filmmaking needs.

As an avid filmmaker and videographer, my love for sound is equally important. In fact, I started with sound first then made the transition into filmmaking. With more comparisons of visual and audio elements, I will attempt to draw comprehensive conclusions, provide solutions and deliver an understanding of audio recording for aspiring filmmakers.

In a recent conversation, I asked an experienced and credible Australian sound recordist how he got into sound for film and TV. "By accident" he casually replied. He continued by stating that his background was primarily broadcast and that he didn't possess an educational background in audio engineering or sound design.

In a similar type fashion, I once again asked a reputable and "seasoned" audio engineer/producer what his thoughts were on sound for film or broadcast. In this case, I got a rather perplexing and almost somewhat uninterested response.

Perhaps here within these general attitudes lies the problem. There seems to be a gap within various industries whereby professionals may deem aspects of their craft or art form, irrelevant. For the independent filmmaker, budgets don't necessarily give us the luxuries of "Oh, let's send it to the sound department" or "lets get the editor to look at that in post", etc.

In the first article, I highlighted the growing changes in technology and how modern filmmaking now requires us to be more "intimate" with our equipment. With digital filmmaking and the DSLR boom becoming more apparent, we now need to capitalize on other factors that can help us become consummate filmmakers.

Ingredients:

While I won't reinvent the wheel, I've devised a method utilizing acronyms that will help you better understand sound and make appropriate choices in equipment selection. I encourage the use of these words as a reference for ongoing technical and artistic sound making as well as purchasing decisions. The system is separated into 3 stages:

The Nature of Acoustics Stage 1:RAD: Reflection, Absorption & Diffusion

The Recording Stage 2 (Golden Rules):PICSS: Proximity, Isolation, Consistency, Sensitivity & Separation

Captured Sounds Stage 3:STAT: Sound Transparency & Audio Translation

Let's take these categories and apply them to some common applications and equipment such as microphone types, polar patterns, recording mediums, etc.

Stage 1 & Location, location, location:

As filmmakers, be it on set, in documentary scenarios or electronic newsgathering (ENG), we are always susceptible to acoustical elements, regardless of interior or exterior environments.

Sound also behaves differently in various spaces. This crucial factor is often overlooked in capturing sound and it generally affects your final product.

Therefore understanding basic acoustics is paramount.

In cinematography, we utilize the direction of continuous light in reflective and non-reflective instances to create a "look." We use reflectors to bounce light for desired results. Similarly, sound reflects off surfaces and may be utilized or minimized as necessary. In sound, **reflection** refers to waves bouncing off planar (flat/even) surfaces, thus resulting in a more focused direction.

Comparatively, sound waves coming off non-planar (irregular) surfaces, results in a **diffused sound**. With diffusion in cinematography, light can be spread more "evenly" or softly with Scrim Jims, Softboxes, etc. Diffusion in sound occurs when sound waves are uniformly distributed which produces a more "even" spread.

Reverberation, or reverb, is a result of the interaction between reflection and diffusion. It is created in an enclosed space which causes a large number of echoes to build up and then slowly decay. The result is a textural and sustaining effect that gives a sound the impression that it's in a physical environment, thus creating space and depth. As a general rule of thumb, try recording dialogue or sounds with as little reverberation and discrete echoes as possible. This will be more conducive and useful during the sound mixing process where "dry" sounds can be altered to create the sound of different environments like up close versus far away, or in a church versus in a cellar.

Absorption refers to a proportion or majority of sound, which is absorbed or "sucked up" by porous materials that are non reflective. Sounds captured and recorded in this environment type will usually yield maximum separation and isolation (as explained further down.) In filmmaking and cinematography comparisons, absorption is utilized to similar effect with flags, barn doors, etc.

Stage 2 & The Golden Rules:

Stage 2 has direct correlation to microphone types, selection, and "behavioural" polar patterns. However, it can also be dependent on Stage 1. We will look at polar patterns in a minute, but let's take a look at my 5 golden rules first:

Proximity – This is simply how close the mic is to the sound source. Other than the reason for which you run the risk of overloading optimum recording levels by being too close, proximity can also be utilized to increase the bass response of a sound or voice, thus "fattening" or providing more "body" to the sound. Proximity also picks up more direct sound amplitude, hence increasing the source signal and decreasing the noise ratio. Adjustment of your input gain

structure on your field recorder or device is key to recording at a correct volume level without creating distortion.

