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ROGER MAYER

The well-informed and ever-effusive Roger Mayer and I met up in my local pub, The Red Lion Teddington, SW London. There couldn't have been a more appropriate location for a heads-down chat with this pedal guru: he used to pass by here on his way to work at the Admiralty Research Laboratories on the other side of Teddington; Kingston and Richmond - the nexus of the British R&B scene of the mid 1960s - are just across the Thames; Eel Pie Island, where The Rolling Stones and others got their start, is just up river; and Mayer's own current home and workshop is only a couple of miles east of here. Oh' and they serve great beer.

Let's have a little bit about your background. What first got you started on effects?

When I was growing up - not far from here - some of the guys who played in the local bands I got to meet were Jeff Beck and Jimmy Page. Playing blues. I play the guitar myself, so when I started hanging out with them we were always interested in what made the American records sound different. We were listening to people like Freddie King and all kinds of different people, kinds of music that not a lot of other people were listening to because it wasn't on the radio. Stuff from Chess Records in Chicago and some of the American stuff, James Brown and that, and those records were really hard to find in England.

Even before that, when I was still in school, I had started making treble boosters and playing around with different guitar tones ... I later did six years of university and studied mechanical engineering and electrical engineering at the same time, then I worked at the Admiralty Research Laboratories, just down the road...

. . . It's a spooky-looking place - these huge airplane hangers and such...

Yeah - the Admiralty was a top-secret establishment. We were involved in vibrational acoustic analysis, which is half engineering and half electronics, because all the measurements you do are electronic, and you've got all the subsequent vibrational and acoustical analysis of it using pickups, using all sorts of transducers and different equipment.

It's all even related to electric guitars, if in a very broad sense.

Well, it is allied. Say in the case of submarine detection, which is done by listening underwater through hydrophones, underwater microphones, the techniques used for listening to the sound and picking up the sound were always state-of-the-art then - they always are - and we were involved with that.

And you were getting heavily involved with the music scene at the same time.

Oh yeah. That was the daytime job. I had a lot of friends who were professional musicians who were making different sounds. Obviously you were actively encouraged to have hobbies to help you at work.

Who was the first person you started building things for.

I suppose really it was Jimmy Page. Jimmy Page and Big Jim Sullivan in the early years. In fact one of the fuzz boxes I designed and made in 1964 was on a Number One record - 'Hold Me' by PJ. Proby. That was the first fuzz box recorded in England.

Everybody argues about where the first fuzz and amp distortions came from...

Put it this way: anybody who turns a guitar amplifier up loud is gonna hear distortion. Anybody who had a car radio back then would have heard distortion. You know what I mean? Electronic amplifiers way back then were not that great.

But turn them up 'too loud' and often they did sound great.

Well...yeah. There's always an optimum window for things to operate in, and they weren't designed for that (being pushed into distortion). Traditionally you'd have that classic rockabilly sound, or the other end of the spectrum you'd have your jazz tone, Charlie Christian and that kind of stuff.

It always occurred to me - despite all the early rock'n'rollers arguing about who played the first distorted tone - that early jazz and blues electric guitarists like Christian and T-Bone Walker and others certainly would have cranked those little amps up well into distortion when they were jamming at home or in small clubs, even if they weren't allowed to do so on the bandstand.

I would imagine so, yeah. Down at the juke joint or wherever. Quite naturally, if someone's going to get an amplifier the first thing they're going to do is turn it up, especially if you're a player like that. To imagine that someone didn't explore the boundaries of it is crazy.

A fuzz tone is a little different than amplifier distortion, obviously, but as a way of getting that tone at different volume levels it must have its roots in the same desires for a particular sound.

It's not so much even getting that tone at different volume levels. The important thing in the beginning was actually producing the sound to be on the record. Because once you've got it on the record, people can play it at any level and it's going to sound right, isn't it. So I started off making stuff that was used on records. It obviously worked live well, but that's really what I'm probably most known for – making pedals and devices that were used on records.

Most of the guitar players I met way back then would want me to make a pedal or something that had a different sound on it, because that was the important thing. Playing live was of secondary importance, because you ain't going to get gigs unless you've got a hit record, and if you want to break new ground you want to get your recording sound right. I still think that holds true today, of any artist. If you listen to a record and in the first five seconds you go, "Who the hell is that making that sound?" – you've got them.

Sure, and if the kids find out what gear they used they'll run out and buy the thing, too.

To some extent. But that's really a marketing exercise of the manufactures jumping on the bandwagon, which really didn't happen so much back then. But yeah, of course.

It always amazes me how many young guitarists don't realize that the way they should set up to play in the studio is very different from the way they set up live.

Oh, there's no comparison. None at all. The actual goal when you're recording is to get the sound on tape so it can be played back through loudspeakers, and then go back through the whole mastering process. What you've actually recorded – on tape or digital, it doesn't matter, that's only a recording medium – it has to go through broadcasting, mastering, CD, vinyl, whatever process you're using, and it has to stand up.

Go way back. If you listen to an early Elvis Presley record with Scotty Moore playing, the sound of the guitar playing still comes through. If you're listening to it in a '57 Chevy on an AM radio, it's still a hit record, it still sounds cool, it still sound rock'n'roll. And that's with limited bandwidth and all....that's, shall we say, the lo-fi of it, that's not hi-fi. But the sound, the intrinsic heart and soul of the sound, still is maintained. That doesn't hold true for an awful lot of modern sounds, for many reasons.

If you're going to make a sound that's going to be recorded, that's completely different than if you going to make a guitar tone that will suit a small pub. Then you've got another further scenario of a major stadium rock band. Then you have to make the sound on-stage, which has to be amplified by a microphone to go upstairs to the big rigs so everyone can hear it. And that's another problem. That's a cross between recording and playing live. It's another tone you would require, because the actual tone is coming out of the speaker cabinet – picked up by an SM57 or whatever they're using – and then it's going through huge linear transistor amplifiers and upstairs to the speaker rigs.

