



OVER NORMAL



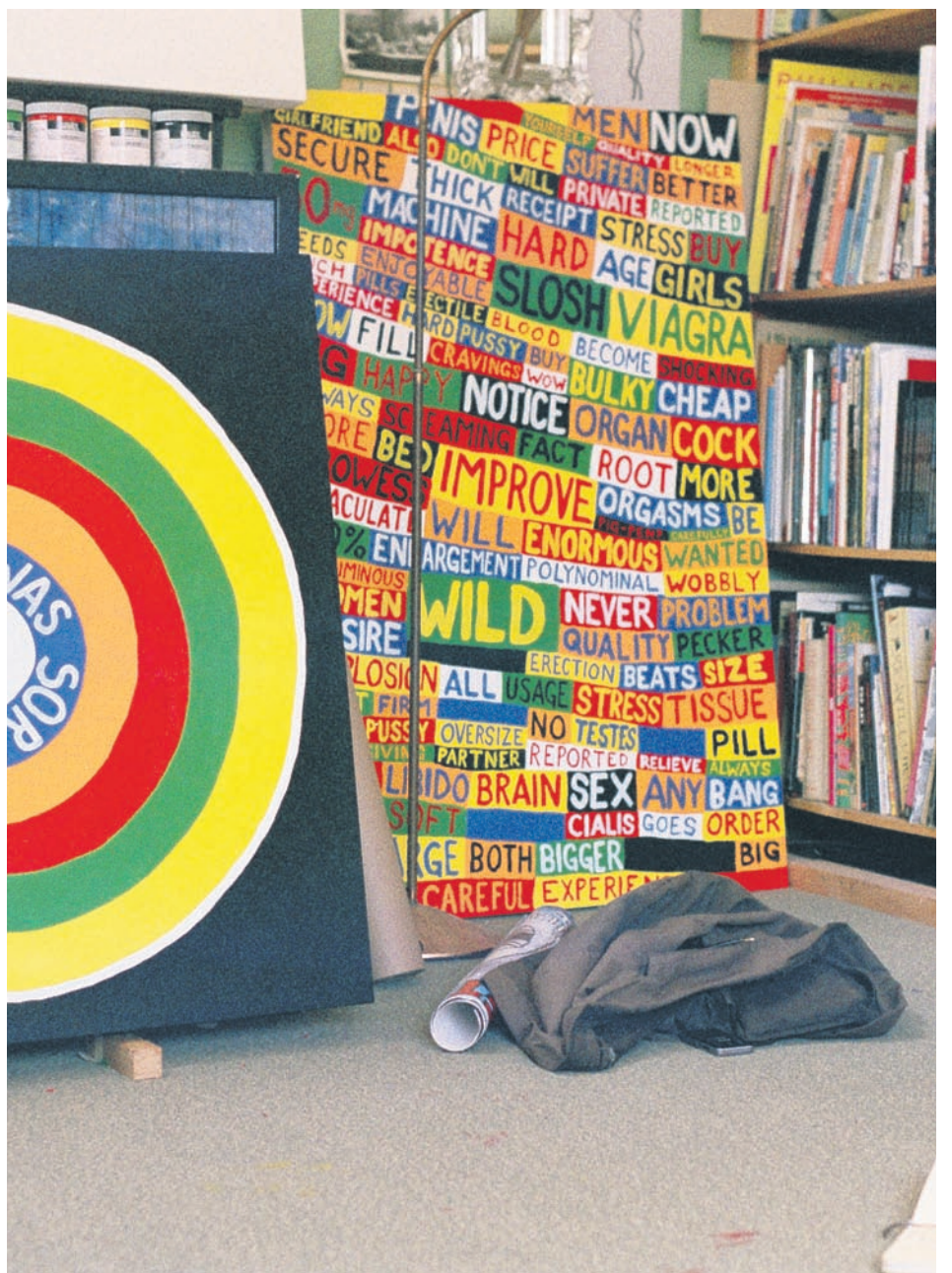
A SLOWLY DOWNWARD PUBLICATION

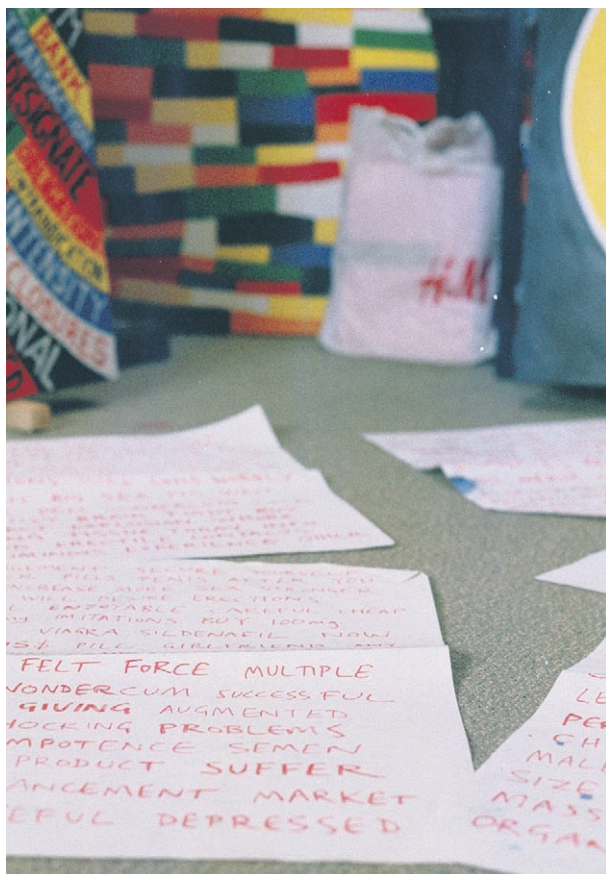
STANLEY DONWOOD

FIFTY24SF, SAN FRANCISCO



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PHOTOGRAPHY BY AMBROSE BLIMFIELD