Isolation – In audio, this can adopt various meanings. Most sound stages or recording studios try to keep out external sounds and keep in the internal sounds. Isolation is also used to create acoustical properties required for recording sound with precision and accuracy. Therefore, it's no surprise that professional sound stages, sets and back lots are designed by acousticians to maximize this element. As for location recording, isolation might be as simple as utilizing shock mounts, preventing handling and extraneous noise or even eliminating a ground loop (ground loops are created by improperly designed or improperly installed equipment and are a major cause of noise and interference in audio and video systems).

Consistency – Having a multitude of mics in your audio kit can be a great thing. However, if utilized incorrectly without some planning and thought, it could spell disaster. Every mic is manufactured to different specs, thereby producing different sounds. Matching these sounds in postproduction can be cumbersome if multiple mics are used. Mics with consistent specs would make this less of a burden. So theoretically, you wouldn't swap mindlessly between shotgun mics and wireless lavs (lavalier/lapel mics) unless you didn't have a choice or the shot called for it.

Even if you have 3 shotgun mics in your kit (long, medium and short), nominate one mic, preferably a versatile mic such as the medium length shotgun, as your "primary" source. Name or call all other mics (utilized simultaneously with your primary mic) as "secondary" sources. Capture all other sounds (dialogue, foley, sfx, etc.) and then try match your secondary to your primary source in post through equalization and sound processing.

Another way to make sure you maintain consistency is to observe the use of any Lo-Cut & Hi-Pass filters across the board, whether on the mic itself, or on any portable recording medium or mixing console. Try to maintain the same method or protocol.

Sensitivity – This facet gravely depends on a microphone's type, anatomy, build and characteristics. Microphones are classed into a few categories with dynamic, electret condenser and condenser being the most common in film and TV use. This will be explained in part 2 of this article.

Sensitivity can also be separated into 2 important fundamentals: the voltage and the electrical output a mic will produce at a certain sound pressure level and its frequency response. Polar patterns are also a contributing factor to sensitivity. We will explore this in more detail when I discuss microphone comparisons.

Separation – Not be confused with isolation, separation is that clean, clear, full bodied, lush, presence and pristine audio quality. You can hear it in dialogue you hear between two actors amongst the chaos of a noisy and polluted city street, or a scene depicting a rendezvous in a large cathedral or old church with conversation between two covert spies.

Ideal separation is where whisper quiet sounds are distinguishable from very loud ones or vice versa.

Good audio separation is the result of:

- A) Observing what the acoustical environment or space does (stage 1)
- B) Recording a close source (stage 2-Proximity)
- C) Reducing or eliminating extraneous noise (stage 2-Isolation)
- D) Keeping your sounds cohesive and consistent (stage 2-Consistency)
- E) Choosing the best mic anatomy (focal length) with characteristics that would fit, support, compliment and augment all of A, B, C & D.

Stage 3 & the Fat Lady Sings:

Both are somewhat subjective, but at the very least, it's been an excellent reference for me and I'll show you why it's useful to think about.

In my first article, I made a brief reference to digital technology and how digital images and audio essentially utilizes data compression. Hence it is through data compression that we usually get artifacts in audio sonic clarity, images, video, etc. If compressed or encoded digital media can produce results that are perceptually indistinguishable from uncompressed formats, then they could be considered "transparent."

Sound Transparency – Digital and solid state field recorders, recording mediums and computers are all used to capture and record video and audio. They also use AD (analogue to digital) and DA (digital to analogue –for playback) conversions.

Basically, in more expensive and higher end sound equipment, the AD chips and the conversion process are of a superior quality.

For example, the pre-amp and analog to digital conversion chips in a Zoom H4N may produce more artifacts in audio quality and have a higher signal to noise ratio when compared to a Marantz PMD 661. Understandably, you will pay twice the amount for a Marantz. On larger or bigger budget productions, sound recordists use sound carts with digital hardware components that sport expensive stand alone mixers, pre-amps, AD converters, recording devices and computers.

Transparency can also apply to microphones, where some are more "coloured" than others. Dynamic microphones tend to be more coloured when compared to condenser mics. Condensers are subjectively more transparent, sensitive and sound accurate. More on this shortly.

So therefore, one could suggest that transparency is where compression artifacts are nonexistent or imperceptible and in audio, a pure and untarnished sound with a broad frequency response is desirable.

Audio Translation – This is a term I've heard used around the industry and its meaning has a "final" sort of significance.

