



Curatorial > PROBES

With this section, RWM continues a line of programmes devoted to exploring the complex map of sound art from different points of view organised in curatorial series.

Curated by Chris Cutler, **PROBES** takes Marshall McLuhan's conceptual contrapositions as a starting point to analyse and expose the search for a new sonic language made urgent after the collapse of tonality in the twentieth century. The series looks at the many probes and experiments that were launched in the last century in search of new musical resources, and a new aesthetic; for ways to make music adequate to a world transformed by disorientating technologies.

Curated by Chris Cutler

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At the start of the seventies, Chris Cutler co-founded The Ottawa Music Company – a 22-piece Rock composer's orchestra – before joining British experimental group Henry Cow, with whom he toured, recorded and worked in dance and theatre projects for the next eight years. Subsequently he co-founded a series of mixed national groups: Art Bears, News from Babel, Cassiber, The (ec) Nudes, p53 and The Science Group, and was a permanent member of American bands Pere Ubu, Hail and The Wooden Birds. Outside a succession of special projects for stage, theatre, film and radio he still works consistently in successive projects with Fred Frith, Zeena Parkins, Jon Rose, David Thomas, Peter Blegvad, Daavid Allen, The Bad Boys Collective and spectralists Iancu Dumitrescu and Ana Maria Avram.

Recent projects include commissioned works for radio, various live movie soundtracks, pieces for the Hyperion Ensemble, *Signe de Trois* for surround-sound projection, a daily year-long soundscape project for Resonance FM, London and p53 for Orchestra and Soloists. He also founded and runs the independent label ReR Megacorp and the art distribution service Gallery and Academic and is author of the theoretical collection *File Under Popular* – as well as of numerous articles and papers published in 16 languages. www.ccutler.com/ccutler

PROBES #1

In the late nineteenth century two facts conspired to change the face of music: the collapse of common practice tonality (which overturned the certainties underpinning the world of Art music), and the invention of a revolutionary new form of memory, sound recording (which redefined and greatly empowered the world of popular music). A tidal wave of probes and experiments into new musical resources and new organisational practices ploughed through both disciplines, bringing parts of each onto shared terrain before rolling on to underpin a new aesthetics able to follow sound and its manipulations beyond the narrow confines of 'music'. This series tries analytically to trace and explain these developments, and to show how, and why, both musical and post-musical genres take the forms they do. This first programme sets the scene and investigates early reconsiderations of pitch: probes that postulate new scales to be constructed through the ever-greater subdivision of the inherited intervals of equal temperament.

01. Transcript. Studio version

Music and memory; the shift from melody to harmony; the collapse of tonality and its consequences.

[Gregorio Paniagua, 'Anakrousis', 1978]

[Mozart, 'Fantasie in D Minor (K. 397)', unknown date. Performed by Richard Egarr]

If you had asked anyone in the eighteenth century what music was, you would have met with broad consensus; music came in three basic forms then – as it had for at least six hundred years: church music, art music, and what we now call folk music – all three of them pretty closely integrated, with many of the same melodies migrating back and forth between them.

[Bruce Odland and Sam Auringer, 'Weather', unknown date]

If you asked the same question today you'd be met with a tortuous attempt at an abstract definition, which would still fail to contain the vast mass of activities – and the diverse aesthetics – now aimed at our ears. Indeed, claims for music today have expanded to include not only anything that you can hear, but kinds of silence too.

Should we take this to imply that a once integrated culture is slowly degenerating into a chaotic and unregulated marketplace? That would certainly be the political reading. But actually I think something more interesting is going on, something quite unusual. What we are living through is a paradigm change. We just can't see it because life is too short and such events normally take centuries to work through.

But here's the argument: for the last hundred and twenty years or so, music and musicians, at least in the industrialised world, have been struggling to come to terms with two catastrophic and destabilising upheavals. The first is the collapse of tonality, which principally affects formal composition and art music; the second the brute fact of sound recording – which has so far utterly transformed everything it has touched.