over normal

STANLEY DONWOOD

The work that would eventually become OVER NORMAL started in California, and maybe it will end there. I found myself in the Golden State once, back in 2003, trying to make artwork. I'd just arrived, and I was with a well-known 'rock' band who had decided that they were going to record an album in two weeks. Similarly, I was supposed to produce the artwork in two weeks. Ho hum. It was the first time I had been to the west coast of America. It's an eerie place for a European; incredibly familiar from television and movies, inhabited by people who mostly speak the same language, but at the same time indefinably foreign. This foreign-ness, I thought, was at least partly to do with scale. Huge skies, huge buildings, huge highways, huge vehicles. Part of this massive scale involved the many advertising materials and traffic signage employed along the multilane highways that dissect the built environment.

I was in the car with my notebook, and for something to do I was writing down what all these signs and advertisements had to say. I realised that they only used a very few colours, and the colours were bold, brash, and used in very visually compelling combinations. I became convinced that about ninety per cent of the messages that flicked past my retinas were using just seven colours.

I noted these colours down; red, green, blue, yellow, orange, black and white. All, I think, made from pigments derived from the petrochemical industry, the same hydrocarbon trade that has made the modern world, its complex and energy-hungry civilization possible. The colours were red, green, blue, yellow, orange, black and white. I decided to paint using these colours, straight from the tub. There were all sorts of practical difficulties involving viscosity and opacity, but soon I had my palette, which I eventually referred to as the 'California palette'.

This was some time ago, back in 2003, I think. I made the paintings for Radiohead's album called 'Hail to the Thief' with these colours, and I continued to use them for several projects afterwards, one involving a large painting of the United States divided up by the contractors 'invited' to tender for contracts in the 'reconstruction' of Iraq; Halliburton, Kellogg Brown & Root and the rest of them.

I find these colours, in combination, both deeply attractive and subtly distressing.

More recently (although, to my sorrow, no longer) I received a whole load of spam emails promising me a better sex life, a bigger penis and something called polynominal slosh prowess. I collected these emails. There were a lot of them. When they inexplicably stopped, they were replaced with spam emails offering me the chance to buy foreclosed homes at bargain prices. I collected these emails too.



And I got spam emails that supposedly came from the impoverished relatives of African presidents who needed my bank account details for some reason.

The icing on the cake, the croutons in the soup, the crème de la crème - were emails that made no sense whatsoever, spam concocted of apparently random words simply thrown together. I had no idea what these were for.

Presumably the nonsense was assembled to evade spam filters, but the results were pure poetry. Like this; 'muddy-mettled mother-sick night soil omnibus clause mirth-marring orchid fly oat-bearing north-northwest'...

What interested me about most of the emails (apart from the promise of wealth, cheap luxury housing and the life of a porn star) was the way that the words in them functioned; just a glance at the title of an email was enough to tell what sort of contents it would hold; much as the colours of L.A. grabbed the visual cortex these words seemed intended to grab the linguistic cortex. And what about spam? What a wonderful thing it had become, from such humble beginnings!

When the internet first began I was really very excited. It seemed to be a brand new thing, the like of which I'd never seen; a transformative force that would surely revolutionise the world as nothing had since the printing press. The idea of email was almost impossible to comprehend. Instead of writing letters on paper, or telephoning someone to attempt to vocalise an idea you could simply type your communication into a computer, click 'send' and your ideas would appear on a computer accessed by whoever it was you wanted to talk to. Or, indeed, a whole group of people. You could write to loads of people at the same time. I cannot stress how amazing this was.

For instance, one of the things I did was this: it was possible to type 'art' into a search engine and there would be about three pages of results. Out of them, there would be about fifty websites that looked interesting enough to email the artists, so I did, and then most of them would email back. And then you could organise what we rather quaintly termed a 'cyberconference'.

This kind of thing happened all the time. I remember how weird it was to meet people who you had only 'met' or 'talked to' over the internet. We weren't used to the idea of doing things without physically getting together, another notion which seems kind of quaint in retrospect.

A lot of things have changed, among which is the fact of the internet changing from a transformative force of potential social good into a gigantic fucking shopping mall full of betting shops, supermarkets, bond trading, auction houses, pornography, and much, much more besides. And email is not quite what it was either.

When 'spam' (incidentally named after a British post-war budget meat product which was then made famous by a Monty Python sketch) first began to arrive in our provisionally-named 'inboxes' it was actually kind of a joke. These were emails that we hadn't solicited, often addressed to 'UNDISCLOSED RECIPIENT'. Some of it was political, some commercial, but largely it wasn't taken seriously as it was obviously sent out at random by weirdos. We would actually tell each other if we'd received a 'spam message'. But you know how it is. You stop paying attention. I did. I was a bit fried by the cyberconferences, and when financial institutions started having websites I was repelled.

But spam never stopped paying attention, and spam got cleverer whilst we got more stupid. We got all seduced by amazon and google friendsreunited and myspace and facebook and stuff like that, and how suddenly you could do all of your shopping using only the internet and (almost without comment) a highly evolved and incredibly complex petroleum-based delivery system. It's evidence of my terrible, incredible innocence that the commercialisation of the internet came as a huge surprise to me.

