

‘COMPUTER MUSIC WITHOUT LIMITS?’

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Abstract

As computer musicians we enjoy a privileged world of nearly infinite tracks, Gigabytes of samples and synthesis that would put the old analogue tools of Abbey Road, IRCAM and The BBC Radiophonic Workshop to shame... all in a laptop... but are we really making better sounding music?

Single Take Talent.

If we look back through 20th century musical history, we soon realise that the coming of the digital music age has deprived us the ability to actually appreciate and recognise a real recorded performance. Prior to multi-tracking, every recording heard, you could assume was a near accurate record of a particular. Musicians and listeners had no concept of multiple takes and re-dubbing in the way that we do today.

The advent of the digital multi-track age, enables us not only to scrutinize and replace every single note, beat and phrase with the utmost ease and fluidity, but to edit process and to replace any imperfection, even artificially tuning the voice of a performer. It is a very different listening and recording climate to that of the pre-digital age because we know that every recording we now hear is, in a sense, a sonic 'lie'. The act of music creation has experienced a seismic shift from the performer to the producer.

Ideas vs. Technology.

Music history is land-marked by examples where the musical idea has outstripped the technology available to realise it, and as a result pushed it's limits. Innovation, or rather the *need* for innovation can be said to be at an all time low today due to exponential technological advancements, we really do 'have it too easy'.

And it's not only the recording and sound editing technology that offers us freedom. The very rules and regulations of the musical language have been blown wide open in the 20th century by jazz, serial atonality and Musique Concrète, opening up the musical realms to the use of any sound from the world, whether considered 'musical' or not.

Let's look at the work of a few of the pioneers who managed to create ground-breaking music with very little technology at their disposal.

It All Began With Multi-track... Discs.

It all really began with Les Paul, the father of modern recording techniques. His innovations with multi-tracking have certainly laid the foundation for everything we now know and take for granted in the modern recording industry...

It was in Hollywood that Les Paul built a studio in his garage and introduced the concepts we are all now familiar with of multi-tracking and overdubbing which eventually became known as 'sound on sound'. He actually built his first recorder from the flywheel of a Cadillac, which had been dynamically balanced in order to act as an effective and stable turntable. In order to get it to run he used a jukebox motor and a belt drive (he got from a nearby dental practice) that linked to his Cadillac wheel. He used what was, even then, dated old glass-based acetate for the recordings. There was also a standard practice at the time, of a guitar standing two feet from the microphone which Les ignored in order to get a clearer more direct sound, thus introducing the 'close-microphone' technique that all guitarists still use today. He introduced delay echo, by putting a playback pickup behind the record head of the recorder. He invented the boxcar pickup for which had closer proximity with each individual string of the guitar. He also had a problem with room sound building up on each layer of sound he recorded and so created Equalisation in order to stop the unwanted sound building up and up on the many layers of tracks he recorded. Among other experiments he managed to introduce virtuosic sounding guitar riffs by slowing down the disc and recording himself playing at normal speed, he then played back the recordings at normal speed to make the guitar riffs sound incredibly fast and accurate.

The Move To Tape.

While it is true that the tape recorder had already been invented in Germany some time prior to the second world war, it was not until one had been confiscated and made it back to the USA that Les Paul would see the benefits of tape first-hand. Machines from Ampex and Westrex started to appear and Les introduced these innovations into his own studio, which was then upgraded to eight tracks.

With the advent of full-blown multi-track recording on tape in the 1960's, recordings finally ceased to be accurate 'records' of any single performance. These techniques gave birth to the 'studio song' which no longer represents a reliable record of a performance, instead representing multiple 'takes' where performers can collaborate in different parts of the world on different days, but all on the same finished piece of music.

Pioneers of Early Sampling: Musique Concrète and the Radiophonic Workshop.

The invention of Musique Concrète, or, sound as musical material by Pierre Schaeffer, was accompanied by a similar experimental thread. Early Electronic music, goes back to 1906 with T. Cahill's 'Telharmonium', followed by L. Theremin's 'Aetherophone' in 1921, and the 'Onde Martenot' invented by Maurice Martenot in 1928. The Italian futurist art movement also had its sound composers, including L. Russolo, who published the widely known futurist music manifesto entitled 'L'arte dei rumori' (The Art of Noises) in 1913. The American composer John Cage gave the first stage performance of a work using variable-speed turntables and frequency recordings entitled 'Imaginary Landscape', in 1938.

