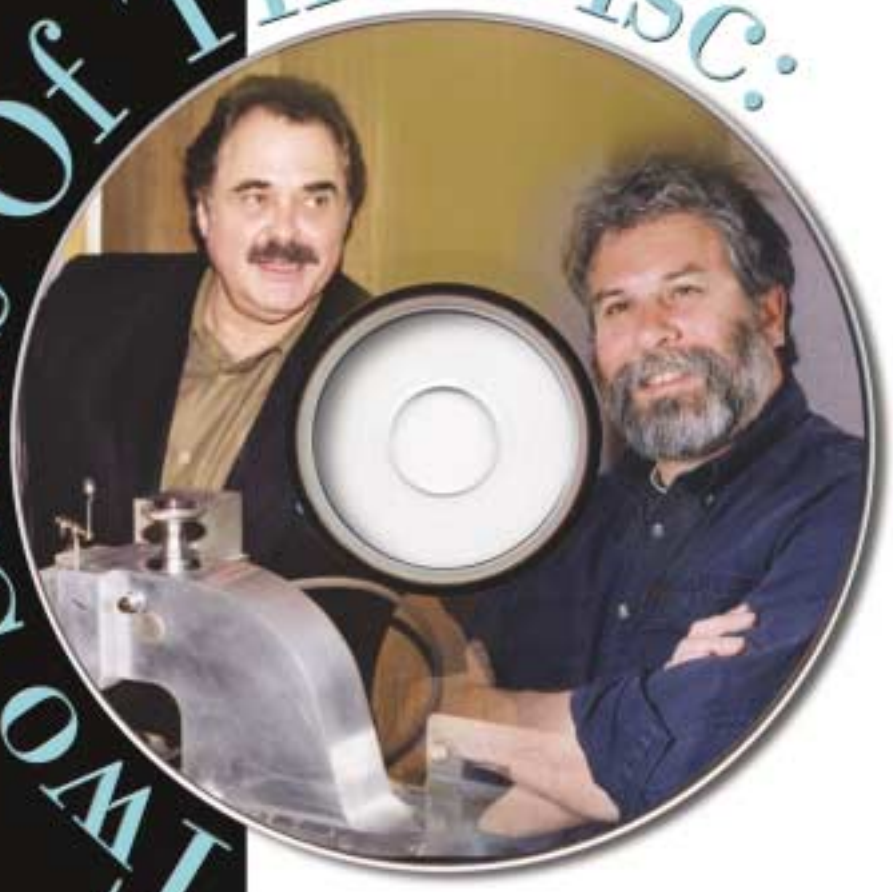
Two Sides Of The Disc:



Doug Sax and

Two award-winning mastering engineers discuss the tools and tricks of the process

Doug Sax of The Mastering Lab

INTERVIEW BY JON BARE

Why spend money on mastering if your new album is already a sonic gem?

Because mastering engineers employ the best digital converters, the cleanest playback equipment, and even the best wire to deliver your masterpiece to the end user at its best.

Because mastering engineers have trained ears and the most accurate monitor systems. They can hear things that maybe you can't (after all those years abusing your ears playing in bar bands).

Because mastering houses offer the finest compressors to even out your mixes and make your tunes more radio-friendly. Perhaps even more importantly, the mastering engineer has learned how much compression is the right amount to apply. Some songs may not need any, others might benefit from a goodly amount.

The way Doug Sax—one of Hollywood's founding fathers of mastering—does it, there are essentially four steps in mastering. The first one is to run through all the songs, making notes about the eq and compression settings that are required for each song.

Next is to transfer the mixes to the final format while applying the eq and compression in real time. This requires having two identical banks of eq and compression, call them banks A and B.

Before the first song plays it is routed through bank A, which is set up for song 1. The tape rolls and the transfer begins. While the first song is playing, bank B is set up for the second song. When song 1 finishes, bank B is engaged before song 2 starts. You go back and forth like this, switching banks between songs.