To find an historical precedent for this, we would need to go back at least 700 years – to the last time European music had to deal with the emergence of a new *memory technology*. Then it was *writing*; today it is *sound recording*.

Memory has this power because it stands at the root of all systems of conscious communication. Without memory, music could not be produced or reproduced, circulated or understood. And different forms of memory will engender different forms of music – that is the underlying thesis of this series.



[Johannes Ockeghem]

[Unidentified artist, Burkina Faso]

So let's test it. In pre-literate cultures we can say with confidence that the *kinds* of music that can be made will be absolutely limited to what our biological memories can process and reproduce. There is no way to exceed them. Our mental and muscular memories have a particular structure and a delineated capacity, and we can not overstep them.

So what sort of music do pre-literate societies evolve? So far as we know, the vast majority of it is monophonic – that is to say, it consists of a single linear melody, accompanied – if it is accompanied – by some sort of drone...

[Swedish Bagpipe, 'Ljugaren', date unknown]

...or by untuned percussion

[Salim Al-N & Pearl Divers, 'Haddadi', 1972]

...or by one or more instruments playing in unison.

[Anon, South Sudan, title and date unknown]

Biology is basic and, so far at least, we can't redesign it. Our genius is to reinvent. For instance, we can only hear what is loud enough and close enough to set our ears in motion. But with a hydrophone we can listen to the muttering of fish...

...with a radio telescope we can eavesdrop on a black hole ...

...with induction headphones, we can enter the otherwise silent world of electromagnetism

[Christina Kubisch, 'La Ville Magnétique', 2008]

...and here are some bacteria freezing in dry ice

[Josh Russell, 'Transgenic bacteria freezing in a dry ice/methanol bath', 2003]

Things that did not exist for us before are now part of our experiential inventory. So although the structural limits of biological memory are absolute, they can be still be extended and readjusted by external, non-biological, technologies. *Writing* is such a technology – it is a memory, but a wholly new *kind* of memory. External and non biological.

[Johannes Ockeghem, 'Kyrie', mid fourteenth century]

That's why, when musical notation emerged out of the bureaucracy of the early western church, it opened a door. Writing put a powerful new resource into the hands of composers, in fact – to our way of understanding – it created composers; or at the very least it reconstructed the relationship between the increasingly divided activities of composition and performance. In this respect, notation is a kind of third body; linking writer and performer, but external to the minds of both.

[Hildegard von Bingen, 'Columba Aspexit', second half twelfth century]

But nothing happened very quickly. Early notation was just an add-on, a bureaucratic shortcut. Its function was to standardise liturgical forms across the vast distances of the Holy Roman Empire; and to preserve them. At first, a simple system of diacritical marks, the *neumes*, as they were called, were intended and able to do little more than remind singers of melodies they already knew.

[John Dowland, 'Lachrimae', 1596]



[Edgar Varèse]

It would only be when writing recast itself as a technology for composition that music would gradually peel away from its roots and begin to adopt more startling forms. And for that, the system of writing itself would have to change. This happened quite naturally, over a long period. And as the properties of writing changed the music that was written, so the success of the music that was written drove improvements in the forms of writing. Scoring grew more accurate, more flexible and more analytic until it settled into the form we now call stave notation – a visual grid in which sound is mapped more or less directly onto space. Once this system was in place, the visual dimension of composition became increasingly influential. Think mirror and retrograde forms – they are clearly visually, not aurally, determined. And they operate far outside the natural scope of biological recollection.

In a nutshell, so long as music depends on biological memory – as all pre-literate musics must – it is ruled by the ear. We listen and we remember. More importantly, we forget, because forgetting is the way such music grows.

Melody comes naturally to biologically mediated music, because aural memory is shaped by narrative and speech, which are linear. Recollection through writing, on the other hand, is ruled by the eye. Melody is horizontal; time is distance; coincidence is vertical – and all values are quantised to fit a universal grid. Isn't it inevitable under these conditions that calculation and visual alignment will exercise an increasingly powerful influence on the formation of musical structures? That's certainly what happened in the fourteenth and fifteenth centuries. Retrogrades, mirrors, inversions, polyphonic puzzles, hidden prayers and magic numbers were invented and proliferated then, and they are all visual games that celebrate the visuality of writing. The score brings time-free calculation to the fore, and encourages architectures way beyond the scope of simple memory.

