



Interviews
by Paul Vnuk Jr.

WHAT IS A MICROPHONE PREAMP,

and

WHY SHOULD I CARE?

Let's start broadly with the title of this discussion. In a few sentences, what is a microphone preamp, and why should we care?

Geoff Daking: The simplest description is that a mic preamp receives the tiny voltage output from a microphone and brings it up to a more usable level.

John La Grou: A microphone preamp is a voltage amplifier and current buffer. It can boost mic output levels by 1000 times or more, while sourcing a significant amount of output current.

Dan Kennedy: It starts at the microphone, which is amplified by the preamp to line level, which is compatible with compressors and equalizers (if used), which then feeds the A/D converter or tape machine input.

EveAnna Manley: Also importantly, the input of your microphone preamplifier has to be able to accommodate different levels and impedances that various microphones will present to it. So your microphone preamplifier needs to amplify with utmost fidelity and be flexible enough to work with a variety of microphone outputs.

Geoff: This is a delicate process, because we require a very high level of

integrity in the process. There are many devices that amplify small signals—radios, for instance—but we do not expect them to have the same standard of performance.

Michael Grace: I think we mostly don't give it credit for what it really has to do. First, the microphone preamplifier has to have an exceptionally wide gain range to be useful. From a quiet whisper on a ribbon mic to a loud roar on a high output condenser mic, we are talking about an input voltage range of more than 1 million times. The mic preamp has to accommodate that range of signal and feed it to your recording device at the proper level without degrading your sound.

Todd Humora: It is a critical first stage, because any noise or character in that stage will be amplified with that gain and be present throughout thereafter.

In the recording chain, which is better in your opinion: a great microphone into a so-so preamp, or a so-so mic into a great preamp, and why?

Wade Goetze: I wouldn't say either one is a place to compromise, but the microphone is a most important first step. Since most recording is digital now, the

initial translation has become even more important than ever.

Dan: It all starts with the microphone, so picking an appropriate mic for the job is most important. It's damn near impossible these days to build a bad preamp, so I'd say best mic into anything is better than iffy mic into a hot shot pre.

Geoff: I would say the preamp is the most important. Microphones are chosen for their character, level handling ability, size etc. Even the least expensive mic will perform better when coupled to a great preamp.

EveAnna: Honestly, probably the preamplifier is most important because one might purposefully choose a "so-so" microphone for a specific reason—color, grit, or distortion—and it is the microphone preamplifier's job to amplify that and turn it over to the next device unmolested! Besides, we have all heard fine vocal takes on SM58s, so we shouldn't pooh-poooh any sub-\$100 transducers!

Michael: In my opinion the difference between a good and not-so-good microphone is way bigger than the difference between a good and not-so-good preamp. The biggest differences in sound quality are still at the transducers (mics and speakers).

John: This question is highly source-dependent. If I'm recording a symphony orchestra, a great mic into a low-grade preamp will sound unnatural, and vice versa. No free lunch. But say I'm recording a gritty pop vocalist. Now it's less about signal purity and more about vibe and color, which means a low-end mic into a high-grade colorful preamp could be a match made in heaven. Sometimes it's objective, and sometimes it's more art than science. In my experience, there is a much broader tonal variation among mics than preamps; this is why many studios that have dozens of preamp types and hundreds of microphones.

Todd: Either can "harm" the result, so both are important. I'll say preamp because great gain can overcome a less-great microphone, but maybe I am biased.

Millennia Media and Grace Design preamps usually get placed in the "straight wire with gain" category. What does this mean?

John: Millennia started life as a classical music production company, and the original HV-3 front-end was designed specifically for maintaining ultimate acoustic purity and dynamic uniformity without regard to manufacturing cost. It was designed for maximum color-free linearity and lowest noise. In other words, a "straight wire with gain."