OK. Here is a scenario you might be familiar with before you wrap your head around audio translation. Think about this:

You've just shot your first scene under tungsten light with a very expensive camera. Unfortunately, your white balance was set to daylight and the external monitor you were using wasn't calibrated. You ingest the footage in post, prep for edit and grade and then start wondering why it doesn't look like anything you envisioned on your \$200 eBay computer monitor. Get the point?

Based on these common mistakes and general technical errors, the same thing can happen when capturing sound. This means that sometimes what you hear isn't really what it will sound like!! What you hear can come from inferior mics, and through headphones and speakers. Wrong equipment operation, selection and choice can affect our final recorded product.

In film, we use a plethora of software and hardware devices to calibrate our monitors to ensure that the recorded image is "transparent", color reproduction is accurate and picture quality is sharp. In audio, we must utilize more than one monitoring reference device. These include multiple speaker monitors and headphones. In audio, a sound may translate well on headphones but not necessarily well on speakers. This means that making sure that your recorded audio is "transparent" and accurate will mean that it will translate well on any playback system. Please invest money on some decent sound location recording headphones.

Now with a little more understanding of these 3 stages and my acronym method, we will take all this information and make educated assessments to distinguish microphone types (where & when to use them), recording mediums (what to look for) and gear selection (price vs performance) in part 2.

Stay tuned...

Tools of the Trade, Part 2 ~Clinton Harn



CLINTON HARN

In Part 1, we concluded that familiarizing yourself with my acronym system and the 3 fundamental stages in observation was important in technical decision making. In this installment, we will look at microphone types plus when and where you might use them.

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Here are the 3 most common microphone types utilized in Film & TV:

- 1) Dynamic Mics
- 2) Electret Condensers
- 3) True Condensers

Dynamic Mics

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The term dynamic stems from the word "dynamo" which is a device that generates electrical current. A dynamic mic creates its own electricity through a magnet and a coil that move in tandem. This back and forth movement creates electrons and therefore generating electricity to power the microphone. This means it doesn't require outside power or voltage.

Dynamic mics are usually more colored and not as "transparent" (refer to part 1) or sensitive. However, they are typically more robust and can handle higher SPLs (sound pressure levels); therefore providing more gain (volume) before feedback. Dynamic mics are also inexpensive and highly resilient to moisture. Additionally, they are great for recording close proximity sounds and rejecting background noise. This is why you sometimes see ENG crews using handheld dynamics when reporting in natural disaster or war zones.

So with this in mind, in application, dynamic mics are frequently used for recording sound effects. This includes Foley or sound effects with high SPLs such as explosions, gunshots, motor vehicles or aircraft and jet engines. Basically, they are good for recording anything "loud." You are better off recording loud sounds with a dynamic mic because they are better suited to these applications.

As filmmakers, shotgun mics (condensor), or "on-camera" mics (electret) are all we generally have in our "vocabulary" when recording sounds. Think of expanding your audio kit by including dynamics microphones in your arsenal. Here are examples of brands and model types. It's not a definitive or extensive list but these are the microphones that are most commonly used:

- Shure SM57 & SM58: *Considered an industry workhorse for almost every sound application.*
- Beyer Dynamic M88: *A mic that is "punchy." This model boasts a good reproduction in mid and bass frequencies often used in high SPL situations.*
- Sennheiser 421: *Commonly used on very loud guitar amps and cabs for music production and live sound reinforcement. Think of the potential in sound design and effects gathering for film. Want proof? Check out the video of Peter Jackson's "King Kong" in sound design for Pre & Post production on YouTube below. See if you can spot the Sennheiser 421 @ 3 mins 25 secs.*
- Audix D1, D2, D3, D4 & D6: *A great company that makes dynamic mics suitable and tailored for almost every possible scenario. Tip: Try the D6 on the rev of a Mustang engine. Its ability to handle SPL and its low frequency response accentuates the rumble and power. The high frequency boost also adds incredible presence.*
- Electro Voice RE20: *A mic very commonly used in radio broadcast that gives a radio presenter or disc jockey full and rich presence to her or his voice. Even though the TV program, Frasier, is fictitious; when Dr. Frasier Crane is talking into the mic, that very mic is an RE20.*

Electret Condensers

This term comes from the mic's need for external electrons to power the mic. Therefore, electret condensers require a cell type battery that stores electrons. Electret condensers also have a thinner and more sensitive diaphragm than a dynamic mic. These mics use a "capacitance" circuit that meters or measures the pressure against the diaphragm and uses the battery to dispense electrons.