Some time after the highly experimental lead of Musique Concrète and early Electronic Music, a more commercial use of sound and synthesis as music began in a small BBC backroom.

In 1957, a small unit of BBC producers and studio managers began using what would be known as 'radiophonic' techniques to create ground-breaking music and drama programmes. These were procedure borrowed from Musique Concrète and consisted of recording sounds, such as glass, bells, percussion and even the human voice. These were then manipulated by using tape or electronic processing to produce entirely new material and arrangements of that material. Tape machines provided reverse playback, speed and pitch changes, and were used to create sound loops, whilst reverberation and equalization were used to modify the final sound quality. Various elements of the work were edited together using early tape splicing, often note-by-note. This was a time-consuming occupation, requiring the seemingly never-ending dexterity and endurance of the technician, but the results were extremely impressive. The famous threatening voices of the Daleks in Doctor Who were created using a simple device known as a ring modulator, something we are all probably now familiar with through effects plug-ins. This was originally made from a small metal box, containing two audio transformers and a quartet of semiconductor diodes. Speech was used as the input whilst a second signal, at around 30 Hz provided by an external oscillator was connected to the carrier input. The more sophisticated ring modulators available in later years simply didn't sound as good as these early devices, simply because they failed to create the same low quality distortion.

Home Recording.

In the 1970's the first consumer cassette four tracks arrived, the much esteemed Tascam Portastudio was quickly followed by products by Yamaha, Fostex, Roland and others. This kicked off the beginning of the home-studio revolution. By the mid-1980's, multi-tracks were big business, fuelled by Punk's DIY ethnics and the proliferation of cheaper effects racks and microphones. By the later half of the 1980's home multi-tracks had increased to 8 tracks and reel to reels, for the pro studios, or home studios with a lot of money, had reached an unimaginable 16 tracks!

Enter Digital.

Digital recording really built on the strengths of the multi-track tape medium. It speeded things up, made available more tracks and allowed for seamless frame by frame editing, while increasing the ease with which to manipulate and layer sounds. It began with the digital 8 track ADAT tape recorders, followed by an 8mm videotape digital audio format. These 'all in one' digital recorders and control surfaces soon became overrun in capacity and usability by personal computers. Almost simultaneously, the PC and the Macintosh began to get onto the music recording scene, first used in the larger studios and then gradually getting cheaper as CPU's got faster Hard Disk storage got larger.

From Cutting Edge, to Bleeding Edge.

With all these digital advancements came unique problems that musicians have never had to deal with before. Maintaining a studio isn't as easy as it used to be. Thirty years ago you could build a reasonably state of the art studio that would actually be able to function and make money for around 20 years without the need for major upgrades. Provided you had pro hardware you were in a position to be able to record music of any kind in any configuration. Now that the focus is on fast turnaround projects, emphasis has moved to software, which goes out of date extremely quickly. Software forms the heart of the modern studio, and it has a very short window of being 'cutting edge' before it rendered obsolete by a newer version. You can expect to be replacing your computer hardware and software in order to remain cutting edge at least every two years. So during all this time are constantly having to learn new tricks and new software and forgetting how you used the old software. This seemingly technology obsessed climate means there is a focus on what the technology *allows* us to do, rather

than what do we actually *want* to do, when in reality we probably don't need to upgrade at all in order to keep making music.

Diminishing Sonic Returns.