If you see ZZ Top or Aerosmith or any other big band live, are you really hearing the guitar amp? I don't know. You are hearing a sound that originated from a guitar amp, but it's had a lot of subsequent processing done to it. It's gone from an electronic signal, into a loudspeaker, into the air, into a microphone, into a whole other bunch of preamps and EQ and maybe compression into another power amp and into a huge set of loudspeakers overhead, and then it's propagated through a huge auditorium before it hits the ears of the punter.

And that only highlights the conundrum a lot of players get into in their search for a certain pedal which they believe some guitar hero or other uses to get a particular sound. They often get the impression that this magic effect will give them 'that sound' in all circumstances...

What they are forgetting - and this is where some understanding of the science of hearing has to be thought about - is, for instance, there's a whole set of perceived frequency response curves of the ear at different sound pressure levels, and these are reasonably well documented. They're called Fletcher- Munsen Curves. Basically the ear perceives different frequencies differently at different sound pressure levels. So as it gets louder, you need more and more top end, and so on.

The actual EQ you perceive - and I'm not saying what's coming out of the loudspeaker, but the EQ that you yourself perceive - changes. It changes with the sound pressure level, and it also changes, too, with the duration that you've been listening to a loud sound.

If you're subjected to continuous high sound pressure levels, say if you're in the studio all the time, your high frequency starts to pack up, and you compensate and compensate. And this is why people can walk out of a mix - and this is not even talking about other

substances, drugs or whatever, which distort it even further - and not be aware of what they've ended up with. Your perception changes with time, and it changes with how loud it is.

You've also got the variables, of course, that the loudspeakers in the amplifier do not respond the same at different volume levels.

There are so many variables. And then someone can take an amplifier into a different acoustic room, and the effect of the room is different. You can do a soundcheck in a room without any people and then come on and play when the room has filled up, and it's dramatically different. It's almost a waste of time doing one. Rooms even sound different in the winter than in the summer, because people wear different clothes. It's all to do with applied acoustics.

The point being that there are no universals: you might find some favorite pedals that do the best for you in certain situations, but they're never going to sound the same for you in every circumstance in which you use them, or the same as when your hero uses them.

Exactly.

Looking a little more at your own career as it developed, what was your first commercial pedal product? Was it the Octavia?

Well, I never originally offered that commercially as such, I just made them for a few select people. They were like prototypes. What happened was, I was working with Jimmy (Hendrix), making all the different sounds. When I made the Octavia for him we made a few, like maybe a half a dozen or so, but when I went to live in America I went straight into manufacturing recording studio electronics. Making studio consoles and equalizers and being involved in the set-up of Record Plant and Electric Ladyland and all that sort of stuff, so I wasn't into making little guitar boxes. The only time we'd make a few guitar boxes for people would be for famous players, not anything available commercially in a store.

When you were working with Hendrix, he obviously couldn't just go to the shop and pick up different boxes for different sounds because the effects just weren't there. But better than that, he had you in the studio working right along with him. What was the process like?

The process started, basically, Jimi's got a particular song, and there'd always be an emotion that he wanted to portray in the song. If you get an idea what the song's about...like, Jimi and I would spend a lot of time around the flat or at the Speakeasy discussing what sound we might want to do. If you were going to use echo on it that would be one sound, or if you wanted the guitar to appear to disappear then come back.... The sound that you're ultimately going to put on the record is going to depend on a couple of things, isn't it; what's the song about - you're not going to put an inappropriate sound on it; what key's the song in, because you can voice the box differently. You might want to tune the wah-wah differently for it....

Would you go as far as tuning in resonant frequencies and such?

Oh yeah, yeah. We'd got one amp, two amps, we had multiple-path techniques of processing because we were only recording to four-track, so it had to be done pretty well immediately. I'd go back to the control room and have a listen and then.....

...And then get out your soldering iron . . .

[laughs] Yeah, well, we'd got the room at the back there, the maintenance room, where we could go and change that. But you'd take a few different things to the studio that you wouldn't have on-stage - different driving stages to put in front of the fuzz boxes, different equalizing stages, different voltages you're using on the fuzz boxes. You'd segment the stages out.

You've got the interesting case of pre and post-equalization. So you can equalize the fuzz box before you turn on, and afterwards, and both, so you've got an infinite number of variables. Then the different amplifiers, the miking techniques, it goes on and on. As I said in the beginning, we are only concerned with making a good sound that goes to tape, and we're going to use anything we can to get it.

And you don't have to repeat it on stage...

No, no – because that's irrelevant. Because when you actually go on stage, the public can only appreciate about three different sounds. They will be much more concerned with the energy on stage, whether he took his jacket off, changed his guitar, and so forth, because they're getting caught up in the hysteria and the noise. It's not technical.

Did Hendrix enjoy recording?

Up to even the *Axis Bold as Love* album he was very shy in the studio. He didn't think he could sing. All the lights would have to be out, he'd sing with his back to the control room, he was very shy. He needed a lot of encouragement. As well as technical side, one of my jobs with Jimi was to help get that three minutes or so of magic. That's the end, the goal. The whole day has to lead up to that, whatever your job is, engineer or making the sandwiches or whatever, your objective is to capture 200 seconds of magic.

Jimi would cut a solo and I might be sitting next to him on the floor of the studio, and he'd say, "Go and listen to that, Roger." He wouldn't even bother to come back in. I'd listen to it, and Jimi'd go on the intercom to the studio and go, "How was that?" Chas would go, "That's great, Jimi that's a take." And then he [Hendrix] would say to me, "What do you think?" I'd say, "Take one more, Jimi." Then he'd do what would end up as the actual solo, and people's jaw would just drop. You see, I knew him, and I knew what he could do. He was just messing around, and that solo wasn't the one.