So by the time I started paying attention again there had been a vastly pervasive homogenisation of the web. My email account had a spam 'filter' which conveniently hid all the spam messages I was receiving from me, but when I had a look at it I was amazed. This stuff looked way better than what I had in my ordinary inbox. I started harvesting my new, exciting spam, and isolating each word from its neighbours. This is what I had started to do when I was painting the work that became the cover of Radiohead's 'Hail to the Thief'; it was something that I started as a quiet homage to Tzara and Burroughs and Bowie. Like them I became intrigued by the combinations of words that arose from these 'random' connections. More particularly, I liked the way that the brain created new meanings from the cut-ups, and how beautifully apparently disparate concepts sit together. The new spam emails that I'd received supplied fantastically elaborate concoctions that hinted at sexual practices I hadn't even begun to imagine: EXPLOSION BUY CAREFUL FUCK. And then SLOSH PROWESS, or FILL YOURSELF FUNCTION or AMERICAN FEDEX PUSSY. Then again, there were amazing vaguely financial confabulations: SET DOLLAR TAKE VOLUME, EUROPEAN THESAURUS MINISTRY, MEDITERRANEAN OSCILLATION and many, many more.

It seemed to me that what had happened was that advertising had almost completely invaded what I had known of the web, but that spam email had somehow eaten advertising up and spat it out in an almost completely pure form. Combined aesthetically with the California palette (itself derived from advertising) and each other, the words gained a vibrant, intoxicating and innocent life of their own.



(There turned out to be an infinite number of connections between the words, which fits very neatly with John Matthias' explanation of the OVERNORMALIZER later on in this newspaper...)

I painted these pictures using all these words and the seven colours in a way that I like to think is at least approximately true to the signs and advertisements I first saw in California all that time ago. I fill space on the panels with paint, treating it like real estate or vacant land or Bhutan or somewhere that needs lurid advertising. I paint rectangles of all the seven colours, and then I paint the words on top of the rectangles. The words must stand out. They should be as vibrant as possible.

They should shout out loud! These paintings are like some kind of weird, blatant advertising, advertising from a zone inside my head where words are enough and there doesn't need to be a product to buy.

I mean, I know that out there there's always a product, and there's always something to buy. (This does, truly, make me a little sad. Money floats above us like some dark cloud, trailing tears of overdrafts, reposessions, foreclosures...)

Despite that terrible truth, I do like advertising. No, I don't. Yes, I do. Okay, no, I don't.

But even if I don't (or do I) my favourite kind of advertising is that found on packets of detergent, bottles of toilet cleaner and bleach, et cetera. It's amazing. If you spend enough time in the aisles of supermarkets that deal with household cleaning products and you will see what I mean. It is pure heaven. They use colours that aren't used for anything else; zingy fluorescents and jangly metallics. It's miles better than going to an art gallery. And the smell! The smell is incredible! It's every kind of 'clean'. The most sinister kind of clean smell it has is the kind that conceals real filth. It's very appealing. Last year I almost got a job at the supermarket so that I could stack the shelves in that aisle every once in a while, but I was told that it was a stupid idea.

Going back to my first impressions of California in 2003; it was the first time that advertising had actually made sense as an aesthetic, rather than the intrusion I'd always considered it. I hated advertising; from a teenage reading of Vance Packard's 'The Hidden Persuaders' to multi-million dollar Pepsi commercials, I'd hated the fucking lot. And because of that, I'd kind of missed the point. I'd thought it was just about selling. The selling is the bad smell, but the advertising is the smell of clean.

Stanley Donwood is best known for his artistic collaboration with Radiohead. He has exhibited in London, Rotterdam, Barcelona, Tokyo, and at Schunck, in Heerlen.





E-SCALE FULFILLED
INGHER INVESTMENT
SPIG MY RISK
BANK IMPOTENT
DESIRE BEDROOM
PENIS OFFICIAL
INTENSITY LONGER
PASSIONATE CHAT
RESULTING OTHER
DIRECTLY WAIT
CAREFUL FUCK
X PUSSY MSNBC
PARTNER CAPABLE
BILLING PECKER
LDENAFIL POWER
WITHDRAW CLOSE
SY MAXIMUM SLIPS
NE MEN CIALIS
GE EXPERIENCED
000 SEXUALLY
R MACHINE CENTER
T STRONG APPROVAL
Y SEXUAL CHANCE
NETWORK WOMEN
INVEST PROCUREMENT
PROVE LENGTH BUY
OSH QUALITY
OOD WESTERN

IMPOSTER UPDATED
COMPANIONS NETWORK
\$ TODAY 100%
BOOMING TISSUE WONDERCUM
DISAPPOINTED FUNCTIONAL
OFFICE SEXUAL WEAKNESS
AREA BEHALF IMPROVING
LOVEMAKING ENHANCED
AGE CHARGES TIMESHARE
THIRD LARGISH FACT
COCK SET DOLLAR
GOALS AGE BULKY
VOLUMINOUS POLYNOMIAL
FORCE PIGPEN FEDEX
EJACULATE CUSTOMER
IMPOTENCE PLEASURE
HOURS INVESTIGATE
US\$ SUCCEED
RUSH WHAT LONG
COUPLES PRESIDENT
DEPOSIT RESPONSE
CURRENT FBI GIVE
ENHANCE PROCUREMENT
ORGASM MONEYGRAM
PECKER MONITORING
OVERSEAS SPERM FILL
HYPNOTISE PERCENTAGE
SILDENAFIL SERVICE
PORTABLE INCREASE
BIGGER CRIME
TISSUE ORGAN
TAKE VOLUME
EXPERIENCE
MEGADIK
FINANCIAL
GIRLS
FORE
INTER
PROBLEM
LENGTH
OUT
BUREAU
ATM
BANK
TRANSACTION
DESIGNATE
OBLIGATION
CONTRAINDICATION

