Towards an object-oriented practice-research

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Oh it was all so much easier then. Just a few TV channels. A handful of national papers setting the agenda and defining the debates and talking points. Happy audiences tugging their forelocks and deferentially thanking the media and advertisers for their words of wisdom. But now, communicative anarchy. A plethora of channels and messages. People formerly known as the audience remix our messages as memes and jokes. Micro content relationships bounce subjectivities around filter bubbles… and no-one listens to me.

Alright it was never that simple. So called ‘old media’ was never one-way ‘munication’. Audiences were never passive. ‘New’ networked media is not without its powerful, domineering voices and spaces. Facebook-Google-Apple-Amazon et al are as communicatively hegemonic as their Rothermere-BBC-News International predecessors. But new times demand new ways of thinking. The new landscapes demand a theory and a methodology for media analysis and communications practice fit for purpose.

We cannot understand the current situation (and develop new communication forms fit for that situation) using our traditional models of structure and agency - mapping the landscape as a reflection of an underlying formation. We cannot map it as a network of relations, a fluid assemblage of processes and flows. If we are to understand the contemporary moment and develop communication practices able to work in that moment,
we need to map the assemblage of human and unhuman actors in play and develop strategies for communication and creation based on understanding those objects through a deep practical engagement. In what follows I argue for an object-oriented ontology of media and a practice-research approach to studying it and creating content for it.

Object-oriented ontology (OOO) is a movement within philosophy that takes objects seriously. It refuses to leave the discussion of existence, politics or media at the macro scale of capitalism or patriarchy - at the structural level, a determining context. Similarly it refuses to look for determination at the micro scale of the material. And finally it refuses to privilege the human Subject. Rather OOO presents a flat ontology of objects (or actants as one of its inspirations Bruno Latour calls them). Here the objects in play in any situation are... anything. They can be physical or virtual, real or imaginary, material or immaterial, human or unhuman. They are all in play and all worthy of study because they all exist and connect in the complex assemblages we live in. There are splits within the OOO community about how those objects relate and connect and the exact nature of those connections but there is agreement amongst them that we need to address the scale of objects, the plethora of objects in any situation and that the human is just a particular sort of object at the same ontological scale as a software app, a meme, an Oculus Rift headset and a Marvel superhero. All are in play, all have a reality and all are powerful.

My reason for raising OOO here is not to engage in a philosophical discussion but because we inevitably approach our media and our media production with a philosophy, a theory in place. That may be 'common sense'. It may be a Marxist account of capitalist media production or a uses and gratifications perspective. It may be critical or conservative, structural or agential, informed by years of media study or by fake news. The thing is we cannot look at media or create media outside of our ways of seeing. I want to present OOO as a way of seeing media that I believe offers a powerful perspective on our current situation and a powerful stimulus to practice. As such I will briefly outline Graham Harman’s particular brand of OOO and how it can be used to map the media assemblage.
The starting point for Harman’s OOO is the work of Bruno Latour and his concept of the ‘actant’. Latour’s Actor Network Theory (ANT) famously looks to “describe”. This is not an uncritical or loose approach so much as a modest yet powerful engagement with the complexity of a situation, whether that is a transport system, a science lab or, as we shall see, a social media culture. For Latour and Harman, these assemblages are networks of objects… acting, connecting and disconnecting in complex relationships. The insight that ANT and OOO offer is to widen what counts as an object and so what must be taken account of.

Fellow OOO thinker Ian Bogost coined the term “Latour litany” for the often extensive lists in ANT and OOO literature. Latour and Harman rattle off lists of things - small and large material things, seemingly insignificant and important things, real and imaginary things, human and inhuman things as a way of emphasising a flat ontology. When Latour ‘describes’ the failure of the French Aramis transport system (Latour, & Porter, 1996), yes humans are significant but so are their unhuman documents; a particular technological object that didn’t work plays its part but so does the French government committee considering the project. Big and small, human and unhuman, cultural and structural - they are all objects and we cannot understand what happened with Aramis without mapping them all.

When Harman maps The Dutch east India Company he too is democratic in his account (Harman, 2016). Here again there are things common sense may tell us are objects (ships and opium); things we might want to see as Subjects but will agree could be seen as objects (men and women) but also things we would not normally classify as things or objects (the British State, capitalism). The power of an object-oriented analysis comes in mapping that democracy of objects as Levi Bryant calls it (Bryant, 2011) in all its complexity and enfoldings. Objects connect and reconnect, fold into each other, affect and effect each other. By approaching them all as objects within a flat map/ontology, Harman looks to avoid what he calls undermining and overmining, an account based on hierarchies or ‘levels’.
Undermining and overmining are tendencies in philosophy, critique and the social and natural sciences that, in Harman’s eyes, take our attention away from objects. Both are forms of reductionism. Undermining reduced downwards. This is common in the natural sciences where physicists search for fundamental particles. New movements in social theory that focus on materiality also undermine the complex assemblage and, in Harman’s view, take our eyes off the flat ontology of objects. Harman rejects a stress on constituent parts. For him, this denies the weird specificity of objects. “An object is more than its components,” he argues (Harman, 2016, p. 9). There is a weird reality, unreachability and power to “Rome”, it existed and exists, acted and acts regardless of changes in populations, governance or culture. We will see the importance of this when we build with code and streams of digital objects - Facebook is an object regardless of how many are using it, how, when and where.

Overmining reduces upwards. This technique reduces an object to its current actions. One version of this is idealism where there is nothing outside perception. Another is social constructivism where there is no reality outside systems of language or power. Overmining says that there is nothing more to objects than their current expression and relations. Harman sees this even in ANT where Latour places the focus on relations rather than on the objects themselves. For Harman, objects have a weird reality and unreachable depths that exist regardless of any particular context or relation. We will see the importance of this when we build with hardware and humans - the human imager is an object regardless of whether it is in relations.

