

# **A BRIEF HISTORY OF SUBTRACTIVE SYNTHESISERS**

**Stephen Howell**

## The birth of synthesisers...

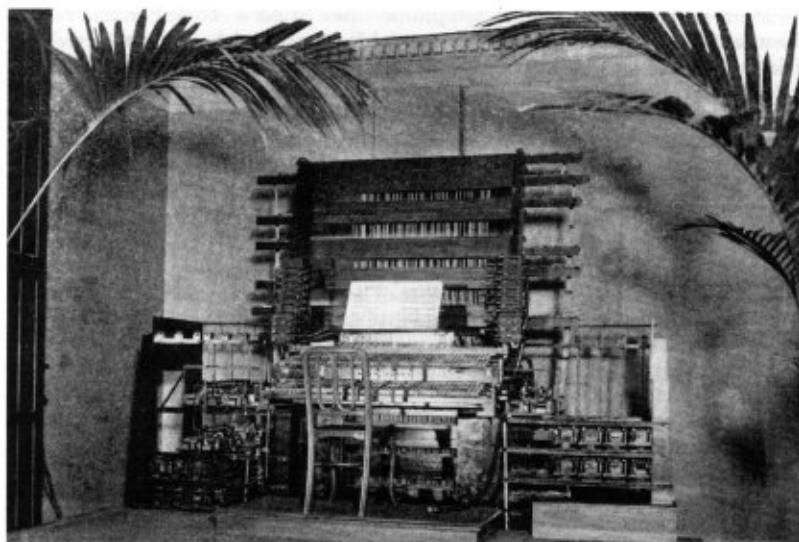
We homo sapiens have always been fascinated with making sounds, from banging rocks with bones to the development of sophisticated instruments and one could argue that church and cathedral organs were, in their way, primitive additive synthesisers.

But when the new fangled electricity was harnessed to power things, it was only natural that we would think of ways to use it to make sounds with it and amazingly, the first electric musical instrument was the Electric Telegraph, invented in 1876 by Elisha Gray. The idea was to transmit music over the new telephone wires...



Nothing ever came of it.

In 1897, one Thadeus Cahill invented the Telharmonium which weighed in at a colossal seven tons ... so hardly portable!



Again, the idea was to 'pipe' music over telephone cables and it enjoyed some success. Not surprising really because this was the first time 'electric music' had been heard. Speakers were installed in the streets and in hotel lobbies of New York – it was first example of 'muzak' – and a player in a central location would play the Telharmonium live with the music relayed over the city.

However, the system was not reliable and there were technical problems and people soon tired of it – hotels stopped paying for installations, bills went unpaid and things went horribly wrong.

And that was the end of the the Telharmonium although its tonewheel technology was later adapted by Hammond for use in their organs.

The early 20<sup>th</sup> century saw the invention of the famous Theremin in 1917...



This weird and wonderful instrument was invented by Leon Theremin, a Russian cellist and electronics engineer, and had two aerials – one to control pitch, the other to control amplitude or volume – and you move your hands to control them. To watch one being played is quite surreal.

It was debuted at the Moscow Industrial Fair in 1920 and Lenin was so impressed, he asked for lessons. He later commissioned 600 models to be made and toured around the country.

Theremin went to the USA and was granted a patent and he attracted many customers. Possibly one of the finest Theremin players was the enigmatic Clara Rockwell...



She did much to popularize the instrument by performing in concerts and playing classical pieces on it. However, the classical world would not take it seriously.

Hollywood did, though, and it became a stalwart sound on many sci-fi and horror movies, one notable movie being the fabulous 'The Day The Earth Stood Still', a film that's as relevant today as it ever was (but do see the original, not the appalling remake!).

The story of the Theremin would not be complete without mentioning that Theremin was kidnapped by the NKVD (later to become the KGB) and was returned to Russia where Stalin accused him of spreading anti-Soviet propaganda. Rumours spread that he was executed but in fact he was sent to a Siberian labour camp where he worked on secret projects for the Soviet secret service. One of his inventions was the 'bug', an eavesdropping device, and he oversaw the installation of bugs in the American Embassy and Stalin's private apartment. For this work, he was awarded the Stalin Prize, Russia's highest honour. He returned to the USA one more time before he died in 1993.

Theremins are still available today, some ready made, some in kit form. Moog make them largely because of Bob Moog's enthusiasm for them when he was a lad.

There was also the Ondes Martenot (or, literally, the sound of Martenot, Maurice Martenot being the inventor) in 1928...



The Ondes Martenot has a keyboard (which can be played as normal with the advantage that the keyboard has a sideways movement for very natural vibrato) but above that is a wire and the player wears a ring and, using the keyboard as a guide, can play the instrument with portamento. It sounds much like a Theremin but in tune!

The sliding tray (or *tiroir*) to the left of the keyboard has various buttons that can govern tone with the selection of different waveforms and can also control dynamics.



The Ondes Martenot also came with three speakers (or *diffuseurs*) specialized for certain tones. One was a normal speaker, another had springs for a reverb effect and the oddly shaped one used strings to produce sympathetic resonances. These could be switched on and off by the player using the *tiroir*.

The Ondes Martenot is one of the few electronic instruments to have found favour in the world of classical music and Olivier Messian wrote several pieces for it as did Edgard Varèse and Pierre Boulez amongst others.

It was also used extensively in movies including 'Lawrence of Arabia', 'Ghostbusters', 'A Passage To India', 'The Red Shoes' and many others. It was also popular in sci-fi movies and TV programmes and John Barry used one in the music for 'Thunderbirds'. It was also featured in the US sci-fi series, 'The Outer Limits'.