the overnormalizer

JOHN MATTHIAS

There are approximately one hundred thousand million neurons (or nerve cells) in the human brain. That's a one with eleven zeros...and each of these neurons connect to approximately ten thousand others. Some of these neurons are sensory neurons, directly connected to the outside world by electromagnetic fields and some of them are motor neurons and perform a function of making our bodies move and react. Many of the neurons are simply concerned with processing information coming in from sensory neurons and are cortical neurons located in the cerebral cortex, a sheet of neural tissue the size of France, which is folded up around the cerebrum of the mammalian brain. That's the size of France. In your brain.

Each of the neurons has a cellular membrane which has a resting potential difference, a small voltage of about -65 millivolts, across it (roughly five hundred times smaller than the voltage from an average household battery). When a neuron gets stimulated electrically (either from the outside world, if it is a sensory neuron or from signals from other neurons), and the membrane voltage gets higher than a certain threshold level, it will fire a signal to all the neurons to which it is connected. This signal takes the form of a 'spike' of voltage – a very short signal which has a duration of around one millisecond.

This 'spiking' behaviour is mediated by the flow of electrical ions in and out of the cellular membrane and was first understood in detail by mathematical biologists, Alan Hodgkin and Andrew Huxley who, in the early 1950s, combined detailed electrical experiments with the axon of a giant squid in Plymouth, England with mathematical calculations on one of the earliest computers, an EDSAC machine in Cambridge. The theory of the 'Action Potential' or the Hodgkin-Huxley model as it is also known, is still the best theory we have of neuronal spiking behaviour.

We can now model networks of similar 'artificial' neurons on a computer using antecedents of the Hodgkin-Huxley theory and patterns in resulting spiking behaviour can be visualized on a diagram known as a raster plot. These are graphs, which plot time on the x –axis and neuron spiking signals on the y -axis, using a single 'dot' as a spiking event. Collective patterns in firing can be seen clearly as patterns across the graph. These firing patterns are intricately linked to the processing of events in the cortex. Indeed as Eugene Izhikevich and others from UCSD suggest, it might be that these patterns are linked to the formation of polychronous (not at the same time, but in clusters) firing groups which are associated with particular sensual (and memorial) signals. As Izhikevich points out, if this is the case, then it is not the number of neurons which is important for brain processing, but the

combinatorial number of possible polychronous groups: a number larger than the total number of elementary particles in the entire universe...

Neurons have many other interesting properties. They are plastic, in the sense that junctions or synapses between them can form or decay (a phenomenon known as synaptogenesis) and the connections between them can also become strengthened or weakened, a phenomenon known as synaptic plasticity. The whole network therefore can adapt to its context and environment.

We have been playing around with artificial spiking neuronal networks for several years to create sound. Essentially the basic idea is that we associate the spiking event with some kind of tiny musical event (using computer programming). The patterns in the spiking events, which you might see on a raster plot, for example, then become translated into patterns in sound. We can then manipulate the neuronal network parameters to include different network topologies and plasticity so that the sounds created change and adapt as the network adapts its behaviour.

The musical events which we have been triggering with neuronal firing events are known as grains. A grain of sound is a tiny particle of sound which typically has a duration of 20 -100 milliseconds (below about 20 milliseconds, we just hear 'clicks', not frequencies). The triggering of patterns of these grains is known as Granular Synthesis if each grain is made up of synthesized packets of sound and is known as Granular Sampling if the grains are from recorded material (which can also be live).

I recently developed a large, live granular sampler with Jane Grant and Nick Ryan called The Fragmented Orchestra which had live inputs from 24 locations across the UK (including sports stadia, schools, performance spaces and galleries) and transmitted the sound from them across the internet to the FACT Gallery in Liverpool, where each stream stimulated a single artificial neuron. Grains of live sound were triggered from the sites each time the neurons fired and were heard through 24 speakers, hanging from the ceiling in the gallery. As the neurons fired and caused each other to fire, sound cascaded across the speaker network in the gallery, transmitting tiny grains taken from the organ at Gloucester Cathedral, the crowd at Millennium stadium, Cardiff and the wind blowing outside the Bronte sisters' house in Yorkshire. The sounds in the Gallery were also sent back to the 24 sites and our website, to make an enormous instrument.

For this project, the OVERNORMALIZER, we started with the spam email messages sent to Stanley Donwood. Reflecting the way that the messages were broken up into their component words in the paintings, we separated the words

and got them to be spoken by a recreation of the original Voder. The Voder is the forerunner of the now-ubiquitous vocoder, and is the name given to one of the earliest speech synthesizers, developed by Homer Dudley, then working at Bell Labs and unveiled at the World's Fair in 1939 in New York. It was the first attempt to synthesise human speech by breaking it down into its component sounds and then reproducing the sound patterns electronically to create speech. To get the machine to actually speak required an operator to manipulate a set of keys and a foot pedal to convert the hisses and tones into vowels, consonants, stops, and inflections. And the operator needed a year's practice just to master the keys.

We asked Norm Leete, an analogue synthesizer expert, to recreate the Voder and make it speak the spam messages which were then fed into the Neurogranular Sampler, a granular sampler, which triggers tiny grains of sound from the spam-voder when the 24 neurons of tiny cortical network fire. We created a set of raster plots, using the spiking events from the triggering of the neurons and the spam-voder grains from the Neurogranular Sampler, and the raster plots were used as a starting point to develop a set of giclée prints which can be seen at the end of the gallery, with each spiking event signifying a potential use and understanding of a word.