What this all means is that an electret condenser is simply 3-4 times more sensitive than your

dynamic mic. Where a dynamic mic is most optimal within close proximity to a sound source, an electret condenser can be deployed a few feet away from your actor and still have the ability to record audio information with more detail, richness, transparency and accuracy.

Typically, an electret condenser is an alternative for filmmakers and sound recordists who want a sound similar to a true condenser but are on a budget. They are portable and convenient when phantom power is not available. They are often used as a back up option and are also affordable. However, most electret condensers use a 3.5mm (1/8 inch mini) stereo (wired as mono) connector type instead of the professional XLR connector. Some do use an XLR connection but are also powered by a battery. ***They are not the serious answer to an audio kit when going for professional results.***

Here are examples of types, brands and models that use the electret condenser principle. The following may consist of not only of shotgun style mics, but also instrument or general type mics for Foley or sound effects:

- Rode NTG 2, M3, Video Mic, Video Mic Pro & Stereo Mic: *The Rode video mic, video mic pro and stereo mic seem to be all the buzz at the moment, but it's target is primarily the consumer market. However, other than Rode's clever marketing campaigns, their Pin Mic deserves a notable mention and is worth checking out. It features a very unique design and discreet profile. The NTG's have always been popular due to their affordability.*
- Sennheiser MKE 400: *Again, another mic that is targeted for "on-camera" use.*

Condenser Mics

Condenser mics are also known as capacitor microphones. This includes shotgun mics, studio mics and lavaliers. Most budding filmmakers and sound recordists forget that a majority of professional shotgun mics are true or genuine condensers. A true condenser mic simply uses the same capacitance formula. The difference this time is that the mic doesn't have a battery compartment and needs phantom power (from an external source) in order to power the mic.

A true condenser mic is a high fidelity recording instrument, which produces higher-quality audio by comparison to its electret condenser cousin. It is manufactured in most cases, in an attempt to provide true and accurate frequency responses by comparison to dynamics or electrets. The intent is – what you hear is what it sounds like, hence the term “transparency” in part 1. So think of it this way, if the electret condenser is more sensitive than the dynamic mic, the condenser is even more sensitive and offers a better frequency response. It is also more accurate and transparent than the electret condenser.

Here are examples of various common industry condenser “shotgun” and “lav” type mics:

- Audio Technica AT875R, AT4073 & AT4071: *Incredible mics. They have been major players in the mic industry. They make high quality products and should receive more credit and product awareness than they get.*
- Audix SCX “One”: *A boutique company that specializes in instrument mics. I have used their mics for over 10 years now in both live and studio applications. Although they don't make mics specifically for the broadcast industry, the SCX Ones are their flagship small diaphragm*

condenser mics. I use these as extra short shotgun mics in the cardioids configuration to capture dialogue indoors and also as "plant" mics. You can hear the audio quality in my introduction video for Zacuto here.

- **Sennheiser MKH 416 & the EW lavalier series:** The MKH 416 has been the staple of condenser shotgun mics and hailed as a very popular choice amongst professionals. Lavaliers like their ew100 G2 series are also utilized frequently.

- **Sanken CS-1, CS-3e & COS-11D:** Again, industry standard and state of the art mics with a focus on film and broadcast. Expensive but well worth the price tag.

- **Schoeps CMC 641 & CMT 5u:** Long cherished and revered by location sound recordists, these mics tend to have the least colouration, amazing off axis rejection and are extremely versatile.

That wraps up the Tools of the Trade part 3. Next time, we will discuss polar patterns.

Tools of the Trade, Part 3 ~Clinton Harn



CLINTON HARN

Before we look at the next section, which discusses Polar Patterns, wrap your head around this:

Basically, there is no such thing as a "zoom" mic. The most common shotgun mic's purpose is to "collect" sounds from the front of the capsule. They use phase cancellation and rejection ports on the side and rear to achieve this result of directionality. Yes, technically that's correct, but it's often complicated marketing jargon used by mic companies to convince you that their product is better and that you should buy it.

I'm not going to assume that most of you reading this have prior knowledge. Instead, I want to give you simpler references, make you feel like you can learn and actually go out and do this! Therefore, I will use film analogy to cement both microphone types and patterns. So, here is how I distinguish the functions.

Much like we have prime lenses that have faster or slower aperture speeds and are susceptible to light conditions, we have also have dynamic, electret condensers and condensers that react faster or slower to sound sensitivity and volume.

In film, we also have the "coverage" of lenses and camera sensors. Think of frame coverage from an 11mm wide-angle lens to a 85mm portrait lens, primes and zooms or the differences between a micro 4/3s and a crop sensor to a full frame image camera. Well, now apply that same concept of "focal length" or "coverage" to the various polar patterns that microphones offer in the ability to pick up or capture the directionality of sound if we could see it.