A crucial further reduction that OOO rejects is a structural reductionism where everything is traced up/down to capitalism or patriarchy or colonialism. It is not that OOO rejects these structures. It takes a far more radical position and treats them as objects that cannot be undermined down to constituent parts nor up to relations. OOO rejects levels in favour of scales. A flat object-oriented ontology of the network operates at multiple scales simultaneously, mapping the objects in their specific instances. Capitalism is an actant, an atom is an object. An OOO analysis demands a weird virtual reality view, an imagining of all the objects in their different instances, in their
different specificities and at the different scales at the same time.

As an example, take Facebook photography. Here is an actor network (network in the wider OOO sense not just the technical sense). One can see Facebook’s empire of imaginings (some 350m uploaded every day at the latest count) and the relationship engine it builds on it, connecting user-data-points to other user-data-points in its Open Graph for the benefit of its advertisers, as techno-capitalism made concrete - a classic overmining move. One can see that same network imag(in)ing practice at the level of algorithms and code and the ones and zeroes that make up the JPEG-encoded images and the Open Graph algorithm - a classic undermining account. And one can of course do both at the same time and “Facebook imag(in)ing” becomes a software-techno-capitalist assemblage.

Tim Morton, another OOO thinker uses the term “mesh” in preference to “assemblage”. He says: “Mesh doesn’t suggest a clear starting point” (2010, p. 29) and “the mesh is made of insubstantial stuff, and its structure is very strange” (ibid p. 35). The term is particularly useful when looking to develop an object-oriented account. As Morton continues: “the mesh isn’t bigger than the sum of its parts” (ibid p. 35). Such a term therefore keeps the focus on objects not some meta context or field and does not preclude an account of nested objects. It is important to note, that Morton’s “mesh” is not a holistic term. When he talks of everything connected within a mesh, each of the objects has its own specificity and reality. This is a flat ontology, not a holistic whole. Drawing on the image of Indra’s net and its jewels reflecting in jewels, he says: “Total interconnectedness isn’t holistic.... Indra’s net implies that large and small things, near and far things are all ‘near’” (ibid p. 40).

The OOO move is to keep this focus on the objects in their specificity. Whether it is the Open Graph, the algorithm that makes it work, the photographer who becomes a data point across it or the selfie culture that she imag(in)es in, each is worthy of our attention and none are the final word. One can map these objects not in levels of importance but in scales. In concrete terms we can map the world of the photographer taking and sharing their selfie on Facebook at the scale of
protocols and standards - the JPEG standard that’s high compression capabilities enable seamless sharing. At the software scale, the camera and Facebook apps act. They ‘take’ and ‘post’ the image. The code object connects the phone hardware object over the 4G or WiFi network objects to Facebook’s server object over undersea cable objects: the hardware scale. There are humans in play: the imager, her friend who likes the selfie, Zuckerberg and his lawyer. OOO does not ignore this scale but neither does it privilege it. These humans are not privileged Subjects but one among many objects. OOO holds that not all objects are material. A culture can be an object as it acts with, against and through other objects. Rather than seeing ‘selfie culture’ as a background or a determinant, one can see it as an object in play at the social scale plaited and enfolded with other objects at other scales of the mesh or network. Although OOO refuses to overmine the operation of objects by tracing everything up to a structural determinant, it is far from apolitical. Capitalism, colonialism, patriarchy all must be accounted for because all are in play at the structural scale. As objects (complex and nested themselves) they connect with and effect the myriad of other objects at their own and other scales. In our study the protocol, software, hardware, human and social objects operate not against a background of techno-capitalism but in complex object-oriented relations with it.

Where OOO builds on Latour’s ANT is in its understanding of the nature of objects. OOO - particularly in Harman’s model - see objects as ‘weird’. They almost withdraw from us. We can never access every facet of them, every dimension. There is always more to them than our senses or analyses can uncover. They also withdraw from each other, they never fully connect. It is this unreachability, weirdness that some OOO thinkers emphasise that not only allows us to map the complex media world in new and interesting ways but also opens up the possibility for researching it through practice, through playing with and through that weirdness in a practice-research laboratory.

Practice-based, practice-led, practice-as or simply practice-research has a long and political history. Victor Burgin (2006) and Desmond Bell (2008) famously debated the position and potential of PhD programmes for arts schools ten years ago. The debate is even more topical now as Universities and Arts
Schools chase funding, research grants and of course research students. As programmes have evolved and projects proposed there has been a growth in discussion of the practice-research methodology.

Hazel Smith and Roger Dean (2009) investigate what they characterise as practice-led research and research-led practice. Their willingness to reverse the terms around the conjunction ‘led’ is important. Their diagram has separate zones for practice-led research and research-led practice within what they call an ‘iterative cyclic web’. They see a dynamic process, a cycle: start-end-start with a ‘research phase’ and a ‘practice phase’ connected, repeated and ratcheting each other up as a project moves forward.

Smith and Dean’s account can sometimes sound almost functionalist: “idea generation leads to experiments, gathering of data and/or analysis of theory or criticism. This may be followed by the development or synthesis of material and can, in turn, lead to the testing of the theory, either empirically or by argument and comparison, with outputs at a number of possible stages” (Smith & Dean, 2009, p. 21). They point to Deleuze and Guattari’s rhizome (1987) “in which any point can be linked to any other and there are ‘multiple entryways and exits’” (Smith & Dean, 2009, p. 21). Around the edge of Smith and Dean’s core cycle, sub-cycles form. These “smaller circles indicate the way in which any stage in the process involves iteration” (ibid p. 19). As one follows the process of evolution around the circle, new organisms form and develop or form and die off, feeding back into the broader ecosystem.