Michael: Coming from a background of live recording, I have always been a fan of capturing as much detail and dynamic range as possible, so that there is more to work with later in mixing and mastering. Grace builds preamplifiers that are as free

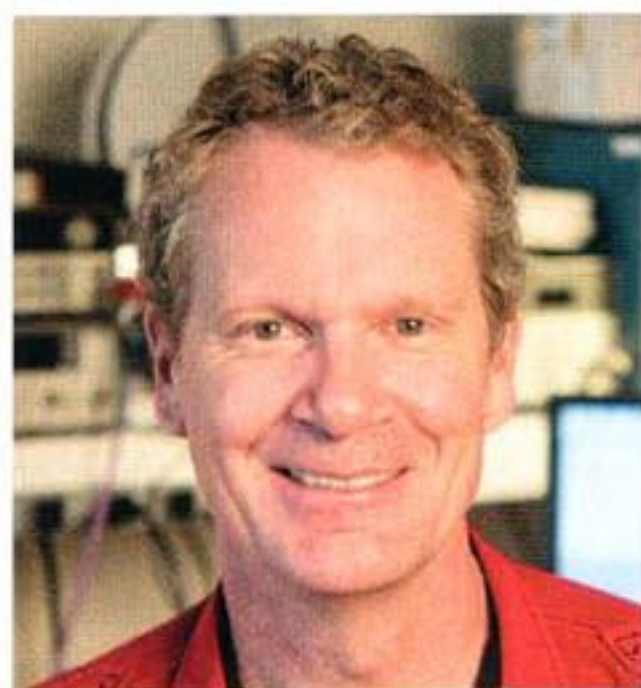
from noise and distortion as possible. It is our goal to not add color to the sound of the instrument and the microphone being used. It's about capturing the full detail, dynamics, and realism of the source.

Chandler Limited and Manley Labs build preamps with and without tubes. What effect do tubes have on the sound of a preamp?

Wade: I think each has its own type of sound to offer us. That said, more and more I do find the depth and dimensionality I get from tubes more and more attractive.... especially when you consider that we are recording and processing so much with digital nowadays. Tube designs, of course, are more expensive to make, which makes them harder to get our hands on.