I guess Chas had some other considerations, too.

As a producer in the studio, Chas was very, very good, but he was always watching the wallet. Jimi would happily spend all day in the studio but Chas was always in a hurry to get it done. The production work in the studio was all done by Chas and Jimi, I handled the guitar sounds, and Eddie Kramer really was the engineer. He had no idea what the song was going to be until Jimi was finished with it. No one did, really, then they totally couldn't believe it, because we were breaking new ground.

Which I guess is partly why people constantly come back to Hendrix, they come back to The Beatles, they come back to Elvis or The Rolling Stones...

Because we didn't have CDs we would listen to and say, "We want to sound like that." We had records we'd say, "We don't want to sound like that." When Eric Clapton and Cream came out with *Disraeli Gears*, Eric was pissed off because we came out with *Are you Experienced*, because that blew him away, and he knew he could never sound like that.

He went out and got permed.

Yeah. [laughs], you know what I'm saying? It was a completely different spirit of breaking new ground, and it was totally on the edge of making new sounds.

Hendrix was working very much at the dawn of transistorized effects, and he used them well, but when we think of Jimi Hendrix's playing we don't think of a player getting his sound by running through a big pile of effects. You think of his Strat, a cranked-up amp, and a lot of feeling and tone.

Oh yeah, yeah – exactly. That's the whole point. You see, that is the true measure of doing a job right; that people don't think of it as an 'effect' sound. Any song you hear with Jimi playing the guitar, OK, yeah, he's got a great sound, but you don't think, "Oh, it's gimmicky." That means the job's done well.

And the songs where people get the sound totally from an extreme use of effects often do come out as gimmicky, usually one-hit wonders.

Or hit and shit, as we used to say.

Something like where a guy has just discovered a flanger, so the whole song is washed in flanger.

Yeah, over-used.

Or, as you put it, the brick wall effects, which don't allow a player's own dynamics and emotion to be a part of the sound.

And then the band becomes anonymous. If the particular effect is not sensitive to the player, then the band becomes anonymous behind it. The band achieves total mediocrity instantly, because the sound is shit. On our website, for example, we've got eight seconds to impress somebody with a guitar tone, no more. And in the first 30 seconds of watching a guitar player, people can usually work out whether they can play or not.

And if you've got a piece of gear with which anyone who plugs into it sounds exactly the same...

Which they don't with Jimi's rig, because I've experienced people come up to Jimi's rig and plug into it, and they sound horrible.

After your days of making studio equipment, working with the Isleys and Bob Marley and Stevie Wonder, what got you back into guitar effects pedals.

It got to about 1980 or so and people started to ask for my effects a bit more, and that's when I designed the rocket-shaped enclosure...

...Which is now such a distinctive thing.

It's an icon, really. The actual reason I designed it was because I wanted to have a pedal that when anyone looked at it they knew it was mine. You didn't have to put any writing on the box. That kind of thinking came about from the automobile industry. People look down the road and you don't have to see the label of the car, it's all shape recognition. And also the shape of the rocket has a lot of ergonomic considerations: it's got the fins on the back that protect the knobs from anyone putting their foot on them, you can drop the box and never hit the knobs, and you can also hit the footswitch from any angle - back, front, sideways. So that enclosure was a culmination of a lot of design parameters.

What did you first put into that enclosure?

The Octavia. But when we first made it we did it with an optical switch, it didn't have a snap-action switch in it. We put those out, and after a period some people said they liked the snap-action of the switch and this and that, so we put a different switch in it, which is slightly cheaper to produce than the optical switch anyway.

And your stuff's been more or less available since that time?

Yeah, since the early 1980s. We had the Axis Fuzz, a Metal Fuzz, and the Mongoose pedal.

It seems, if anything, you've had more of a boom again just recently.

What I started doing, when we came back to England, was I stopped making any specialized rack-mounted equipment for different people, and concentrated on worldwide distribution. Japan's always been our biggest customer. We're very well known in Japan. In Japan the equipment is perceived in a different way. The multi-FX digital pedals are really perceived as amateur pedals, they're not used by professional rock musicians at all, or very, very rarely.

And then all the cheaper types of Chinese and Korean pedals and all that, they're strictly entry level pedals for beginners. And the mass produced Japanese pedals are considered not quite professional level....so it's just perceived differently. Our pedals, in Japan are one of the best-selling of the high-end pedals. We're probably about number six in the whole of Japan.

What do you think of the whole so-called 'boutique' pedal market?

Boutique pedal market? I don't consider myself in that market. Most of them are just clones and rip-off merchants. Most aren't designing anything new. They're not putting any R&D into it, they're not designing their own enclosures, and they're not making anything new. And I'm getting tired of being ripped off.

But since you were one of the first builders, it's probably hard to follow you without building something that is at least vaguely similar to a pedal you have done yourself. Like with the Octavia, which you never offered commercially the first time round...

Yeah, but that type of market is charging someone a lot of money for rubbish. What I'm saying is they're not spending any real money on R&D, are they? They're really not taking it any further. And also, continuously going back to the past and not evolving is bad. It's not investing in the future. In any publicity, I've never said that all we do is make a version of our old pedals. We're always constantly evolving: new enclosures, new this, new that. We're always using new components. We never make a feature out of using an old component, because years ago most of the components were crap and horrible, and they are better today.

So many people make a big deal about dredging out old vintage germanium transistors and this and that . . .

We use germanium transistors in a couple of designs. But the reality is that you've got to buy thousands of them, then you've got to sit down and test them all, and you're only going to come up with a small percentage that are any good.

How bad are the tolerances?