Since 2008, Jean-Loup Dierstein, with the support of Maurice Martenot's son, has been developing a new, officially named Ondes Martenot instruments.

There was also the Trautonium in 1929...



Invented by Frederich Trautwein in Berlin, it used a metal strip to play it. Trautwein was joined by Oskar Sala who not only became a virtuoso on the instrument but also continued its development until his death in 2002. Here's one from 1952...



There was also the little known and catchily titled 'Automatically Operating Musical Instrument Of The Electronic Oscillator Type' built by Eduoard Coupleux and Joseph Givelet and shown at the Paris Exposition in 1929...



It disappeared into obscurity after the Exposition but was a 4-voice synthesiser and sequencer with control over pitch, tone and dynamics.

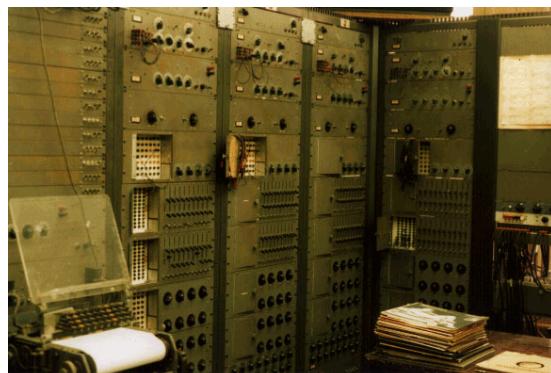
In the US, Laurens Hammond developed his tonewheel organ in 1934 and the world's first polyphonic synthesiser, the Hammond Novachord, in 1939...



Made from over a hundred valves, thousands of capacitors and miles of hand sewn wiring looms and built in 1939, it was several decades ahead of its time. With three resonators, envelope shaping, a polyphonic vibrato LFO, presets and full polyphony in a sumptuous wooden cabinet, it was capable of astonishing sounds which graced many a film soundtrack up until the 60s and eminent composers such as Elmer Bernstein, Jerry Goldsmith, Henry Mancini and Dimitri Tiomkin scored for it in films produced by Alfred Hitchcock, John Huston, Cecil B. DeMille and Frederico Fellini in films as diverse as 'Gone With The Wind', 'Rebecca', 'The Maltese Falcon', 'The Ten Commandments', various Frankenstein films and sci-fi classics such as 'It Came From Outer Space', 'The Beast From 20,000 Fathoms', 'This Island Earth' and many others right up until the '60s.

Unfortunately, people didn't see the potential of the Novachord and also kind of missed the point. It wasn't an organ so organists didn't take to it and it wasn't a piano either so pianists weren't interested. It was also damned expensive. So it didn't really take off. It was debuted at the 1939 World Fair in New York where they had a trio of Novachords playing popular ditties of the time. How different things might be had musicians of the time embraced the rich strings, eerie vocals, quirky percussive sounds, etc.. Around 1,000 were made of which only a handful remain today.

But progress in this area halted during WWII (obviously – more important things to attend to!) but in the 50s, RCA developed a synthesiser-cum-sequencer that used punch tape to 'program' it. It also featured disk recording ... direct to lacquer disks!!



In Europe, modern, avant garde music was expanding (largely due to the availability of tape recorders following WWII) and as far back as the mid-1940s, Frenchman Pierre Schaeffer was pioneering a new musical form called *musique concrète* which involved recording acoustic sounds to short lengths of recording tape, speeding them up and slowing them down, reversing them, splicing them together and otherwise manipulating them to create collages of sounds.

Schaeffer's first piece (in collaboration with fellow French composer, Pierre Henry) was *Symphonie Pour Un Homme Seul* and was made up entirely of sounds from the human body. Later works included sounds from locomotives to kitchen utensils. But it was a painful process, splicing up tiny bits of tape. However, special new studios (which were more akin to 'sonic laboratories') were constructed in Cologne, Milan, Rome, Poland, Brussels, Eindhoven and New York to explore these new territories.

*Musique concrète* wasn't very popular with the traditional classical music fraternity; the notion of using acoustic sounds in a non-real-time performance was not classed as 'music'. However, that didn't stop composers such as John Cage, Edgar Varèse, Karl-Heinz Stockhausen and Iannis Xenakis experimenting with the form.

Back in the US, in 1956, "Forbidden Planet" was the first movie to have a totally electronic soundtrack AND it was credited as such ... as 'Electronic Tonalities'.



Based on Shakespeare's play, 'The Tempest', The story takes place in the far future with the crew of the United Planets cruiser C-57D on a mission to Altair IV in search of survivors from a previous expedition. Much like the lost island of the original play that is buzzing with the spirit of the faeries, the landscape of Altair IV is alive with strange extra-terrestrial mystery.

On the planet, the crew of the rescue ship encounters the mysterious Dr Morbius and his beautiful daughter Altaira, the only remaining survivors of the spaceship Bellerophon which had landed on the planet twenty years earlier.

The electronic music soundtrack created by Louis and Bebe Barron, a husband and wife team based in their private studio in New York, was to be a major influence on the use of electronic music in the movie industry for years to come.... even to this day!



This was not an orchestral score with some gratuitous Theremin thrown in as an afterthought as was the case with so many sci-fi films of the period - for the first time in the history of movies, here was a totally electronic music soundtrack that was an integral part of the film and hearing these sounds for the first time must have been a truly 'out-of-this-world' experience for most people at the time.

But the Barrons didn't use 'synthesisers' in the strict sense of the word – they built circuits which they designed for specific sounds, each one being unique. They described their circuits as 'non-linear' and they tried to imbue their designs with an 'organic' quality but the process was subject to serendipity - that is, their circuits had flaws and imperfections and didn't always behave as expected. However, if anything, this was a strength that the Barrons exploited to highlight the human flaws in the characters or, indeed, the unpredictability of an unknown alien landscape.

