ByteNoise

Electronomicon

Resurrecting the lost art of manual modular music

Universal principles

Music is a bizarre, abstract thing, exploiting some quirks of the human brain. It causes us to feel emotions that we've previously felt while listening to similar music; it sounds a bit like voices communicating in a language, and often literally employs voices singing; it contains patterns for us to predict and recognise.

Purpose

It has something that you don't have, Max. It has a philosophy, and that is what makes it dangerous. — Masha, Videodrome

Each band or alias you create should be about one particular topic or philosophy. For examples, see Devo (commenting on the regression of American society), Kraftwerk (both celebrating and warning about modern technology), and Marilyn Manson (acting as a scapegoat for the media). Note that these bands don't merely comment upon, but actually personify the issues they raise. The topic you settle upon should be unfulfilled by other contemporary bands (although it's fine if historical ones had previously covered it). Find your niche, your purpose. Your band will become synonymous with this topic, and even symbolise it. The idea is even more important than the music, to

a certain extent. Your songs, in particular the emotions they conjure, their lyrics, their instrumentation, and their general style, are the medium through which your ideas are expressed in a form that people can identify with and rally behind. Your theme is also expressed in your general presentation and showmanship, including live performances, videos, cover artwork, liner notes, interviews and press releases.

Showmanship

In order to make music for a living, you don't need to learn to be the best musician or composer there ever was. You need to learn to be a very good musician, and a very good composer, and at least competent at a myriad of other tangentially related skills. If you perform live, you need to learn how to put on a visually engaging show. Whatever you do, you need to learn how to promote yourself, at least to A&R people. You need to work out what your image will be, and how to keep every aspect of your public facing persona in tune with it. You need to be larger than life. There's a flood of competent and even very talented musicians in the world, but usually a dearth of intriguing, personable people that everyone would like to identify with and learn more about who also happen to be making interesting and engaging music.

For example, Lady Gaga has been proficient at playing the piano for a long time, but it was only after she became proficient at playing the media that she attained success.

Imperfection

Perfection fatigues the ear and is boring. Liven up performances with more human playing. Subtly change and introduce variations and imperfections to timbres, rhythms and pitches.

When using several oscillators in a single synthesiser patch, detune them slightly from one another to thicken them up. Try modifying the pitch of oscillators slightly using a random source, such as the Doepfer A-118's random voltage output.

Balance

Balance is important. Just as percussion and sustained notes complement each other, such as drums and pads, so does an album consisting of some ambient tracks that give the listener a rest and some intense tracks. The left and right ears should be roughly equally stimulated at any given octave, so any instrument heavily panned to one side should probably have a counterpart. Balance is important in all aspects of music.

Emotion

Above all, invoke a single, strong emotion per song. People can strongly emotionally react to music, and this is generally the main goal of a composer: to impart her emotions to others.

Originality

Sound innovative and fresh, not just professional. You don't need more equipment, you need to learn to do much with little. Concentrate on finding your own unique style.

Just as you need to strike a balance with each piece of music between it being too repetitive and not repetitive enough, you need to strike a balance with your work in general between it being too derivative and not derivative enough. Both of these are examples of fulfilling or violating the listener's *expectations*, or predictions, of what you will do next. You need to walk a fine line between being too predictable and boring, and being too

unusual and difficult to get into.

To clarify the distinction, objective originality involves finding a good balance between being too predictable (such as a four-to-the-floor disco beat in isolation) and not predictable enough (such as a truly random striking of drums with no discernable rhythm). One extreme is too easy to predict, the other not easy enough. On top of that, you have subjective originality, which is dependent on the listener's previous experience with other music, and involves being similar enough to other music she's already heard to give her a comfortable path to reaching your music, yet different enough to other music she's heard (and possibly all other music that already exists) to be novel and interesting.