So now let's look at some common Polar Patterns, literally.

First, I'd like to thank my colleague and editor, Mike Crick, for the following illustrations. I specified the importance in simplicity of polar patterns in application.

In these pictures, I have placed an individual (being the sound source, ie. dialogue/speech) at the upper end of a square room and stationed a mic consistently in the middle of the room in all 4 images. This is to illustrate the directionality and functionality of various polar patterns.

So, by simply moving along the "proximity" grid line, closer or further to the sound source, you achieve more or less level. This also indicates the "reach" of each polar pattern. The polar pattern remains consistent in each instance, but the timbre of your sound will change slightly as it is now susceptible to acoustical reflection, absorption and diffusion because of the proximity of the walls. Check out my R.A.D acronym in [part 1](#).

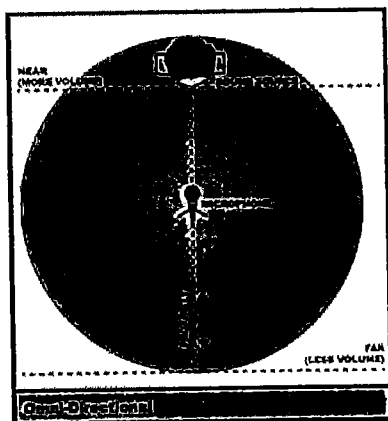


Figure 1

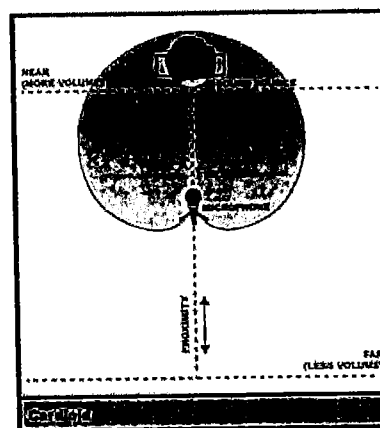


Figure 2

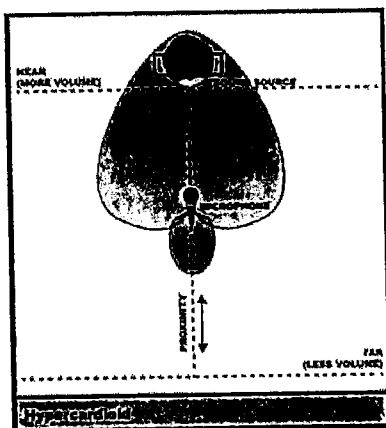


Figure 3

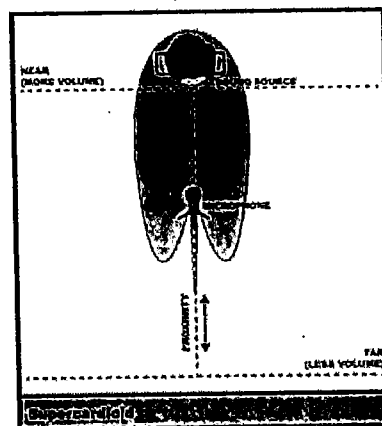


Figure 4

Polar Pattern Characteristics and Applications

Omni-Directional (also known as non directional) (Figure 1) mics pick up sound from all directions in an almost 360 degree spherical shape. In theory, omni type microphones eliminate

directionality and can also be regarded as “transparent” or “pure” in which sound colouration is minimised.

Mics that employ this polar pattern are generally lavalier mics, both wired and wireless. Some handheld mics, for Electronic News Gathering, also use this particular polar pattern.

Practical Applications and Tips:

- Excellent for exterior scenes where echo or reflections are not an issue. Even with the 360 degree pick up pattern and close proximity to the subject, the signal will be greater than the extraneous noise bleed.
- Also ideal in a controlled environment or treated sound stage where multiple actors have to be mic'd for dialogue.
- Easy to conceal on an actor and creates “mobility” when a wide shot does not permit for a boom mic. Sound is also consistent when the actor moves his/her head around while speaking.
- Not ideal in very tight spaces where the pickup pattern is susceptible to delay or ambience. The omni pattern can also pick up extraneous noise bleed and room reverberance while not properly separating dialogue from ambience.

Cardioid (Figure 2)

The cardioid pattern is the most common of directional mics and is called cardioid because of its inverted heart shape like pattern sensitivity or “focal range” to sound.