Around the same time in East Germany (or, as it was known then, the Deutsche Demokratische Republik), they were building the Subharchord...



This was a development on the 1929 Trautonium but disappeared into obscurity in communist East Germany. It was recently re-discovered in 2001 and now resides in the Berlin Museum Of Technology where it is being painstakingly renovated by a team of engineers that includes one of the engineers who worked on the original project. I spent a very enjoyable week in their company recently, sampling it for a forthcoming Hollow Sun library and taking part in a documentary that's being filmed about the instrument. But I digress...

Meanwhile, in 1958, maverick Daphne Oram was working with primitive electronics in the UK...

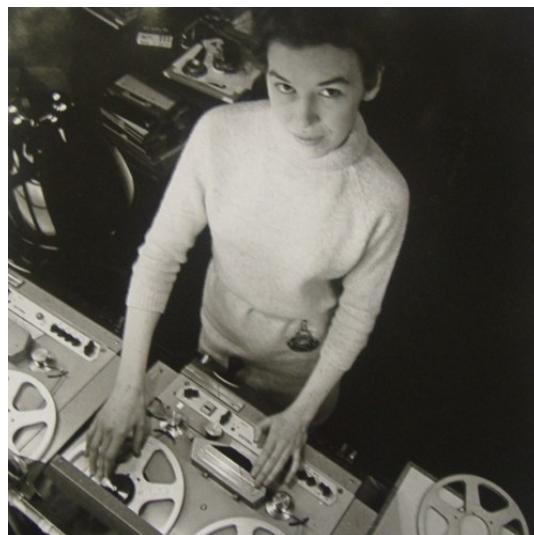


She was working as a studio engineer with the BBC and could see the future of electronic music for radio and TV soundtrack work but faced apathy from the BBC's very conservative 'suits' who didn't see her vision and who didn't class electronica as 'music'.

But she was a stubborn woman and was eventually given a modest budget to start up the now legendary BBC Radiophonic Workshop which provided electronic soundscapes for radio and TV dramas. At a time when electronic music was regarded as weird, the BBC's Radiophonic Workshop kind of introduced electronica to mainstream audiences through the back door so to speak.

There were no synthesisers there (they didn't really exist at this point), just sine wave oscillators, self-built equipment (most famously, the 'Wobbulator'), tape machines and unbelievable patience and skill with a tape splicing block.

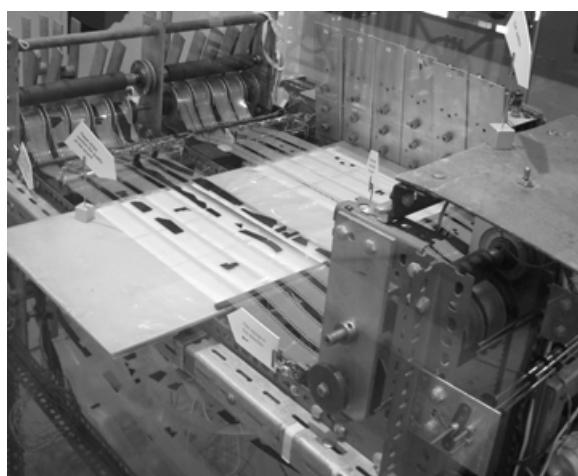
It (arguably) became best known for the Dr Who theme composed by Ron Grainer (originally for a conventional orchestra/band setup) but realized electronically by the delicious Delia Derbyshire...



Not just that, but some of the background 'music' for Dr Who was deeply avant garde at times using techniques exploited by the early pioneers (and, in fact, used many of the early pioneers such as Tristram Cary – see later).

People who would never normally listen to abstract electronica were now enjoying it (well... being scared by it!) every Saturday evening for 30 minutes as well as hearing it in radio productions, news programme theme tunes etc..

But frustrated by BBC polices, Oram left and in 1962, she expanded on her 'Oramics' machine (with the help of a grant from the Gulbenkian Foundation) which allowed composers using her facility in Tower Folly in Kent, UK, to literally draw sounds that would be replayed by the machine...



You can actually see the ‘sounds’ on the multitrack film strips. The original Oramics Machine is currently on display at the Science Museum in London.

Which brings us neatly to 1964, around the time when a young man called Robert Moog was showing very early prototypes of his modular analogue synths at the AES show in America.



*The first commercial Moog synthesiser, 1964*

He built Theremins as a lad which started the fascination that would lead him to gain physics and electrical engineering degrees from various prestigious US universities.

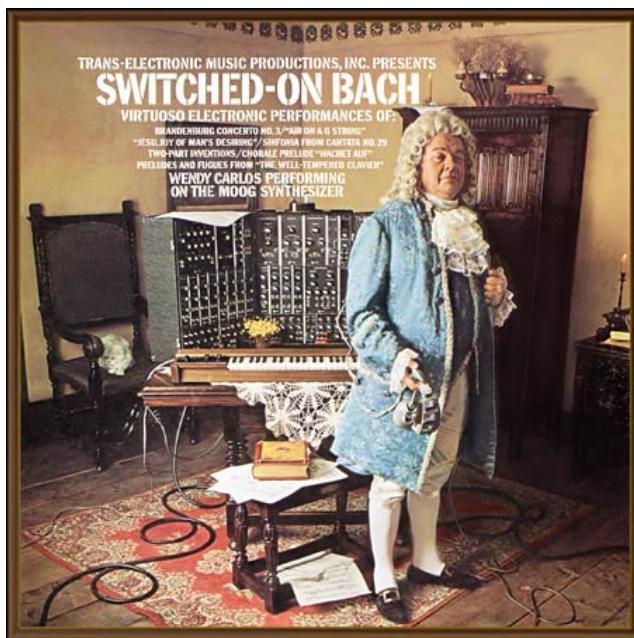
Heretical though it sounds, he didn’t actually ‘invent’ the modern synthesiser because the basic principles had been understood for a while. Instead, he ‘rationalised’ the synthesiser with a logical collection of modules and a standardised voltage control method which was to be adopted and adapted by other manufacturers and which still forms the basis of most modern synths in one way or another.