It is very difficult to make something original, and more importantly, doing so often steers you dangerously close to the too unusual side of the spectrum. It's often not a whole piece of work that's unique, so much as the *combination* of ideas, each one being stolen from a very different source from the others. Those sources, in turn, usually get those ideas from yet others. If you do decide to throw in some entirely original ideas, it's almost certainly advisable to juxtapose them with some very popular ones in order to create a balanced whole. When Wendy Carlos introduced the general public to synthesisers with Switched-On Bach, she counteracted the new and often perceived as scary technology with comfortingly familiar music. Similarly, Trent Reznor often combines harsh timbres with catchy melodies.

Pushing the state of the art

The cycle of technology and art: you create technology that allows you to do something you can't otherwise do, and then

use that technology to make art that no one else can make. That's pushing the state of the art. Player pianos only push the state of the art once people make art that exploits their unique potential: to play faster than a person can. The same is true of computer performed music, and this aspect of it is underused. (See, for example, the occasionally faster than human synth solo at the end of Landscape's **Shake the West Awake**. They certainly took advantage of having a sequencer, which was then a very new technology.) Similarly, synthesisers only push the state of the art once people make art that exploits *their* unique potential: to make sounds that *aren't* imitations of naturally occurring acoustic sounds. For any given piece of equipment you have, concentrate on doing with it what you cannot do with any other.

Pushing yourself

It's easy to fall into habits, to do the same things over and over again, to let your music become formulaic. To avoid this, it's worth occasionally reminding yourself of the endless possibilites that are out there, that may seem obvious to say out loud, but can be easily overlooked. For instance:

- Chords needn't start or finish at the beginning of bars
- The same goes for melodies, which needn't start at the beginning of bars *or* the beginning of chords
- The number of bars it takes to repeat things needn't be a power of two... or even an integer
- 4/4 isn't the only metre
- You can take ideas from more than one genre at a time

In other words, remember to occasionally make lateral moves. Throw a curveball into the mix every now and then. Spice things up a bit.

The music itself

The constituent parts of music are easiest thought of when split into somewhat arbitrary groups: lyrics, melodies, harmonies, rhythms and timbres.

Lyrics

In rough order of importance, a lyric needs to fulfil the following criteria:

- It must be catchy, like the melody it's sung to
- It should rhyme and scan in fairly unpredictable, interesting ways
- It should be emotional, the stronger the better
- Ideally, it should make sense and have correct grammar

The making sense part is especially *un*important. Even some entirely nonsensical lyrics are fine. (See The Beatles' **I Am the Walrus** for a classic example.) A lot of pop songs spend a lot of time letting the singer make nonsensical open-vowel sounds, and occasionally even feature stuttering (Girls Aloud's **Graffiti My Soul**), and so on. Try to think of lyrics as being overly stylised, as much about how words sound as what they mean. Even though they're the most cerebral part of a song, even they are more for the subconscious to soak up and relish in than the conscious to ponder.

As with any other instruments, the singers' voices should interact with each other, play off of each other, and fill in each other's gaps, even if they're overdubs of the same singer. Michael Jackson was the obvious expert at this. Another nice example is Pink's **18 Wheeler**, worth listening to for the various

ways she sings the word "I'll" alone. The emotional, wholehearted performance obviously helps too.

The aim of a good lyric is to express what the listener is feeling better than she herself can. Find a topic that emotionally resonates with other people, and articulate your earnest thoughts on it. This can be, and most often is, achieved on the subject of love (finding it, losing it, and so on), but pretty much anything emotional is a good topic. The more sincerely and earnestly emotional it is, the better, so make it personal. Don't be afraid to fill a niche. Speak from your heart. Even negative emotions are better than no emotions. You want to make the listener feel elated or suicidal or aroused or angry, but never bored or indifferent.

The lyric can either complement the music, resonating with it, or it can contradict it for juxtaposition, to give the music an ironic twist.