There's maybe 30 per cent that you can use. But it's always like that. The tolerance on the gain of a germanium transistor can go from 20 to 600. That's 30-to-1. You always had to select them, and in these simple circuits you spend more time biasing than you do making them.

And, of course, what you're buying today, because they're not made any more, is you're buying old transistors. It's like buying old capacitors - they're rubbish. Even if you bought an old fuzz box, all the electrolytic capacitors are going to be dried out, gone. And today all the resistors are much better.

So you don't think there's anything in carbon comp resistors, or...

No. Rubbish. That's just myth. Noooo... rubbish. A resistor doesn't do anything. There is nothing in the composition of a carbon comp resistor versus a metal film resistor that is going to add or subtract any harmonics to the signal. It's the same as audiophiles in hi-fi talking about different types of copper and speaker cable. That is unbelievable... and it's the people they're selling it to, the mugs. I'm a scientist, and copper is copper. More copper is better than less copper, but there's no such thing as great 'northern Italian copper' and all this rubbish. That is the biggest load of bollocks I've ever heard in my life. Absolutely unsubstantiated snake oil.

So you feel you can almost always do the job with new and improved technology?

The only exception you have to that would be in transformers, in transformer steel - talking about valve amplifiers in particular. Certain types of laminations used back then are a different shape than they use today, but they were less economical to produce than they are today and the steel was slightly better.

So your output transformers would sound a little different.

Yeah, and you might like that. And with the old loudspeakers, the lighter alnico magnets used to sound different of course, but now they're horrendously expensive. But when it comes to resistors and capacitors, there's nothing you can put on the bench with all the most sophisticated analytical equipment and find that one bit of mylar capacitor is different from another.

What about differences between different types of op amps on the market?

Well, then you get into design, and actually knowing what's inside the operational amplifier. That's where you really have to know your beans. If you're going to use an operational amplifier, it's not what they put on the specification sheet, it's what they don't put on it. And that - when you're an electronic designer and not an experimenter - that's an art form. If you're writing a specification sheet, it's what you *don't* put on it.

If you're on the cutting edge, as manufacturers, when we're using a different component we actually have to go to the manufacturer of that component and speak to the design engineer to get the information we want. And then he puts you on the shortlist, so you give him feedback from your experiments. Because if you're on the cutting edge, you're always going to be in an area that's not even written down. They're only going to write the specification generally: the car's got four wheels, it does 100 miles per hour. Things like that. They're not going to tell you what happens if you operate it at this voltage rather than that voltage, all these other things. There are so many exceptions, you see. And to produce distortion, you've got to know how to bend the parameters to get what you want.

And dealing with guitar tone, it might often be that in the exceptions to the rules is where you find the cool sounds.

Oh, the most important thing you realize about sound is that music, by definition, is a non-repetitive waveform. It doesn't repeat.

Though when you get it represented in the usual waveform diagram it's always illustrated as if it is repeating So tell us why it's not...

Because it's not repetitive. Music is not a repetitive waveform. Once the brain hears a repetitive waveform, like a door chime or a drum machine pattern, it immediately categorizes that as a not being music. It becomes a mechanical pattern, and we are programmed to recognize it. We can sit on a train and hear the rhythm of a train, and we hear it as a mechanical rhythm. Say you listen to a dance record, you immediately work out what's done by a machine and what it's, if it's repetitive. You'll categorize a repetitive pattern like that as being non-musical.

But getting back to the technical side of a repetitive waveform - music doesn't repeat itself, no two cycles of music are the same. When you start using techniques such as electronic feedback and so forth, they don't necessarily work. Because feedback is a process - and I don't mean squealing and howling, but electrical feedback as a corrective process. The point is, that because the waveform has changed by the time you apply feedback, there is a finite time delay: you are time-smearing it. So what happens is the electronics you require to accurately reproduce amplifier distortion and so forth have got to be incredibly quick, and have to have a huge bandwidth to faithfully reproduce what's going on, because once you start applying feedback to limit the bandwidth, it gets distorted, in the truest sense, because it gets altered into something it never was.

That's one thing. So any analysis techniques you apply to music using sine waves is limited, because it doesn't give you the dynamic response. It doesn't give you the true technical response of what's going on.

So what do you do? Just play the thing?

What you do is use every tool in your arsenal, whether it's conventional distortion analyzers, time domain analysis, and all these different techniques to look at the waveform to see what the harmonic content is. But these are only ever guidelines, because it's the instantaneous dynamic response of the amplifier or effect that you're interested in. I've always specialized in designs where we use a lot of different techniques. We use a lot of feed-forward in my designs, which means you're taking information from the input or the guitar to modify the circuit. So all this is changing in real time: how hard you play, how soft you play, all the subtleties and nuances are changing. It's impossible for someone to really analyze this, because they have to know what you are trying to do to start with before they can even decipher it.

A simple circuit, if it's designed in a certain way, becomes a very complex thing analytically. It does not become that simple. But it becomes organic, so the actual sound itself then begins to take on a human quality, because quite naturally you are taking information from the [guitarist's playing technique] or from the input, and that's control in itself, that's determining its own output. It hasn't had an algorithm or a set of parameters placed on it to predetermine the sound.

And that's where your dynamics and your touch-sensitivity come from...

Exactly.

Which end up being the sounds people really like, even if they don't know exactly why.

Because they're not repetitive and they're constantly changing - then it takes on an organic quality, a very human type of sound. Even though it's distorted, it's not the same type of distortion. You know, all that stuff that was done with Jimi on all the records, even the stuff that was very distorted, it was very human sounding. The sounds take you out into space and they take you back, and you relate to it better.

If you listen to the classic 'brick wall' effect of a fuzzbox on something like, say, 'Summer Breeze' [by The Isley Brothers], that's got one tone on it and that's it. You might like what it's playing, but it's got no human quality to it.

It's the 'can of bees' sound.