The model is seductive. The virtuous circle offers a clear how-to way forward. Let research drive the practice which feeds back into the research: let practice raise the research questions that drive the practice. Wherever you start on the circle, your progress around cranks up the knowledge. Practice-led research: research-led practice. The problem here is that the two are held apart. Another model looks to bring them together in a complex-adaptive system.

Graeme Sullivan places “art practice [as the] core around which inquiry unfolds” (Sullivan 2010, p. 102). He literally draws ‘prac-
tice as research' as a series of interlocking pieces. He begins with two triangles forming a diamond "as theoretical issues are investigated through creating and critiquing" (ibid p. 106). Here practice is the way of answering our research questions. As valid as any other route to knowledge, practice is a tool. Sullivan does not leave it there however. Through a series of increasingly complex visual figures he develops his idea of the "braid, with its infolding and unfurling form that disengages and reconnects with core themes while continually moving into new spaces" (ibid p. 112). The final image has moved from a tangram-like two dimensional jigsaw to a more fractal-like, 3d, dynamic visualisation where, “irrespective of where visual arts research happens, the structure has similar qualities - it is simple, complex, and dynamic all at the same time” (ibid p. 113). Using imagery reminiscent of computer visualizations, the metaphor of the braid sees the core practice triangle connecting with interpretivist, empiricist and critical fragments, splitting, recombining and finally stabilizing. The researcher engages in practice as well as other critical work. She combines or plaits these into a multi-dimensional method.

Sullivan positions this as “practice as research”. In his effort to raise the profile and perhaps the credibility of practice he puts practice alongside other research methods. We can confidently say: "My PhD artist student has done research"... "My practice is REFable". While it may itself fragment into multiple practices, practice acts as the attractor pulling the complex system into a form of stability.

Practice as research is an important step. Presenting (and teaching) practice as a way of discovering knowledge and answering research questions is useful. Putting it on the same level as any other research method opens up possibilities. Where perhaps Sullivan falls short is in his separation of practice and research. Even though he calls his model "practice as research", there is a separation. He argues powerfully that practice can be research, it can act as the attractor in a hybrid method. It can add that missing dimension and make its contribution to a multi-dimensional picture. But to take practice as research seriously we need to take the next step and present practice as a way of doing research not simply a component within research.
Ian Bogost writes about "doing" philosophy through practice. He calls it 'carpentry' (Bogost, 2012). He argues that the most abstract and cerebral of research can be done through practice. The philosophical toys he reports in "Alien Phenomenology" are not the raw material for philosophy/research (Smith & Dean) nor part of a larger picture (Sullivan), they "are" philosophy. Practice is research.

Bogost goes on to argue that this philosophical/practice-research opens up the possibility for new forms of communication and publishing. He argues that the philosophical works he creates (the mashup, the game, the software) are works of philosophy, research outputs as valid as the research report, the thesis, the paper.

Where Smith & Dean and Sullivan see practice as part of the iterative circle/jigsaw emerging in established research objects, Bogost, as an OOO thinker, places the practice-object at the same scale as any other. He refuses to privilege practice or research or the artist or the researcher. Practice is research. It is this flattening, democratizing maybe, that opens up a way of engaging with the flat ontology of media objects.

The power of practice hyphen research carpentry is not just in terms of analysis but also creativity. It offers a powerful way of mapping the complex object landscape without undermining or overmining but also offers a way through to new forms of object-oriented creativity and communication as well as building new communications objects.

In a later work Bogost celebrates play, not as a contributor to educational success or emotional wellbeing but as a way of life (Bogost, 2016) like his approach to practice-research as method, playing with the world and its objects. Here play objects, at any scale - material, human, cultural, structural, are worthy of study and play practice becomes the space in which we discover.

One final way of thinking through the relationship between practice and research that holds both in hand at the same scale is jazz. Improvising musicians discover new forms of music (new research knowledge) as they create (practice). Their play-
ing is their way of pushing music. Smith & Dean would say they are discovering, creating, discovering: a virtuoso circle. Sullivan would say their practice is their way of generating knowledge or new forms, their way of answering their own questions about music and improvisatory communication.

But we can also see improvising as object oriented practice research. When improvising musicians play (in all senses) across a chord progression, within a particular harmonic environment or enfold their musical object-phrase with or in response to another player, they are playing with objects, creating new objects but also researching with objects. A sound, a call or response are objects every bit as real and weird as the mouthpiece and the guitar string. The jam session and the master, the songbook and the chord, the club, the melody, the chord are objects brought into a space and played (with). Yes new forms and new knowledge are created through practice. Yes that knowledge feeds into new practices but as with Bogost’s games, the music (practice) is a research output. Practice and research are not separate or even just intimately linked - they are connected by a power full hyphen.

Carpentry, play, jazz are not just metaphors or analogies for practice-research, they are examples of it. The carpenter’s workshop, the playground and the jazz club are sites of object-oriented practice-research. When we make things or play with things we are engaging in research and our creations (the game or the game or the jam) are research outputs as much as they are creative objects. Thinking with objects and the hyphen offer new ways of framing knowledge and knowledge creation as well as creativity and creative works.

One way to imagine this flat practice hyphen research, is to think of a practice-laboratory. Here we run experiments. Smith & Dean would see that laboratory as on their wheel. We toll in that laboratory, emerge with our practice object. We take off our artist’s apron and put on our researcher lab coat, hone our research question and return to the lab, swapping coat en-route. Sullivan would be happy for us to stay in the laboratory as long as we leave the windows open so we can see and hear the other parallel research experiments running in the interviews or survey or critical theory laboratories. Smith &
Dean’s wheel stops turning when the practice-led research is cooked to perfection, it emerges as a finished, polished piece of research. Sullivan too works towards a finished product, the fractal pieces move and are moved until the picture is right, the balance and composition right.