Cardioids are also the most misunderstood and underutilized pattern in independent film and broadcast. They are widely used in music production, Foley and sound design. The studio cardioid condenser is the staple of any audio engineer's diet. Contrary to popular belief, the narrow or omni pick up patterns are not the only means of recording dialogue for interior scenes. Cardioids can be considered a specialty pattern in film and TV. They usually exist as extra short shotguns, but are described as small diaphragm condenser mics in audio engineering terms. They are wider in “focal point” than standard shotgun mics with narrower patterns. Cardioid patterns can also be found on some lav mics.

Practical Applications and Tips:

- Excellent for interior scenes, low ceilings and confined spaces where echo and ambience is an issue.
- Does a great job of minimising echoes and creates more natural sounding dialogue with amazing, clear and pristine results.
- Best choice for car interiors. By placing or concealing cardioid lavs or smaller cardioid mics on sun visors or headrests in close proximity to the actor's head, the mic will yield clearer and richer dialogue. Experiment with your placement and remember, cardioids have excellent rear

axis rejection, wide enough to sound natural and are not too open like an omni. With an omni, you hear everything from engine noise to wind.

- These patterns don't have much reach or side rejection, but they do have a wider pattern that can cover two people with no need to swivel your boom. Great for close ups and medium close ups.
- Ideal pattern when "planting" or hiding mics amongst props within a set.
- Excellent choice for recording sounds and effects in Foley applications.

Hyper Cardioid (Figure 3)

A polar pattern that is more narrow and tighter in sensitivity when compared to the cardioid pattern. This polar pattern has more side rejection, more reach and a small "lobe" of sensitivity at the rear. This pattern is commonly found in short to medium shotgun mics.

This polar pattern is perhaps the most versatile and consistent while keeping "mobile" and recording dialogue indoors or outdoors.

Practical Applications and Tips:

- A mic with this pattern will cover your general audio recording needs if you're on a budget or if you need to make an initial purchase.
- A good general starting point as a primary microphone pattern, while blending or matching all your other mics and pattern types to this one.
- Handy for general mono recordings either in the field or in the studio for Additional Dialogue Replacement.
- Mics available with these patterns are available in small form factors, which are light, portable and convenient.
- Mics available with these patterns are small enough to mount on cameras if you don't have a dedicated boom operator or sound recordist.
- Has a more prominent "focal point" and reach compared to the cardioids. This can accentuate sound from behind the sound source when held vertically. Think of a higher F-stop on a lens, which throws everything else in the background more in focus.

Super Cardioid (Figure 4)

An extremely tight pattern as far as sound sensitivity is concerned. The super cardioid has the highest possible directivity and is sometimes listed as a line + gradient. It also has a narrower lobe on the rear, which picks up some sound. This polar pattern is usually found on long to extra-long shotgun mics.

Practical Applications and Tips:

- Fantastic for outdoor applications and noisy exteriors.
- Superior reach or "focal length," especially when you cannot get the mic close to the sound source.
- Ideal for wider framed shots.
- Negative characteristic of extreme narrow pattern means that a lot of ancillary sound is picked up from the rear of the pattern.
- If shooting indoors, any set, crew, sound activity and room echo reverberant properties will also be picked up.
- Make sure to observe my R.A.D acronym argument when using super-cardioid related mics indoors.
- Remember to use these polar pattern type mics (ie. long and extra-long shotguns) with adequate support systems such as suspension mounts, blimps, zeppelins, windscreens and wind jammers, etc. to minimize wind and handling noise.

Tools of the Trade, Part 4 ~Clinton Harn



CLINTON HARN

Since we now know various microphone types and applications, the next step is to observe support systems and how they affect your general efforts with handling and placement techniques. As a bonus, I have included a video on tips and techniques for capturing clean audio in car scenes.

Mounting and suspension devices are crucial. If you remember the P.I.C.S.S acronym from the first article, I mentioned the importance of isolation and consistency. These properties can be achieved by ensuring that you research and find mounting systems that support your microphones very well.

- I recommend that you choose companies or products that solely focus on shock mounting and suspension technology. This is a good indication that you'll get a great product that serves the purpose.
- Know your equipment and how it performs and functions in the field. Be familiar with its advantages and limitations.