The OVERNORMALIZER can be heard in the four sets of headphones connected to the central plinth.

Web references: www.thefragmentedorchestra.com, www.davidszondy.com/future/robot/voder.htm

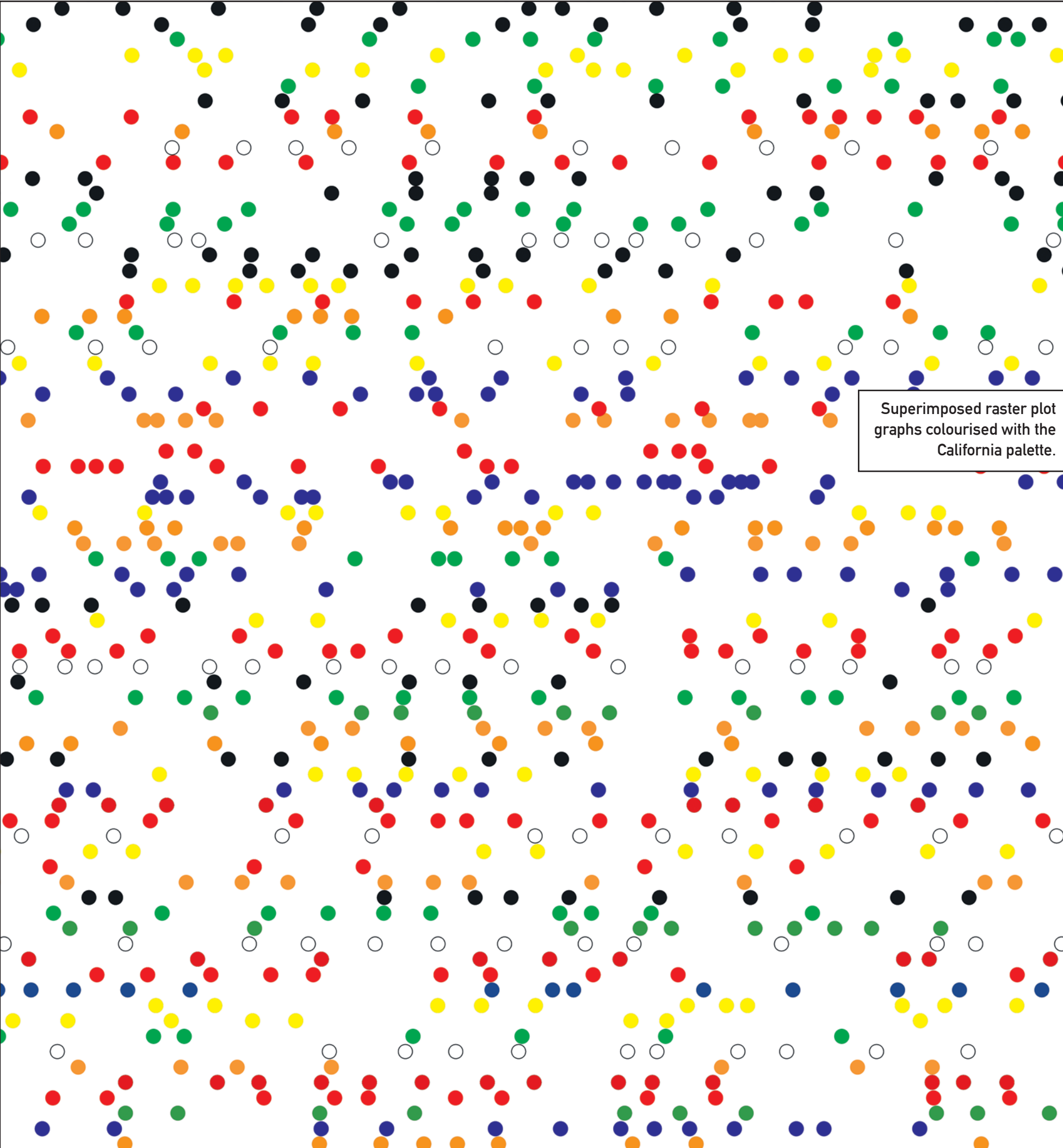
John Matthias is an award winning musician and composer. In 2008, he won the PRS Foundation New Music Award (the musical equivalent of 'The Turner Prize') for the development of a huge sonic installation entitled The Fragmented Orchestra (with Jane Grant and Nick Ryan), which also won an Honorary Mention at the Prix Ars Electronica 2009. He has released three albums, Smalltown, Shining (2001) on the Accidental label, Stories from the Watercooler (2008) on the Ninja Tune/ Counter label and Cortical Songs (2008) (with Nick Ryan), a work for string orchestra and solo violin which includes remixes by Thom Yorke, Simon Tong, Jem Finer and many others, on Gabriel Prokofiev's Nonclassical record label, which was shortlisted for the Independent Music Awards (US) 2010. He has worked with many recording artists including Radiohead (The Bends), Matthew Herbert and Coldcut and performed extensively including at the Wordless Music Series in New York, The Pompidou Centre in Paris and at the Union Chapel in London. He has worked on the scores of several film projects including The Hamburg Cell (Dir. Antonia Bird), Three Degrees Colder (Dir. Florian Hoffmeister) and recently co-scored the straight 8 film 'Out of Time' (Dir. Duncan Wellaway) which was a winner at the Cannes International Film Festival 2009. He is a lecturer in the School of Art and Media at the University of Plymouth, UK and is currently developing new instruments and compositional processes relating to sonic events and spiking neurons. These initiatives include orchestral composition, distributed systems and the development of a new Neuronal Music Technology and will form the basis of many new works and artistic collaborations.