But Moog wasn’t alone. Around the same time that Moog was showing his early modules, Don Buchla was designing his own synths on the east coast...



Buchla synths were popular with the more avant garde composers of the time such as Morton Subotnik who released the first ever all electronic album, 'Silver Apples Of The Moon', commissioned by a record label in the mid 60s.

Of course, this was eclipsed by Walter Carlos' 'Switched On Bach' which was released in 1968 and was the best selling classical music album at the time even though it was performed entirely on a Moog modular (not the one shown on the album cover which, if you want some real nerdy synth geekery, is a IIIP whereas the Moog used on the album was a IIIC! Sorry about that!).



The interesting thing (perhaps) was that composers/musicians Subotnik and Carlos were working with the synth designers to improve their instruments to make them more 'musical'.

Carlos had his own studio in a brownstone in New York...



It was built around a custom Moog modular and a custom built 8-track he'd made himself. Together with Rachel Elkind, they made the 'Switched On Bach' album which went on to sell well over a million copies and won awards for Best Classical Album, Best Classical Performance and Best engineered Classical Recording – it was a phenomenal success and very influential in introducing the synthesizer as a serious instrument, not just a weird box that made abstract, bleepy sounds! But during the making of the album, he was in constant contact with Bob Moog who refined and improved his modules (it helped that Carlos had a BA in physics as well being a musical prodigy as a child!).

With the success of SOB (as Carlos refers to it), everyone wanted a Moog synthesiser (often mistakenly referred to as a 'Mood Synthesiser' at the time due to a mispronunciation of Moog's name ... which should rhyme with 'vogue' not 'mood'). Even The Rolling Stones bought one (they later sold it to Tangerine Dream) and you can hear Abbey Road's Moog modular featured on later Beatles records (George Harrison's 'Here come the sun' for example) - but there were some God-awful Moog albums released then – 'Switched on Bacharach', 'Switched on Gershwin', 'Switched on go pop', 'Switched on country', 'Switched on rock', 'Switched on Santa' and so on...



Too horrible to contemplate. I feel sullied just mentioning them! Moving on...

Moog didn't just make the big modulars – they also made the smaller and more modest three oscillator System 15 towards the end of the 60s...



This was famously used by Larry Fast (synthist with Nektar and also Peter Gabriel in his early solo career) and John Paul Jones of Led Zeppelin and was to become the forerunner of the MiniMoog – in fact, apart from the fixed frequency filter that was (optionally) included, it was a modular MiniMoog pretty much with three oscillators, a lowpass filter, two envelope generators, etc..

But before we get all dewy eyed with nostalgia for these old things, things weren't quite as rosy as they seemed... the early Moogs were unreliable especially with regard to tuning.

The early oscillators were appalling and it's a wonder anyone made any meaningful music with them although with the introduction of the Moog 921 oscillator, they were more stable.

But around this time, Alan R Pearlman also started up his company, ARP (so named after his initials) in the US which made the big 2500 modular...



A big, lumbering beast of a modular, it used a (complicated) matrix of slider switches to route modules to each other. It could be expanded with side wings to accommodate more modules.

As an interesting 'factoid', the 2500 was the big synth used in the final scenes of 'Close Encounters Of The Third Kind' when the aliens are met and communicate with us musically. It was operated by one of ARP's engineers, Phil Dodds. Dodds had gone to the set to install it and set it all up for the actor who was to operate it but Spielberg thought Dodds looked more convincing in the part as he operated it so cast him in the film. I bet the original actor wasn't best pleased!!

ARP followed this up in 1970 with the now legendary ARP2600...



Where the ARPs scored over the Moogs was better tuning stability. Also, Pearlman decided on sliders for his panels as he felt they gave a better visual feedback than rotaries. He also used a clever patching system where the basic signals were prepatched but could be overridden by inserting patch cords.

But although the 2600 was (relatively) portable, self contained (it had internal speakers) and was very popular in schools and universities to teach the basic principles of synthesis, it couldn't compete with the contemporaneous MiniMoog.

So ARP retaliated with the Odyssey...



With two oscillators, oscillator, PWM, ring modulator, an LFO, a comprehensive sample & hold, high and lowpass filters and a flexible modulation matrix, it was a much better synth in many ways than the MiniMoog but the MiniMoog, while much simpler, was much more playable ... and sounded fruitier than the Odyssey.

But some naughtiness abounded because ARP had copied Moog's patented filter design and so were in breach of copyright. Suffice to say, legal battles ensued which were eventually resolved with ARP designing their own filter.

At first, they designed a 12dB/Octave which was used in later white faced Odysseys (above) but eventually settled on a 24dB/Octave filter which was used in their subsequent black faced models.

ARP's weak spot, however, was that their products lacked the pitch bend and mod wheels of the MiniMoog and in an attempt to overcome that without copying Moog (again!), they introduced the Proportional Pitch Control or PPC on later models...



These were three pressure sensitive rubber pads, the left one for pitch bend down, the centre one for vibrato and the right one for pitch bend up. They worked quite well but weren't as expressive as Moog's wheels. They also got pretty grubby looking after a while!