- Choose a light, preferably carbon fibre, boom pole to mount your shotgun mics. This will minimize physical fatigue.
- Internal coiled cables within boom poles can induce noise during handling while normal boom poles with exterior coiled cables can prove cumbersome. Try both and then stick with one.
- **PRACTICE!!** Practice your handling skills, period.
- Purchase a small and large blimp/windscreen/zeppelin, with dead cats if your budget permits. Use one for a medium shotgun and the other for a large. Swap between both for interior and exterior scenes. Otherwise, just go for a medium.
- Some of these windscreens also incorporate pistol grips that can be handheld. They also have the option of mounting onto a boom pole.
- Acquire suspension mount systems that will cater to the microphone types in your audio kit. This will allow you to mount or plant these mics in various places.
- Two names that come to mind immediately are Rycote and K-Tek. Both are reputable companies that make accessories specifically for audio and sound support. They are the industry choice of many location and studio sound recording professionals. Personally, I use Rycote because of their reputation, build and reliability. However, you should do your own research and find products that suit you and your budget.

In the next instalment, we will look at recording, digital storage mediums, sound to camera and double system sound. We will also take a look at understanding how to set optimal levels, technical parameters and what characteristics to look for when buying gear.

The Metaphorical “Budget” Allocation ~ Clinton Harn



CLINTON HARN

These series of videos (#3 & #4 coming soon) are not reviews of field recorders or recording mediums, but are solely intended for the purpose of discussing the choices, advantages & disadvantages, and selection of hardware depending on job applications. Hence, I've enlisted the interview type scenario with my colleague, Greg Simmons, an experienced field, sound & location recordist, to talk about audio acquisition. It's important to note that this sound series was designed for aspiring filmmakers who want to further explore audio recording fundamentals.

Greg and I discussed this at great length, and that is, what constitutes a great sound recording? Is it how much money you should spend on an audio kit? I often ask aspiring filmmakers a simple question. “Would you buy something that cost around \$400 to utilize as your main camera to shoot a feature, indie short, documentary, etc, and expect the little thing to capture gorgeous footage?” Well, there are smart phones, compact pov cameras, etc that will stack up if you're doing web content. Regardless, it seems like while we spend bucket loads of money on new cameras, we treat audio acquisition like “spare change”.

Today, the likes of Zoom, Tascam, Roland, etc seem to be all the rage for cost effective solutions, while the Nagra, Aaton Cantar, Sound Devices, Zaxxon recorders etc, are the staple choice for industry professionals. Watch part 1 below, <http://www.zacuto.com/clinton-harn-sound-series>

So does this mean that the more money you spend, the better your recordings will be? Well, as Greg stated, this matter can appear quite subjective. Nowadays, solid state & digital technology has enabled us to capture sounds, and the differences in results are often negligible to the untrained ear. High-end manufacturers often argue that compact or surface mount technology units are usually inferior compared to larger ones. The more you pay for something, you'd expect it to yield better results. So, through extensive testing, Greg and I came to this metaphorical conclusion of budget allocation. Your "front end" such as a great mic makes a massive difference. See part 2 below now!

In part 3 of this video series (coming soon), we came up with priorities of components that followed in this order. Your final sound is the result of percentages with the microphone bearing 85%, 10% being the quality of pre-amps on your recorder and 5% allocated to your analog to digital converters:

I'd like to reassess that conclusion and perhaps suggest that it should look something like this: 50% is the USER 35% your mic, 10% Pre-Amps & 5% your A/D converters. Get my drift? I realize this opinion may differ amongst individuals, but it's certainly a good place to start thinking about your gear selection, recording methods and workflow.

Coming soon will be video #3 and #4. Stay tuned!

The Metaphorical "Budget" Allocation, Part 2 ~ Clinton Harn



CLINTON HARN

Featured recorders in these video discussions were the Zoom H4n, Roland R26, Marantz PMD 661 and the Nagra. These choices were neither intentional nor influenced by the vast popularity of its sales. These are units we have used extensively or had on hand at the time. While there is debate amongst serious sound recordist & indie filmmakers on "prosumer" units, they can also often be "under utilized". Let's explore why.

For argument sake, let's compare 2 popular audio recorders for the HD/SLR market. Current trends show that some have opted for the newly released Roland R26 over the Zoom H4n. The fact that it records 6 audio channels simultaneously and the touch screen function are major selling points. The R26 is larger in form factor, and the unit incorporates 2 combo XLR inputs, an onboard XY coincident pair and a pair of spaced Omni mics. While recording simultaneously for example, the XY pair may sound great but the spaced Omnis may not be at an optimal position depending on the sound source. The notion of more is better doesn't mean it's conducive to a good recording. Ultimately both the R26 & H4n have identical options of 2 XLR

inputs. Take away the other bells and whistles, and effectively you have a stereo recording medium. One very legitimate appeal of the R26 any professional sound recordist will tell you, are the large rotary knobs designed for adjusting incoming signals. This is important when you need to "ride" or adjust input levels on the fly. While the H4n doesn't have large rotary knobs, the little unit is often underestimated. You only have to look at its popularity & sales statistics. Stay tuned to watch part 3 as we explain why.

