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Transmateriality

Toward an Energetics of Signal in Contemporary Mediatic Assemblages

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Code has served time doing hard labour in the domains of digital culture and technologies. But there have been signs recently that code may not be all it is conceptually, technically or aesthetically cut out to be. In this article, I propose we loosen our claims on the importance of code to circumscribe and delineate contemporary media. Our mediatic assemblages may not then be best described as 'digital'. This is not to say we should revisit debates about the importance of older or analogue media. Rather, I suggest that digital code as a defining and ubiquitous characteristic of contemporary media is overworked. I am not the first to propose this—I am riding the wave of a critical approach to software studies that can be found in the work of theorists such as Adrian Mackenzie and Wendy Chun. Chun especially has excoriated new media theory and its cultures of free software, hacking and gamers for an over reliance on code as a defining logic behind or beneath all things digital.[1] Simply 'knowing code' or venerating it as the 'source' does not, she suggests, provide explanatory value for how interfaces are experienced, how hacking unfolds—in China as opposed to the United States or from

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China into the United States, for instance—or where free software cultures sit within broader juridical frameworks such as copyright.

I share Chun's criticisms of the fetishisation of code but it is not for this reason that I too want to let it go. I am interested instead in the ways our experience of contemporary technicity is always in process *before* the labour of codification. By technicity I do not mean the sum total of our technologies but rather the network of spatio-temporal relays through which technical objects are diffracted. Such relays run at a different pace and involve other modes of materiality than just those of software, running through code, or hardware that encodes and decodes digitally.[2] It no longer suffices, then, to count code as *the* ontological marker for a range of technical phenomena, the generation of a variety of media or our relations with these. Something else is already in process, working itself through actual technical objects and their relations.

Take, for instance, the increasingly popular hobby activity of strapping a camera to a drone then recording footage of the drone's flight, providing a narrative for it and uploading the result to YouTube. A technical ensemble is constructed of quadcopter, GoPro Hero 2 (an HD sports-camera) and, for instance, the DroneMobile app for iPhone, which uses the phone's global positioning satellite (GPS) capabilities as a signal transmitter to fly the drone. Such DIY assemblies perform a literal diffraction of the technical programs of each separate object. Assembled, a proto 'technicity' emerges that involves a network of spatio-temporal relays between the human and the nonhuman technical objects both mobilising and patched into political currents and affective potentials. These relations incur conjunctions at the level of human–machine interaction, the vision systems of both human and camera and disjunctions with regulatory aviation protocols and authorities. A mode of aesthetic experimentation opens up, resulting in a novel style of aerial videography and a subgenre of banal real time action movies: the 'dronecam' clip, of which hundreds can now be viewed on YouTube.

With such endeavours, we witness the crossover of drones into civil and domestic space, and given the signal flows that conjoin these objects, it is not surprising that, beyond the hobbyist deployment, entire new media and discursive formations such as drone journalism, drone hacking and drone research are on the rise.[3] But before such larger formations, what we find in these simple dronecam

clips made by geeks and hobbyists are smaller movements in culture that suggest we are also in the midst of the supercession of code as the *modus operandus* for contemporary technicity. What returns—what is on display for us in the YouTube dronecam genre—is what has been persistently with us since at least the end of the nineteenth century: *signal*.

These clips reveal something very interesting about signal and should make us excited about exploring its political and aesthetic possibilities in the context of contemporary media. Typical clips begin with a dronecam genre set-up shot, as a way of establishing human–drone–camera relations, which presents the drone's point of view facing toward and hovering near its human (remote) controllers. This is quite typical of the style. Interestingly, many of the dronecam clips that appear on YouTube are titled as 'FPV' or first person viewpoint, as if assimilating the clip genre to the FPV position in gaming. We get the sense, via such framing, that this is just a form of 'in the world' gaming and perhaps then just another instantiation of digital code working its way into the meadows, gorges, bridges and car parks from where hobbyists launch their cinematographically enabled quadcopters. But the feeling produced is quite the opposite from the launch into action of, for example, first person shooter games. As Simon Penny has noted, such games function not at the level of representation but of enaction, where the body of the gamer is 'naturalised' to a training regime of 'seek and destroy' movements that work at the level of procedural navigation of the digital game's virtual space.[4] Here we might locate the labour of code at the level of an enactive 'encoding' of gaming bodies. Penny has also claimed that the dominant paradigm encapsulated by first person shooter games creates a much stronger tethering of bodies to the procedural actions of automated and repetitive industrial labour itself.[5]