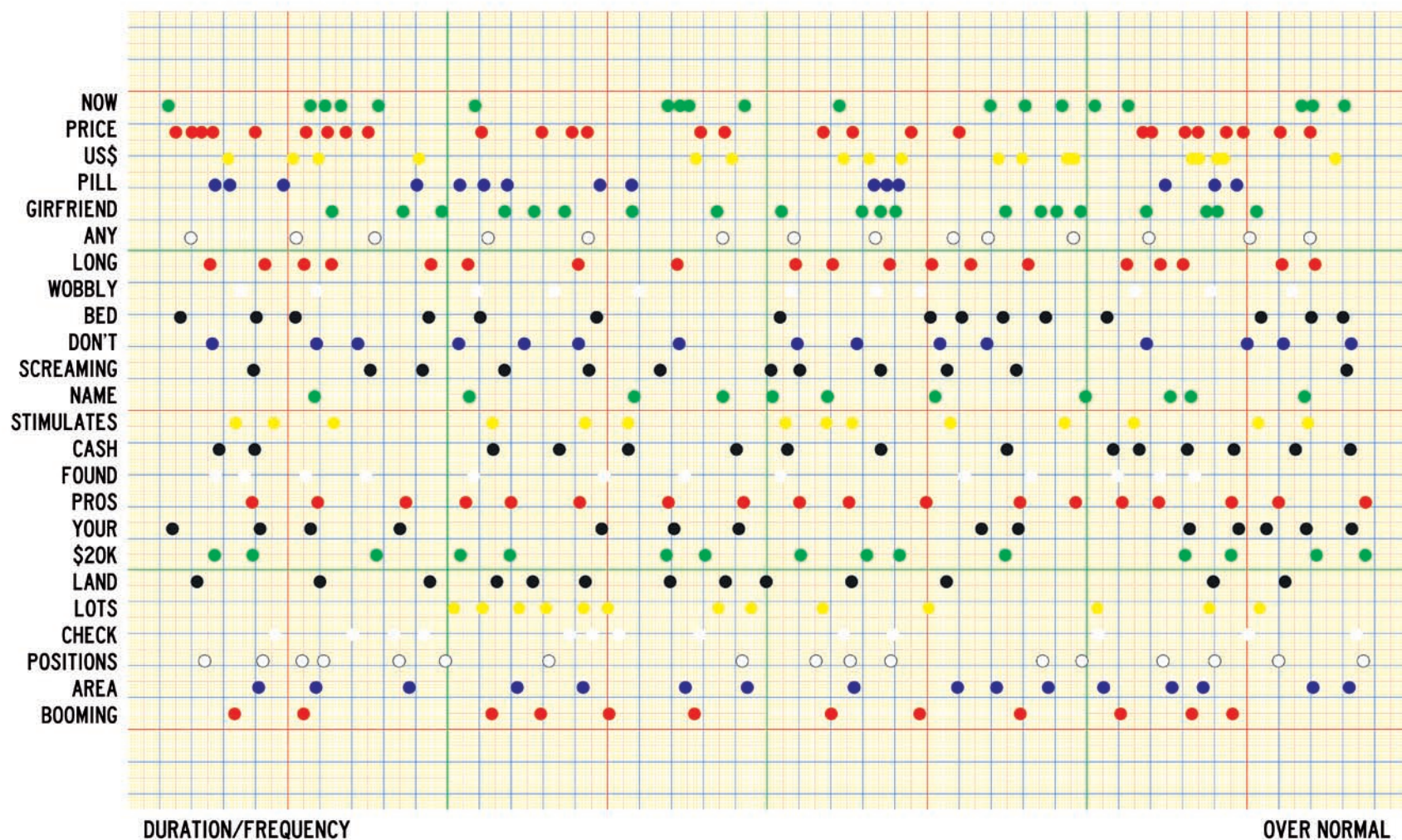
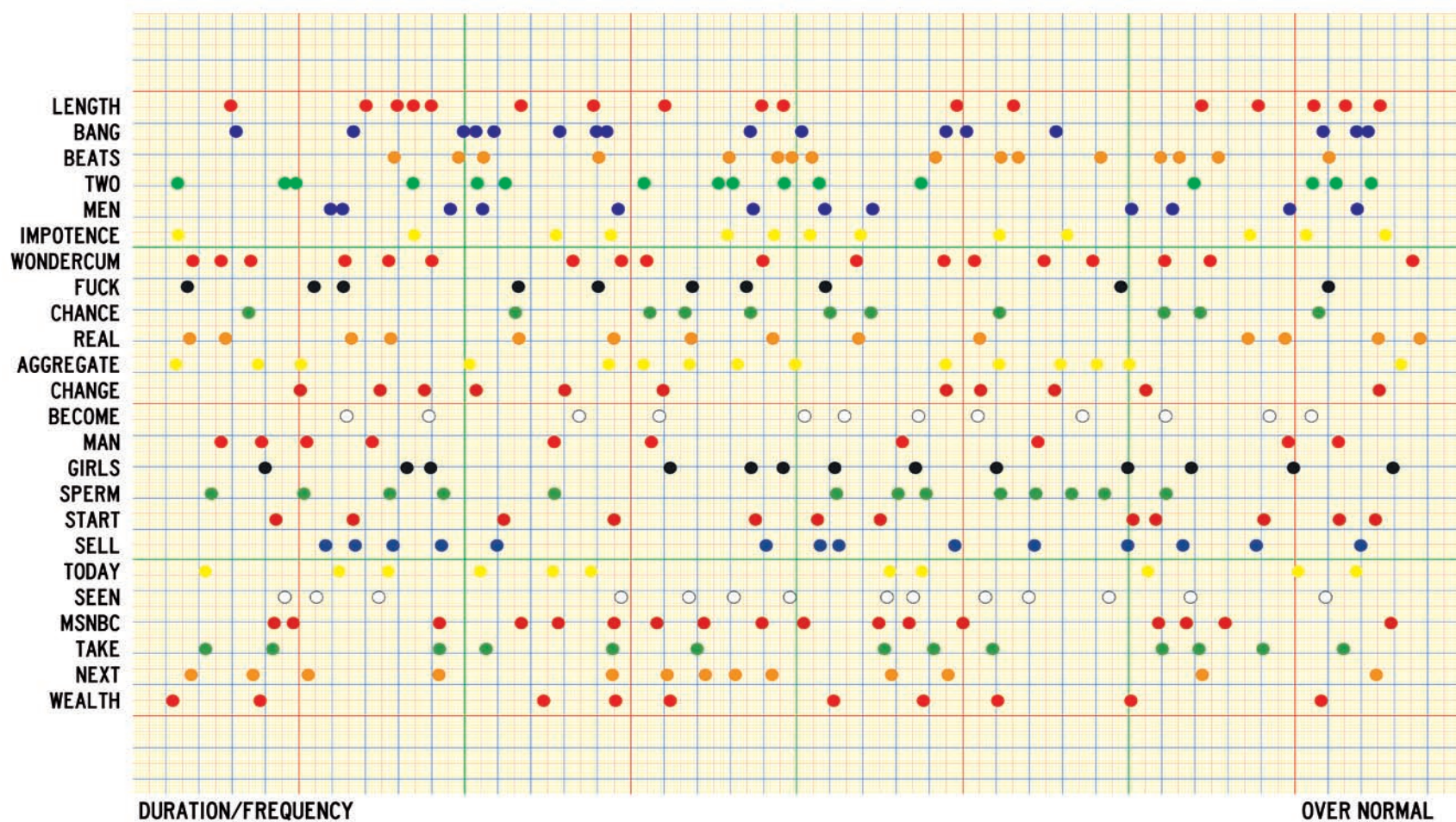
Every time that you hear a sound when listening to The OVERNORMALIZER through your headphones, you are hearing the result of a neuron firing in an artificial neural network.