The object-oriented practice hyphen research laboratory is not separate from the objects it is building with or researching, it is in play in the media mesh. If you like, the laboratory has no walls. The object-oriented, practice-researcher, like a mad scientist is not concerned for the product. The outputs are prototypes. The products are processes, temporary configurations of objects, as fleeting and ephemeral as the objects assemblages under investigation. That is why they are power full. They do philosophy. They do media. They are philosophy. They are media. And there lies the power for the creative, whether artist, designer or advertiser.

In the remainder of this paper I report on my own work in my practice-research laboratory, working with and through objects to create research and creative objects. Starting from an OOO framework, a way of seeing the world I was analysing and creating within, I constructed laboratory experiments designed to map that object landscape and also create objects (philosophical/analytical as well as creative/communicative).

My first series of experiments were designed to understand contemporary digital photography as well as open up new creative possibilities for object-oriented imag(in)ing. The project centred on mapping a single object - the JPEG standard. By focusing on one object at one scale and looking to map its connections, enfoldings and weird relations with other objects at other scales I looked to understand the digital imag(in)ing mesh.

I took a range of objects into my laboratory and played with them. I connected them. I failed to connect them. I gradually mapped the landscape. As I did so I created new practice-research (output) objects. Because this was a PhD one of those outputs was a thesis - a traditional 80,000 word tome. But, following Bogost’s carpentry, there were also other creative objects including e-(photo)books and a new form of photograph-
ic practice I dubbed Object Oriented Photography (OOPh).

Before we get on to discuss the experiments, it is necessary to know a little about the objects under investigation that form the raw materials in the laboratory; to briefly discuss two software objects, JPEG and Haystack:

JPEG is one of the objects involved in turning light into data. As a compression standard the object works on digital data. Before that object can come into play, the analog light object needs to become a digital data object. In digital imag(in)ing, light hits an electronic sensor. Sensors are effectively an array of silicon, solar or photovoltaic cells. When light hits one of these cells, some of its energy is absorbed by the silicon, knocking electrons loose which are forced to flow in a particular direction creating a current: photons become electrons, light become electricity. Each cell is covered by either a red, green or blue filter, essentially making it only sensitive to red, green or blue light. These are arranged in a Bayer mosaic pattern consisting of two green, one red and one blue filter - designed to match the bias of human perception of colours.

The sensor reads the amount of charge from each cell (what comes to be known as pixels). These electrical charges need to be collected and organised before they can be processed by other software objects. At this point the light-as-electricity is still “analogue”. In order for the software (including JPEG) to be able to work with it, it needs to become digital. An integrated circuit/hardware object called an analog-to-digital converter (ADC) samples the analogue feed from the sensor into a number of discrete levels of brightness. It then adds extra information: information about a pixel’s location (and hence whether it was “under” a red, green or blue filter) as well as metadata about the sensor’s colour space; and the camera’s white balance setting.

Because each pixel/cell only senses one wavelength of light (red, green or blue), the information making up the “latent image” needs to be interpolated so that the image can represent the amount of red across the whole image not just on those bits where the filter measured the red light. To do this a “demosaicing algorithm” averages the values from the closest
surrounding pixels to assign a “true colour” to each pixel. This digital information becomes the RAW data file that is written to the camera’s storage medium.

JPEG is a compression standard. It takes the raw feed of digital information from the camera’s sensor and compresses it to make it usable for the human object and the Facebook Open Graph object. JPEG works through four steps: Sampling, Discrete Cosine Transform, Quantization and Huffman Coding. At the end, the light-as-data is a JFIF image, commonly known as a “JPEG photograph”.

The JPEG protocol is principally about compression. Its role in the imaging pipeline is to reduce the amount of data in the file - hence its importance in the early days of the Internet when bandwidth was at a premium. Part of the work of compression is the move from RGB to YCbCr colorspace. Storing image data in both RGB and YCbCr colorspaces demands three channels of information - in RGB: red, green and blue; in YCbCr: luminance and two chrominance, blue and red (Miano, 1999, p. 6). Both allow a full range of colours but in RGB, each channel is sampled at the same frequency while in YCbCr, this can be varied. The Y component contributes most information to the visible image and JPEG therefore assigns more weight to that component and reduces the amount of information in the Cb and Cr channels, thus reducing the amount of information and so the file size.

The next step in JPEG encoding is “Discrete Cosine Transform” (DCT). This divides the YCbCr image data into 8x8 blocks called data units. DCT does not actually compress or throw information away, it merely readies the data/information for that to happen in the next step by sorting the information which can safely be discarded. Rather than record the individual values of each Y, Cb and Cr component over an 8x8 block, we could average the values for each block and record how each pixel differs from that average value. DCT takes the set of values in each data unit and transforms it into a set of coefficients to cosine functions with increasing frequencies (ibid pp. 77-90). In effect DCT arranges the digital information ready for compression by finding the frequency of each value - in lay terms the most frequent tone or colour values.
JPEG compression depends on the fact that human perception is not perfect. A lot of information can be thrown away and, effectively we fill in the gaps the way the demosaicing algorithm does. The next step takes the sorted data from the DCT and discards those coefficients that contribute less information to the image. This is the quantization step. This rounding process effectively discards some of the coefficients and information. This is why JPEG compression is referred to as "lossy compression" because data is lost. The JPEG standard does not specify the value to be used in quantization. It leaves that up to the application using the protocol. Rather it provides 8x8 quantization tables that map onto the 8x8 data units. We normally come across these tables when we choose the "quality" setting for JPEG compression in end-user software such as Photoshop or select Fine, HQ or SHQ quality settings in a camera.