But the so-called first person dronecam clip frames a very different kind of start to the action, quickly switching the camera perspective to a reverse shot of the human hobbyist at their remote controller. It turns out that the 'first person' viewpoint does not come from a person at all but offers us a hovering, probing perspective on the human instead, reminding us that this is indeed a drone, a 'personless' flying object. It is as if the first person position is already complicated by the untethering of code and bodies from the 'action' and goals at hand in spite of the

obvious continuity of the (militaristic) relation of the digital technical assemblage of gaming with the dronecam.

In these dronecam clips, we often watch the drone ascend and, in postproduction, this moment in the clip typically matches an accompanying soundtrack in which the beat and tempo accelerate. A number of clips feature drones that lose control, often because of the drone's power failure. The camera (still strapped to the non human-occupied aeronautical machine), nonetheless sails on and up into the atmosphere tossed by the wind, only to eventually crash somewhere far away. Take, for instance, the clip titled 'Go Pro and Parrot AR. Drone fly away very high'.[6] Not long after launch, the guy controlling his drone loses its (remote control) signal and, again, we experience a sense of the nonhuman capacities of both the drone *and* the image, cut adrift from human control. The point is, of course, that we know all this has happened because we continue to watch the camera image transmitting back to us. Hence signal is not lost at all. Something persists unassisted by the human controller; an affect of signal simply being to transmit. We discover, then, that there is not just one signal but instead a multiplicity—the one controlling the drone, the one powering the drone and camera and the one that ensures the image persists. The drone sails on untethered, maintaining its own rhythms and transmission beyond the command of the human, while the image continues to be captured and transmitted. Eventually the drone crashes due to power failure, somewhere far away.

Signal, as such clips unwittingly inform us, is fundamentally beyond, before and above the human, making such cinematography an entirely new instantiation of what Paul Virilio called machine vision.[7] Unlike the history of cinema that was Virilio's preoccupation, the dronecam technical ensemble and clip artefact touches on the question of transmission in ways that are more profound than his declaration of the wholesale replacement of human perception by that of the machine. For as we see in this clip, signal multiplies yet its relays do not entirely replace the human, rather it passes through and around us, integrating us into its circuits while not relying on us. Signal is transmitted through relays that are not entirely encoded nor entirely under human control. And if we also examine the sensory and compositional qualities offered by the moving image in dronecam clips, we detect a very non first-*person* sensibility in the fluctuating framings actually captured.

In many of these clips, the camera attempts to stabilise its horizon as the drone itself moves up and down, through wind currents and as a result of the user's hand movements on the controller. This is a common artefact in all such dronecam footage caused by warping from the fish-eye lens often used on GoPro cameras. What is conveyed affectively through the dronecam clip is not first person point of view or narrative action but instead a sense of being in the midst of transmission, buoyed by a network of multiple signal flows, subject to fluctuations, transitions, instabilities.