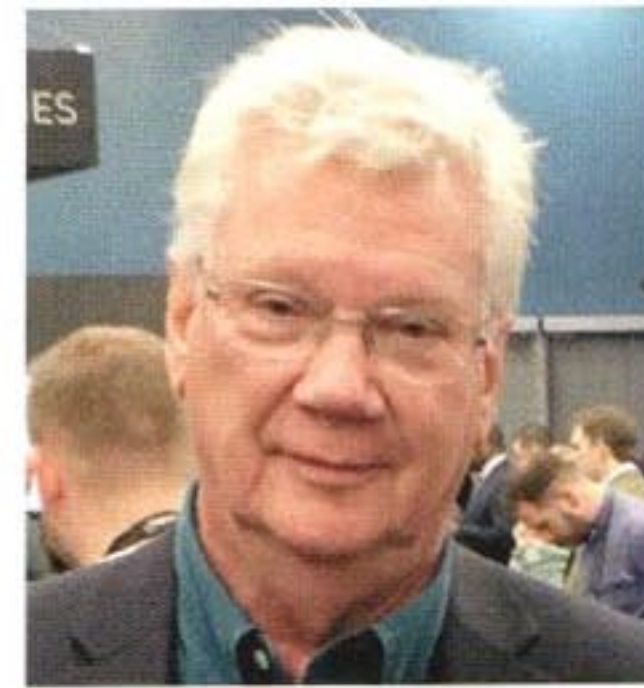
John La Grou
Founder
Millennia Media



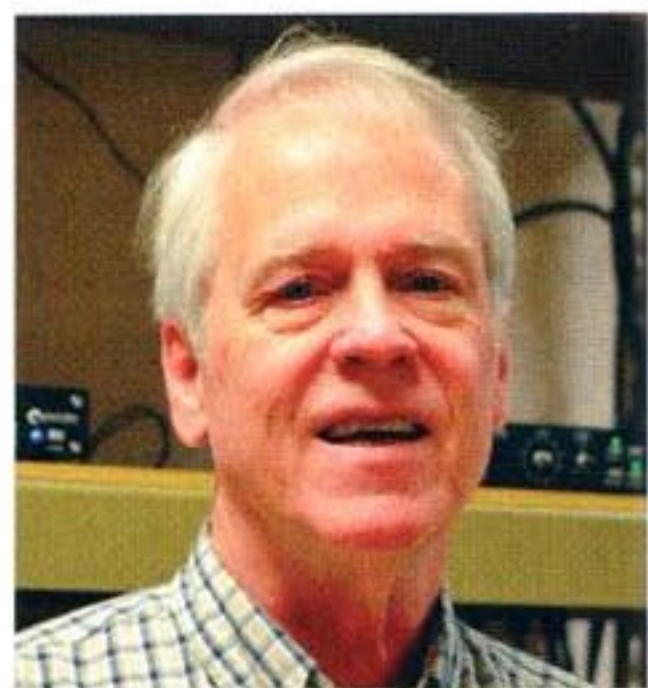
Michael Grace
President at
Grace Design



Wade Goeke
Owner and Designer
at Chandler Ltd



Geoff Daking
President/Groovy Guru
at Daking Audio



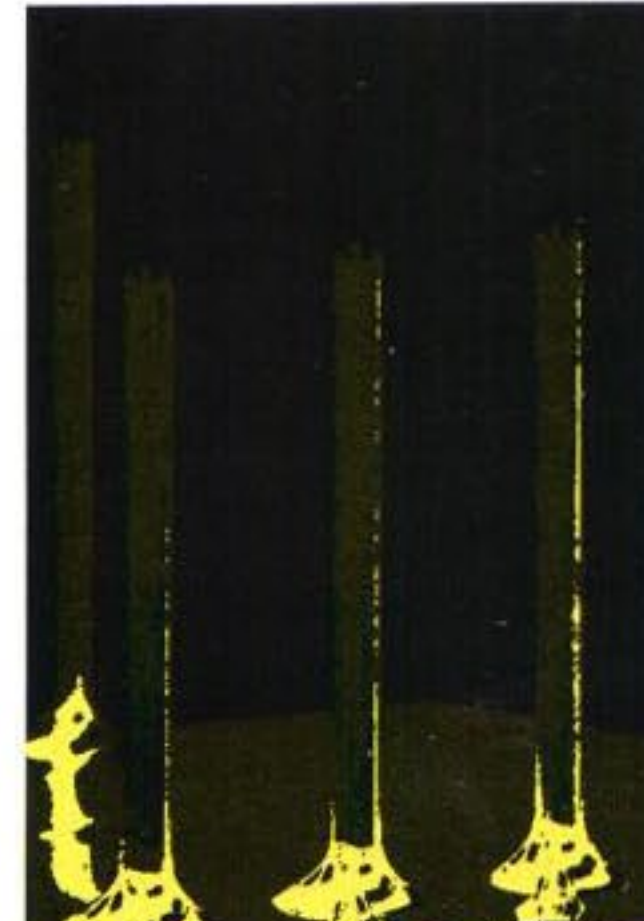
Dan Kennedy
CEO/Janitor at
Great River Electronics



Todd Humora
Director of Engineering at
Automated Processes, Inc.



EveAnna Manley
President of
Manley Audio Labs



7

of the most respected
PREAMP DESIGNERS in the
industry come together at our virtual
round table to **GIVE US THE ANSWER**

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Please don't take this as an "anything with tubes sounds awesome" statement, though. Everything in audio depends on its application and is not simply a reflection of topology choice.

EveAnna: We are great proponents of vacuum tube amplification for a few technical reasons, including their intrinsically linear characteristics, huge high headroom that comes from high voltage rails, and rich meaty character, often associated with surrounding components such as transformers and the circuit topology.

John, Millennia also offers a tube based preamp. Anything you can add?