The third step is to create a reference CD for the client to take home and listen to. Most reputable mastering engineers will encourage you to do this in order to guarantee your satisfaction.

The fourth and final step begins when you notify the mastering house that you are happy. They will then assign PQ sub-codes to the 1630 (or whatever) format and check it for errors and dropouts. Doing this properly is more complex than just pushing TOC Renum on your DAT (another reason to have a project mastered). If it passes inspection, you're ready to manufacture CDs.

My first introduction to mastering was on my first album. Back then you needed a 1630 master to create the CD glass master, so mastering was an essential part of CD manufacturing. 1630 is the format used by a $40,000 Sony U-matic digital tape machine that looks like a giant VCR. Nowadays plants will accept other media, including PM-CDs and DAT tapes.

My next four albums were produced without the help of a professional mastering engineer. I had the chance to hear several songs off each of those albums play on the radio here in Los Angeles. They always sounded kinda… funny. After being squashed by the station's compressors, the music sounded quite different from the way I mixed it—and not in a particularly good way.

David Glasser on Mastering

For my sixth album Shredzilla I decided to spare no expense and enlist the aid of Doug Sax. When I heard those cuts on the radio I breathed a huge sigh of relief. They sounded wonderful! I taped all those radio broadcasts and compared them to confirm my suspicions: mastering made a huge difference to the radio-friendliness of my music.

After completing the mixes for my latest CD Orcastra, I was intent upon returning to Doug for mastering. Radio-friendliness is an elusive quality; often what sounds great on your home stereo does not translate well to radio. If mastering is what was required to bridge that gap, then so be it.

We spent from 10 AM to about 3 PM together, which included lunch, a few interruptions for Doug to make decisions about carpet color, etc. for his other room that was being remodeled, and a very interesting tour of the complex. We took our time, and I had a chance to ask a lot of questions and learn a lot about what goes on behind the scenes in mastering.

It was so interesting that I had to return to The Mastering Lab to interview Doug....

Last time I was here you showed me the inside of your 1/4-inch playback deck. Why?

Because it's special. We custom built it with all-tube electronics. It also has no transformers, a combination that I have never seen in other facilities.

And your eq—you said it was all passive. What does that mean?

It means that the curve-shaping components, capacitors and inductors, are not in the feedback loop of the amplifiers. One amplifier at the end makes up the loss of level, approximately 21 dB. That amplifier was designed by my brother Sherwood Sax in 1966. It is a Class A solid-state design. It has been in service for 34 years. Definitely time-proven.

Who are some of your high-profile clients, other than myself?

[*Smiles*] Ray Charles, Pink Floyd, Diana Krall, Faith Hill. Whenever I am asked about who my famous artist clients are, I always draw a blank. What I am most proud of is who my steady engineering clients are: Bill Schnee, Al Schmitt, George Massenburg, James Guthrie, Ed Cherney, Greg Ladanyi, Chris Lord Alge, Eric Zobler, to name a few.

I'll bet that not too many people know you used to play trumpet with Herb Alpert.

Right. Herbie and I were in both Junior High and Senior High School together. We were competitors and friends. We just worked on a 20-song retrospective together, which was really different, since I never did his mastering in his heyday. It was great fun.

What's up with your fancy compressors?

Our compressors are totally my brother's work. They are built around the venerable LA-2A. The only common components with the original Teletronix are the light cell and the meter. Pure tube, and transformerless. It is the one component that I guard zealously. The tube line amp is in use in a few rival mastering facilities.

How much compression do you typically apply to a mix?

Between 1 to 3 dB. It depends on the music. Classical music never needs it. A country ballad might get 1 or 2 dB, hard rock a little more. There is a sweet spot on the Mastering Labs compressors. I might do some gain riding to keep the whole song in the sweet spot. If a mix is right and the components of the mix are balanced, I tend to not limit, even when the customer wants a little extra pizzazz. I would like to think I eq for a year later, after the nervousness of the producer/artist/engineer have long ago faded away.

You took me back into the shop area and showed me those $800 rotary switches —seven $100 wafers [which are the rotary switch layers] plus another $100 for the central core. How many of those are in your console?