Exactly. And I've always stayed clear of making any of that kind of thing.

Whereas your goal would be to build a fuzz that you can play with, not one that's just a wall-of mush fuzz.

Yeah, you want a tone that's organic. And it's so easy to build a fuzz box or a distortion type of box. You've got many boxes that, to be frank, you put a guitar into it and you wouldn't know what type of guitar it is. The whole tonal quality of that guitar just disappears. It's got 'brick wall' processing in it, and this ever so true of some of the cheaper multi-FX processors. Horrendous.....

That's where I often hear the flaws, on the note decay.

That's where you always hear it, especially on digital echoes. I worked in the studio years ago when digital echoes were first coming out, and they were ferociously expensive - I'm

talking about studio echoes that cost about \$20,000 – and, naaah.... They didn't sound any good.

The best digital echo you can get is using Pro Tools and some of this stuff, but that's using a very fast processor, and it's got the benefit of buffering the signal before you process it. And it's not in real time.

The whole thing about digital processing in real time is that you're always going to have at least one sample delay before you can do anything to it. It's quite a delay. And the other thing about using digital processing is you've got to decide exactly what you're going to do the signal before you do it. You cannot use feed-forward techniques, you cannot use the input of the signal to suddenly modify the algorithm as the signal is changing. You're stuck with it. And digital [emulations of] distortion are not proper... digital modeling of amplifiers does not sound that clever.

The whole problem with the digital thing is you can't put enough processing into it for the money. When it comes to cheap digital products, you simply can't put enough processing into it. They'd all like you to believe you can, but you can't the amount of processing you need to do the job properly is enormous. The difference with computer stuff is you're not doing it in real time. They can put a buffer in of half a second, they can use latency in the processing to their advantage. You've got this latency, which makes these hard disk systems work. But when you're playing live, you can't play with 30 or 40 milliseconds of latency. It's just not quick enough.

The other thing you don't want to do, is you don't want to go in and out of the digital domain more than once, if you can help it. If you can record digitally, OK. But then transfer digitally, master digitally, and then make the CD digitally and bring it back to analog one time, when you listen it. You don't want to go in and out two or three times. You don't want to have a digital stomp box on the bloody floor, plug into a digital guitar amp, then go into a microphone that's recording on digital, then so back out to mix it in analog and record on another digital recorder, all this and that. You've got a complete nightmare of approximation.

You're losing bits all over the place...

Exactly. Once again, it comes down to a simple test that anyone can do. If you roll off treble from your signal source, you can't add it back again to your original sound source. And that's in the analog domain.

Once you're done a digital process to something, how's it going to know, where it was before? The info's gone, lost, finished. You cannot know.

It's not like video. See, video's a different aspect where digital works, because you're surrounded by other information from the pixels around it. You can make an educated guess at to what the picture should be. But you can't do that with audio, because it's changed. Once again, you go back to the definition: music is non – repetitive.

And the artifacts in digital, once they go down to a certain level, become very grainy. It gets a bit annoying on the old ears. People call it coldness, hardness, listening fatigue, all kinds of stuff. It's literally attributed to the fact that the brain is having to do too much processing. If you are listening to a telephone conversation or even someone talking in a rock club, and it's very very loud, and you have to keep straining to hear what they're saying, after a couple of minutes you're going to tell them to shut up and let's wait until we can hear one another. Because the brain is using so much processing power to

screen out all the background noise to try and understand what they are saying. You don't realize it is going on, but it is, and it's very tiring on the old brain – and after a while it goes, “Oh, bollocks” It can't be bothered to deal with it.

This occurs to me time and again when I've tested or reviewed a digital modeling guitar amp. Maybe it has 16 amp models and 20 effects on it, and you'd think a guitarist would enjoy playing with that all day, but more often than not I want to put the guitar down after 30 minutes or an hour. My ears are tired, I feel like I'm getting a headache, and I'm just not enjoying playing. Give me a little 15W tube amp, though, even a cheap little thing, and I'll play it all day.

That's because your brain is totally dissatisfied with the work it has to do listening to the digital amp.

It always struck me that way - and it's not that I have any prejudice against modeling amps or anything.

Oh, no, no, no - that's exactly what it is. Your brain is worn out by it. It's an interesting thing. Look at it like this. Imagine walking in a jungle. We are conditioned, through millions of years of evolution, to detect a stick breaking, in amongst all the other noises, as a danger signal. Pieces of glass breaks, you turn around. We've got all these inbuilt danger signals.

That's what you're hearing, without you realizing it. When you hear sounds that are artificial, they stand out to you. When you hear a synthesizer rendition of an actual instrument trying to sound like something, your brain rejects it. It says, “That's not real.”

And the synths that worked best were - and are - often analog synths, that are not trying to sound like something, but generating a sound in their own right.

Yeah, and the actual sound source was analog. I did three albums with Stevie Wonder: *Music Of My Mind*, *Innervisions*.....We used analog synthesizers. I built them, and we were using analog sound sources and modifying them. Sounds great. Those types of analog that are developed, even though they're synthetic, sit in the mix. You can mix them in. Whereas when they first came out with certain types of digital synthesizers, maybe DX7s and that, you could identify any DX7 sound. Didn't matter what they were set like. You'd go “That's a DX7, that's an M1.” Now it's funny that the brain can identify the algorithm the bloody thing was based upon and categorize it, just like that? The brain's got a huge machinery.

To get back to effects, the best effects are the one that sound human, and blend into the music, become part of the music.

Do you feel you're best known for any one particular pedal?

I suppose the most unique pedal is the Octavia which is the frequency doubling one that Jimi used on ‘Purple Haze.’ And that's the one that's probably been ripped off the most [laughs].

Had anybody done anything like that before you?