John: Often when people describe a "tube sound" they are actually very often describing the surrounding transformer sound. Millennia's tube circuits are transformerless, so what you're hearing is the rare, unadulterated sound of the tubes themselves. Their sonic signature is utterly sublime and 3-dimensional.

What differentiates a tube preamp from a solid state preamp in sound and function?

EveAnna: Overall, probably the headroom and eventual graceful clipping of the vacuum tube beats its solid-state counterparts. I always hear a more bountiful lower midrange presence and 3-dimensional depth of a stereo image with a vacuum tube amplifier. Solid State to me just sounds more flat and boring.

Daking preamps fall into the "classic console sound" category. Geoff tell me about your designs.

Geoff: My design objective was to create an easy to use, great sounding preamp with lots of gain, wide response, and high headroom, similar to the console preamps of the 1970s.

And what gives the classic consoles and preamps their sound?

Geoff: Continuity. Most of the classic consoles had good-to-great preamps—API, Neve, Trident. The big difference between using a console and a card table full of different preamps is the continuity of sound. Multiple preamps cause what I call "audio schizophrenia."

Geoff mentioned API, so let's talk about the style of preamps that API builds. Todd, API makes a preamp that dates back 40+ years in its origins, designed by Saul Walker. It was originally found in consoles, but eventually it went modular and gave birth to the 500 Series format.

Todd: Actually, 2019 is the 50th Anniversary of API!

That's right—congrats to you guys!



Todd: Our core preamp design, and sound, is the same for all versions of our preamp—200, 500, and rackmount. The API preamp has been modular from the beginning, with the 312 preamp card in the earliest consoles. The API 500 Series module also existed from the beginning in those earliest consoles, but was only for EQ or other signal processing. The preamp didn't make it into the API 500 Series range until the mid-1980s.

Great River builds a modern take on a classic British-style console design. What gave those classic preamps their sound?

Dan: It's the transformers, to a large degree. They contribute a lot to the sound, things like the thickness and fullness of the bass and mid-bass, as well as a bit of softening of the high end.

The other major contributing factor is the amplifying circuitry. In the case of the Great River NV series, I use the classic 3-transistor single-ended Class A amplifier stages. These circuits generate increasing distortion as they work harder, causing a change in the tone and feel of the signal at high levels. It is fairly subtle, but definitely there, and is part of the sound of a lot of popular recordings for the last 50 years.

What effect does a transformer have on a preamp's sound?

EveAnna: The input transformer performs a few tasks: receiving the balanced input signal from the microphone, converting the impedance, and providing some nearly noise-free gain. When implemented correctly, the input transformer has a small contribution to the sound and doesn't add or subtract much at all!

Wade: How the input transformer interacts with the microphone is paramount. One example of this is the 300 or 1200 ohm switch on our TG2s. People often prefer the 300 setting because it is fuller and smoother, even though by today's standards it might be considered an impedance mismatch. By 1950s and 1960s standards, though, that would have been considered the correct impedance. This, to me, points to "advancements" not always being better in audio. In computers... yes. Audio... no.

Dan: It depends a lot on the transformer you're talking about. In a very general way, a transformer contributes frequency- and level-dependent distortion and some bandwidth limiting. Of course, if you are doing a professional-level product, you have to use good transformers, so these "problems" of transformers are minimized and don't make things sound like an old telephone.

Todd: For the API preamp we use an input gain transformer and then a combination of our op amp and an output transformer, so they are large contributors to our character and sound.

Geoff: Some transformers, due to inherent flaws, affect sound in a way that

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is pleasing. We use transformers that are pretty transparent.

Geoff, some of your preamps have a transformer input and a transformer out, while others only have an input transformer. How come?

Geoff: All of our preamps have input transformers. The decision to use an output transformer is based on other criteria, like space, cost, whether the preamp is expected to drive long cables, etc. Our output amplifiers contribute more to the vibe in our preamps. Our differential outputs have greater low-frequency response than a transformer, flat down to 10Hz.

What is an op amp (operational amplifier) or differential amp, and what does it do?