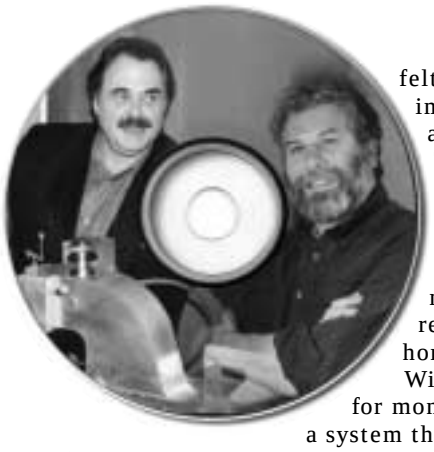
Those switches are large ceramic wafers with solid silver redundant contacts. There are a ton of them, and they not only do the obvious moves of frequency and amount, but also do the switching between the two identical banks of eq and limiting at the lab.

Why so many layers?

They also take the place of *all* patching in the analog domain, inputs, outputs, limiting before or after eq, etc. I do not know the cost of just the switches, but it is probably closer to $10,000 than $5,000.

Tell me about your speakers and the room they're in.

When we went into the then-new business of Independent Disc Mastering in 1966, my brother and I



felt that it would be of key importance that we had accurate loudspeakers. These speakers would have to relate to the outside world, so that modifications to the frequency response of the master supplied would relate properly in the home playback.

With an unlimited budget for monitoring, I could not find a system that I felt confident would fill the bill. My brother then designed and built the 3-way system that we used until 1976, and then modified with a change of mid-range horn and driver (Altec 288-16G with a 511E horn).

This system is what we are still using today. It has my brother's passive crossover design utilizing iron core inductors. It used acoustic time-alignment of the drivers before the word was even coined.

You must have the best A/D converters available. What do you use?

I use GML Converters that have been modified by George Massenburg to best fit our single-ended topology. I haven't yet picked the 96/24 converters for Surround sound.

Wire?

We have done extensive listening to wire. We use Alpha 1775C. It is inexpensive, but very hard to work with since it is solid core wire, and cannot be flexed much at all.

How many years have you been listening to music in this room?

We started with the original system in 1967, and did a final modification in 1976, so essentially 34 years. Again, time-proven.

I'll bet you've seen a lot of people come through here with stars in their eyes.

Everyone has stars in their eyes.

What's the most common mistake made by the average home recordist?

Record bad songs. Ha ha.

No, really.

Boy, that is a loaded question. I would say there are several most common mistakes. One: not taking enough care in the recording of the basic tracks, both sonically and musically. A lot of people have the attitude that poor recording can be fixed later.

Two: equipment inferiority response. Home recordists are painfully aware of all the equipment and tools they don't own, and tend to concentrate on what they can't do rather than exploit what they have to the fullest.

You mean they give up too soon when trying to get a good sound? They don't try hard enough?

Yes to both questions. "I couldn't get the echo I wanted so I didn't optimize the one I had. I couldn't get the vocal right because I don't have a new Neumann mic," etc.

Three: if the home recordist turns out to not be a really good mixer, then he should go to someone who is. Call me and I'll recommend an engineer that will be cost-effective. I would rather see you spend the money on the mix instead of mastering.

Also, there is now a tendency among home recordists to exploit the amazing crush abilities of the new digital processors to raise the level of their mix to the stun area. The hidden danger is the fact that this cannot be undone in mastering. So slow songs that should be open and pretty can assault you, and that assault is forever.

The same "mistake" has often occurred when an engineer wants to exploit the audio effects of analog tape compression. When he goes too far, it is forever. And the number one problem of all engineers is sibilance in the recording and mixing of vocals. Sibilance is an artifact of close-miking, and should be dealt with at the earliest stages of recording.

You believe song order is pretty important, don't you?

Yes. Absolutely. Today you get about ten seconds to grab someone's attention or you've lost your chance.

When people mix to analog tape, what kind of tones should they bring in?