Nah. I was just thinking about doubling the frequency and different electronic techniques. And we came across a technique that, looking at it simplistically it almost acts like a mirror. It doubles the number of images of the note. And that, apparently, makes it sound twice the frequency - whereas it really isn't, but it does [laughs].

Because the signal's going up and down twice as much, even though you've changed the relationship of it, the ear perceives it as twice the frequency. It's much like putting a picture up to a mirror and you see two of them, but there's still only one real picture.

Reflection of sound is much like that in a room.

You can make it sound louder. When you mix two signals together, you've got two mathematical variables: one is the sum of the signal, and the other is the difference. Now if you get two frequencies and mix them together, you get the sum and the difference. Going back to the digital side, that's why you need a huge bandwidth. If you're making an analog mixing console, the actual mixing amplifier needs to have a frequency response of up to 300 kilocycles, because it's mixing together all the tracks, and it couldn't mix them together properly unless it had a huge bandwidth. You would lose all the air and the definition between the signals. Everyone says, "You can't hear more than 20kHz," but that's a sine wave - we're talking about the subtle variations in the music, and you can hear those.

That's a great point that doesn't get said much: things happening in a sonic realm beyond the capabilities of our hearing can still affect the reproduction of the parts of the sound we do hear.

Well, it's amazing what you perceive. One of the most frequent comments that you get from engineers when they use digital on a microphone is that they lose what they say is 'the air' around a recording. You hear the actual sound, but you don't hear the ambience. So you're not hearing the tiny subtleties.

And one of the tricks of good engineering is capturing the ambience.

Once you've lost detail in an audio signal, it's gone forever. It's like in a guitar: once you've lost the high frequency from a guitar in a pickup, you can't get it back.

The detail is gone. And that's what you're struggling to maintain.

Do you ever wish you'd put out the Octavia commercially yourself back in the late 1960s, and so undercut the copyists who came along soon after?

Nah. I had my other work, and besides the interesting thing is that the copies never quite did it right.

But I've got no sour grapes about any of that. The one matter about infringing the copyright, though, is they should at least pay respect, you know? If you're making a copy of something, don't tell me the copy's better than the original, when all you're doing is ripping something off.

You see, that's the problem with all these retro, reintroduced pedals - they're not doing anyone any favors. They're not doing the musician a favor, they're not taking anything forward.

Which of your own newer designs has excited you the most?

Recently, an updated version of the Octavia. That's good. I think the most universally used pedal is the Voodoo-Vibe – that's been used by all kinds of people. Now we've just recently come up with a smaller version of the pedal called the Voodoo-Vibe Jr, in the new Vision enclosure. See, this is the new enclosure [removes a new Vision Octavia from its box]. The batterydoor slides like this.... [demonstrates], I designed this enclosure. That's a proper piece of engineering, see. That's not a *'boutique'* pedal....

I know people who have enjoyed the Voodoo-Boost a lot.

Yeah, that's a good pedal. That works. It's the perfect example of a good silicon circuit driving a tube amplifier. It'll interface perfectly for that.

Plenty of players will swear by tubes - they don't want anything but tubes amplifying their sound - and I'm more of a tube-freak than most - but put a good solid state booster pedal in front of their favorite vintage tube amp and suddenly they're in tone heaven...

They do benefit from some preamplification. The 12AX7 is very limited in what you can do with it, in terms of getting good distortion. I don't like the sound of 12AX7's distorting much. Pretty horrible, actually. It's very, very nasal.

I'm almost always disappointed by the proper tube-based distortion pedals out there, except sometimes when used for that massive, cascading-drive modern rock sound.

Yeah. They don't sound right. And once again, that's the properties of the preamplifier tube. The preamplifier tube is fine for amplification and a little bit of distortion, but for the subtleties of it, no.

And the distortion we usually like most - whether we know it or not - is output tube distortion.

Yeah, but it helps to do something before that stage. The type of solid state pedal circuitry we use works better than tubes - and I've tried both.

Do you find certain types of amps get the best sound from good pedals?

I personally design my pedals on a Fender amplifier, a very clean amplifier. I want a reference tone that I'm voicing for. I tend to voice the pedals from a clean amplifier so that someone can go from clean to distorted. I use a '57 Fender Super. It's a classic amp – I've put Celestions in and boxed up the Jensens to avoid bugging them up. Then I'll also try the pedals out with the Fender distorted as well, and that gives me a very good basis. A Marshall amplifier is very hard to design on, because it never goes clean enough, so you can ever hear the subtleties.

Amps like that Super of yours sound great clean, but even the beauty of their clean settings are generated by subtle degrees of distortion.

Yeah. And you can listen to it all day as well. It's a very, good frame of reference

Which other designs are you pleased with?

I designed my Vision Wah because the traditional Wah was designed to be played from a sitting position.

When you play the traditional treadle wah standing up, it puts your hip at a funny angle, you're off balance, you can't stand on it. But my basic aim with the Vision Wah, from an ergonomic standpoint, was to connect the foot to the brain with a more transparent medium. The actual pedal goes slightly forward at an angle. It's still got the same travel, but it's more comfortable, and it's the ultimate low-profile device, so that when you put your foot on it it's as close to standing on nothing as you can get.

See, you've got to connect your brain to your foot. From an ergonomic standpoint, I looked at the foot and the bones and the way they moved, and we went from the angles to create the wah at the minimum height. The Vision Wah is a full inch lower than any other wah. It doesn't use potentiometers, no moving parts, no moving switches. It's all electronically adjustable, and it's very high tech. I went to the top people who do all the composite work for aerospace, and that's where we designed the carbon fiber top plate.

That's a lot of work,..

You're talking a lot of money. Upwards of £100,000 [approximately \$160,000 US] in development for that pedal. And the whole point of that is to develop a transparent interface from the pedal to the brain, to make a pedal that the musician can use – and a lot of people use them now. Santana bought six. It's a cool pedal, and it was very, very satisfying piece of design to do. The actual position of the pedal is sensed electromagnetically.