Having discarded data from the RAW data file, JPEG's final step is to create a visible (JFIF) file. This is achieved through Huffman coding. Like DCT, Huffman coding takes the set of values in each data unit and transforms it into another set of values. Unlike the DCT, Huffman coding is lossless - no further information is discarded. Rather this process saves further space by assigning shorter codes to the most frequently used values. Like Morse code, Huffman Coding assigns shorter codes to the most frequently occurring values (vowels have shorter Morse code symbols than x or z) according to a Huffman table. Having mapped the data to new (shorter) values according to a Huffman table, the resultant file must include that table (or reference the standard table) to enable other software to decode the data as a visible image.

Having started as light photons, being turned into electrical charge and from there into data, the resultant information has been sorted and compressed by JPEG into a file ready to be written (potentially alongside a RAW file) to the camera's memory. This admittedly technical account of mathematical operations and technical processes can be read as objects engaging and connecting. The Huffman table, the Photoshop interface, the camera sensor, the photon, the filters, the JPEG standard... all are objects playing their part in this media moment and practice - a moment, as we shall see, crucial to Facebook’s business, selfie culture, the NSA’s surveillance and my family’s
trove of memories... amongst other meshes.

The JPEG-encoded file, which we can see as an object, then connects with other objects in the digital imag(in)ing assemblage and it was here where my experiments began. I brought a number of other objects into the laboratory. At the hardware scale, I ‘brought in’ my camera, Facebook’s data servers, the transatlantic cables that connected my computer to those servers, an iPad, and a Kindle. At the human scale I brought the imager into the laboratory. At the software scale I have the in-camera software (including the JPEG standard) that encoded the light as a “photo”, the browser software through which I upload the photo, the Facebook database and its Open Graph algorithms that turns the image and imager into data points. At the structural scale I added “data capitalism” or “the Like Economy” as objects in my laboratory. Then I started to experiment: connecting and failing to connect, building and playing. This practice is not separate from critical, political-economic research nor a spur to that ‘real’ research. The practice was about building critical/philosophical objects... and also defining a new creative practice.

A second software object in play in digital imag(in)ing and another object I took into my laboratory is ‘Haystack’, Facebook’s database system. Facebook can be seen as a “relationship engine”. Its business model is based on enabling content relationships (tags and Likes and Shares) that build up the Open Graph that they allow advertisers to access. Images are a crucial part of that.

A key element in the commercial and governmental success of Facebook as a practice is the ordering and connecting as well as the generation of new relationships. It happens as seamlessly, transparently and quickly as possible. Faced with the overwhelming quantity of image objects being added to, and generated by the site as well as the data, metadata and meta-metadata Facebook’s relationship engine generated, the engineers at Facebook decided to redesign the image storage system, creating a system they called “Haystack”.

The secret to effective photo storage and retrieval and thus
running of the “relationship engine” is metadata - creating, finding and serving scopic data points to enable new relationships. Leaving aside issues surrounding the company’s controversial exploration of face-recognition, what Facebook’s Timeline, tagging and other relationship services and practice do is deal with metadata. Users connect “images-taken-on-my-birthday”, “images-tagged-with-Charlie’s name”, “images-in-my-eBook-album”. This metadata can be organised, connected and governed, by me or by software. The key problem for Facebook and the most important aspect of Haystack, is managing or governing that metadata as a way not only of finding and serving images but also enabling relationships. The engineers identified that the existing system was slowing down because of the amount of (governmental) metadata associated with each image-object and the financial, storage and speed of access costs involved in having to access all that metadata each time an image was searched for or rendered. Their solution was to “keep [...] all metadata in main memory, which we make practical by dramatically reducing the per photo metadata necessary to find a photo on disk” (Beaver et al, 2010, p. 1). By making image objects in the system easier to find, resources could be saved for the social metadata that enables the relationship engine to function and new governmental relationships to be set in motion.

On a user’s domestic photo management system such as iPhoto, Aperture or Lightroom each photo-object is stored as a separate file - visually apparent in the PC’s directory structure or Finder. This results in a lot of metadata. Each image has its own location as well as any other metadata (time of creation, time of modification, owner etc). With a small-scale archive on a PC, this is not a huge problem. On a social archive, it is. Facebook needs to keep that metadata in memory to allow quick and easy access and connection. Haystack’s solution was to store multiple photos in a single file and therefore maintains very large files. The system then works with “needles” and “index records”. “Each needle represents a photo stored in Haystack” (ibid p. 6) complete with the metadata supplied at upload. Searches however are not on the metadata in the JPEG-encoded files or even the needles but on an index record.

It is “minimal”. Space and computing power is used to connect
those objects, set up governmental relations. In simple terms, each discrete photo is mapped to a needle which is in turn mapped to an index record. Each mapping makes the data smaller, more manageable and more connectable.

Haystack is an object. It connects with JPEG-Encoded files and Facebook’s search algorithms and business model, its human engineers and lawyers and me as an imager and countless other human and unhuman, material and digital, real and imaginary objects some of which I brought into my laboratory.

I brought JPEG and Haystack (along with many other objects) into my laboratory and began to practice, to play, to build. I built a series of eBooks for iPad, Kindle and Facebook. I took a series of photo-objects I made (encoded using different compression standard/objects) and made and failed to make Photo Books. JPEG-encoded objects connected happily. The images were visible and networked. They were indexible and integrated into the databases and data relationship structures that drive what I ended up calling the “relationship engine”.