You can't have too many, but minimally 1 kHz, 10 kHz, 100 Hz AND 50 Hz—30 seconds of each. If you want to add 15 kHz and 5 kHz I would applaud you even further. Now to really impress the mastering engineer of your choice, leader each tone for quick use.

What's better, analog or digital?

If you are comparing the best of analog to a standard DAT done at 44.1 and 16 bits, then to my ears analog is clearly better. If you are talking about a high resolution digital 96/24 or Sony DSD, then you have a contest. For complex material with many elements going at once, the best analog is still the best that I have heard.

"Home recordists... tend to concentrate on what they can't do rather than exploit what they have to the fullest."—Doug Sax

Maybe that is why many outstanding engineers will pick 30 ips 1/2" to mix to, even though the last final assembled release will be in a digital format. I just worked today with Al Schmitt who is doing a lot of mixing to Surround Sound, and he mixes everything to an 8-track 2" Studer. Al just turned 71 today, and he is the most Grammy-awarded engineer, period.

How about mastering to PMCD versus 1630 digital tape?

Going to a PMCD requires that the digital information comes off a hard disc system. Digital does not get better going through a computer. At the CD plant, a PMCD will be transferred at two to six times speed. You can transfer and assemble directly to 1630 without going into a computer system, and the glass master will be cut in real time. It is the shortest distance between two points.

You were taking your old Scully lathe out of here last time I was over. What happened to it?

We weren't using them much because we don't do a lot of dance / club music. We are looking for a customer for one of the lathes, and the other might be on display in our Ojai facility.

You're moving from Hollywood to Ojai later this year. How come?

Because I love it there. It will be a chance to get out of L.A. but still be in driving distance to our Hollywood facility. Ojai is in addition to Hollywood, not in place of it.

Our new facility in Ojai will be where we build our Surround Sound Room for all multi-channel mastering, which at this time is Dolby Digital and DTS for DVD Video releases, High Resolution 96/24 for DVD-A, and DSD for Sony SACD releases. All of our mastering engineers, Gavin Lurssen, Arnie Acosta, Robert Hadley, and myself will be happy to serve you in Hollywood.

What do you think of these home mastering boxes such as the TC Electronic Finalizer?

With every day the equipment and what it can do is getting better and better. If an engineer or artist wants to save money, the whole mastering process can be done at home. In 1970 an individual would have had to spend the equivalent of $1,000,000 in today's money to be a full service mastering facility. The home engineer can do the same for $ 5,000 or less. I sincerely feel that every good year could be our last.

My newest thought is that it takes more than a stethoscope to make a doctor.

How does someone decide whether or not to spend the extra money and get their project professionally mastered?

Every released album represents months to years of work. Often the budget album put together with less than the best engineering needs the touch of an experienced mastering engineer much more than the expensive production using world-class equipment and talent. Sometimes the difference between unmastered and mastered is literally night and day. The Mastering Lab has a low-price service for self-released albums that we are proud to offer to the starting artist.

What was your worst mastering nightmare?

Well, no nightmares really, but occasionally you get the gorgeous blonde client who is used to getting everything she wants. She has no sense of how business is conducted, and expects to get everything for free. Fortunately, clients like that are few and far between.

Do you ever tell a client to go back and re-mix a song?

Oh, sure. It happens. If you can't make it sound good in mastering, you have to re-mix it.

Will record collections on vinyl soar in value or become worthless when all music is available for free on the Internet?

It doesn't appear that all music will become available for free on the Internet, and if it did I would be concerned how the industry could survive. I think the careful re-mastering of analog product to high resolution digital, such as 96/24 or better yet Sony DSD, would be my choice.

Any final words of wisdom?

It is an exciting industry. If you have technical ability, the sky is the limit for anyone that can keep all of this stuff working. There is no question that the final product we sell, music on demand, is wanted and desired more and more. As long as the customer has to pay for it, the song shall go on and on.

Contact information for Doug Sax: The Mastering Lab, 6033 Hollywood Blvd., Hollywood, CA 90028. 323/466-8589.