This is a 'tiny cortex' of 24 neurons, all which are connected together, yet whose connections change and adapt, get stronger and weaker, according to the firing activity on the network. The network connections, and therefore the firing patterns, and therefore the sound patterns which you will hear will adapt and change over the two month duration of the show.... and it will never repeat itself.

Every time a neuron fires, a sound is triggered. There are two streams of sound; one is the sound of a single violin, played by John Matthias and the other sound is the Voderised speech synthesis of SPAM messages. Both streams continually play and are audible when triggered through the firing of the neurons. When a sound is triggered, the computer takes a tiny fragment of the sounds, a tiny grain and makes it audible. The rhythm of the processing of the network, embodied in sound.

The dots on the prints come from data recorded using this instrument, which is known as a 'Neurogranular Sampler'. You can see the dynamics of the firing neurons and how they trigger each other by looking for patterns in the dots on the raster plot. If the membrane voltage on a particular neuron goes over its threshold, it will fire and send a spike signal to all connected neurons. These spikes in voltage will then get 'added' to the membrane voltage of the neurons at which they arrive and if that voltage is above a threshold, then those neurons will fire, and so on, and so on, and so on...





Above are shown two graphs from the OVERNORMALIZER raster plots. As each isolated word from the spam vocabulary is 'spoken' by the OVERNORMALIZER, the human brain creates associations for the mental spaces both before and after the word is heard and registered. For example, the words NOW and PRICE show high correlation to begin with, but this correlation tails off over the duration of this raster plot. As with the paintings, previously unlikely or inconceivable associations become quite possible, and the cortex begins to make 'sense' from these unlikely associations. The 'California palette', derived originally from the roadside advertising materials and traffic signage of the Golden State by Stanley Donwood for the 2004 Radiohead album 'Hail to the Thief' has been used to colorize the graphs, which are plotted on graph paper drawn with those same colors.

the voder simulizer

NORM LEETE

It may surprise you to know that attempts to simulate speech go back to the latter half of the eighteenth century. In about 1770 experiments by G. Kratzenstein, professor of physiology in Copenhagen, succeeded in producing vowel sounds by using resonance tubes connected to organ pipes. However the first real speech synthesiser was developed by Wolfgang von Kempelen in Vienna at about the same time.

Von Kempelen’s machine was the first that allowed to produce not only some speech sounds, but also whole words and short sentences. Von Kempelen, reckoned it was possible to “acquire an admirable facility in playing the machine within three weeks” Apparently this claim was only true if you chose Latin, French, or Italian, since German was much more difficult because of its many closed syllables and consonant clusters.

The machine consisted of a bellows that simulated the lungs and a ‘wind box’ that was provided with levers to be actuated with the fingers of the right hand. The levers actuated a ‘mouth’, made of rubber, there was also a ‘nose with two nostrils that had to be covered with two fingers unless a nasal sound was to be produced. The whole speech production mechanism was enclosed in a box with holes for the hands. There were two ways of getting an air flow through the artificial mouth one through a tube that contained an oscillating reed, acting as vocal chords, and also through a narrow shunting tube. This allowed the air pressure in the mouth cavity to be increased when its opening was covered tightly in order to produce unvoiced speech sounds.