Around this time, both Moog and ARP (now facing stiff competition from Japanese manufacturers) 'downsized' their synths bringing us the more affordable MicroMoog and ARP Axxe. ARP also had their preset ProSoloist...



Although Moog had made something similar a few years earlier (the Moog Satellite ... for the organ market), unique to the ProSoloist was aftertouch which was very expressive and quite an achievement back then.

The ProSoloist's most famous user was probably Tony Banks of Genesis who started using it on 'Selling England By The Pound' and afterwards. It was very handy for him as he could switch sounds very quickly when playing live, the extended solo in 'Cinema Show' being a good example of this.

A little known (almost unknown) series of products from ARP were the little modules they made for educational purposes...



These were inexpensive little boxes to be used in schools to teach the principles of sound and synthesis. You could buy whatever combination you want and add to them as your requirements and budget allowed.

I have no idea how many were sold (and I suspect very few survive now) but it would be a wheeze to have such a quirky modular system ... or to add to an existing modular system. I'd love to add a genuine ARP filter box to mine!

But around the same time that ARP were beginning to make synths in 1968/9, a small British company started up called EMS or 'Electronic Music Studios'. Founded by avant garde composers, Peter Zinovieff and Tristram Cary (the latter did a lot of work on early Dr Who episodes and also created a lot of electronic music for films one of which was the classic 'Quatermass And The Pit') and an unsung electronics genius, David Cockerell, EMS were forging ahead and the first to be dabbling with digital electronics in music making.

Zinovieff had been working with electronic music using test oscillators, tape machines, splicing, etc., since the 50s...



As had Tristram Cary...



But in the mid to late 60s, using primitive PDP8 mainframe computers with a mere few kilobytes of memory, Cockerell was pioneering early sampling, digital envelopes, digital multi-track sequencing and more at EMS' studio in London.



EMS Studio circa 1969

*An amusing anecdote... A Japanese manufacturer took out patents in the late '80s on things like digital envelope shapers, digital sequencing, recording into memory, etc., and hit every synth manufacturer expecting royalty payments if they contravened the patents. Bloody silly really – a bit like patenting the application of butter to toast! Whatever, what the other manufacturers had to prove in order to avoid payment was that they were using the techniques before the patents were taken out. David Cockerell was working for Akai at the time and when the head of R+D asked if he'd been using these things before the patents, he replied "Ermm, yes... since 1968"!!*

In 1969, they released (as a means to fund Zinovieff's composing career) the now legendary VCS3 (Voltage Controlled Studio 3) modular synth better known as 'The Putney' in the US (because they were made in Putney, a small suburb of London)...



It didn't use traditional patch cords like modular synths of the time – instead, it used a pin matrix to connect the various modules together. When Cockerell was asked what inspired him to use a pin matrix, with typical modesty, he replied... "Errrrmmmm ... I got them cheap as a job lot at an electronics shop in Tottenham Court Road"!

It was a beautiful design but a bugger to transport and needed a large flightcase. To overcome this, they also released their Synthi-A and Synthi-AKS, the latter being the first synth to feature a digital sequencer...



That too comes with typical British modesty and when asked what inspired the company to build a synth into a briefcase, it was because (you guessed it)... they got a job lot on moulded plastic briefcases!

It was British bands who embraced the EMS range such as Pink Floyd, Hawkwind, The Who, King Crimson, the BBC Radiophonic Workshop and Roxy Music's Eno amongst others. It wasn't only British musicians who used them - Jean Michel Jarre's first synth was a VCS3 and he still uses them today. Tangerine Dream, Klaus Shultze, Kraftwerk, Todd Rundgren, Tonto's Expanding Head Band and many others were also users and they were popular as a teaching aid in universities across the world.

Because EMS were British and their products weren't that expensive (£330 for a VCS3 at the time ... still quite a lot of money back then but a lot cheaper than the competition) and because of the BBC's strange procurement practices at the time, they were popular at the Radiophonic Workshop up to and including the massive EMS Synthi100 (which they called 'The Delaware' after the name of the street where they were based ... and the building in which they resided was once an ice skating rink!...)



12 oscillators, 8 filters, three envelopes, 3 ring mods and so on – it even had an oscilloscope and frequency counter and was switched on using an 'ignition key'! But it was also up to 4-voice polyphonic and came with a 3-track, 256-step digital sequencer with editing ... technology unheard of at the time and a vast improvement on Moog and ARP's 16-step analogue sequencers.

Curiously, however, the acquisition of these synths prompted some of the stalwarts at the Radiophonic to up sticks and leave – so used were they to sine wave generators, self-built 'wobblulators', *music concrète* and splicing tape, they thought this was going against the grain of The Workshop's ethos! As such, there are almost two Radiophonic Workshops – pre-synth and post synth.

Like the other EMS synths, they were used in universities to teach the basic principles of sound and Cardiff University had one (in their physics department rather than the music department!). Being my home town, back in the early 70s, I cut my teeth on it aged 15 during university downtime ... until the Health & Safety Nazis moved in bleating on about public liability insurance, etc.!

EMS' demise was rather tragic – when the company folded, Zinovieff offered the entire thing to the country for free to use as an electronic music centre but they were rejected. The instruments went into storage and the building was flooded, destroying it all. Sad!