Jon Bare (bare@recordingmag.com) is the author of the newest Playback Platinum CD/Book volume, Recording The Electric Guitar—It's All About Tone. His new CD Orcastra hit the streets on 4/10/01.

David Glasser of Airshow Mastering

INTERVIEW BY LORENZ RYCHNER

David Glasser's Airshow Mastering is located just down the road from Recording's HQ in Boulder, CO, while his partner Charlie Pilzer runs their other facility in Springfield, Virginia. The main room in Boulder is built around a Sonic Solutions system, with a plethora of high-end and specialized gear to take care of most mixing and mastering situations.

You're the co-winner of a Grammy for Best Historical Recording 1997, for your work on the Anthology of American Folk Music. Do you specialize in any one musical genre?

We do all kinds of different projects, but, yes, we do a lot of acoustic music—folk, rock, country, bluegrass, jazz—natural sounding music.

What can a mastering house do for recording musicians that they or whoever mixes their project can't do?

It can either do nothing if their mix is perfect, and occasionally they are, although that's a very small percentage, or it can do one of three things. It can take a very good mix and put the final polish on it that brings it into the realm of other professional products like it. Number two, the mastering house could show the engineer or artist some problems that they might want to go back and fix in their mixes. Or three, it could take a mix that's just okay and mitigate certain problems and make it presentable as a finished product.

Obviously, the first of these three, working on a very good mix, is what we're after.

How would you like to receive a mix—finished and normalized and compressed to the engineer or artist's best ability, or without such final processing?

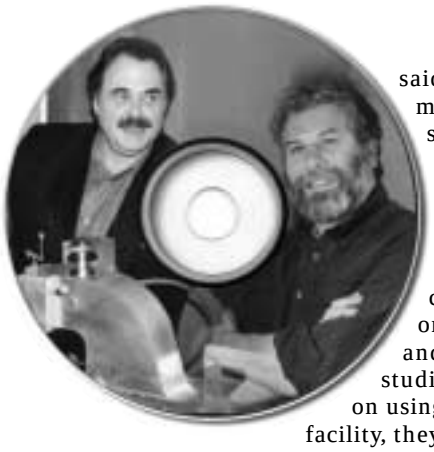
I tell people to print two mixes. One that has all the processing on it that they think they'd like, whether it's a buss compressor or a Finalizer or final eq or whatever. And a second mix that is without all that extra buss processing. The processed mix will at least give me an idea of the direction they want to take, and if it's a good direction, sometimes we will work with that. At other times we'll take the unprocessed mix and take it even farther in quality than what they'd been looking for.

Do you like to start with a clean slate, or should clients bring you previous projects of theirs so that you get a sense of where their sonic sensibilities are?

It can be helpful to hear earlier projects they've done, sure, and also some other records they might say they're aiming for.

What other information, if any, do you welcome in preliminary discussions? Hints about a client's musical likes and dislikes, personal preferences—are they useful to you?

Ah yes, I encourage that. I can't have too much information. I just finished a project last week where the artist sent me a little booklet, and she



said "You asked for information on what I'm after, so here's a little essay about each song." I'm not sure I always need quite that much detail, but at every stage of the process there should be communication. If someone is doing the tracking and mixing in their home studio and they're planning on using an outside mastering facility, they should start that conversation early so that we can head off any fires.

So if someone has a 10-song CD planned, you'd like to just hear the first one on completion?

Yes, I'd say bring or send me a mix, we'll listen and discuss it. I do that quite often. Occasionally someone will hear their mix in that context (points at his room and speakers) and goes home to start all over again. Better after the first than after the tenth song.

How do your make sure that folks with affordable mainstream monitoring setups can relate when they hear your high-end playback system? Isn't there an intimidation factor to overcome?

If they have a special reference they are familiar with, maybe a boom box, or their car stereo, we'll work towards that with reference discs that they can listen to on their systems. But as far as my system here goes—maybe some people can't relate to it when they first hear their music in here. But I can, and they'll have to trust me that if it sounds good in here, it translates well to most any decent system out there.