A lyric usually shouldn't be direct. While everyone knows that most pop songs deal with love and sex, they seldom explicitly state such, especially the latter. I'm not sure if this is only due to our current state of society (likely so), but at least for right now, it seems better to tackle the subject of sexual desire as erotically as possible without ever flat out stating it. This gives us intriguing lines such as "It feels so good, I'm shaking in my bed" and "I wanna freak in the morning," leaving little... and yet a lot... to the imagination. (It seems like a lot of the latter lyric revolves around the word "freak" being used as a pun, to ambiguously mean both a type of person and an act that might be performed with such a person. That's getting quite some mileage out of self-censorship.)

It's curious that people are so strongly driven by urges they

don't want to articulate for fear of what others might think, but that's quite typical of the intellectual and base instinct parts of the brain clashing in their desires. At any rate, it seems important to respect and adhere to this quirk of the human brain. Embrace it, cater to it, profit from it.

The purpose of a lyric is not to speak *to* the listener, but to speak *as* or *for* the listener. You're articulating thoughts and desires on behalf of the audience. The point of a good lyric is to say for the listener what she's feeling but is having trouble putting into words.

Delayed rhymes

Lyrics aren't read by the general public, they're listened to when set to melodies. As such, they must be thought of as fundamentally intertwined with these melodies.

As a particular melody that is being sung can benefit from being extended or contracted the second time around, a lyric for it has to accommodate this. See, for instance, the Little Boots song **New in Town**. The third and fourth lines in the chorus consist of a delayed rhyme. The writer has inserted a few more syllables into the fourth line, to delay the listener's gratification of hearing the rhyme's completion. When the entire rhyme is again repeated, it's extended even further.

While this is important to lyric writing, bear in mind that it's a fundamental technique that can be used in all rhythmic aspects of music.

Melody

Melodies as a conversation between instruments

Music is a conversation between several instruments, each one contributing ideas that agree with, support, and pleasantly contrast each other. Each musical phrase is like a sentence. A lot of popular music consists of repeating a sentence using the notes of each chord in a progression, so it goes up or down slightly in places, and slightly varying it. Another popular technique is call and response, such as the first phrase going up at the end, and the second going back down again, as if to reply to it. The latter is especially popular using two different instruments, one for each sentence, but there are no rules. You can take a single phrase and give one particular note or two out of it to a different instrument.

Putting a twist on expectations

A large part of music is building up an expectation that something in particular will happen or happen again, and then putting in a little twist for the repetition, getting a good mix between fulfilling the listener's expectations and surprising her. In this way, it's similar to the plot twists of stories and the punchlines of jokes.

One of the ways this can be done is by repeating a melody, but not quite repeating it perfectly. You can either keep its rhythm the same, and change its pitches (as with the bassline in B12's **Obsessed**, and far too much music that bends melodies to fit chord progressions). Another, exact opposite, way is to keep the pitches at least roughly the same, but change the rhythm of the melody. You can also change both at once, but making both sets of changes more subtle.

Harmony

To make scary music, play adjacent notes (clustering). For everything else, don't. Music theory is a whole other book in itself. Remember to experiment by playing in unfamiliar keys until you're familiar with them all, to encourage you to try new inversions and chord progressions.

Bear in mind how strings are played in an orchestra, especially if you're outright trying to emulate them. Although they play harmonies, they are not polyphonic instruments. They're a group of several monophonic ones. It's therefore possible to think of them not just as playing a single chord so much as being several different yet compatible instruments each playing a slow melody. Anyone using a monophonic instrument shouldn't feel too jealous of polyphony, given that with modern technology they can simply multitrack themselves into a stunning, diverse array of subtly different timbres each playing a single note that contributes to the whole. More than that, though, this knowledge could influence your writing style, and help get you out of one of the worst kinds of oversimplification: block chords. While the aggregate, gestalt entity produced by a string section is essentially chords, each instrument can ebb and flow independently of the others, talking back and forth in conversation in their own right.

