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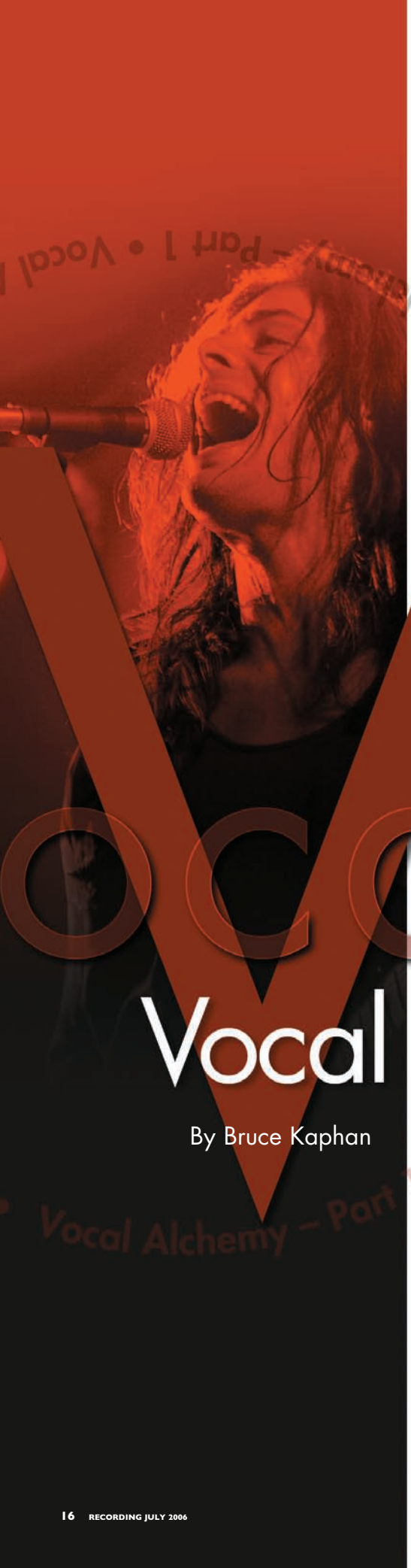

Vocal Alchemy – Part 1

By Bruce Kaphan

For many years I've thought of mixing as alchemy. Merriam-Webster defines "alchemy" as

1 : a medieval chemical science [...]
2 : a power or process of transforming something common into something special
3 : an inexplicable or mysterious transmuting

Don't you agree that meanings #2 and #3 just hit the bullseye?

No, it wasn't meant to be simple

I was recently asked to do some last-minute work on a project for an artist who wanted me to tweak a few of the mixes that his producer/engineer had done on a Pro Tools LE system in his home studio. When I opened these "mixes", I was confused by the sound—the material seemed unmixed to my ear, and contained hardly any plug-ins or eq.

When I called the producer/engineer to make sure I had the right files, it took me a few minutes to pick my jaw up off the floor after listening to his reason for this absence of processing. He said something to the effect that mixing this particular genre of music required a certain purity/simplicity, hence the absence of plug-ins.

Balderdash! Tell me what is so pure and simple about *anything* having to do with recording! My point of view is that there ain't nothing pure and simple or natural about any aspect of creating recordings. It's an incredibly complicated amalgam of art and science, the point of which is to create a work of art that *didn't exist* before. In my humble opinion, this precludes the notion that an uncomplicated signal path has any inherent artistic value unto itself. Make the listener *feel* something, using whatever means you have at your disposal!

Sure, in the old days (some time after wax transcriptions, but before DAWs) when every addition to a signal path almost undoubtedly meant an increased noise floor, there would have been a degree of merit in trying to keep signal paths simple. And it could certainly be argued that with a world-class signal chain, chances are better that just a great mic and a great preamp are all you'll ever need for tone shaping. But most Pro Tools LE studios I know of are lucky to even have a relatively decent collection of mics and pres, and the utter beginner may not even be at *that* point yet.

Mixing, to me, means donning the alchemist's hat and stirring the cauldron until something special comes out of the mix. Other than the subtle improvements mastering can bring about, mixing is the last opportunity to make the most of the images you've collected so carefully—do what you need to do to make it sound as good as it can sound. Anything less is a copout.

Do you like to mix?