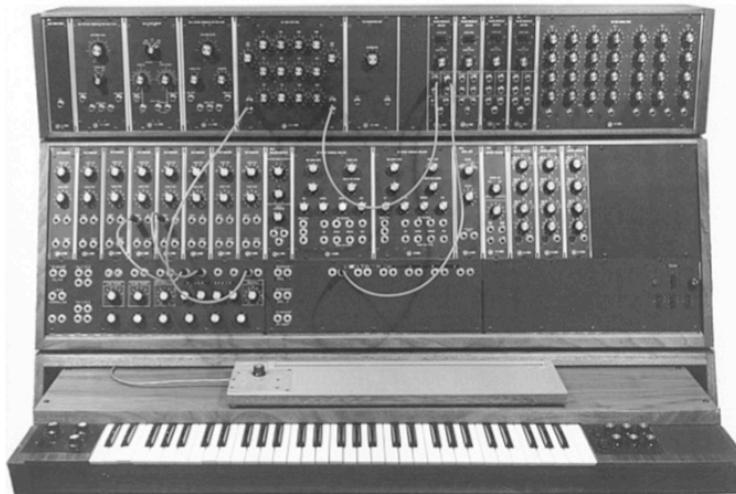
Cockerell went on to design Akai's samplers in the 80s and 90s as well as many of ElectroHarmonix' pedals. For an insight into EMS, hunt down the documentary "What the future sounded like" on the internet – very good.

An ex-employee later bought the company and amazingly, EMS are still in business and selling VCS3s and Synthi-As to order! Not cheap though and a large waiting list ... but still as quirky as ever!

But it was around this time in the late 60s that things were coming together and synths became more established with a kind of standard complement of functions and fairly standardised ways of operating them and although the Moog modulars, the ARPs and the EMS all look very different, their complement of 'modules' - two or three oscillators, a noise generator, a filter, two envelopes, amplifiers and so on and the controls that made them work – were all essentially the same (even if different manufacturers used different nomenclature ... for example, in 'Moogspeak', filter resonance was called 'Emphasis' whilst ARP called it 'Resonance' and EMS referred to it as 'Q') and it's a voice structure that remains much the same today in modern analogue modulars, modern VA (virtual analogue) hardware synths, software synths and samplers.

### The ascent of synths....

In the early days of synthesisers (as we know them today), all the different components mentioned above (oscillators, filters, envelopes, etc.) were available as separate 'modules' and were connected together using 'patch cords'...



Thus, to make a sound, you would typically patch a cord (cable) from the output of an oscillator (sound generator) to the input of a filter (sound processor). You'd then patch a cord from the output of that filter to the input of an amplifier and the whole lot would be controlled by various controllers such as envelopes and LFOs (all patched in with various cords). This was the classic modular synthesiser.

But apart from being big, bulky and expensive (not to mention somewhat temperamental and unreliable!), this made them unsuitable for use live on stage because each sound had to be made from scratch (there were no patch memories in those days!). That said, some such as Tangerine Dream and Klaus Schulze did take these behemoths on tour and even today, Jean-Michel Jarre still carts one around in his live set.

With that in mind, in 1970, Moog released the seminal MiniMoog synthesiser:



It was an immediate success with musicians and remained in production, unchanged, for 12 years. Whilst not the best specified synth on the market, it sounded fantastic and was extremely playable.

The oscillators, filters, amplifiers and controllers were 'pre-patched' and switched on and off using front panel rocker switches (colour coded blue for audio signals and red for control signals). The MiniMoog was considerably easier to use both on stage and in the studio. It was also portable. The MiniMoog spawned all sorts of similar 'synth-alikes' from competing manufacturers such as ARP (their Odyssey) and, of course, Japanese manufacturers such as Roland, Yamaha and Korg who were making their first foray into synthesisers in the early 70s.

At first, the oriental offerings were considered a bit weak and many of them were kind of intended for the organ market which was quite large in Japan and, as a result, resembled the ARP ProSoloist with tabs to select sounds ... such as this Yamaha SY1...



The Japanese manufacturers soon remedied this and became such key players with such great synths that Moog, ARP and EMS struggled to survive.

Of course, at this time, all synthesisers were 'monophonic' - that is, you could only play one note at a time - but in the mid-70s, we saw the release of 'polyphonic' synthesisers. There was the PolyMoog...



Except that it wasn't TRULY polyphonic – it used 'divide down' oscillators (like string synths of the time and derived from transistor organ technology) and had a single filter to service all voices which was hardly ideal. It was also notoriously unreliable and spent more time in the repair shop than the studio!

The first *true* modern polysynth was the Yamaha CS80 which could play as many as eight (!!) notes simultaneously – quite an achievement at the time.



Famously used by Vangelis, it came with a weighted keyboard with polyphonic aftertouch making it enormously expressive and many of its trademark sounds can be heard in Vangelis' soundtrack for the film 'Bladerunner'. It was actually two synths in one which could be layered, came with rudimentary presets and a very crude method to store your own sounds using the mini-panel under the lift up flap.

It may seem a bit primitive by today's standards but it made a hell of a sound and moved some serious air on full tilt ... and that smooth polyphonic aftertouch with the weighted keyboard – sorry but you're not going to get that on some modern virtual recreation! But I digress...

It was Sequential Circuits' 'Prophet 5' in 1978 that set the pace for the next generation of synthesisers.



Featuring 5-note polyphony, the Prophet 5 had one more trick up its sleeve - the settings of the front panel controls could be stored and recalled with a button press allowing you to flick between different sounds quickly and easily.

However, worthy of note is the fact that the structure of each of the Prophet's five voices was pretty much exactly the same as the MiniMoog's. Other manufacturers released similar products such as the Oberheim OB8 (and variations), the Roland Jupiter 8 and others (including an obscure French polysynth, the RSF PolyKobol which never really made it into production) and Moog entered the arena rather late in 1982 with the magnificent (if unreliable) MemoryMoog – six MiniMoogs on steroids in one polyphonic instrument!