[Giovanni Pierluigi Palestrina, 'Super Flumina Babylonis', composed ca. 1584]

That's why, all through the fourteenth century, we hear melodies multiplying; running backwards, stacking up in polyphonic masses and winding around each other with increasing complexity.

Even here, the individual melodies are still melodies, though they bind in an increasingly complex way. Even when polyphony is reborn as counterpoint, melody is still there at the centre of musical thought. But, in time, as more and more notes begin sounding together, shifting patterns of harmony emerge that command ever greater attention until it is chords, rather than notes, that come to underpin large-scale musical structure; and chords, not notes, that signal structural cadence.

With this new idea – harmonic thinking – the endless summer of tonality began.¹ It was a paradigm that would dominate western musical thought for the next five hundred years.

[Guillaume Machaut 'Hoketus David', 1364]

Back in the fourteenth century, as writing took hold and melodic thinking began to evolve toward harmonic thinking, western art music found itself in a 200 year thicket of experiments and innovation – ranging from the wild diversity of the fourteenth century *Ars Nova* to the increasingly focused probes characteristic of the late Italian Renaissance.

In the programmes that follow, I shall be arguing that as writing now gives way to a third, and equally revolutionary, kind of memory – that is, sound recording – we find ourselves again in a period of upheaval and transition. It is the test-flights into this new sonosphere that I am calling – with thanks to Marshall MacLuhan – *probes*.

[Edgar Varèse, 'Tuning up', 1947]

So, lets get back to basics. The fundamental elements of music can be reduced to sound and silence. In the late ninetieh century, musical sounds were



[Portrait of Bach by Haussmann, 1748]

understood in terms of **pitch**, timbre, loudness and duration. Silences were understood only to have duration. Of these four qualities, pitch underwrote content – and was thought of as the source of melody and harmony. **Duration** underwrote form – and was thought of as the source of pulse & rhythm. **Timbre** and **loudness** were regarded as somewhat subsidiary agents of nuance – and were treated as a source of expressivity and character. In the course of the first half of the twentieth century, every single identifiable aspect of every single one of these parameters would be probed and questioned. And since the art-music world was tipped into crisis on the fulcrum of pitch, that's where we'll start too.

1: PITCH. Probes into tuning systems

Pitch, like language, is arbitrary and volitional. The world is full of wildly different – and incompatible – scales and tuning systems. Only the interval of the octave is more or less universally recognised – and there are scales that don't even recognise that.

Tuning might even be set at the level of individual instruments. For instance, no two sets of gamelan are tuned or played in quite the same way.

But we value concord. And when we play together, we like to be in tune. So we tune to one another and to our cultural norms. Our culture recognises a 12-note octave whose origins go back at least to (middle period) Sumeria. However, the specific values of those twelve notes have shifted significantly over time, and have varied wildly from place to place.

[Snatch of Bach in Werckmeister tuning]

Bach and his contemporaries, for instance – and many of his successors – habitually used different tunings for different compositions. Different orchestras tuned differently. Western art music didn't officially adopt 12-tone equal temperament – that's the system we think of now as natural – until the middle of the eighteenth century, and, even then, not fully. Choirs and string quartets still routinely deviate to purer tunings. In essence, equal temperament was a messy compromise, but it did help unleash the power of writing because, by making every note acceptable in every key, it achieved a kind of neutral parity for every pitch – admittedly at the expense of making them all – in terms of the natural harmonic series, a little out of tune.²

By the early twentieth century, western art music had come head-to-head with the pressures and complexities of early modernity. Internally weakened by two hundred years of progressive extension, common-practice tonality had become all but fatally compromised – or at least reduced to a patchwork of accumulated ambiguities. With no centre, the whole project was in crisis. Too broken to repair; and too inflexible to address the new conditions, western art music needed more than a new vocabulary; it was looking for a new foundation.