For years I found mixing much more daunting than pleasurable. I loved tracking, but mixing seemed so impossibly complicated to me! I began mixing in the early eighties when cheaper studios had no automation. A mix generally meant an engineer plus a couple of band members elbow-to-elbow at the console, watching the tape position locator, creating and reacting to carefully considered scripts created over the course of hours of listening and manipulation, moving knobs, switches and faders manually to the pencil marks carefully marked on the console over the course of the day.

A complicated mix usually went well into the wee hours and if everyone was still speaking to each other the next day, it was usually to lament the handful of problems with the mix. And by then, the studio was likely completely reset and in use by

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another client. Console automation improved this scenario greatly, but it wasn't until the advent of the DAW that I really came to *love* mixing.

These days, I like to mix by myself. When I feel the mix is finished, I'll upload the mix—from there on, it's up to my client. If they like the mix as is, we're finished. If they want to change anything about it, no problem, since it's 100% automated. They email me with suggestions; I make the suggested changes, upload the new version, and so on until the client is happy.

What mixing means to me

My intent in mixing is to aid and abet the song, singer, and producer in order to make the listener *feel* something when they listen to our collective work. In a mere magazine article I couldn't begin to list all of the elements that have gone/go through my conscious and subconscious mind when it comes to mixing. The art & science that go into mixing are indelibly intertwined and as such the possibilities are literally infinite any time one mixes.

With these concepts in mind, please excuse the ultra-simplification I will be using throughout the remainder of this article, when it comes to pointing out this dichotomy of art and science—I'll point to the "science-side" or "art-side" from time to time, and hopefully you'll be able to follow the thread of my thoughts more ably as a result.

In the course of this article, I hope to convey many tips for making vocals be all they can be. Obviously, a mix is only as good as the tracks allow, so getting a singer to give a compelling performance and requiring that the engineer capture it well are imperative. Are there rules? Aside from controlling levels to avoid digital clipping, the only significant general "rule" of mixing that comes to my mind is this:

Everything you change changes everything.

Mixing is entirely about the relationships within a mix. Change one thing and you've changed its relationship with *every other element* of the mix.

Lead vocals

Popular music is most often composed of a *lead vocal* supported by instrumental and possibly *backing* or *background vocal* performances. Whenever a lead vocal is present, it should dominate the arrangement. There are many techniques the mix engineer can use to make sure the lead vocal is dominant. These include techniques for increasing the robustness and consistency of the lead vocal, as well as techniques for insuring that other tracks stay out of its way. As for backing vocal tracks, there are numerous approaches that can be taken either to adhere them to the lead vocal, to blend them into the instrumental tracks, or to have them stand as an independent entity in-between the lead vocal and the instruments. Elsewhere in this issue, you'll find discussions on background vocals.

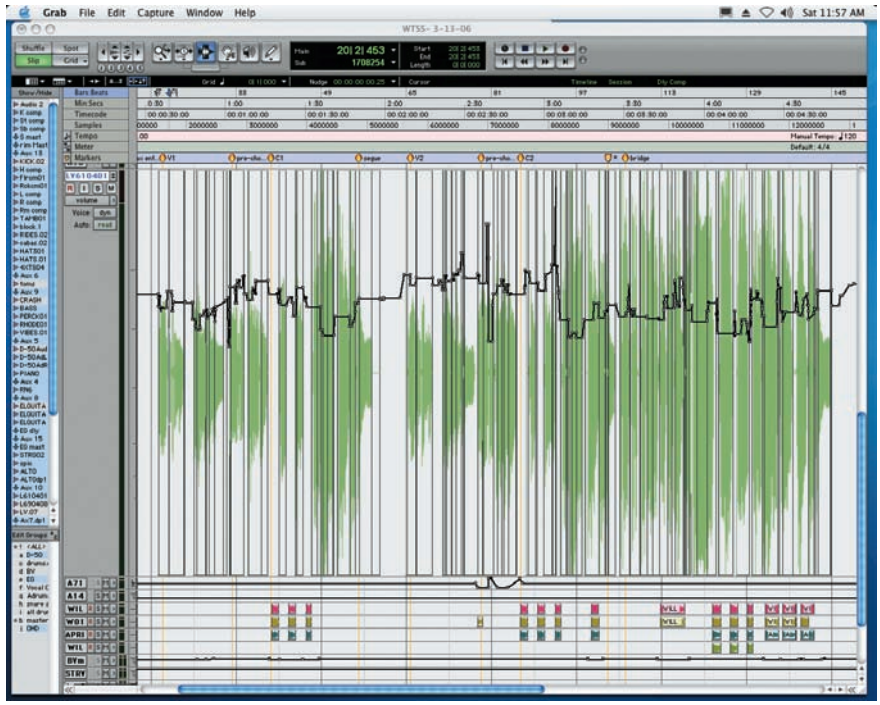
No amount of engineering can substitute for a good musical arrangement or performance. A well-produced track suggests its own mix. A track that is less well produced makes mixing a chore, so if you have any control over tracking while it's happening, it is best to keep an ear toward how the tracks are adding up with respect to envisioning the mix before it begins. The same goes for mixing both vocals and the instrumental parts of the track. Making a lead vocal stand out is just as much a function of how the instruments and backing vocals are mixed as it is of how the lead vocal is treated in the mix.