Unlike the modular logic and claims for knowability that continue to inflect notions of the code-basis of digital culture, signal tends toward instability. There are a number of reasons for this not least being that, in the emerging mediatic assemblages with which I am concerned, we are often dealing with multiple signals. In the dronecam, for instance, we are dealing with wireless signal relays between the remote controller and the drone, digital signal processing as information is encoded as moving image and sound by the camera, and the relay and transmission of a GPS signal as navigational information is used by the drone and whatever satellite or satellites are in range. The instability of signal in such assemblages derives from its plurality, its heterogeneity. But there is something about signal, prior to its inmixing through mediatic assemblages, that also makes it immanently unstable. Signal is energetic and its force and matter persist outside our attempts to encode and decode it. This matter-energy is electromagnetic, travelling at the speed of light and always fluctuating. As Douglas Kahn argues, electromagnetism's sudden phase shifts and changes afford signal a mode of movement specific to it, which he names transmission.[8] The energetics of signal cannot be reduced to our digital encoding or decoding of it, cannot be completely accounted for by the labour we perform upon it. It is a mistake, Kahn and other ecologically inspired humanities and social science scholars such as Karen Barad are beginning to argue, to reduce signal's transmission to digitally mediated communication flows. Barad, for example, draws our attention to the energetics of electromagnetic 'communication', which she finds demonstrated in such phenomena as the 'step leaders' of lightening bolts.[9] These begin in the initial transmission of 'sparks' of a lightning bolt's path in a storm cloud high up from the earth's surface *and* from the earth's surface as electrons become polarised at both sites. The step leader, caught on high frame per

second ratio digital camera recordings and slowed down in playback, shows the unpredictable and fluctuating path the lightning follows on its way from the sky to the earth's surface. Barad suggests that such movement of electromagnetic energy suggests less a straightforward flow of signal and more a kind of 'chatter' or stuttering between electrons. It is just such an affectivity that I want to suggest inhabits the intensive and immanent movement of signal before, but also even when, it is digitally encoded.

Our signaletic technologies—for example, digital signal processing, the spectral division of GPS signal into the two forms of Coarse/Acquisition signal for civilian and Precision signal for military use, as well as the subsequent modernisation of these—are precisely techniques that attempt to counter the fluctuating unstable tendencies of signal by various methods of capture. We could, then, render the relation of 'code' to signal as one of machinic labour expended in the capture—the encoding/decoding—of signal's lightening fast, fluctuating tendencies. Using sheer quantity as a gauge of the ubiquity of devices with chipsets enabling wifi (and hence the global scale of wireless signal process), shipping estimates of such hardware for 2012 was over 1.5 billion units.[10] Yet, as Adrian Mackenzie has argued, while the scale and pervasiveness of wireless encoding technologies has increased this does not necessarily result in a correlative qualitative increase in networked regulation and predictability.[11] Indeed, he suggests that the multiplication of wireless technologies, concentrated in urban locations, has opposite effects: 'the wireless signal presents a domain of excess pathways and overwhelming openness to cross-signalling, multiple paths, cross connection and interference from others'.[12] The capture and modulation of signal by digital processing, then, preserves and perhaps even intensifies what is already immanent to signal—variability.

One of the main fears accompanying the increase of drones into domestic airspace lies with the potential for drone signal to be hacked into, achieved by 'spoofing' a false signal through the GPS and 'tricking' the drones into flying a different path. GPS satellites for civilian use sport an 'open signal'—sometimes referred to as 'dirty signal'—which allows for signal to be used for (cross)-purposes. A recent experiment by researchers from the University of Texas, for example, saw a yacht being steered off course through the use of a handheld device that generated a fake GPS signal identical to the one sent out by the real GPS.[13] Both signals reached

the yacht's system at the same time, but the strengthened 'fake' signal overtook the navigation and shifted the yacht off course several degrees. Here we witness a kind of variability found in repetition or, as Mackenzie might put it, an excess in pathways, which is indicative of exactly the qualitatively different experience generated by new mediatic assemblages that are more signaletic than digital. Signal is first and foremost 'alien', insofar as it is outside us and, even in its modulation by code, mutable. And it is increasingly the mode of gathering and distributing contemporary technical objects. For all these reasons, I want to propose that we re-examine and rethink the dynamics and energetics of signal.

Oscilliatory capacities permeate the aesthesia of the dronecam assemblage. The buoyant cinematography combined with the frequent crash and loss of its other signals suggest a fundamental heterogeneity and inmixing of signals, crossing each other's paths, sometimes bypassing the work done by code to capture them. Signal may be modulated by code in order for us to 'see' digitally but there is a persistence of vision in the drone that sails on beyond its wireless signal commands, eventually returning the locational status of its hardware to us via its GPS signal. Such persistence in the face of failure suggests something beyond all our laborious efforts to 'know' it simply as primarily a digital mediatic assemblage.