Is there a favorite medium on which you like to receive client files to work on?

What's most important to me is that I get it at the highest possible resolution. I don't really care about the media—whether it's a workstation archive on an Exabyte, a CD-ROM with files, a Masterlink disc, or a 24-bit DAT. If we can't already handle the format in-house we'll make arrangements, that's no problem, but the resolution must be the highest the client can achieve. And I'd rather get a bunch of DATs or whatever with a mix on each than a compilation—the fewer transfers that have happened before the mixes get to me, the better.

So you'd rather have a shoebox full of mixes than a neatly compiled CD-R?

Absolutely, as long as everything is identified correctly. Which brings me to my pet peeve: documentation. There's such a huge variety of platforms and software and hardware, it's extremely important that when a project moves from one place to another it is thoroughly documented. Not just the track list, but things like what workstation was it made on, what software version, what operating system, how it was backed up, what version of the backup software, if the backup is Retrospect we need the catalog file on a separate piece of media, if it's a project that has multiple sample rates for various songs we need to know that…the more documentation that somebody can provide, the smoother things will go.

Info on plug-ins, on dither and noise shaping?

Any info that they can think of might become useful; even if someone is not sure, include it anyway. If I dropped in from another planet and had to start working on their project, I would have to see all the information right there. It's not like the old days when all you needed was a reel of tape and some tones.

Can you give readers a ballpark idea of cost, maybe assuming that they come to you with clean tops and tails and basically good mixes?

If there is such a thing as a typical 10–12 song project that doesn't involve a whole lot of editing, it might be four to six hours. If more detailed work is called for it might add up to a day. Then there are exceptions for special projects, of course. We usually charge by the hour, somewhat more than a regular recording studio—most mastering houses do. But since it's a day or less, it still doesn't break most people's budget.

What's the first thing you do on a new project? Fly it into Sonic Solutions?

If it comes analog, I like to use analog processing first as I transfer it into Sonic Solutions. If it arrives digital, I sample it first and then I decide what processing is appropriate.

Do you send the client away or are they welcome to attend?

Well, about half my projects are long distance where I do the mastering and send a reference disc for approval. The other half comes from people who stay here for the entire session. Sometimes the client is heavily involved, suggesting various ideas; others are just here to learn and to keep an ear on things.

What are the two or three most typical flaws that you keep hearing, even in projects from people with some experience in tracking and mixing?

Probably the biggest problem would be mixes that are over-compressed or too heavily limited. Sometimes that was done intentionally because they thought that they were doing the right thing, that by doing that they were going to make my job easier somehow. Other times it's obviously because they've used their equipment improperly.

People have got to know their gain structure. Sometimes I get a project where I ask "How come you limited it so much?" and they say that there was no limiter on it. And it may turn out that the problem was a buss on an analog console that was overloaded—it hits the power supply rails and gets squished. Some of that comes about because particularly low-cost equipment doesn't have adequate metering. So if someone is going to add something to their setup at home, a set of well calibrated VU meters is a great thing to have. And some real digital meters with digital input that read the sample values.

Then there are plug-ins [on digital workstations] that don't give you a clear indication of metering—you might think "I'm just gonna add a little bit of compression here" and you don't realize that you're overdoing it. The display doesn't give you adequate feedback, and maybe your monitoring isn't set up to do that either.

"The biggest problem would be mixes that are over-compressed or too heavily limited..." —David Glasser

The second problem would be low end that isn't right. It's fairly common, after all the low end is the hardest thing to get right.

Could subwoofers during mixing be the cause, fooling someone into believing they had more bass in the tracks than ends up in the mix?

Yeah, that can be it. I know that it is possible to make really well-balanced mixes on speakers that don't have any real low bass, people do it all the time on NS10s. Once again it's a matter of knowing your speakers and referencing your mixes in other environments.

That's two—what's the third main problem you keep seeing?