Robustness of a lead vocal in a mix can be achieved in many ways. Work that can be done to the lead vocal track itself includes panning, dynamic processing consisting of compression and/or limiting, eq, leveling, time-domain processing which includes the use of reverb and delay, and pitch processing such as harmonization. Then there is ducking, using the vocal track as a sidechain trigger to "duck" or automatically control the gain of other tracks in the mix, thereby carving more space for the vocal and thus increasing its perceived dominance in the mix.

Panning

Panning is such a basic element within a mix, but often presents a deceptively difficult task. Any time I find myself working on a complicated mix, I'll play around with different pan positions until I find a combination of pans that satisfies my desire for maximum intelligibility and panoramic interest, while maintaining left-right musical arrangement and sonic power balance. Often, I'll settle on a pan scheme early in the mix process, only to fiddle with it more, hours later. Essentially all of this is art-side (in the ear of the beholder), but intelligibility and sonic power balance are very real concerns of the science-side of mixing.

A good pan concept allows individual tracks to be more intelligible at lower gain levels, thereby increasing the dynamic potential for the overall mix. Good left-right balance is fundamental to giving the listener the most pleasurable, interesting and diverse listening experience. The center is the most obvious pan position for the most important element of a track. This is usually where a solo lead vocal is positioned. In a duet vocal, often the two lead vocalists will be slightly panned off-center, one slightly left, the other slightly right. In my experience this can be single-digit percentages, up to 25% left/right, but there are no rules other than satisfying your ears.



A lead vocal track with extensive volume automation changes as described in this article. The vocal is from "When Time Stands Still" by Jeffrey Wash.

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To emphasize the importance of the centered vocal image(s), when mixing the instruments, use the stereo (or surround, for that matter) field to its maximum potential. Don't be afraid to push sounds out to hard left or right. Everything you do to keep the center available for the most important elements of the mix will make those elements more intelligible.

Of course there are significant art-side considerations to hard-panning—it may be too distracting to have an individual track panned all the way to one side or the other. Hard panning can also create science-side problems, mostly when it comes to elements of the mix that require a lot of power to reproduce, i.e., bass sounds. The lower the frequency, the more difficult it is for the human ear to perceive directionality. This is one really good reason why kick drum and bass are usually panned dead-center—off-center bass dimishes the overall loudness. You might like to hear something else, but since louder is more attractive (literally) to the average listener, most pop music producers will go for "loud" rather than for "quirky".

Dynamics Processing

Dynamics processing of a lead vocal can dramatically improve the way it sits in the track. I almost never record a lead vocal without inserting a compressor or limiter into the recording chain prior to the recorder; regardless, I often use a compressor or limiter or both in the lead vocal chain during mixdown.

When mixing, when I first begin listening to a lead vocal, while considering how I may want to process it, I listen to how it sits in the track. If the vocal recording is an absolutely perfect fit for the rest of the mix, I'll leave it entirely alone, applying no processing at all. Truth be told, even when I have tracked everything myself, this is a relatively rare occurrence. If there are particularly loudly or softly sung regions of the performance, I'll go through the track and write volume automation to make the vocal sit in roughly the right spot from top to bottom, and listen to it in this improved perspective.

If there are severely resonant or harsh frequencies in the vocal (often as a result of a not-so-great choice of mic or preamp or a not-so-great-sounding room), I'll consider inserting a multiband compressor at the top of the chain, so as to tame these problems before they hit additional processing. If the vocalist's technique in combination with the tools and techniques used by the recording engineer have left some syllables popping out of the mix, I'll insert a limiter at the top of my inserts.