To further compound the problems experienced in keeping up with a technology that moves so fast, is a symptom of gradually decreasing audio channel capacity. The almost infinite number of tracks we now have has given rise to a particularly digital problem. In terms of current trends in music, TV, film, videogames and radio, sound is becoming more and more maximised, compressed, limited and overloaded. As hundreds of tracks are being layered, all the sounds are competing for our attention in a mix. Without wishing to sound like an alarmist Prince Charles here, there does come a point of diminishing sonic returns, where the more you add the more you just end up with the sonic equivalent of a 'grey goo'. This is where every frequency is filled and there is no more room to add anything without taking something else away. Even though we have reached the limits of replicating what the human ear can actually discern, anything above 24khz is considered inaudible, we still increase our capacity to create and record sound above and beyond 96khz. There is definitely a point at which no more useful information can be added to a single channel sonic field. Stereo and Surround sound began, to some extent, to get around these issues by spreading the sounds around in space so they at least do not compete with frequencies within the same spatial location. However, number of individual audio channels available to us far outstrips the number of speaker channels we currently have available. Again, that question comes back "...are we really making better sounding music than we did twenty years ago?"

Tips on limiting your Music.

This might seem like a strange topic for CM but, how can we begin to make better music in this seemingly limitless age by using less? It begins with realising that it is how we approach technical limitations as musicians that forms the very core of our art. The second thing to realise is that as perhaps 'home studio' or laptop musicians we do in fact have greater limitations than the fully equipped million dollar studio, and this gives us a distinct advantage. All we need to do is recognise and capitalise on our limitations and avoid some of the easier traps to fall into.

Avoiding Complacency.

Due to the ease with which digital music making now occurs, many musicians' compositions are guided by the samples and also by the synthesiser voices immediately available. How often have you started to create a track and pulled a drum beat from a sample library, starting to build your music up track by track from that drum loop bed? You've just got a new soft synthesiser, the preset sounds are pretty new and fresh to your ears, so you pick those sounds for you lead lines and pads. Now consider how many millions of other musicians have bought the same drum samples, have the same soft synthesiser and you start to realise the problem in musical aesthetics that is occurring with computer musicians.

Many of the tips and tricks we talk about here will make you commit to a sound or musical idea earlier on in the recording process than you normally would in the digital age. With the emphasis taken away from the post production, from frame by frame, from mixing every single element individually and adding effects to every single element separately, you begin to see that you can actually commit to the music and the sound long before you record it.

Melody.

Start with the idea first, strip things down. Start with a melody, if you have problems even at this stage, then start to limit the notes you are using within the scale, let's say you like a particular interval or chord structure, use only notes from those chords. This can also be done with rhythmic tracks. Start by tapping out a drum rhythm you like and *then* creating it in the computer, essentially, make sure that your starting point is not at the computer at all.

Most rhythm creation software such as **Native Instrument's Battery** is actually very sophisticated in terms of allowing you a great degree of control over exactly how you want to create beats and supports very varied workflow methods. Pretty much all sequencers such as **Acid, Nuendo, Pro Tools** also support this kind of small scale beat editing, and are not merely looping tools. Try zooming in on samples and doing very small scale beat level editing on a beat to replicate what you hear rather than using those easy loop tools.

Another technique, which is becoming more forgotten, is to write all the parts of your music sitting at a piano or a guitar, before you move to orchestrate on the computer. In this way you could actually fully realise the

piece of music before you even get near the computer. At the stage when you do sit down to recreate the piece of music, you will find yourself using software to build up a fully realised piece of music.

Limit Voices.

Choose only one instrument with which to explore your musical ideas. Try using only one soft synthesiser patch and really explore the limits of what that one 'voice' can achieve. If you consider musicians who actually spend years and years perfecting an instrument, they only really have the one voice that instrument carries, yet they spend their whole lives learning new and innovative things to do with that instrument.

Reducing things on this level leaves more room for dynamics with that voice. You can literally do this with the most simple to the most complex soft synthesisers.

Native Instruments Absynth allows a huge deal of control to be had over a great deal of the parameters of any *one* particular voice, and these are all assignable to a midi controller for virtuosic ease.

It can be tempting to really go big when overdubbing things like vocal harmonies, more often than not getting three or more people who can sing vocal lines perfectly in one take can prove frustrating and time consuming, so in instances like this where you cannot limit yourself to one track, either due to budget or due to time constraints, you can begin to get really clever about how you use those few tracks you have. Of course this is where software can really help us out of those jams...