In a dizzying half-century, the world had become almost unrecognizable. Trying to adapt to the imbricated shocks of mechanisation, Taylorism, mass communications, electrification, the phonograph, the photograph, clock time, commercial travel – and a violently transformed sonosphere – composers, like rodeo competitors, needed to get a handle on the general confusion. Even their basic materials had changed. In the cacophonous world of mechanised modernity, and under the uncanny spell of the phonograph, not only had sound acquired a wide range of new qualities and meanings but it had metamorphosed into a *material*. From being elusive and insubstantial, sound had suddenly become as durable as paint: a kind of *stuff* that could be captured, pinned in place and endlessly repeated.

And the world was shrinking fast. Travel had become almost safe and people were moving, and taking their music with them.

[Anonymous, title and date unknown]

Certainly the gamelan that appeared in Paris at the exposition of 1899 made an enormous impression on Erik Satie and Claude Debussy – who both quickly incorporated what they learned into their own work.



[Alois Hába]

[Erik Satie, 'Gnossiennes no.1', 1890-92]

And it wasn't only musicians who were travelling: no longer dependent on physical proximity or the skeleton of writing for its survival, music had escaped its body and was now circulating on wax and shellac.

['Elindultam a Hazámból', field recording by Bartók in 1906]

By 1890, a number of musicologists and composers, Bartók and Kodály amongst them, were using the phonograph to collect folk performances. Earlier collectors had notated the music they studied 'correcting' it as they wrote it out – to make it fit into the straightjacket of the 12-note stave. Recordings, on the other hand, could remember every nuance accurately, meaning that non equal-tempered scales, were now surviving their collection. So when, in 1919, an early probe into pitch was launched by the Czech composer Alois Hába, in the form of quarter-tone compositions, these could be traced directly back to their use in Moravian folk music.

[Alois Hába, 'Sonata for quarter-tone piano', 1956-7]

In the same year, the Russian composer Ivan Wyschnegradsky, who was not inspired – he said – by any existing music at all, but was acting in response to what he called a profoundly mystical ultrachromatic revelation, also began composing with quartertones and sixth tones.

[Ivan Wyschnegradsky, 'Prelude no. 5', 1934]

Some instruments can expand easily into these more nuanced tunings – unfretted strings, for instance, the trombone, the human voice, but the rest of the orchestral family has frets, measured holes or fixed lengths that limit the pitches they are capable of producing. Keyboards in particular, with their fixed black and white, whole and half tone layout, just don't have the space for any extra notes inside an octave. That said, the piano is the flagship of the western art tradition, and composers are addicted to it. So at first they wrote four handed, using two separate pianos tuned a quarter-tone apart.

[Scott Crothers, 'Quarter-tone Piano Prelude no.2', 2008]

More studies were written for the piano, in spite of the availability of other instruments, and by the mid twenties, both Hába and Wyschnegradsky – in close co-operation with the Forster piano company in Prague – had designed and built their own dedicated two-manual, quartertone pianos.

[Quarter-tone scale]

[Charles Ives, 'Quarter-tone studies: Largo', 1925]

In America too, and at almost the same time, the pianist and composer Hans Barth – a man you will look for in vain in almost every encyclopaedia of twentieth century music – had independently designed his own quartertone piano which was presented to the world in 1925. Charles Ives, who had been experimenting with quartertones since the late nineteenth century, was then commissioned to produce three studies for its premiere. This is the second of them.

[Charles Ives, 'Allegro', 1925]

Like Ives – and again quite independently – Julian Carrillo had been experimenting in Mexico City, also at the end of the nineteenth century, with micro-divisions of the octave – using a razorblade to mark out scales of quarter, sixth and even twelfth-tones.