Todd: An op amp is used as a gain/buffer stage to amplify and/or add drive capabilities to a signal. Thus it can be used as the gain stage of a preamp, as a buffer to filter a signal for an equalizer, etc.

John and Michael, tell us about your choice not to use transformers in your designs.

John: Millennia is all about clear, color-free performance, so we tend to avoid transformers. That said, our TD-1 half-rack channel strip actually has 3 audio transformers: one for the DI section (mostly for galvanic isolation) and two for the Reamp sections. We have a technology in development that, counterintuitively, derives audio transparency and linearity from transformers. We also recently designed a 3-pound line-level output transformer for customers who, for whatever reason, want a transformer-coupled output stage in their NSEQ, TCL, STT-1, or any other 2U product. It's the most neutral line-output transformer we've ever heard,

and stays linear up to +32dBu (88 volts peak to peak), even at bass frequencies.

Michael: I think there are two primary reasons (no pun intended) to use a transformer for signal coupling. RFI filtering and ground isolation is one, and adding harmonics and "warmth" is another. While modern transformers are capable of very low distortion and fairly wide bandwidth, we feel that there is still some loss of resolution. Since we strive for absolute transparency with our designs, we don't use transformers to avoid any added coloration. To achieve good immunity from RFI/EMI (radio frequency interference and electromagnetic interference), we have had to focus on protective filtering circuits. All of us know what it sounds like when your cell phone is about to ring!

What about some of the terms we typically see in preamp descriptions? What is a discrete design?

John: The common definition of "discrete design" is that which employs individual transistors and tubes rather than integrated circuits. But that definition is somewhat murky, as many modern designs are better called "hybrid" devices, with both discrete and integrated circuits side-by-side.

What is a balanced design?

Geoff: A balanced signal is composed of a positive (+) signal and a mirror-image negative (-) signal. Using differential receivers and transmitters allows a signal to go from place to place with a minimum of degradation due to ground loops and radiated noise. This is true for connecting a signal from a microphone to a preamplifier, or from the preamplifier to a recording device. As well, in our mic preamps, the signal stays balanced internally to further minimize interference from adjacent channels or external noise sources.

What is a transimpedance circuit topology?

Michael: A transimpedance amplifier is another name for a current feedback amplifier.

Except for a few no-feedback designs, all amplifiers use some sort of negative feedback to reduce distortion and control gain. All our mic preamps use transimpedance or current feedback amplifiers.

What is a Class A design?

Dan: It's a circuit comprised of individual transistors, resistors, and capacitors that operate in an always-on manner. There is no point in the cycle of the signal that there is not current flowing through everything.

EveAnna: It is usually a single-ended design and it is not as efficient as, say Class B or AB push-pull designs. That said, with Class A designs, you will not get any "crossover" distortion, because the device is not handing off part of the signal to its partner device. Each of these topology arrangements does produce different distortion products. In general, you'll get odd-order harmonic products from push-pull designs, and more benign-sounding even-order harmonics from single-ended designs. This all applies to solid-state and vacuum tube designs, by the way.

Geoff: "Class A" is a very misunderstood buzzword. Basically, that means that the output devices draw constant current. I'm sure that helps the layman a lot. The two schools of power are "single sided", meaning one voltage and ground (Daking and Rupert Neve), and bipolar voltages, meaning plus and minus voltage plus ground (API and many others).

What is a FET output stage?

EveAnna: FET is an abbreviation for Field Effect Transistor (such as a discrete Toshiba 2SJ74). An active audio block ("stage") can be designed with FETs, BJTs, ICs, hybrids, tubes, and so forth. Any output stage designed using FET technology can be called a "FET output stage."

Wade, you made a germanium preamp a few years back. What is a germanium circuit, and what does it do to the sound?



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Wade: Germanium transistors were some of the earliest transistors built, and when done right, offer a mix of tube and solid-state characteristics—the extra depth associated with tubes but the firmness of solid state. Although it's not a preamp, I feel that our Curve Bender EQ is a great example of this sound.