In Germany, PPG took the concept a little further. Company founder, Wolfgang Palm, had been building analogue modular synths (often custom modules for Berliner Krautrockers, Tangerine Dream) and in 1981 brought out the PPG Wave, a hybrid analogue/digital polysynth with digital wavetable oscillators feeding analogue filters...



A quirky thing, it had a familiar knobby panel but also menu driven modes (a first) and it made totally unique sounds with its edgy digital waveforms that could cut through a mix like a hot knife through butter. Here was an indication of the future and people like Thomas Dolby embraced it.

But development stayed rather dormant until Korg brought out their budget PolySix swiftly followed by Roland's Juno 6 which made polyphonic analogue synths affordable. However, these only had one oscillator per voice and were beefed up with chorus units – a compromise but they sounded good, were affordable and were hugely popular. Around the same time, Roland brought out their (slightly) more affordable Jupiter 6 and the rack mount MKS80 'Super Jupiter' and a new company called Akai brought out their 8-voice, £1,200 two oscillator AX80 with its innovative user interface. It was all looking rosy.

However, this was all to change – dramatically - in 1982 when Yamaha released the now legendary DX7....

It was one of the first synthesisers to feature the new 'Musical Instrument Digital Interface' otherwise known as MIDI that was invented by Dave Smith of Sequential Circuits and (amazingly) adopted by all electronic musical instrument manufacturers.



The DX7 was an immediate success offering 16-voice polyphony (unheard of in those days), a velocity sensitive keyboard (also very rare back then) and loads of playable presets for about a fifth of the cost of an analogue polysynth. It was ubiquitous and almost every keyboard player had one (or the less expensive DX9).

Analogue synthesisers fell from grace almost overnight and you could barely give them away during the 80s - no-one wanted that analogue sound anymore; instead, they wanted the fashionable FM sounds that littered almost every record of the time.

In the mid-80s, affordable sampling also took off with products such as the Akai S900...



Akai's first sampler was the simple S612 but it was the S900 that captured peoples' imagination as it offered most of the facilities of the legendary Fairlight from 1979 for a fraction of the price. It was superceded by the S1000 which brought stereo sampling into the equation. There was also Emu – previously (kind of) known for their modular synths, they moved into sampling, first with the Emulator then the Emulator II and then the Emax.

Sampler specifications rapidly improved until they were almost indistinguishable from an analogue synth in many ways with multi-mode filters, extensive modulation, etc., the only difference being that the oscillators can be any sound you want, not just the usual waveforms.

This technology gave rise to 'ROMplers' – preset synths with short samples stored in ROM (Read Only Memory) such as the Roland D50 and Korg M1 upon which all the current 'workstations' from Korg, Roland and Yamaha are largely based (except whereas the M1 had 4MB of ROM, modern workstations have hundreds of MB, disk streaming, user sampling, instrument modeling and so forth).



These were the hot sellers of the time (especially the M1 – best selling synth of all time at over 100,000 units sold, eclipsing the DX7!).

The future of the analogue synth seemed doomed forever in this digital world, a species due for imminent extinction. Or was it?

Not quite.

In the 90s, impoverished musicians were picking up the old analogue synth relics dirt cheap in second-hand shops or classified ads and they became popular again. For some young people, it was the first time they'd heard a filter sweep. People also re-discovered their rich, warm and vibrant sound (especially after almost a decade of clean and detailed FM and static samples). And then these old things were appearing on hit records and they became very fashionable. As a result, prices soon started to escalate and analogue instruments you almost literally couldn't give away a few years earlier were selling for more than their original price!

But these old things were unreliable (some notoriously so) and costly to maintain (even more so these days). It was also difficult to locate good examples of the old instruments (and, of course, most of them didn't have MIDI which by now had become a vital part of the music making process). But still they remained popular for their sound.

Advances in computing power meant that it was possible to 'model' (i.e. re-create) the sound of analogue synths using advanced digital sound processing (DSP) and so the 'virtual analogue' – or VA - synth was born.



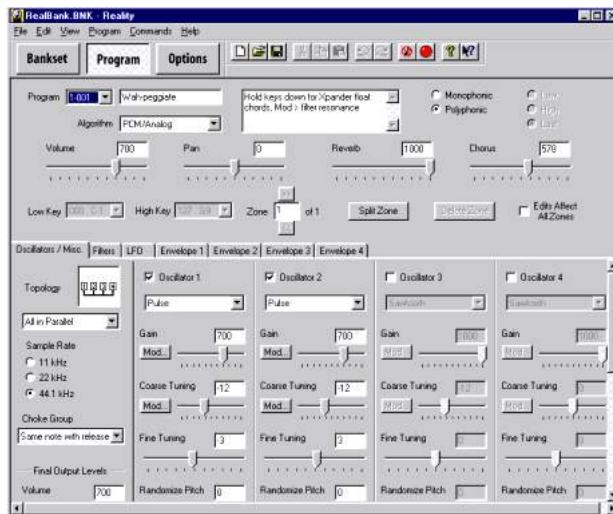
Offering the characteristic richness of genuine analogue synths, they overcame many of the reliability problems as well as offering greater functionality and facilities and higher polyphony at much lower cost.

Some will argue that true analogue has a richer sound compared with 'virtual analogue' and up to point, they have a point – nothing can compare with real electrons flowing through real circuits and bits of wire (especially if valves/tubes are involved) – but we won't go there as it's too subjective and the subject of many a protracted (and futile!) internet forum discussion!