Rhythm

Expanding, contracting and shuffling repetitions

One of the most fundamental aspects of music is repetition with a twist. With melodies and percussive noise alike, this can be achieved by keeping the pitches or timbres the same, and by expanding, contracting, shuffling or changing the offset of some or all of the notes and rests. An alternative for melodies is to keep the rhythm the same while changing the notes' pitches; the

equivalent for percussive noise is to swap the instruments around or substitute some for others while keeping the rhythm the same. Of course, you can also change several things slightly at once.

Notice, for instance, the subtle percussive noise hook in Aphex Twin's **Mt Saint Michel + Saint Michaels Mount**, which is about as close as a pure rhythm devoid of pitch gets to call and response, or even the simple offset shift of the cowbell-esque sound in his **Cow Cud Is a Twin**.

Polyrhythms and polymeters

When two or more instruments play at the same time, there's no need for them to use the same metre (metre being represented by, and often confused with, the time signature). If they don't, you're using either polyrhythms or polymeters.

Let's use the word *pulse* to mean where a note can start, regardless of whether any notes actually do occur on any particular given pulse or not. In the heavily mechanically quantised world of step sequencers, such as trackers, each row is a pulse.

To make a polyrhythm, give each instrument equal bar lengths to the others, but divide it up into different pulse lengths. One instrument might have three pulses in its bar, while another has four, for instance.

To make a polymeter, give each instrument equal pulse lengths to the others, but grouped together into different bar lengths.

A very simple version of the former used to be used often in classical music in the form of triplets, whereas the latter is used

in a lot of popular music, especially one instrument repeating every three or six beats while the others repeat every four or eight, in order to make things slightly more interesting. Compare the former (AFX's **CAT 00897-A2** combining 11/4 with 4/4; N-Trance's **Set You Free** combining 3/4 with 4/4; The Future Sound of London's **Dead Skin Cells** combining something longwinded with 4/4) with the latter (several tracks on Nine Inch Nails' album The Fragile).

Another way to liven up the rhythm is to alternate the number of beats each bar has, or to come up with an even more complex rule for when to switch back and forth between two different metres. (See, for instance, Nine Inch Nails' **March of the Pigs**, which has seven beats, then seven again, then seven *again*, then finally eight, before repeating. An early demo in regular 4/4 time sounds flat and dull in comparison to the finished version with its more quirky rhythm.)

Yet another idea that livens things up is to repeat things after a number of bars that *isn't* a power of two. For example, Aphex Twin's **Alberto Balsalm** alternates between four bars of melody and two of just a drum solo, giving a total of six bars before it repeats.

Perhaps the only contemporary example of someone pushing the boundaries of what can be done with metres, pushing the state of the art by dreaming up new ideas and figuring out ways to conceive them, is BT. In his track **Le Nocturne de Lumière**, he uses a bit of maths and a lot of time to painstakingly program in music that seamlessly morphs from 4/4 to 6/8.

Swing / shuffle

Remember that swing/shuffle exists, and remember to try it out

occasionally to see if it improves a track. It basically plays 4/4 rhythms as 3/4 ones with gaps inserted for all the middle notes, between each pair of regular ones. To look at it another way, it doubles the length of every odd note or rest.

Timbre

Broadly speaking, at any given time a timbre's constituent frequencies fall into one of three categories: harmonious, inharmonious or noise. Harmonious timbres have fractionally related constituent frequencies, or close approximations thereof. In other words, they are periodic waveforms such as sawtooth, triangle, or pulse waves. Inharmonious or discordant timbres have non-related frequencies, such as those generated by the TR-808's cymbal circuit, and Doepfer's recreation of it in their A-117 module, as well as by ring modulation and FM synthesis. Noise theoretically has close to all frequencies within a certain range, clustered together.