Yet don't we already know about signal, having lived through the rise and recent demise, or at least transformation, of radio and television as broadcast media? I am somewhat suspicious of the lack of serious attention to the technicity of both television and radio in the many historical remediations of old media by new media studies.[14] In the light of the repositioning of signal's role via mobile telecommunication and digital media hybridisations such as the dronecam, as well as the discovery of an aesthetic connection between contemporary audiovisual and early media arts practices that reconfigure signal—which I will come to later—it is time to revisit signal beyond its circumscription by digital code.

Maurizio Lazzarato provides one of the few rigorously articulated accounts of the molar and molecular relational assemblage that is video signal.[15] For him, video is a machine that establishes a relation between the asignifying flows of electromagnetic waves coursing through the exosphere and signifying ones. Signification here entails the technical modulation of flow as matter-energy to becoming a signal capable of transmitting moving image as video. The video

image—captured at this intersection of the continuous oscillating flux of signal—is a modulation of the exospheric flows of electromagnetic waves or what Lazzarato calls 'time-matter'.[16] Lazzarato does not make a semiotic, aesthetic or political break between the electromagnetic and *digital* capture of video signal. Instead, he provides us with a different way to track this technical shift as it is harnessed to new political economies of media. Digital, video signal—indeed all digital modulations of flow that become information—presents an increasing deterritorialisation, not remediation, of flow. The computational modulation of flow producing informatic signal, then, is a further deterritorialisation of the flow of video signal. Deterritorialisation here refers to the decoupling of the media artefact (image, for example) from, first, a physical-chemical indexicality (as in photography or celluloid film) and, second, the inscription of this indexical relationship in the processing and procession of the image. For Lazzarato, to make video is to insert oneself and the apparatus into the flow of the arbitrary and nonhuman asignifying movements and fluctuations of electromagnetism. The video as electromagnetic recording device quite literally captures this flow as oscillating electromagnetic flux. With video signal we do not index the world but rather leap into the exosphere, launching ourselves into space-time-matter-flows.

To make *digital* video multiplies and further deterritorialises the flows into which we have inserted ourselves, even though it does require us to make different kinds of modulations that take into account the declarative and executive technical operations of functions like the algorithm and assemblages such as the database:

> all images produced by electronic and digital technologies are transformations and combinations (composites) of intensities, forces, fields, taking place in the flow—the electromagnetic flow in the case of video, the optical flow in the case of the telematic, the algorithmic flow in the case of the computer. The transition from the first to the last can be defined as an increasingly forced deterritorialisation. Fibreoptic cables replace copper. Lasers and silicon cables make the control and canalisation of light possible and now replace the electric shock as the vector of information bound to the net. The flow of information overcomes, again, matter, and light is just a mathematic (non-discursive) language.[17]

This multiplying, arbitrary and nonhuman flow of signal(s) is exactly what is realised by the dronecam, which deterritorialises itself from the human completely, finding its own jet stream of transmission far above and beyond its remote human controller.

But for Lazzarato, what is aesthetically interesting about video, and then digital technologies, is not this molar process of deterritorialisation, which for him resonates with the increasing deterritorialising trajectories of post-Fordist or *cognitive* capitalism. He alerts us instead to the ways both electronic and digital technologies transform and compose intensities, forces and fields within these flows. Picking up these compositional possibilities, Bodil Marie Stavning Thomsen has recently argued for a rethinking of digital media through Deleuze's concept of 'signaletic material'.[18] This locates digital media's aesthetic potential—the possibilities for different and genuinely novel composites of intensities, forces, fields—in the nexus between the asignifying and signifying; in the possibility of modulating signal as it becomes transmissable. For Stavning Thomsen, this suggests *the becoming of time* in signal. For what is increasingly reterritorialised by signal regimes—from broadcast television in the 1980s to current attempts to control signal in the deployment of drone vision in warfare and surveillance—is the matter of time, its material currents. Amid the deterritorialisation of media from indexical artefact and process, time is increasingly stratified making it function as *real time*, a modulation that attempts to index time to signal and modulate out the instabilities of signaletic materiality. For time to become—that is for it to become other than *real time capture*—we must allow for these intensities and different kinds of durations to also materialise.