The third is stereo, imaging and placement. That goes back to people not knowing their monitoring environment or not having accurate monitoring. I'll get some mixes where everything is all squashed in the center.

Do you find that it comes from using too many L+R outputs on processors, synths, and samplers—everything is stereo so nothing is stereo?

I think it's more that their monitors aren't telling them what's going on. I also think that people rely too much on the mechanical positioning of the panpots. When I ask "Why didn't you pan this a bit wider?" someone will say "Well, the panpot was pointing there." And I'll ask "What did it sound like?" and I'll get "I don't know, but it said it was going over there." So go by your ears and not the console.

Along with that come projects that have phase problems, where some instruments are just fine, others are out of phase, and not intentionally so. An X/Y scope is a great thing to have, to slap across your monitor bus. So even if you can't hear any obvious problems, you can at least see that there are problems and correct them before it is too late.

Once such problems are buried in the mix, there's not much you can do, is there?

We can help somewhat, with sum-and-difference processing for example, but that only goes so far.

With the increasing affordability of equipment that is getting better and better, have you see a change in the quality of what you're getting over the last few years?

The biggest change I've noticed is the effect that higher resolution has had, now that it is available on many devices. All else being equal, a project that was 24-bit all through the process is not going to have as many of those problems that we used to see, compared to 16 bits.

Is that just to the credit of the higher resolution, or could it be that 24-bit systems have raised the bar for everything, with better plug-ins and so on?

To a point. Mainly you won't have rounding-off problems from 24 down to 16 that sound like eq problems, a kind of brittleness that isn't really something you can correct with just eq. I've found that full 24-bit projects, particularly those at double the sample rate, 88.2 or 96, need less band-aid fixes and lend themselves more to creative processing.

Speaking of high-end gear, can you elaborate on how your setup affects what you do, other than your ears and experience?

"Most of the time I think that making a CD loud for the sake of being loud is inappropriate." —David Glasser

It doesn't really come down to any one piece of gear, it's how they all interact and the order in which I hook them together that determines the outcome. With every project I first listen, then I try out different things—should I use all digital, should I use a combination of analog then digital processing—you really never know what's going to work, there is no formula. Sometimes it's different from song to song.

What about special audio formats?

We do a lot of SACD, not just mastering but production and editing and quality control. That requires a whole new set of equipment and processors. I'm sold on the SACD format, I think it sounds fabulous. [*DSD (Direct Stream Digital) is Sony's technology behind their SACD (Super Audio CD).* Ed.]

We also do some mastering of audio for DVD—not authoring, just working on the audio for those formats. And we've done some DVD Audio, in stereo and surround.

What's the ratio between stereo and surround projects you get these days?

Still mostly stereo; we have done enough surround to know what gear works for us, and we get about one project every other week.

If someone does a project in the hope of someday releasing it in surround, should they do certain things a certain way even while tracking?

They should talk to us as early as possible, and also discuss the release format with us. Are they talking about DVD Video, DVD Audio, Super Audio (SACD), DTS, etc.?

What about the question of "make my CD as loud as the ones I buy?" And—tied into this—the question of prepping a track for radio where the stations' compressors kick in?

That comes up a lot, even in musical styles where you wouldn't expect it to become an issue. Most of the time I think that making a CD loud for the sake of being loud is inappropriate. Many times one can make it reasonably loud and sounding great. But some people insist on it being real loud. I've heard CDs that are extremely loud that sound awesome. But that's really hard to do.

Doesn't that have to start at the mix? Can you provide the magic bullet on your own?

No, that has to be carefully planned throughout the process. But in the end a good mastering house can do better than somebody who has just a one-box "mastering" multiprocessor. It's usually a matter of using several dynamics processors carefully in combination. If the client insists, even if it means knowingly compromising the sound, we'll try to help him.

There's a misconception out there that a maxed-out mix will sound better on the air than a less compressed one. But it often turns out that it's better to give those comp/limiters something to work with. What's your take on that?

For radio play, something with a wider dynamic range will sound better on the air than something that's totally squashed.

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