Celemony's **Melodyne** is a program that offers a frightening amount of freedom that you can harness by bouncing down multiple vocal harmonies to just one track.

In an interesting quote from Morgan Fisher, who has worked with Mott the Hoople, Queen, Robert Fripp, Moondog, Andy Partridge, Residents states...

"Melodyne gives me *dangerous amounts of freedom*, as it allows me to rapidly transform any melody into almost any other melody, regardless of key or tempo." (quote from the Celemony website)

Old techniques like pitching or bouncing down onto one track are incredibly hard to do once you actually start to try it the old fashioned way particularly when you come from a digital perspective. Record a vocal line, listen back and record another vocal line on a second track, now, bounce those two tracks down onto one track and add your third harmony line, again bounce those three onto one track, and carry on and on. You start to realise that control over mix elements is no longer possible and that you have to know, in advance, at the mix down stage which lines need to be brought out more, or mixed in deeper. You will notice that you will create a piece of music and then need to completely recreate it again and again in order to get what you really want. Above all you begin to get a sense of sheer awe for the compositions and recordings of artists such as Les Paul and The Beatles, while also giving the amazing digital technology we now have available to us a new found respect.

Limit Tracks.

Limit the record tracks available, choose a limit with which you feel you can still create something that suits your music, but that you feel you still may struggle with, perhaps only four tracks, whatever you feel comfortable with, take one more track away. At first this sounds impossible for us now, but just try it and see how this changes the way you think about music, get your musical ideas across with less instruments. You may quickly run into problems initially and start thinking 'I need another track', however start to think your way around these problems, you will be able to get out of the limitation more and more easily the more you develop techniques to cope with this limitation. This can be achieved with any sequencer such as **Nuendo, Cubase, Logic, Pro Tools** et al, it just requires some initial organisation, something as simple as naming tracks and sticking to what you have named them will help to limit your endeavours. Try setting up templates for two track sessions, four track sessions etc. Just remember that in the not too distant past, four tracks was actually an expensive luxury.

Just Say No to DSP.

OK, so you don't have to totally disregard DSP, but try imagining life without DSP effects for a moment. This will enable you to think about what the DSP is actually doing to your music. Are you using reverbs and effects just for the sake of it, or does the sound you require *really* depend on it. Find new ways of creating your own effects, such as playing back your music into a live acoustic space and re-recording the result. Play it in the acoustic space you wish to create. If you want a phaser, play back the same sound a few frames out of sync with itself, You can literally find yourself doing what all the great producers have been doing from George

Martin to Martin Hannett, who famously recording Joy Division's drummer on the roof of the studio to get the sound he wanted.

Limit Your Microphones.

Having amazing frequency reproduction and quality is something we all rely on these days, but the microphone you choose adds a particular colour and perspective to everything you record, and using the same microphone on every track, while creating a consistency that may be desirable, may also make everything begin to sound the same. One great way to really rethink the instruments you are recording is to use one microphone where you would have previously used several. In the example of drums, it is a great technical and artistic challenge to actually use one microphone to record the entire kit at once. This limiting of choice actually makes you think about the end result of what you want to create, so that rather than making the decision about how to mix the drums later, you actually have to make that decision while recording, and commit to it. You will need to experiment a great deal with microphone positioning, perhaps even think more about the location in which you record the drums, you could even get the reverb you require by recording the drums in a highly reverberant space thus saving yourself a DSP pass.

You can also record using whatever you have lying around, an inexpensive microphone, a Dictaphone, all these things can create very unique sounding samples, record a transistor radio through the pickup of your guitar by holding the speaker onto the pickup, or better yet, record something onto a Dictaphone and then replay that through the pickup of a guitar.

One Track, One Take.

We opened this feature by mentioning an era of one-take musicians who were primarily performers. Use only one track. Record your entire performance in one go. This will show you just how many times you need to be able to play and perfect a piece before you are able to play it all in one go and get that 'perfect take', not by digital manipulation, but by moving the focus onto the actual performance. The blood, sweat and tears of getting that perfect performance will increase your skills and motivations as a performing musician and your understanding as a producer. Again, we can see the movement from music as a performing medium into a medium of frame by frame manipulation and perfection, the creativity has moved from the performer and onto the engineers in charge of machines.