Attending to 'signaletic material', to the nexus between asignifying and signifying flows in contemporary regimes governed by real time media, requires an understanding of *transmateriality* and attenuation to transmaterial potentialities in digital-signaletic practices. Transmateriality is first and foremost matter in movement, matter as relations of forces, matter as an energetics. Transmaterial movements are already in motion *prior to* any instantiation of 'a' given material; hence the 'trans' should not be taken simply to indicate movement across preconstituted media materialities. Taking off from Mitchell Whitelaw's observation that digital transmateriality encompasses *a movement* between its specific material

situatedness and the performative illusion of its immateriality, we can expand to suggest that any mediated material today involves such movements between mattering and performance or operativity.[19] Today many scientific and medical images, for example, are transmaterially generated: images of the insides of bodies have optical qualities that are not so much properties of the image but rather artefacts of the transduction of nonvisual materialities and relations such as ultrasonic waves. It is the various relations that dynamically hold between and across light, sound and algorithmic transform that crystallise to become, for example, a range of contemporary medical imaging processes and artefacts such as magnetic resonance imaging (MRI).

Transmateriality, then, is a metastable *process* that ontogenetically *precedes* a given material individuation. It denotes the potential to become some individuated material as a result of differentiation transforming this potentiality in the direction of a structuration. I am here calling on the process of individuation outlined in the philosopher of technology Gilbert Simondon's work.[20] Transmateriality, auspiced by this intellectual tradition, sits more on the side of Deleuze's virtual 'signaletic material'—unstable fluctuations of the time-matter, electromagnetic waves and/or particles in flux. But transmateriality is also that movement through which matter-flow is modulated, actualising toward individuation. Transmaterial relations, then, are both the metastable, virtual ones of pure difference *and* the processual actualising ones of a singular materiality assembling.

Attending to transmaterial flows as they are actualised by technical machines that capture and modulate their asignifying intensities and forces and which organise them into the signifying regimes of signal, moves us away from a preoccupation with the division between, for example, analogue (electromagnetic video) and digital video. The distinction to be made is not between continuous recording on the one hand and discrete codifications on the other, since the digital too can now be seen to take its place along a spectrum of technical captures of time-matter/signal-flow. It is not that the apparatus of capture is not important. Instead the focus shifts to the role of both electronic and digital media in modulating temporality by transducing signal. Following this we might investigate, on the one hand, fluctuations between deterritorialisations and reterritorialisations of signaletic matter as these occur across both a nonhuman cosmological wave

spectrum and the more recent, human-scale post-World War II timeline. This would give us a diagram of the *un*becoming of time as it is indexed to signal in the signal-ifying regime of real time. On the other hand, we very much need to also account for heterogeneous break-flows and movements of signaletic energies; modulations that are not simply performed by technical machines but are always aesthetico-political and offer new possibilities for the signaletic.

And we need a better concept to account for what occurs transmaterially in these molecular and molar modulations. That concept, or at least, a concept with which to begin these investigations is 'transduction'. Adrian Mackenzie has already given us a brilliant working through of Simondon's original idea.[21] For Mackenzie, rethinking Simondon's notion of transduction provides more exacting ways of considering the heterogeneities at work in the collective thing we call 'technology' and accounting for the technicity of collectivities such as society. My aim here is different—to find a way to think through processual modulations of signal as a becoming, as a fluctuating transmaterial contraction and dilation that composes contemporary technical ensembles. Transduction can help us get at the ways in which both war machines *and* aesthetic arrangements work variably across the nexus of asignaletic time-matter and signal-ifying regimes. Transduction helps us to think about this junction dynamically and relationally. Time-matter, matter-flows should not be thought of as substance but rather as modes of movement and as an intensive plasticity. Both function through movements-of-coming-into, contractions and dilations, or what Deleuze and Guattari often call 'becomings'.[22]