If the above steps make the vocal sit perfectly, I stop adding dynamics processing. But if the perceived robustness of the track is still somewhat inconsistent, or if I feel the track needs to sound more robust overall, I'll insert a compressor. Whether I insert this before or after other processing is based on what I feel the vocal needs in terms of overall processing. If I intend to eq, de-ess or excite the vocal, I'll need to decide whether the compressor comes before or after this additional processing. As if knowing which tools to choose at all isn't complicated enough, the order in which they are placed can profoundly alter their combined effect.

Limiting

I almost always choose a Waves L1 limiter to correct the above example of syllables popping out of a mix. I like it because it is a "lookahead" limiter, meaning that it analyzes peak levels before they occur and processes accordingly. This results in less perceptible processing. I also like it because the controls are few, extremely straightforward, and very easy and fast to use.

The manual accompanying this software warns that limiting more than 6.0 dB can result in distortion, so generally, I'll instantiate an L1, select the control that allows me to adjust both threshold and output simultaneously, and drag that down to –6.0 dB. I set the release so that it seems musical to my ear. Generally this is a little slower than the default setting. The net result of setting the L1 this way is that the average level remains essentially the same, while peaks are reduced by 6.0 dB.

Once it's set this way, I'll play the vocal track from top to bottom, watching the gain reduction meter and listening to the effect on the track. Once I've run the entire track, assuming that the meter shows some activity, I'll generally make up the difference in what it read, by dragging the both-levels-at-once control to a setting which nets a total of 6.0 dB worth of gain reduction. For example, let's say that running a vocal track with threshold set at –6.0 dB, the gain reduction meter reads –3.4 dB of gain reduction. To obtain the maximum gain reduction before distortion (6.0 dB), I can realize the 2.6 dB potential by setting the threshold and output to –8.6 dB. The next time I run the track, the gain reduction should read –6.0 dB.

Of course, one must always be listening to the track—does the adjustment you just made make the track sound better or worse to your ear? This is obviously an art-side call. If the track is *wildly* inconsistent, or if there's just one peak in the entire track that triggers the limiter, you can always consider automating the limiter's threshold control.

Compression

When it comes to compression, there are so many good plug-in choices available these days. I use Digidesign Smack!, Joemeek SC2, and either the Bomb Factory LA2A or LA3 emulators the most, but I also sometimes use the Focusrite d3 and Digidesign's Slightly Rude Compressor. I also occasionally use McDSP's Analog Channel 2. This plug-in isn't a compressor per se, but it does perform gain reduction, from the standpoint of emulating tape compression.

More often than not, since I almost always automate lead vocal fader levels, I use compression to smooth out inconsistencies in lead vocal level, but even more so to impart a perception of robustness to the lead vocal.

All of these and other compressors available offer a variety of controls. Across the board, the only control they all share is output level. Some have an input control that is independent of the threshold control; some do not. Some have attack and release time controls; some do not. Some have compression ratio controls; some do not. Since there is no consistent set of controls among these different products, within the scope of this article there's no point in discussing exactly how to set a compressor. Universally, it can be said that the output should be set to avoid red lights/distortion. From there, it boils down to using your ears.

Mixing, to me, means donning the alchemist's hat and stirring the cauldron until something special comes out of the mix.

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Multiband Compression

If I encounter a lead vocal track in which the singer tends to be much more powerful in some frequency ranges than in others, and this inconsistency causes the lead vocal to be too loud or soft in particular spots in the mix, I consider using a multiband compressor. Multiband compressors such as the Waves C4 are powerful tools indeed.

Simplistically described, the C4 is essentially four semi-independent frequency-dependent compressors in one package. Controls per band include threshold, range, release, attack and release times, and gain. Global controls include master controls for the per-band threshold, gain, range, attack and release controls as well as "behavior" (this control allows the user to choose between opto-coupled modeling or "electro", a setting Waves describes as the opposite of opto), release (which includes an automatic setting), and knee.

To my ear, for a variety of reasons, the controls and even the sound of the C4 in some ways remind me of the feel of a dbx 160a—it's like four of these (on steroids), each assigned to act on a unique range of frequencies, synced together with one control panel. I don't often use a multiband compressor because at least for me, there are so many possible adjustments and they're all so powerful, that I find it takes me too long to set one up—that is, unless I really need what only it can do.

If you are new to multiband compressors, more than ever, use your ears! As is the case with any change you are in the process of making, frequently bypass the effect and compare the modified sound to the original unprocessed sound. Just because a plug-in or hardware box has a good reputation or a cool-looking display doesn't mean that it adds something positive to the mix!