There's no parts to wear out, and the switch action... as the pedal comes to rest on a piece of rubber, we still measured the angle of the pedal, but then we measured the little change of the angle of the pedal as the little piece of rubber compresses and that triggers the switch. Then you can adjust how much you press down on the rubber, so the switch pressure's adjustable.

Sounds like you should be in aerospace or something.

Yeah, well, I come from that kind of thing... But my pleasure is hearing the stuff used on records, and getting to meet great guitar players and being their friend.

Financially, I could probably have made more money by having my stuff made in some Chinese sweat shop or in Taiwan or something. Like everybody else does.

But you probably wouldn't be happy with your work.

Exactly. I can still eat a steak when I want to eat one. I bump into a lot of other manufacturers at a lot of trade shows, and I'm not envious of them at all. It's the other way round. I look at them and I say,

“So, how's your Taiwanese manufacturer doing?” ‘Cos I know that they're going to be put through the mangle, whereas I know that our stuff is all made in the UK. We just hand it out to the top people, a certain niche of people that's going to pay for it, and that's it.

Tell me a little about the circuitry inside a traditional wah-wah pedal. People usually get the short explanation, that it's a tone control with a rocker pedal on top.

No, no. It's a bit more than that. Basically, the wah-wah circuitry is a filter. It's a peaking type of filter that is swept roughly in about a two-and-a-half octave range. Maybe from 400Hz up to 2.2kHz. Now, there's a couple of variables in the circuitry that make the difference. You have a virtually infinite number of values of coil inductors and capacitance that will give the same sweep range. Because of the mathematics of it, you can still get the same sweep range using different coil values and capacitor values. But this then, in turn, changes the actual fatness of the curve, so the actual EQ curve then starts to change in character. In other words, the Q of the curve gets broader or it gets narrower.

So you've got quite a few variables to tune in a wah-wah. Not only in the sweep range - what the frequency begins at and what it ends at - but also in the fatness of the curve. This makes a big difference on the actual perceived sound of the wah. To make matters even worse, I found early on - like, with Jimi - that if you started varying the actual quality of the magnetics you use in the coil, that also changed some of the distortions produced in the circuit itself. In actual fact, tuning wah-wah is a black art, of which I am probably considered one of the masters. I used to spend quite a bit of time back then.... I didn't actually wind too many new coils, but we spent a lot of time playing around with different capacitors to tune the wah-wah for different songs.

Just to get it to react better in the key of each individual song?

Yeah. Because, if you imagine that you've got a song where you don't want to use the whole travel of the wah-wah, you can adjust the wah-wah so the actual travel doesn't operate the whole sweep, you see? It makes it more expressive from your own brain-to-foot connection. It really becomes an exercise in fine-tuning what your foot does and what you hear. And that will depend on what shoes you're wearing and all this kind of shit.

And this still applies to the stuff you build today, even the Vision Wah?

Yeah, but it's been taken to the nth degree. We do make a kit today called the Red Lion Wah, which has got continuously variable sweep on it with one potentiometer, and that goes into a standard Cry Baby housing - but our new one, which will probably be based on the Vision Wah carbon fiber housing, will have an even more extended sweep. Once again, it's tuning the sweep and the frequency of the sweep to what people want to hear. The Vision Wah that we introduced a few years ago has an additional feature based on something that we did in the studio with Jimi, which is to blend the original guitar back in with the wah-wah, to lessen the effect of the wah. You've got a wah-wah going on, but if you blend the guitar back in it softens it down. We just used a parallel path, with one signal going straight back into the studio. You could try it at home: you have one guitar that's clean, one that's distorted with wah-wah, and you mix them back together.

That's something I've found makes sense with a lot of effects; if you feel you're losing too much of the dynamics, split the signal before the pedal and take one path straight into the second channel on your amp, or to another amp.

Yeah, exactly. That's why our Voodoo and Vision effects have two outputs, so you can parallel-path all the time.

Plus, your current stuff is a lot quieter than most of the older, vintage pedals anyway.

Yeah, and that's because up until the early 1970s, low-noise transistors were nearly non-existent and extremely expensive. They just weren't being manufactured.

What's your view on the whole 'true bypass' issue?

What a lot of manufacturers are trying to do is make something of the fact that bypassing the effect with a piece of wire is a feature. Well, look at it like this: the best signal path from guitar to an amplifier is a short piece of wire. In many cases this is impossible. So if you go into an effect and then bypass the effect with another piece of wire, then come out with a 20' lead, in a stage environment you might be better off using a buffer, because that will eliminate any stage vibration, cable noise, whatever. And the amplifiers like to be driven from a low source impedance. Many amplifiers do not like to see a long cable with a guitar pickup on the end of it. The amplifier starts oscillating. So, you know, buffers are useful in many instances. Our latest Vision Series of pedals has one hard-wired and two buffered outputs, so you can choose the output you prefer. But which is best depends upon a lot of things.....

...Such as how many pedals you've got in the chain?

Yeah, and where you use the buffer in the chain. But listen to the Vision Octavia on the buffer and on the hard-wired output, and with short cables I defy you to hear the difference. On a long cable, that's where the difference comes in.

The whole true bypass thing came from one person in America who started selling three-pole double-throw switches and wanted to make that a feature. It's marketing. It's not based upon any technical advantage whatsoever. It was based upon a myth of many years ago that some pedals had a very low input impedance and sucked the tone from the guitar, even when they were off - but modern pedals. nah.

And wouldn't it be true that if you've got a long chain of pedals that all have true bypass, you're going to be changing the impedance load every time you switch pedals, whether you've got one pedal on, or two or three on together or none.