An instrument's decay can be any length, from very quick (percussive, such as a xylophone) to very long (sustained, such as a bowed violin). Inharmonious sounds, due to their unpleasantness, should generally be short-lived, in other words percussive. Harmonic sounds can be of any duration. Noise is traditionally played with a very short duration, in other words percussively, but sounds surprisingly pleasant when played for longer periods of time. See, for instance, AFX's **CAT 00897-AA1** and **Batine Acid**. When drawn out even longer and put through a low-pass filter, it even sounds pleasantly like the wind or the ocean, both of which we've naturally evolved to not mind in the slightest.

Of course, this is a gross oversimplification. It's worthwhile experimenting with creating instruments which have an initially

inharmonious sound which quickly gives way to a harmonious one, smoothly metamorphosing from one to the other. Indeed, this is the basis of many patches that use frequency modulation.

People respond to what sounds like a human voice. Vocode and use band-pass / formant filters. Whenever possible, write lyrics with actual rhyming and scanning words, preferably sung to the main melody, to give the emotions context.

Because rhythms can be played just as well on inharmonious and noisy timbres as harmonious ones, they're ideally suited for utilising the most experimental timbres: extreme oscillator sweeps, recordings of household objects such as knives and baking trays clanging, and anything else that you can conceive. Remember, any professional instrument you can think of is just the result of a steady set of incremental improvements to the original design, which was quite likely just as cobbled together. If you need some original sounds, see what you can create for little or no budget, using things that other people have overlooked as a source of interesting sounds because they're only looking for instruments designed to be such.

Even harmonious sounds can be played on surprising acoustic objects and electronic equipment not designed to be musical instruments, especially when you can sample things in their arbitrary natural frequency and later on use an electronic guitar tuner to tune them like any other instrument.

The sound arms race

Here's something you can't do... — Hoban Washburne, Firefly pilot

As with any other fashion, people show off what they have that

others don't, and what they can do that others can't, while manufacturers make products that allow everyone else to attain or at least emulate what was previously only available to a select few. For example, an artist's reaction to the majority of other artists having pristine piano samples might be to record a piano piece with the microphone actually in the piano, recording the mechanical noises alongside the music. This allows their music to be unique, at least for a short period. If the musician is sufficiently popular, this then causes a demand for such a sound, stirring up a desire in other musicians to incorporate it in their own work. Answering this demand, as if offering a countermeasure, the people manufacturing instruments, patches and samples for musicians then make sample CDs recorded from a similar vantage point, allowing other musicians to use the same sound. The cycle repeats in this way forever, in unlimited variations and permutations. Of course, it's possible to ignore everyone else to a large extent, and make your own idiosyncratic sounds with a complete disregard to how similar or different they sound to everyone else, which may well be a good way of finding a unique voice that allows you to carve your own niche in the music industry's ecosystem.

For a more general example, note how musicians wanted a clean, polished, professional sound, until every DAW could deliver such a sound for a mere few hundred pounds, at which point it became fashionable to buy old hardware that was noisy and messy. See (and avoid) the whole analogue versus digital debate.

Similarly, the arms race of prog rock was followed by punk's ethos of making music that anyone could play regardless of whether they had any money or indeed talent. Not to take a dig at punk, as it was a cunning strategy that resonated with a lot of people.

Production and Engineering

EQing

When EQing instruments, there are two contradictory philosophies: to boost what sounds good; and to cut what sounds bad. Work out which you prefer, or even better, learn when to use one and when to use the other.

There are also two *other* contradictory philosophies: to emphasise what makes an instrument resonate at some particular frequencies, as that emphasises what gives it its own unique character; and to lessen what makes an instrument stand out, so it fits in better. Again, work out which you personally prefer, or learn when to use one and when to use the other.

Compression

Just tickle the compressor, don't slam right into it. Subtlety is good.