I created a Photo book in an album on Facebook. The images I uploaded into Facebook’s Haystack database object became a nested part of my Facebook profile/Open Graph object. They became Likeable and Shareable. They generated new data objects as they circulated. In contrast the RAW-encoded photo-objects stubbornly refused to connect. As objects they resisted connections. Facebook’s software objects refused to recognise them. The software that connected my browser to Haystack rendered the RAW files as greyed out. I couldn’t
select them for upload. The Facebook eBook within Haystack had to be a JPEG eBook. I could upload PNG-encoded files but Facebook’s software re-encoded them through JPEG in different sizes, ready to sit in Haystack, ready to connect with the relationship engine and the Open Graph. Creating the same book using Apple’s iBooks Author similarly demanded JPEG. The software object, and the hardware object that would render the book viewable and connect it with the human object’s e-reading culture (object) would connect with the RAW file but only the JPEG-encoded preview within that file. The rest it ignored.

If Smith and Dean had been exploring digital imag(in)ing and built eBooks they would have been raw material for new research questions about scopic regimes and governmentality or about data capitalism. These questions would have promoted other practices in a virtuous circle of pass the power. If Sullivan had been designing the project the practice of making eBooks would have sat alongside other critical methods, contributing real knowledge about the material and technical workings of data-capitalism and scopic regimes.
My object-oriented practice hyphen research model refused to privilege any one object and refused to privilege or separate practice and research. Furthermore, "yes" the books generated new knowledge. But they were also research objects and outputs themselves. Readers could read or fail to read them, they could play with them or even take them into their own remix laboratories. There were ‘traditional’ research outputs: the PhD, this publication, etc., but the objects were not the spur to that or even a part of the bigger research jigsaw. They stood alone as research, as research objects.

A second experiment was designed to explore the app economy and mobilities. As with the digital imag(in)ing project, I collected a myriad of objects from the different scales of the assemblage, brought them into my laboratory and built not as the precursor to research nor even as the practical part of a broader research project, but simply as research.

To again take a couple of the objects I worked with, a server farm and a cable:

The Haystack object I explored in the first experiment is not simply software. It is not virtual. It is materially located - a series of actual, material, connected objects. The Store, the persistent storage where “photos” are stored, consists of arrays of 10 terabyte web servers.

Facebook, like all the data-capitalist objects, are in a continual battle to build server capacity and crucially to manage them. Moores Law has of course meant that storage and processing power are getting exponentially cheaper but the real problem now is running these objects - the power required, the cooling required to keep these quaintly named ‘farms’ functioning. The Arctic circle is becoming an offshoot of Silicon Valley. Google bought a disused paper mill in Hamima, southern Finland in 2009; Microsoft built a farm in Siberia in 2007 and in 2011, Facebook went for Luleå situated at the northern tip of the Baltic Sea, just over 62 miles South of the Arctic Circle. Mats Engman, chief executive of the Aurorum Science Park told the Daily Telegraph: "The climate will allow them to just use only air for cooling the servers. If you take the statistics, the tem-
perature has not been above 30C [86F] for more than 24 hours since 1961. If you take the average temperature, it’s around 2C [35.6F]” (Orange, 2011).

A New York Times investigation found that moving North makes little difference to the material reality and impact of the server objects. Data centres waste 90 percent or more of the 30 billion watts of electricity (roughly equivalent to the output of 30 nuclear power plants) they take from the grid and in addition they have to use diesel-powered backup generators churning out exhausts and pollutants. (Glanz, 2012)

And it is not just active objects like Haystack that are materially present and costly. There are whole networks of ‘comatose’ or what we might call zombie objects. The New York Times talked to engineers who described servers that are plugged in and using energy even as their processors are doing little if any computational work. “In one sample of 333 servers monitored in 2010, more than half were found to be comatose. All told, nearly three-quarters of the servers in the sample were using less than 10 percent of their computational brainpower, on average, to process data… In many facilities, servers are loaded with applications and left to run indefinitely, even after nearly all users have vanished or new versions of the same programs are running elsewhere.” (ibid)

The desire for instant access to our JPEG-encoded objects demands built in redundancy, power hungry and comatose objects.

A second object deeply enveloped in the mesh I was investigating and creating through, are the cables that link those servers to the ISP that my router object and computer object connects to.

These cables, graphically described by Andrew Blum (Blum, 2012), are the real backbone of the Internet and, as a result, data capitalism, data governmentality, digital imag(in)ing and, in this project, the app economy. As the Snowden revelations also made clear, the cable objects are quite literally connected to other governmental objects such as the NSA. Its XKeyscore programme database received a “constant flow of Internet traffic from fiber optic cables that make up the back of the world’s
communication network, among other sources, for processing” (Marquis-Boire et al., 2015). This was achieved by very real, material undersea wire tapping.

Further proof of the importance of this hardware object comes with the news that Microsoft and Facebook are building their own private highway between northern Virginia in the US, a major junction point in the global internet, to Bilbao in Spain, and then onward to the rest of Europe, Africa, the Middle East and Asia (Yadron, 2016)). Like the Flash Boys in Michael Lewis’ book, network players need their own hardware objects (Lewis, 2015).

I brought the server object and the cable object (and by implication the data capitalism object, the climate change object, the Google and Hamima local council objects) into my laboratory and I began to build. I connected objects and again failed to connect objects. I made a simple mobile Web app that used the geolocative affordance of the phone object to provide simple directions for the human object.
A Web app is essentially a Web page with what’s called a 'Cache manifest' file that tells the browser to save the HTML file and any other files for off-line use. These two objects effectively create a self-contained app. Modern pocket, networked, always-on, remixological machines - or phones as they are called - can render a simple web page as an object alongside other data and content objects and connect with hardware sensors and screens. So, to keep things simple, I just created a web page object via a semantically constructed document following the HTML standard. At its most basic it consists of:

```html
<!DOCTYPE html />
<html>
<head>
<title></title>
</head>
<body>
</body>
</html>
```

To create a simple Web page object that can circulate across the networks, be read in browser-objects on phones, tablets, computers, TVs, fridges etc, we simply add content in between the 'body' tags:

```html
<!DOCTYPE html />
<html>
<head>
<title>Practice-Research</title>
</head>
<body>Hello world</body>
</html>
```

Through a few lines of HTML and Javascript code, I connected my app object/phone object via the cable and server object to the Google server object, its location datamining strategy objects, its business object and the myriad of other Google objects in play.