All these exercises form the beginning of a process that should enable you to begin to think about how digital technology can totally dictate the way you create music, and to rethink the ways in which it can help our music making.

Pushing the Limits Now.

What all this does is enable you to really think about the sound that you actually want, it should force you to rethink the ways of making music that have become engrained within digital music making over the last five or so years. For many studio musicians the changes that have come into effect through the digital age are a great bonus, because they remember the old tape multi-track days, if you are one of these musicians who can remember using tape, it would be interesting for you to look at how your compositional techniques have changes, if at all, through the advent of digital.

In the examples just described we are essentially faking limitations in order to put our musical ideas into a place where the technology doesn't exist for us to be able to realise them. But let's consider the things that we really can't do yet? What are the things that we simply can't do in music yet? If we use this as a starting point we can begin to push the boundaries of what our current technology can do.

Inventing something as revolutionary as the equivalent of multi-track recording or editing today is indeed a tough proposition. You may just have a musical idea that you can't possibly articulate because it would involve a technology that simply doesn't yet exist – so what are you waiting for?

If we delve into music history, one doesn't have to look that far before many parallels begin to emerge. During the mid seventies the backlash against what were considered over-the-top histrionic concept albums by giant stadium filling bands such as Led Zeppelin and Yes gave birth to the backlash of Punk. Bands such as the Sex Pistols and The Clash delivered performances and recordings that were fast, practically no budget, and yet with

their own distinctive sound. The histrionic period of 'over-the-top production' could be echoed in today's post-production oriented computer music studios where we can make decisions over every frame of sound.

Keep in mind that you can always take advantages of your limits, there will always be a 'better' piece of kit available, a 'better' studio than the one you have, but what it comes down to is not who has the most up to date high tech studio, but what you do with what you have.

RECOMMENDED LISTENING... "The Breakthroughs."

Les Paul – Brazil (1948), 'Mockin' Bird Hill'. 'How High The Moon' (1951)

His 1948 hit, 'Brazil' featured six guitar parts, all played by Les in a virtuoso demonstration that would eventually earn him acknowledgment as the father of multi-track recording. The combination of his guitar and electronic talents with the vocals of his wife Mary Ford, resulted in two million-selling records in 1951, 'Mockin' Bird Hill' and 'How High the Moon', both still sound fresh, clean and dynamic to this day.

The Beatles - 'Strawberry Fields Forever' (1967)

'Strawberry Fields Forever' represented the culmination of everything that the Beatles and George Martin had learnt in the studio up to this point.

The song proved to be one of the most tricky and complex The Beatles would ever record and would change shape in the studio numerous times before completion.

The first take was totally different from the final track, with the only similarity being the song's Mellotron introduction.

The Beatles did several takes on the 24th but these were never used and still remain in the vaults to this day. The version recorded on this night came to a full ending with the Mellotron. The entire take was also recorded at 53 cycles per second so that it sounded faster on playback but it still only lasted 2'54".

On December 8th, 1966, the Beatles re-recorded 'Strawberry Fields Forever' with cellos and trumpets added as an overdub.

By the end of the session 15 more takes had been recorded, all of them rhythm tracks with two of the incomplete takes used to take the song to the next stage. Before the end of this session George Martin and engineer Geoff Emerick edited together the first three-quarters of take 15 with the last quarter of take 24.

There were still a lot of overdubs to add. On December 9th, the previous night's work was mixed down to one track and called take 25. This left three tracks free with which to record a series of overdubs. Onto track two, Ringo added some percussion, which included some heavy drum sounds, George Harrison added a Swardmandel, an Indian instrument that sounds like a small harpsichord. Backward cymbals were also added with the pattern of the song worked out and then written down in reverse, so that when recorded with the tape played backwards, the sounds would fit the bars precisely.

On the 15th of December, cellos and trumpets were added to this remake of 'Strawberry Fields Forever'. The trumpets and cellos were then mixed down to another four track which would become 'take 26'. With its frantic strings, blaring trumpets, heavy drum sound and two, extremely fast Lennon vocal takes, it seemed to be finished. But was Lennon was still unhappy with the result.