> I use compression to smooth out inconsistencies in lead vocal level, but even more so to impart a perception of robustness to the lead vocal.

De-essing

Some singers just have a natural tendency to produce loud sibilant sounds. For the uninitiated, The Merriam-Webster Online Dictionary defines *sibilant* as: having, containing, or producing the sound of or a sound resembling that of the *s* or the *sh* in *sash* <a sibilant affricate> <a sibilant snake>.

Sibilant sounds can be exacerbated by poor choices in microphone, preamp and dynamics processing. Once recorded, in the context of mixing, sibilance can be tamed using a variety of techniques including de-essing, eq, editing and gain riding, alone or in combination.

Generally speaking, sibilance is centered in the region of 5 kHz to 7 kHz. A *de-esser* is a self-contained special-purpose compressor that is designed to trigger compression only when selected frequencies exceed a given threshold. A general-purpose compressor can be set to act as a de-esser if and only if it offers a *sidechain* input. This sidechain input connects to the detector circuit in the compressor. To make a general purpose compressor work as a de-esser, the engineer must take a feed from the track to be de-essed, send it through an equalizer that de-emphasizes all other frequency ranges other than the sibilant sounds in need of taming, then connect this signal to the sidechain input of the compressor.

Some de-essers offer very little in the way of control over the various parameters that could be useful to the engineer. Others allow the engineer to select the center frequency and filter type (usually bandpass or highpass) for adjusting the sidechain signal. Generally I'm not a big fan of de-essers—I hear them at work and don't much care for their overall impact on vocal quality. If my clients don't want me to spend very much time on the sound of a vocal, I'll usually tend to instantiate a de-esser as a quick but not so elegant fix for egregious "s" sounds.

Generally, using eq to control sibilance is not a terribly effective option. Since sibilant sounds are not the only sound in the 5 kHz to 7 kHz range, notching out sibilant sounds using eq also affects the good information in that range. In the contemporary DAW environment, at least if eq is an option for taming sibilance, it can be automated to specifically act only on problem spots. Unfortunately, even this application of eq can be problematic, not all DAWs and/or software are capable of enacting artifact-free fast automation of all parameters. Over the years using Pro Tools, I have definitely experienced some situations in which this kind of automated corrective eq created noticeable clicking.

When my clients allow me the time necessary to do the best I can do, I favor using gain riding and editing to solve sibilance problems. If I have time, I'll go through the lead vocal, writing volume automation down to the syllabic level as needed. In this context, I can literally reduce or increase the gain of any sound, including harsh sibilance. I trust that I'm better equipped than a detection circuit to judge sibilance that needs adjustment.

Taken one step further, in a case of really bad sibilance, I'll scour the vocal performance for other occurrences of the same sound—whether it's an "s" or "sh" or "t". I've rarely not been able to find numerous examples of these sounds within a given song/set of takes. I then simply substitute a more usable iteration of the sound by means of copying a friendly version of the needed sound and pasting it over an egregious one.

Ducking

Brought up earlier in this article is the technique known as *ducking*. This is another application of sidechain compression. In almost every pop music mix I do, I use the lead vocal to automatically turn down certain other parts, usually things like rhythm guitar or a padding keyboard part. I generally set the ducking device to effect anywhere from less than a dB to as much as 5 or 6 dB change. When the vocalist sings, the ducked part is turned down; as soon as the vocalist stops singing, based on settings, the ducked instrument's volume automatically returns to its un-ducked level.

This is a great technique for keeping supporting parts as robust as possible without impeding the intelligibility or power of the lead vocal. And best of all, it hardly takes any time to set up, saving loads of level automating time. Ducking is worth an entire article in itself, and is useful for more than just vocal work; look for just such an article in an upcoming issue of *Recording*.

That's enough for one month. In the next instalment we'll look at equalization, harmonics processors (exciters and distortions), time domain and other processing, completing our comprehensive look at the art and science of vocal mixing.

Bruce Kaphan (kaphan@recordingmag.com) is a freelance producer/engineer/composer/musician living in the San Francisco Bay Area. His pedal steel playing can be heard on the recordings of Sheryl Crow, R.E.M., Jewel, American Music Club, The Black Crowes, and others. He "adapted the underscore" to Bob Dylan's Masked & Anonymous *and has toured with David Byrne & American Music Club.*