# Hollow Sun

Hand Crafted Sample Libraries

And then they took away the hardware and now, of course, we have squillions of software ‘analogue’ synthesisers that use your computer’s processing power to create sounds. Ironically, it was hardware synth king, Dave Smith, of Prophet 5 fame, who developed the first software synth for Seer Systems...



Of course, GUIs have moved on a lot since then, most of them resembling actual analogue synth control panels, even emulating classic old synths...



While other software synth designers have more fun with their GUIs like the Schwa Olga...



But despite advances in virtual analogue (or VA) and software synths, things have never looked rosier for *true* analogue synths today and there are seemingly no end of new and excellent products you can buy from small manufacturers in the shape of inexpensive little table top units such as the Vermona Lancet...



Or the Doepfer Dark Matter...



These are great little synths and an ideal and relatively affordable entry into the world of *true* analogues.

There's also the budget-conscious Moogery of the (stupidly named IMO) 'Little Phatty'...



And more recently, the table top MiniTaur...



We also have polyphonic synths in the form of Dave Smith's 'Prophet 08'...



8-voice polyphonic, built in analogue step sequencer and whatever else, it outperforms Smith's original Prophet 5 although some will say that the 08 doesn't sound as good as the P5 (again, the subject of other long, drawn out internet forum discussions and trolling!).

And modular synths are more popular than ever with several small ‘boutique’ manufacturers making them. One is Synthesizers.com in the US who make a wide range of different systems (and being modular, you can configure your own system, of course – they even have a PC programme where you can design your own system prior to ordering)...



That's a very large system, obviously, but smaller and surprisingly affordable systems are also available from them...

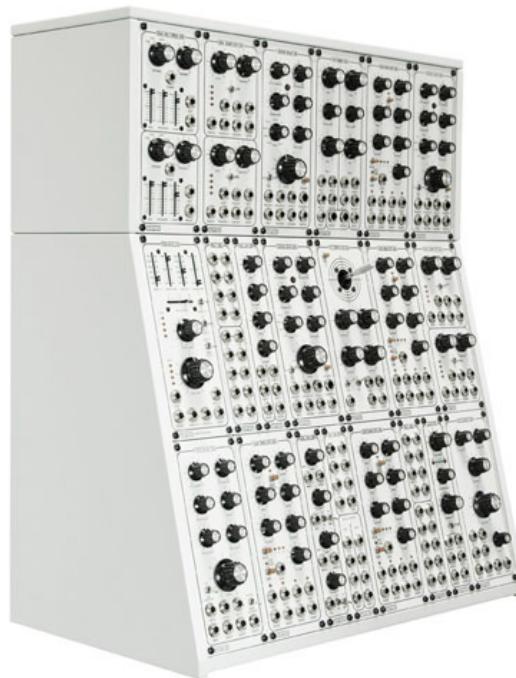


They also make a ‘Pay As You Go’ system where you pay monthly when you sign up and receive a new module every month – an excellent way to introduce yourself to modular synthesis.

There are also modulars from Doepfer in Germany...



And the Californian Modcan...



And the Swedish Cwejman...



And Macbeth in Scotland...



And there's the amusingly titled Club Of The Knobs in Portugal...



They make quite authentic Moog modular clones, the above being a copy of the Moog 15

A fantastic choice to suit all sorts of budgets and requirements.

There are others too – Analogue Solutions, Blacet, MOTM, Wiard, Paia, Cyndustries, Serge, Encore Electronics, Metasonix, Oakley, MFB and more.

The other beauty of these systems is that are made by enthusiasts and eccentrics and the systems are all but hand built – it's like buying a bespoke suit!

Furthermore, they are built using modern, readily available components so, unlike some old vintage relic, in the unlikely event of something going wrong, they can be easily and affordably fixed. Also, many lessons have been learnt over the decades so modern *true* analogues are more reliable, have better tuning, etc., than their ancient predecessors AND come with a warranty. Win win as they say.

Despite being the first synth design made back in 1964, patching modules together using patch cords to make a sound still represents probably the best and most flexible (and satisfying) form of synthesis around. Not only can you patch anything to anything but you can design and build your own system to your own requirements and build it up over time as your budget allows and requirements change – add another oscillator, add a different filter, buy some extra envelopes, add a sequencer, etc..

And they sound amazing – VA and soft synths are undoubtedly excellent these days and they are very convenient but nothing can quite move air like a true analogue modular on full tilt!

But modulars represent just one facet of what's available today - in fact, we are spoilt for choice with everything from freebie soft synths to fantastic commercial soft synths to VA keyboard synths to inexpensive table top analogues to polysynths and monosynths and extensive modulars. To paraphrase Harold McMillan, we've never had it so good !

And if you have a very large wallet in your Paypal account, there are all sorts of vintage analogue antiques to pick up (for insane prices, however) on eBay. As desirable as that route may seem – to own an original – be prepared for ongoing repair and maintenance costs so consider it carefully before bidding on some £20,000 Moog Modular!

## CONCLUSION

It's impossible to write a comprehensive and digestible history of over 150 years of synthesis in just 30 pages and I have deliberately left out classic instruments such as the Mellotron, string synthesizers, the Fairlight, the Synclavier, electro mechanical keyboards such as the Fender Rhodes and Wurlitzer electric pianos, etc..

I have also left out certain quirky, mad things that never really came to anything, things like the Electrophon, Sphäraphon, Partiturophon and the Kaleidophon from the 1920s ... or the Variophon, the Emiriton (invented by Rimsky-Korsakov's grandson), the Hellertion, the Heliophon and other exotically and wonderfully named nearly-rants but which disappeared into obscurity almost the day they were unveiled. Instead, I have concentrated on significant landmarks.

But whatever, I hope you have enjoyed the short travel through time