On December 22nd, John approached George Martin with an interesting project. He told George that he liked both versions of the song, the original, lighter version and the more intense, scored version. He suggested that he join the beginning of the first one to the end of the second one. George told him that there were two problems. One was that they were both in a entirely different keys, the second was that they were both at different tempos. John replied "Well you can fix it!". So George Martin and Geoff Emerick set about the assignment. First they established that the difference between the two versions was, in musical terms, a semitone and that it could be done if they speeded up the remix of the first version and then slow down the remix of the second version. All that was left was to edit the two pieces together and the track would be complete. Finally the pitch of the first version was decreased at the join to make them fit together.

This was done so well that very few people even know exactly where the edit is, or that there even was an edit. If you listen very closely, the edit point can be found around 60 seconds into the song, although you may never hear the song in quite the same way again.

The Beach Boys - Pet Sounds (1966) / Smile (2004)

Brian Wilson pioneered compositional techniques on the Pet Sounds album of creating intricate pieces of songs, taking full advantage of multi-track techniques and technology, and editing them together into one coherent masterpiece. Brian wanted to use these same techniques to record the next Beach Boys album 'Smile' surrounded by intense publicity at the time and unfortunately Brian succumbed to a nervous breakdown. 'Smile', and the sessions became legend — the most famous album never to be released.

And after the 'Smile' session tapes were shelved some of the songs did manage to escape — including mega hits 'Good Vibrations', 'Surf's up' plus 'Heroes and Villains'. Others graced the next few Beach Boys albums in the late '60s such as the fragmented 'Smiley Smile' and '20/20'. But the public was never able to hear the entire album that Wilson had in mind.

Around 2003, Brian started to pick up the pieces. He and Van Dyke Parks got back together and finished 'Smile'. The result is well worth listening to alongside the earlier Pet Sounds.

RECOMMENDED LISTENING... "The Backlash, Re-introducing the Limits."

White Town – Abort, Retry, Fail? (1996)

White Town's Jyoti Mishra famously still recorded his hit 'Your Woman' in his bedroom on an Atari ST, a £30 microphone and a tape multi-track, beating music recorded by the best studios in the world to the number one spot in the UK charts. Both the single and album were made with an old Tascam 688 multi-track tape recorder, an Atari ST and a free sequencer that he got from the front of a computer magazine because he couldn't afford a 'proper' sequencer.

Jyoti is deliberately limiting the technology he uses to record his music because he believes art needs limits. "... one of the things I think is wrong with contemporary recording is that it's too generic, too sterile. Technology can make things too perfect [and] polished - it can dehumanise you to a certain extent if you let it. You've got to fuck up the technology you've got rather than let the technology fuck you up. It took me two days to get the beats slightly out of time on Your Woman. Two days. Getting them in time took two seconds. At one time I was routing the synch signal from the multi-track to my computer through a little box I'd built to put noise into it so that it'd lose a few clock pulses. I know that sounds mad but my major complaint about most contemporary music is that it all sounds the same; all the studios have got the same gear, they've all got their Korg M1s, their Trinitys. You can hear those sounds a mile off. My album is full of pops, clicks, buzzes and hums, notes I don't quite get to, notes I miss completely but it's all part of being human that you're not perfect. The perfection is in the imperfection." – *From an Interview with Daniel Pemberton for Wired Magazine*

The Sad Mac - Stephan Mathieu (2005)

A recent ambient electronic example of self imposed limitations. This is the fourth album by German laptop artist Stephan Mathieu. According to Mathieu, "The Sad Mac is dedicated to the sheer weight of hardware

troubles I've endlessly experienced with a series of computers throughout the past three years." This, in turn, motivated Mathieu to reduce his methods of production to an absolute minimum, using only the most simple software in order to avoid any further technical complications, as well as challenging himself to create something unique with relatively simple means. Not being so reliant on unforgiving and unstable technologies hasn't really changed Mathieu's compositional approach at all, and this is an approach in music production that we are likely to see much more of in the future.