Do you think there is a British preamp/console sound vs. an American sound, and if so, what is it?

Wade: To me it's more of an EMI sound vs. the others, especially in the tube era of the 1960s. EMI just had their own approach and way of designing. You see this in the TG console channel strips with compressors in 1969, a decade before many others. They made the RS114 tube-based diode compressor in the 1950s, decades before other diode compressors became known. The RS56 tone control had advanced frequency and shape selections also developed in the 1950s, which I feel was a huge influence on later parametric EQ designs.

Dan: I think there was more distinction between Brit and American consoles in the beginning of the solid-state era, when the Brits built more single-ended stuff, but the Americans were using more discrete op amp type circuits. The American circuits—like API and Electrodyne and Sphere—were more linear and typically had wider dynamic ranges. Things evened up pretty much by the early 1970s.

API designs are often labeled "the American preamp/console sound." How does this differ from the British sound?

Todd: It has to do more with the character or fingerprint that different manufacturers'

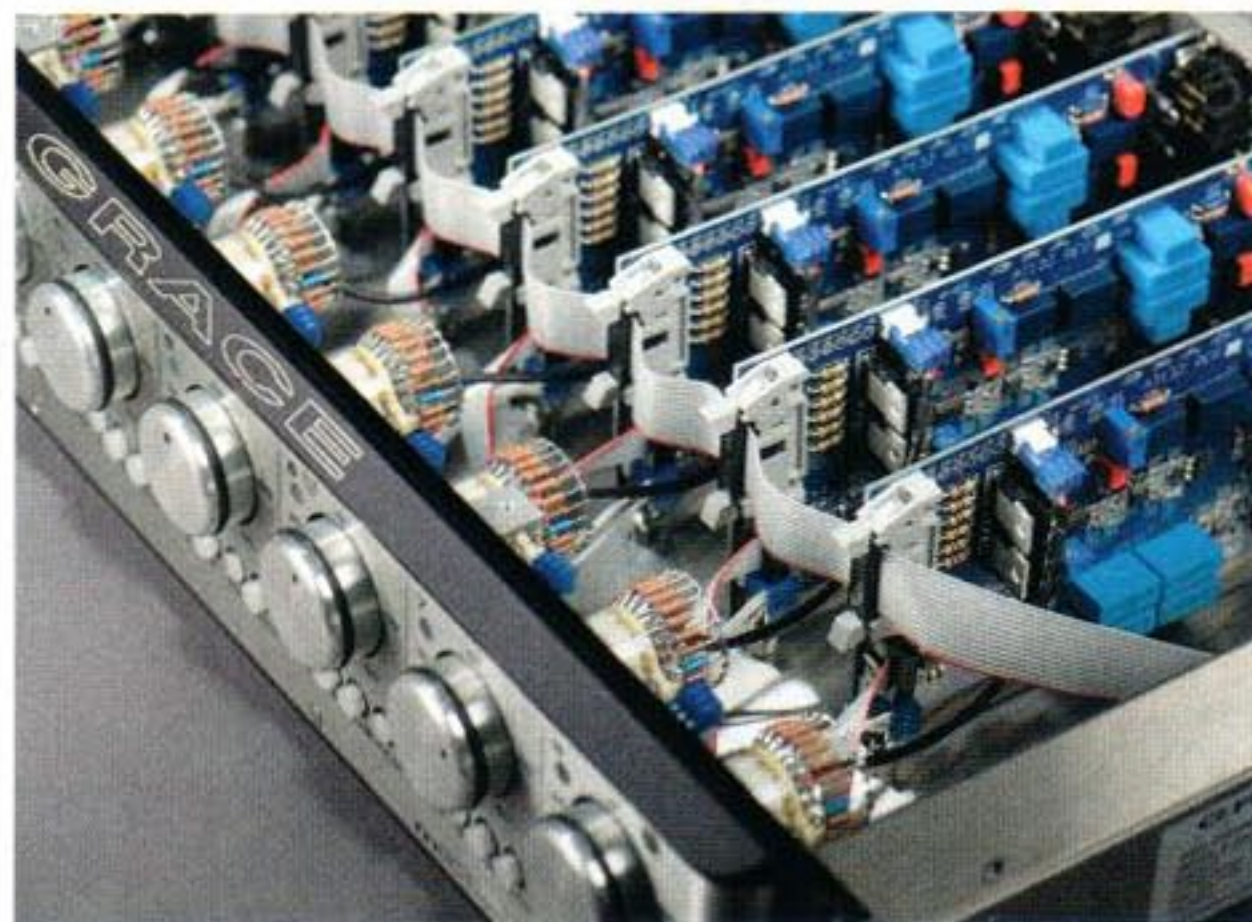
gear gives to the audio signal. The British sound is often used in reference to a Neve preamp. Common description is that they tend to be a little darker in character, where the API preamp is often described as brighter and punchier.