There were no further breakthroughs in the nineteenth century. Several other machines were developed but these were just refinements of the original Von Kempelen machine.

The next major development in speech synthesis came in the 1930’s at the Bell Telephone Labs, where Homer Dudley (with the assistance of Richard Riesz, and Stanley Watkins) developed the Voder (Voice Operation DemonstratoR) and Vocoder (VoiCe enCODER) . Since the late 1920s Homer Dudley had been refining the idea that vocal sounds can be grouped into a fairly small number of pitched and un-pitched sounds that could be created electronically. For example letter “A” is pitched and the letter “S” is un-pitched. He also realised that the vocal chords were a “carrier” and that the lips, tongue, cheeks etc. were filtering the carrier to create all the different sounds required to produce speech. He reasoned that if these simulated sounds were then strung together in the correct order then speech could be created from scratch. His system used ten filters that could, if used in the correct combinations, create approximations of the most common vocal sounds. The (highly skilled) operator of the Voder had to manipulate

10 keys, a footpedal and wrist switches to create each of the sounds. Apparently it took about a year to become good enough to produce reasonable speech.

It should be noted that there was a bit of a cheat to help intelligibility in public demonstrations. If you listen to some of the recorded examples of the Voder often the format will be on the lines of “could you make the Voder say ‘good afternoon, radio audience’”. This means that the listener had already heard the phrase from the presenter making it easier for the brain to fill in any gaps in the Voder’s speech that immediately follows... rather cunning.

However that didn’t stop the Voder being one of the attractions at the World Fair in New York in 1939, along with a robot that would smoke cigarettes!

Practical experiment time. Try saying the following letters – “A”, “E”, “I”, “O”, “U” (probably best done alone...) in a monotone. Notice that the source of the sound, your vocal chords, remains the same but that your lips, tongue and mouth all change position to create the different sounds. What you are doing is creating a number of different resonant filters mechanically to create each of the sounds. Now imagine manipulating ten filters (tone controls) simultaneously to create similar sounds, this gives you an idea how difficult the Voder was to operate as these sounds are some of the simpler ones. Explosive sounds such as “T” or “P” are even harder!

So to make the Voder say “she saw me” you would have to do the following...

	SH-E	S- AW	M-E
key	7 & 8	1 & 8 9 3	11, 8
wrist lever	up down	up down	down down

This was from the Voder instruction manual – Lesson 1...

Originally the plan was to recreate the Voder using a modern modular synth. As previously described speech can be broken down into fragments, vowels and consonants. The Voder patch would consist of a number of different filter settings programmed to imitate the formant structure of different fragments of speech. Each one of these filter setting would be assigned to a different key on the keyboard. So, the bottom 16 keys of the keyboard could trigger the phonemes R, Y, EE, E, EH, AH, UH, OH, OW, OO, I, L, M, N,D, and V. The rest of the keyboard would then be used to play and control the pitch of the sound in the usual way.

However as there wasn’t a year available to learn how to play the sounds like the original Voder a method of automating the process was required. This was achieved by analysing the incoming signal and splitting it into its

component parts. So there was a pitch detector to determine the inflection, an unvoiced detector to detect letters like “S” and a bank of filters followed by amplitude detectors to determine how much energy was in each band (equivalent to the original Voder operator’s fingers). The sound was then reconstructed with an oscillator, a bank of formant filters and white noise for the “S” sounds in the same way that the Voder did. This set up is similar to the Vocoder which was also developed by Homer Dudley.

To reproduce the sound of the Voder for the installation a Clavia Nord Modular G2 was used to recreate the major elements as described in the original patent (US patent 2121142, available on-line). The Modular G2 is a software / hardware system that uses the same method of working as the original Moog systems except that the modules are created on a computer and then loaded into the synth’s DSP chips to create the sounds. This means you can create very sophisticated patches that can be recalled at will but still have the hands on approach of an old modular synth. The Voder patch pushed the Nord Modular to the extreme with the hardware load indicator hitting 95% usage at times!

The original text was supplied by the artists and a speech to text converter was used to convert the text to a source for the analysis, the result was then recorded. Using a speech to text conversion gave some of the inaccuracies of conversion present in the original examples of the Voder being used for comparison.

As well as producing music for his own amusement Norm Leete has written music for corporate videos and for theatrical productions. He has also repaired and restored some of the older electronic instruments and created/ designed sounds. He explored a number of electronic music sites and was amazed at the range of quality of the information about various electronic musical instruments on the web but also alarmed at the inaccuracy of some sites (especially some references to the Mellotron, one of his favourite instruments). He therefore decided to start a site of his own that would reflect his personal experience of electronic musical instruments. This activity resulted in Streetly Electronics asking him to help to design the Streetly Electronics M4000. In 2008 he formed NormLeete Industries repairing and restoring old electronic musical instruments as well as building parts for new ones.



One way is to look for patterns in the frequency of the data. The frequency of a wave is the number of

There might be interesting things going on physically in the making of a particular signal though, which take it away from 'white noise'. Two physicists, called Musha and Higuchi, spent quite a bit of time in the 1980's standing on a bridge in Japan counting the number of cars per second that were travelling under the bridge on a busy road. They were not working for the local council, but were interested in the dynamics of the signal of the number of cars

The signal is indeterminate, it has correlations, is not random, but is not predictable in advance.