Simondon's concept of transduction is processual—it involves knitting, knotting, interlacing together or *mediating* across diverse elements. But this action is not one that progresses in a pre-determined direction, for example, toward an increasing delivery of speeds or a smoothing of all time flows into *real time*. Nor is it one determined by the choices of the human; that is, the actions of either the human user as modifier of individual technical objects in human-machine interaction or of technical progress achieved socially. Transduction is a genetic process—a process of the becoming of something; in this case a becoming-signal in which there will be both directions toward actualisation as a concrete transmission of, for example, sound waves, microwaves, or the more deterritorialised form of information, *and* the continuing potential of signal to become *other* through its radical contingencies,

indeterminacies, exigencies: 'Transduction arises from the nonsimultenaity of *metastability* of a domain, that is, in the fact that it is not fully simultaneous or coincident with itself.'[23] Erin Manning also makes this clear: 'Transduction is not translation, it is a shifting between planes that requires a simultaneous shift in process.'[24]

Because for Simondon transduction never begins in a stable state but rather with metastability—forces of differentiation amid potentialities as a conditioning of things to come—then understanding signal means always already acknowledging its immersion within an energetics. We can also understand digitality in such a way, beginning with its conditioning by exospheric, historical, political and aesthetic flows of the metastable transmaterial diagram of the signaletic. Once we enter the transmaterial realm of indeterminate energetic flux, transduction does not imply a simple movement from one potentiality to the other, as if two different energies were possessed of the same underlying materiality. Both material and processual shifts take place as planes, surfaces, levels, scales are traversed. Transduction involves energetic modulation and conservation, in which the ongoing becoming of energy is preserved even as it changes. And in the relations between and across the changes and continuities, novel possibilities emerge. Indeed, I want to suggest that media arts invents itself not so much through extending and remediating media nor does it gain contemporary precedence in transcoding all previous media under one digital regime. Instead, I want to suggest that media arts has its ontogenesis in the discovery of the transmateriality of signal and in experiments with transducing signals' intensities into novel compositions. By reconsidering media arts via a signaletic aesthetics we can begin to see how contemporary aesthetic modulations of signal connect these arts to earlier experiments with electronic sound and video. In turn I will suggest that such experiments attempt to preserve a becoming other of signal by exploring its transmateriality against the deterritorialisation of the signaletic through real time regimes.

In Nam June Paik's first solo exhibition in 1963, *Exposition of Music—Electronic Television*, just such a discovery of the transmaterial potential of a signaletic understanding of media in the arts occurs. The exhibition, mounted at Galèrie Parnass in Wuppertal, Germany, is often seen as important for being the first art show to incorporate television sets. Thirteen televisions all broadcasting German

television's only transmitting station between 7.30 and 9.30pm were modulated by Paik as he changed the parameters of the broadcast signal or by being brought it into relation with other kinds of signal:

> the «kuba tv» is the most extreme; it is connected to a tape recorder that feeds music to the tv (and to us): parameters of the music determine parameters of the picture. Finally (on the top storey) you have the [one point tv] that is connected to a radio; in the middle of its screen is a bright point whose size is governed by the current volume of the radio; the louder the radio, the larger the point, the quieter the radio, the smaller the point becomes.[25]

Other contraptions included 'prepared pianos', an ox's head dripping blood and a dismembered shop mannequin in a bathtub. It was clear that Paik was not exploring a straight conversion of electronic music signal into other formats nor was he interested in television as (mass) media *per se*. He was interested in the experimental activation of signal. His methods involved transduction—traversing different modulations of signal but also across the corporeal and incorporeal, the material and immaterial. His interests lay with developing ways to respond to signal as transmaterial becoming rather than as communicational. His interests lay, then, with signaletic material rather than the smooth and seamless transmission of signal.