Including the lines:

```html
<link rel="stylesheet" href="http://code.jquery.com/mobile/1.2.0/jquery.mobile-1.2.0.min.css" />
```
uses code located on jQuery’s servers (in San Francisco), these lines of code, in between the <head> tags, enable the browser object on my phone to connect with the web page object I am making and render a mobile app.

Adding another line:

```html
<script type="text/javascript" src="http://maps.google.com/maps/api/js?sensor=TRUE"></script>
```

instructs the mobile browser to connect to Google’s API (application programming interface) software at IP address 74.125.225.48 in Mountain View, California (latitude: 37.4192, longitude: -122.057) and load a Javascript library into the phone’s memory. The “sensor=TRUE” parameter informs Google that the map will be used with a geolocation sensor.

Then I simply added another script remixed from a web tutorial to give the user directions or in object-oriented terms, connect them as an object to data, hardware, software, political-economic, physical and material objects.

```javascript
var directionDisplay, map;
var directionsService = new google.maps.DirectionsService();
var geocoder = new google.maps.Geocoder();

function initialize() {
    // set the default center of the map
    var latlng = new google.maps.LatLng(42.982621,-81.255127);
    // set route options (draggable means you can alter/drag the route in the map)
    var rendererOptions = { draggable: true };
    directionsDisplay = new google.maps.DirectionsRenderer(rendererOptions);
    // set the display options for the map
```
var myOptions = {
    zoom: 18,
    center: latlng,
    mapTypeId: google.maps.MapTypeId.ROADMAP,
    mapTypeControl: false
};
// add the map to the map placeholder
map = new google.maps.Map(document.getElementById("map_canvas"), myOptions);
// bind the map to the directions
directionsDisplay.setMap(map);
// point the directions to the container for the direction details
directionsDisplay.setPanel(document.getElementById("directionsPanel"));
// start the geolocation API
if (navigator.geolocation) {
    // when geolocation is available on your device, run this function
    navigator.geolocation.getCurrentPosition(foundYou, notFound);
} else {
    // when no geolocation is available, alert this message
    alert('Geolocation not supported or not enabled.');
}
function notFound(msg) {
    alert('Could not find your location :(')
}
function foundYou(position) {
    // convert the position returned by the geolocation API to a google coordinate object
    var latlng = new google.maps.LatLng(position.coords.latitude, position.coords.longitude);
    // then try to reverse geocode the location to return a human-readable address
    geocoder.geocode({'latLng': latlng}, function(results, status) {
        if (status == google.maps.GeocoderStatus.OK) {
            // if the geolocation was recognized and an address was found
            if (results[0]) {
                // add a marker to the map
            }
        }
    });
}
on the geolocated point

```javascript
marker = new google.maps.Marker({
  position: 
  map: map
});
// compose a string with the address parts
var address = results[0].address_components[1].long_name + ' ' + results[0].address_components[0].long_name + ', ' + results[0].address_components[3].long_name
// set the located address to the link, show the link and add a click event handler
$('.autoLink span').html(address).parent().show().click(function(){
  // onclick, set the geocoded address to the start-point formfield
  $('#routeStart').val(address);
  // call the calcRoute function to start calculating the route
  calcRoute();
});
```

} else {
// if the address couldn't be determined, alert and error with the status message
  alert("Geocoder failed due to: " + status);
}

}

}

function calcRoute() {
  // get the travelmode, startpoint and via point from the form
  var travelMode = $('input[name="travelMode"]:checked').val();
  var start = $('#routeStart').val();
  var end = $('#routeEnd').val();
  // compose a array with options for the directions/route request
  var request = {
    origin: start,
    destination: end,
    travelMode: travelMode
  };
unitSystem: google.maps.UnitSystem.IMPERIAL,
travelMode: google.maps.DirectionsTravelMode[travelMode]
);
// call the directions API
directionsService.route(request, function(response, status) {
    if (status == google.maps.DirectionsStatus.OK) {
        // directions returned by the API, clear the directions panel before adding new directions
        $('#directionsPanel').empty();
        // display the direction details in the container
        directionsDisplay.setDirections(response);
    } else {
        // alert an error message when the route could not be calculated.
        if (status == 'ZERO_RESULTS') {
            alert('No route could be found between the origin and destination.');</n        } else if (status == 'UNKNOWN_ERROR') {
            alert('A directions request could not be processed due to a server error. The request may succeed if you try again.');</n        } else if (status == 'REQUEST_DENIED') {
            alert('This webpage is not allowed to use the directions service.');</n        } else if (status == 'OVER_QUERY_LIMIT') {
            alert('The webpage has gone over the requests limit in too short a period of time.');</n        } else if (status == 'NOT_FOUND') {
            alert('At least one of the origin, destination, or waypoints could not be geocoded.');</n        } else if (status == 'INVALID_REQUEST') {
            alert('The DirectionsRequest provided was invalid.');}
Finally, I added the code to the <body> of the page that pulls the data (objects) from Google’s server (object) into my phone (object) and my journey to work (object):

```html
<div data-role="content">
  <form action="/routebeschrijving" onSubmit="calcRoute();return false;" id="routeForm">
    <div style="overflow: hidden; width: 100%; margin: 0 auto;">
      <div style="width: 100%; text-align: left; margin-right: 40px">
        <label>From: <br />
          <input type="text" id="routeStart" value="London College of Communication">
          <a href="#" class="autoLink">Use current location: <span>not found</span></a>
        </label>
      </div>
      <div style="width: 100%; text-align: left;">
        <label>To: <br />
          <input type="text" id="routeEnd" value="Museum of London">
        </label>
      </div>
      <div style="width: 100%; text-align: left;">
        <label>Travel mode:</label>
        <label><input type="radio" name="travelMode" value="DRIVING" checked /> by car</label>
        <label><input type="radio" name="travelMode" value="PUBLIC" /> by public transport</label>
      </div>
    </div>
  </form>
</div>
```