The dialogue in these videos when done using a single Schoeps CCM4 compact cardioid microphone, mounted on a Rycote Lyre system and a fixed boom pole approximately 2.5 feet above & between us. Audio was recorded onto a Marantz PMD 661, which is still a favorite unit of mine for a number of reasons. While the 661 is a tad more expensive, the signal to noise in its pre's are significantly quieter, it has a digital spdif input which allows me to bypass it's internal A/D converter, and use it in conjunction with my Apogee pre amps and standalone A/D converters. It also has a pair of unbalanced RCA line outputs should I need to connect it to a playback system. Not ideal but handy nonetheless. Metering is both LED and on screen. And lastly, Neutrik XLR input connectors and a proper 6.5 TRS headphone output jack for monitoring spells reliability for me.

As discussed in my previous articles, using a single cardioid mic indoors to record 2 subjects can sometimes yield more natural results. In the past, I've been asked why I haven't used a Lav mic. Well, keep in mind that placing 2 Omni Lavs on either of us within close proximity could have induced comb filtering. Also, the space we shot in is right next to a major traffic intersection & under a flight path. Considering the extraneous noise, the dialogue was processed only with a roll off filter and a minuscule amount of compression.

For those of you that still are not willing to explore the options of recording separate sound, and would rather opt for convenience, portability and capturing straight to camera, I'd recommend checking out Robert Rozak and his audio solutions. He is the founder & president of Juicedlink products. Robert is passionate about his stuff and provides excellent educational info too. Another terrific resource for serious aspiring sound recordist is a discussion group JWS Sound Group Another worthy mention is GearSlutz com for those who want to explore audio pre & post production a step further.

I studied audio engineering by necessity as I soon realized the relevance it had if I wanted to aspire and become a versatile & consummate professional. Constant research & practical field recording & studio time is essential in drawing any type of conclusion when making decisions on buying equipment.

Misinformation is often fueled by ignorance or generally by hear say. And with the influx of mindless blogging, bombardment of media content, reviews & opinions, finding out what equipment you need best becomes even harder. Hence I urge you to check out the websites I mentioned above.

In conclusion, it would be safe to assume that there is no such thing as one ultimate recorder. Different models have their own merit and it greatly depends on what your job requires from

you. It's refreshing to hear from someone like Greg who loves his quality units but still acknowledges the merit, functionality & advantages in cheaper recorders for folks on a budget. But as the saying goes, you pay for what you get. Now, it's time to sell my left kidney to buy that Aaton Cantar-X2 I so desperately want.

Video Tutorials: Capturing Sound in Cars ~Clinton Harn



CLINTON HARN

I have been providing the film community with several articles educating filmmakers on how to capture excellent audio. Now, it is time to give some video tutorials. These first two videos demonstrate how to capture car interior sound. In this first video, I will discuss 3 simple techniques, microphone types & placements for car interior sound.

In the part 2 video, you will hear the audible differences using these methods discussed in the part 1 video. There will always be continued debates in regards to equipment selection, choices & methods, however, the objective of these tutorials, both written & video, aims to provide cost effective and practical solutions to independent filmmakers without breaking the bank balance. The main goal in this video is to illustrate the point that you can yield very useable & desirable results. Keep in mind that these results will vary depending on microphone types, recorder types, analogue to digital conversion quality, different placement & mounting options, proximity, etc. The important part here is to capture clarity, and keep experimenting to yield better sonic fidelity. All audio samples of dialogue in the following in-car video are unprocessed and have no EQ on them. Only a low-cut filter was applied. This is a good starting point, and provides more latitude to mix & process during sound editing or at a later stage. Enjoy & Learn!

Tools of the Trade, Part 4 ~Clinton Harn



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[Watch Clinton Harn's Location Sound Car Interior, Part 2 Here!](#)

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Clinton Harn is a producer, filmmaker, session musician, drummer and recording engineer. His involvement in tertiary education has spanned the last 15 years and includes concepts, realistic and practical tips and methods for achieving professional results in the field of small business, filmmaking & audio recording.