In a leaflet accompanying the exhibition Paik stated:

> One can say that electronic television is not the mere application and expansion of electronic music in the field of optics but represents a contrast to electronic music (at least in its starting phase), which shows a pre-defined, determined tendency both in its serial compositional method and in its ontological form (tape recordings destined for repetition).[26]

Paik stated that his interest in modulating optical signal via sonic transduction lay with the possibility of tapping into the electron's indeterminacy—its dual wave-particle status: 'I have not only expanded from 20 kHz to 4 MHz the material being treated, but have more pronouncedly used the physical property of the electron (indeterminacy, the dual character of corpuscles (particles) and waves (status).'[27] Paik's experimentation, then, was not so much with media as channel, extension or message or with its inscriptive format as analogue recording. Instead, I suggest he

was concerned with the transmaterial signaletic conditions of media; that is, with a *becoming media*.

The point for Paik was not to create a signal path from the sonic to the optical, from electronic music to its visualisation. He experimented with transductive processes so as to rediscover variability or difference as the metastable plane of ontogenesis for the electronic arts. And this rediscovery could only take place in and as process; there was for him no originary signal, no place, no idea to start from—there was only the 'WAY':

> in the experimental TV … I don't, or cannot have any pre-imaged VISION before working. First I seek the 'WAY' of which I cannot foresee where it leads to. The 'WAY' ... that means, to study the circuit, to try various 'FEEDBACKS', to cut some places and feed the different waves there, to change the phase of waves, etc.[28]

In repositioning Paik's experimentation on media as primarily processual and opening up media arts histories in this way, what possibilities also arise for thinking through media arts as signaletic rather than remedial or transcodificatory? How might a signaletic approach allow us to see how media arts tap into time-matter's becoming rather than understanding a march toward an aesthetic preoccupation with the digital delivery of real time?

Paik's transmaterial transductions in his first exhibition are such as to set up a stream of future artistic novel compositions reactivating and repotentialising the energetics of human and inhuman bodies as they conjoin in novel ways. Instruments and media might become less communication devices, less instrumentalised and unfold toward mediatic *environments*. And, perhaps most importantly, acknowledging Paik's transductive methods allows us to encounter perception unyoked from regimes dominated by deterritorialised broadcast media and real time modulations; they might allow human encounters of the signaletic as multiplicitous instead. For Paik, media were mechanisms that could transmaterially modulate flows, allowing human perception to touch on something nonhuman—medial movement already in motion, composed through the relations across and between signaletic flows flowing.

In activating this transmaterial potentiality for media arts, Paik set up certain trajectories for composition, which are grasped again by artists operating in a digital

environment such as Carsten Nicolai and Ryoiuchi Kurokawa as they cross-process signal. In *telefunken* from 2002, a cross-media installation by Nicolai, digital 'signal' criss-crosses media players. Instead of an image signal coming out of a video player, a CD player is hooked up to a television monitor. Audio tracks playing on a CD in a gallery space visually generate the movement, pulse and pace of white lines de- and recomposing across a bank of monitors. Nicolai calls this connection of CD to the visual 'erroneous', giving us an insight into something different at work in digital synaesthesia.[29] For Nicolai, digital signal does not simply flow seamlessly from one machine to another. Instead, the idea is to see what happens if an error across signal, and in connectivity, can be fashioned and of what that 'error' is itself composed. This is not simply 'the error' as it appears in avant-garde art making, rather it is the error as a fundamental problem encountered and in need of resolution in the digital milieu—a milieu comprised of the forces, patterns and processes of signal generated in and out of code, passing in and out of electronic materialities. Error as difference that sets off energetic potentials toward digital individuation. The error in *telefunken* launches a bank of signal flows, which mesh and self-organise, resolving themselves in a composition in which neither sound nor moving image takes ontological precedence. An 'unnatural' digital ecology temporarily forms instead, consisting of cross-processed audio (CD) and image (televisual) signal, both resting upon the erroneous synthetic conjunction of media players.

Like Paik, Nicolai is trying to transduce the fluxes out of which media materialise and which then provide the milieu for patterns and rhythms to transpire. This provides the (trans)materiality for his work. The point is not to visualise sound but rather to energise across the nexuses; ones that lie at the threshold of perceptibility, where time contracts and dilates in its simultaneous and independent movements. Unmistakeably 'digital' in its tools and sensibility, Nicolai's work in pieces such as *telefunken* and *m6re* from 2006, like Paik's experimental television, subject us not to codification but insert us into the (re)becoming signaletic of media.