Structure

Complexity

If you can find any, listen to the original multitrack recordings of songs, so you can listen to each instrument in isolation. If you can't, listen to a regular recording and make notes with a pen and paper, drawing out when each instrument comes in and goes away again. Listen not for pleasure, but to dissect and analyse the music, to listen to each instrument in turn, and to work out how each individual part helps to form the whole.

Notice how each single instrument, in isolation, is too boring to

keep your interest. This is how it should be. Any given instrument's music should not be complicated. Complexity arises from adding more layers. Generally, in most popular music, there should be just slightly more going on at any given time than you can concentrate on at once, so you can't listen to it all. Rather, you have to choose which instruments you pay attention to, and let the rest wash over you. Usually people pay attention to the lead, which should usually be a vocal imparting meaning into the song.

Once you have sketched out a few songs you like, you should be able to extrapolate how many channels that song uses. From analysing historical songs in this way, you can deduce when the four-track and then sixteen-track multitrack recorders became popular, and how these inventions changed the music made on them.

Cohesion

Music is a conversation between instruments. They shouldn't be talking over the top of each other about unrelated things, so much as bouncing ideas off of each other and finishing each other's sentences.

Teasing

Learning how to tease your audience with your music can give it an extra dimension. For instance, you can pepper your performances with long intros (BT's **Suddenly**), long outros (**Every Other Way**), false endings (**Analogue Bubblebath**), false bridges (**Windowlicker**), buildups rather than introducing everything at once to add variety (the entirety of The Downward Spiral has plenty of examples of slowly layering up each section of a song), breakdowns, dropping everything except the vocal to

highlight a particular phrase, teasing with the bass (Lou Bega's cover of Pérez Prado's **Mambo No. 5**), and countless other variations of teasing. A little restraint here and there can make those things seem that much better once they finally do appear or reappear.

Themes

Tangentially related to the cohesion of what's happening during one moment, or during a whole track, is what happens throughout a whole album. Different tracks can be linked together (emotionally, not in terms of literal distance in time such as with the running order of tracks) using themes, otherwise known as leitmotif.

People like repetition in a different context. A line of dialogue said frivolously or nonchalantly in a film is often given a deeper meaning later on in that film by being repeated in a different context. See, for example, The Matrix ("There is no spoon"), or Adaptation ("Imagine me and you"). Leitmotif applies the same idea to melodies instead of dialogue.

Any given melody can represent a person, a place or an idea, and playing this same melody (or a slight variation of it) later on in a different style and context can similarly make it seem poignant. For example, a happy or angry melody can be slowed down and played on strings to represent a previously happy or angry character's death. Alternatively, you could keep the instrumentation the same and change the chord structure slightly to segue towards minor chords, again turning a love theme into a death theme, for example. (I do this in my Bonnie and Clyde score.) Even outside of the context of soundtracks, themes are a nice idea for everyone. For the listener, it sounds deep and meaningful. For the composer, it saves time coming

up with entirely new melodies for every track.

This works especially well in concept albums, for both melodies and lyrics. Good examples include The Wall and The Downward Spiral.

Frequencies

Different instruments playing at the same time should generally not overlap fundamental frequencies with one another.

Lower frequency instruments should generally be simpler and slower in notation. (e.g. 1/8th notes, not 1/16th, for basslines.) The higher frequency the instrument, the more complex its notation can be, and the more reverb and delay you can apply to it.

Time

Like stories, but unlike static pictures, music exists in time. You don't take it all in at once, but rather it takes you on a journey consisting of several distinct stages. It consists of a sequence of events happening in a specific order.

To extend the analogy, if a piece of music is like a story, each section is like an individual scene, and each song a chapter, or a wholly different short story. Each section should logically flow from the previous one, but there's still room for unexpected twists and turns, as long as they're not jarring, and make sense in hindsight.

Another similarity between stories and music is that they should both steadily build to a climax, both in the context of each specific part (scenes in the case of stories, and each verse and

chorus in the case of a song) and in the case of each chapter, whole novel, song and ideally even the whole album.