What is your favorite historic or modern preamp design and why?

Wade: The REDD.47 and RS61 EMI preamps. They are thick and dense but still open and "hi-fi" at the same time.

EveAnna: Doug Sax's Mastering Lab preamplifier is our favorite historic design, which is why we have gone back and re-emulated it in the CORE. If you're a fan of the rare Mastering Lab preamps, the closest thing you'll find in modern production to them will be the preamp in the Manley CORE.

John: I love the 1073 circuit, the sound is so forward and in-your-face without being



overly harsh. And I love the old Telefunken V-72 and V-76 tube console preamps. They are rich and lush in a 1950s smoky jazz-bar way that I've never heard in any other mic amp design. Another favorite is taking an old Ampex 351 tape-head amplifier and using it as a microphone preamp—gorgeous thick and full sonics, especially when overdriven.

Todd: This sort of cheats your question, but the Audio Toys, Inc. preamp from the old Paragon and Paragon II live consoles. We use it in our JDK line in the JDK 8MX2. It was a very different design than the API preamp—heaps of gain and headroom, but so different in that its goal was to be as clean and distortion-free as possible.

Dan: I like the discrete op amp/transformer designs—DeMidio, John Hardy, Sphere, Electrodyne, that kind of stuff.

Geoff: Trident A Range. That was the best sounding console ever!

Michael: I would have to say the old Manley Dual Mono mic preamp is one of my favorites. I guess it's "modern," but I think they have been building them for more than 25 years.

Final question: If there was one myth or misconception about preamps that you would love to dispel, what would that be?

EveAnna: It is one I also try to educate the audiophiles about, which is: when faced with a volume control or input attenuator, turn that knob up and do not be afraid! Let the tunes get into the unit. Don't throw away your signal-to-noise ratio on the volume control. In our preamps, think of that input control like a variable pad. Start with it full up, keep the preamp gain on the low selection, and only pad down the input signal if you are overloading the next stage. If you don't have enough gain with the input even all the way open, only then invoke a higher gain setting on the preamp.

Michael: I guess I have always been a little frustrated with the discrete-vs.-IC debate. I think both approaches to audio circuits have merit. It just depends on what you are looking for. Modern IC designs are capable of vanishingly low distortion. If this is what you need, then you will not get it with a discrete design. If you want a preamplifier that is forgiving and provides some "warmth," then you

will probably be better served by a discrete design. It is generally much more difficult to build a practical amplifier from discrete components that will not have considerably higher distortion than an IC design.

Geoff: That phantom power damages ribbon mics. You can damage a ribbon by patching with the phantom hot, or a bad mic cable, but correctly connected, the mic does not "see" the phantom voltage.

Todd: Possibly the idea that everything can be "fixed in the mix." If you don't start with a good sound, including a good preamp, you will always be struggling.

Dan: Oh, I don't know... maybe that you should only have one type, 'cause that's how they did it in the old days? I think that's crap. But I suppose having one of everything can lead to analysis paralysis. One or two each from about seven companies would probably be best! [laughs]