[Julián Carrillo, 'Horizonte', 1950]

He brought together all his results in 1916, under the name of the 'Thirteenth Sound' and went on to produce a substantial body of microtonal works over the next 40 years. We have been listening to 'Horizonte', for violin, cello and harp in quarter- eighth- and sixteenth-tones, first performed in 1951 by Stokowski in



[Mildred Couper and Joachim Chassman]

Pittsburg. Here is an extract from his 'Balbuceos', commissioned by Leopold Stokowski in 1960. It's for orchestra and a specially constructed 96-EDO piano. EDO meaning Equal Division of the Octave. The whole keyboard, in other words, only spans a single octave.

[Julián Carrillo, 'Balbuceos, part 2', 1960]

In Prague, Paris, Mexico City and Connecticut, four composers, each for very different reasons, agreed that breaking with common practice tonality might open a possible route into a more contemporary music.

One last example, by the Argentinian composer Mildred Couper, written for a 1930 theatre production in California.

[Mildred Couper, 'Xanadu', 1930]

Equal divisions that weren't just multiples of twelve were also probed, most consequently in Holland where the physicist Adriaan Fokker built a 31 tone equal tempered organ. In this, he followed the work of the seventeenth century mathematician Christiaan Huygens, who was himself following tuning theories developed during the renaissance.³

Here's what it sounds like.

[Peter Schat, 'Collages voor 31-toonsorgel', 1962]

And here's a probe into 21 equal divisions to the octave. This is from Easley Blackwood's CD *Microtonal compositions* on which he probes all the equal divisions between 13 and 24 to the octave, in rather baroque style.

[Easley Blackwood, 'Suite in four movements, mvt. 1', 1979]

And this, Easley Blackwood again with a fifteen to the octave division...

[Easley Blackwood, 'Lento', 1979]

Unlike most of the early microtonalists, the Czech composer Josef Berg espoused no general system at all; he was just attracted by the sheer strangeness of the harmonies that slicing up conventional single tones could produce. In this piece, 'Dreaming' from 1970, he uses sheets of twelfth tones – only avoiding the 6th, because it's a semitone and therefore too familiar.

[Josef Berg, 'Dreaming', 1970]

In part two we will look at a very different way of thinking about scales.

[Gregorio Paniagua, 'Anakrousis', unknown date]

¹ Edward Lowinsky thought that the cadence was the 'cradle of tonality'. Cristle Collins Judd, 'Introduction: Analyzing Early Music', *Tonal Structures of Early Music*. (ed. Judd). New York: Garland Publishing, 1998. ISBN 0-8153-2388-3.

² At the same time, absolute pitch continued to roam free: an English pitch-pipe from 1720 fixed A above middle C at 380 Hz, a Weimar organ from the same period set it at 480 Hz. This measure – which we call concert pitch – was different everywhere and floated around over time, generally rising, because higher pitching produces a livelier, brighter tone – until singers' voices and valuable violins crack under the increased tension. An international standard that A = 440 was only adopted in 1926. And even after that, musicians playing Baroque music continued tuning to 415.

³ 'Even without wanting a new harmony, in our desire to produce a cycle of chords with perfect fifths and major thirds we are led to improve the keyboard by multiplying the number of keys. This was an urgent need felt by great masters of the Renaissance in the sixteenth century. The Italian Nicola Vicentino proclaimed in 1555 that the octave should be divided into thirty-one degrees. A century later in Paris Christiaan Huygens confirmed this statement, and he computed the exact figures for this division. After Vicentino several artists tried to construct a harpsichord, an archicembalo with thirty-one keys in the octave. Alas, they failed. The technique of that epoch was unable to cope with the difficulties. For vocal music, about 1600 Carlo Gesualdo di Venosa composed unparalleled five-part madrigals with utmost refinement of perfect chords. But vocal art had no support by instruments and Gesualdo's achievements sank into oblivion.' Adriaan D. Fokker, 'On the Expansion of the Musician's Realm of Harmony', *Acta Musicologica* vol. 38, Fasc. 2/4. International Musicological Society, 1966, pp. 197-202.



[Julián Carrillo]

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