Yeah, of course you are. The actual fact of the matter is that most tube amplifiers do not like seeing an inductive coil at the end of a cable. They're not that thrilled with it.

And that's where the buffer helps.

Yeah. Some amplifiers go unstable without them. Some of the American boutique amplifiers are built without the grid resistor, the 68k resistor, and they've just decided they don't need that for some reason. But without it, the amp can start to oscillate wildly.

Let's talk some more about your Voodoo Vibe. I understand a good 'Vibe-type pedal is a tricky effect to build.

That was an evolution... it all started off with Jimi and his Uni-Vibes, you know. The Uni-Vibe was developed by a Japanese company, primarily for keyboards to start with, to simulate the Leslie sound.

It's almost like a four-stage phaser, in a way, but the frequencies are set differently so you get this chorusing effect from the unit. When we started using it with Jimi, there was no stabilized power supply within the unit, so the operation went up and down with any variation in the mains voltage, which is quite substantial in America. And the input impedance of them wasn't that great.

The first ones, yeah, they were OK. Then after a while in the States people asked me about them, and I made another version of it for myself, called the Super-Vibe, which Stevie Ray and Robin Tower and other people used.

that was another evolution of the effect that addressed some of the problems of the earlier one. After the Super Vibe, I developed the circuit even further.

I took a lot more care in matching and selecting all the light cells, because once again it's a swept filter that's using a light source and light dependent resistors. The secret to making them work well is to have a good matched set of light cells, which you need in groups of four, and then just keep tuning them.

I took this to the ultimate, really, because we had variations for everything: the type of waveform we used - we could use a sine, we could use a triangle - we could modify the symmetry of the waveform to modify the rise and fall times, to give you helicopter effects and this and that. Lots of different speed ranges of the unit, and a footcontrol for the speed too. The trick with them, because you've got quite a few variables, is to find a really good starting point. To find a ballpark in terms of what type of sweep you want. On the Voodoo-Vibe, you can change the way it sweeps, not to mention the speed and the waveform, so it's quite complicated to use really.

But a lot of players seem to have been happy with it.

Yeah, it's probably the most successful of all the vibe-type units, certainly in terms of sales. In Japan and Europe, more of those have been sold than any other clone that's been produced. And a part of that is because our one isn't a clone of the original. We're not trying to make it a clone, we've taken the downfalls of the original one and improved upon them. Some worked, some didn't, because they weren't that well selected. And they used light bulbs whose characteristics varied with age.

And the original Uni-Vibe also had a light cell that used a particular toxic form of cadmium sulphide that you can't use any more, because you can't get rid of the toxic waste because it's bloody lethal, you know. So the chances of you finding an old Uni-Vibe that really works well are practically zero.

We use a modern type of light cell – once again they have to be carefully selected.

There's about a 6 to 1 spread in the light cells, so we buy literally 10,000 at a time and they're all selected out. The batches are put together, then they're matched with selected batches of LEDs, and then each unit is voiced individually. That's part of what makes their success, that the unit is voiced.

That's what you're paying for, really. The chances of you buying a bag of LEDs and a bag of light cells and putting them together and making it work is nil. I mean, it might work, it might not, but it's not going to sound great. The people who use our pedal acknowledge it, studio wise, as the one to have.

We've just come out with the Vibe Jr, which is a slightly cut-down version of it. It's got four knobs, we've dropped the tremolo function which was just a plus that wasn't on the

original, and we've got a wide-range speed control. It's been designed as a plug-in-and-go version, so musicians can leave the knobs at 12 o'clock and it's going to sound cool. It's got exactly the same circuitry as the other one[Voodoo-Vibe], just that it's got a Speed knob rather than multiple speed ranges – which will cover 90 per cent of what people used anyway – and we've got rid of the triangle wave form, which most people didn't use. The Symmetry control we got rid of; which was most useful on tremolo effects. So we just got rid of two knobs.

Plus it's got hardwire bypass and two buffered out puts. And ours is all class A discrete circuitry, no opamps in it, which can't be said for a lot of them. That also maintains the transparency and detail all the way throughout the range.

Do you ever think back to the heyday of working with Hendrix and miss those times?

The thing I miss probably most of all about Jimi is that he was up for anything. If you came up with a new idea and it appealed to him and he could imagine it, he'd say, "Let's do it!" The enthusiasm he exhibited for doing something new and exciting and innovative was great. Nowadays you speak to a lot of the people and.....you know, any guitar player who cannot be bothered enough to sort himself out and thinks the roadie can do it for him, in my book, he's not even interested.

It would be like a Formula One driver totally trusting his test driver to select the car for him. If he can't be arsed..... Do you know what I mean? Some people imagine that by reading a few magazines, reading a few reviews, they can go and emulate a great sound. The problem is even if they can emulate a great sound, it would always be in the past, they'd always be six months, a year, behind what could be in the future. So they're not even interested.

I find a lot of the guitar players nowadays are extremely conservative. The sad fact of the matter is that unless they've got any vision to aspire to a future, all they're going to be doing is duplicating something that happened 30 years ago, which to me is sad.

And that's kind of what spawned effects pedals in the first place. You get this box with two or three knobs on it, and by the time you figure in all the variables you can always do something that sounds different from everybody else.

When it comes to guitar effects, the sky is limit. Believe you me. You can paint a sonic picture between someone's ears that will blow their mind. If they've got the vision, and they've got the balls to follow it.

Guitar playing does not have to appear to come from one place in the mix. Jimi's never did; it went from left to right, backwards and forwards. It took you to dimensions - your mind traveled with the sound. He took you out with the music, out into space and back again. He painted a very, very colorful picture in your own mind's eye of what was going on. It wasn't one-dimensional.

Additional Titles by Dave Hunter:

- The Guitar Amp Handbook: Understanding Tube Amplifiers and Getting Great Sounds
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