Although digital code does not disappear in a transmaterial analysis of contemporary mediatic assemblages—whether these be dronecams strapped together by enthusiasts or media players conjoined by artists—it should no longer be the bedrock for aesthetic, cultural or technical analysis of contemporary media.

The work of encoding and decoding, accomplished at the site of signal capture and modulation, cannot be considered as the defining or determining element in the energetic movements of signal. Signaletic material both continues to become *and* is stratified by regimes such as real time. And yet the energetics of this occurs on a scale both larger, in the cosmological sense, and faster, in its micro-transmissibility, than the labour of codification. It may well be that the very attempts to work at modulating signal, whether via chipsets encoding wireless signal or via digital signal processing, for example, simply multiply signal's variability rather than regulate and encode it. We must begin to take into account this fluctuating variability of signal, its transmateriality, as a real nondigital and nonhuman perturbation, traversing the overworked domain of code.

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[1] See Wendy Hui Kyong Chun, *Programmed Visions: Software and Memory*, MIT Press, Cambridge, MA, 2011; and Wendy Hui Kyong Chun, 'On "Sourcery" or Code as Fetish', *Configurations*, vol. 16, no. 3, 2008, pp. 299–324.

[2] Adrian Mackenzie, *Transductions: Bodies and Machines at Speed*, Continuum, London, 2002, p. 19.

[3] For the emergence of the term 'drone' research, see, for example, Susanne Posel, 'Researchers Show DHS How Hackers Can Redirect Drones With GPS', *Occupy Corporatism*, 2012, <http://occupycorporatism.com/researchers-show-dhs-how-hackers-can-redirect-drones-with-gps/>.

[4] Simon Penny, 'Representation, Enaction, and the Ethics of Simulation', *Electronic Book Review,* 2004, <http://www.electronicbookreview.com/thread/firstperson/machanimate>.

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[8] Douglas Kahn, *Earth Sound, Earth Signal: Energies and Earth Magnitude in the Arts*, University of California Press, Berkeley, 2013, pp. 19–20.

[9] For a lengthy discussion of the communicability and performativity immanent to this energetic phenomenon, see Karen Barad, 'Nature's Queer Performativity', *Qui Parle: Critical Humanities and Social Sciences*, vol. 19, no 2, 2011, pp. 127–30.

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[12] Ibid., p. 60.

[13] See Aviva Hope Rutkin, '"Spoofers" Use Fake GPS Signals to Knock a Yacht Off Course', *MIT Technology Review*, 14 August 2013, <http://www.technologyreview.com/news/517686/spoofers-use-fake-gps-signals-to-knock-a-yacht-off-course/>.

[14] Cinema has received a lot of attention in the archaeology of new media through especially Lev Manovich's *The Language of New Media*, MIT Press, Cambridge, MA, 2001. The publication of Douglas Kahn's *Earth Sound, Earth Signal,* cited previously, is the first serious attempt to rethink radio as the signaletic genesis for a new conception of media.

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[17] Ibid., p. 285.

[18] Bodil Marie Stavning Thomsen, 'Signaletic, Haptic and Real-Time Material', *Journal of Aesthetics and Culture*, vol. 4, 2012, <http://www.aestheticsandculture.net/index.php/jac/article/view/18148/22809#NOTE0034>.

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[23] Adrian MacKenzie, *Transductions: Bodies and Machines at Speed*, Continuum, London, 2002, p. 17.

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[28] Ibid.

[29] Carsten Nicolai and Hans Ulrich Obrist, 'Hans Ulrich Obrist in Conversation with Carsten Nicolai', *Autopilot,* Die Gestalten-Verlag GmbH, Berlin, 2002, p. 78. I discuss this work in detail in Anna Munster, *An Aesthesia of Networks*: *Conjunctive Experience in Art and Technology*, MIT Press, Cambridge, MA, 2013, pp. 153–73.