I saved the app to a server object and when my phone object connected to it (and the myriad of other objects in play), I was offered directions from my current location to my work at London College of Communication. At the same time as I remixed these objects as part of my experiments, I was simultaneously remixed as a data object by the ISP, Google and potentially the NSA/GCHQ.

Writing this app was not simply using these code objects and my phone object, it was building with the undersea cable that took my app’s data request across to Mountain View, California; the server at latitude: 37.4192, longitude: -122.057 and then sent the map back under the Atlantic, through my phone provider’s hardware and phone masts to my phone.

I don’t need to worry about the detail of this code object I have remixed from a web tutorial, but I can play with it. I can change the centre of the map that is loaded. I can change the measurements from Imperial to Metric. I can change the To and From locations. Or I can play by breaking the code, seeing what code and code connections are vital to this machine and which can be lost.

This experiment in building raised new research questions: about space and time and remix. In Smith & Dean’s terms it turned the circle another notch. Sullivan would applaud the
Calculate route

62 Brocasley St, London E3 4QJ, UK

0.6 mi. About 21 mins

1. Head north on Brocasley St toward Mile End Rd/A11
   390 ft

2. Turn left at the 1st cross street onto Mile End Rd/A11
   Continue to follow A11
   1.9 m

3. Turn left onto Leman St/A1202
   0.1 m

4. Continue straight to stay on Leman St/A1202
   0.2 m

5. Turn right onto Chamber St
   0.2 m

6. Turn left onto Mansell St/A1210
   0.1 m

7. Continue onto Tower Bridge Approach/A100
   Continue to follow A100
   0.5 m

8. Continue straight onto Tower Bridge Rd/A100
   0.4 m

9. Continue straight to stay on Tower Bridge Rd/A100
   0.2 m

10. At the roundabout, take the 2nd exit onto New Kent Rd/A20
    0.3 m

11. New Kent Rd/A201 turns slightly left and becomes Elephant and Castle 384 ft

12. Turn right onto St George's Rd/A202
    115 ft

Elephant & Castle, London SE1 6SD, UK

Map data ©2017 Google

Brocasley Streeet 62-63, London

Use current location: Brocasley Street 62-63, London

To:

London College of Communication

Travel mode:

- by car
- by bike
- by public transport
engagement with code alongside a critical exploration of materiality and the data-capitalist implications of APIs. But this practice was not simply a spur to the next stage or a partner to other research methods or work. It was practice hyphen research, a flat partnership. The article that I wrote (Caplan, 2015) was an output, a research object but so too was the app. Readers could use the app, they could play with it and take it into their own remix laboratories. It stood alone as research, as a research object.

A third experiment was designed to investigate contemporary advertising. As a former marketing consultant and now someone who runs an advertising degree and works every day with the industry object and its future human objects, I wanted to use my laboratory to explore contemporary advertising and to create adverts. Once again I approached that question via objects. The assemblage under investigation was a mass of objects and so the best way to map those objects and their relations and working was by bringing some of them into the laboratory and working with them, not so as to simply generate knowledge or as part of a wider jigsaw of approaches but so as to make research objects and outputs: objects that did analysis and even creation.

Once again, to draw attention to a couple of the objects I took into my laboratory, the human and the cultural object:

To speak of the ‘human’ as an object often causes problems for those approaching OOO, but it is crucial to the OOO perspective - and the practice-research method I am proposing. OOO demands a flat ontology. It demands a step away from privileging any one scale in the assemblage. In particular it demands a non-anthropocentric starting point. Human actants are in play. Sometime they are powerful, sometimes less so. Sometimes they are in relations with other objects. Sometimes less so. The key thing is that they are never outside the play of actants.

As a photographer/imager, remix artist or advertiser I am in play. In the two previous experiments I connected with code objects and phone objects. I did not connect with the Open Graph object, my data subject did that. As author of my PhD or app, I connected with the research objects I built as well as the
University and publisher that accepted the written objects. To bring the human into the laboratory is not simply to acknowledge my position as researcher, to self-reflexively admit to my role as spectator effecting the outcome, structuring the research. OOO's move is much more radical. I am not a spectator. I am not introducing bias or structuring something that is somehow outside me. I am one among many objects. As such I can be built with. I can be a component in the research machine being built. This mind-bending stance, where I am author and authored, creator and created, component and builder is weird - as so much of OOO is. What it allows however is a full acknowledgement of the mesh's complexity.

Seeing a phone, a server, a cable and even a human as objects is not difficult. Even seeing them as active players connecting and power full is not a big step. But to see 'culture' as an object is perhaps more of a leap. But OOO's refusal to undermine and overmine demands that the very real and powerful cultures across which digital imag(in)ing, mobilities and advertising work must be seen as an actant-object not as a passive nor even active and determining context or background.

To repeat, for OOO and ANT before it, an object/actant is something that acts. Culture acts, it does things in the world. It connects other objects and it connects with them. As with all objects there are unfathomable depths and a creative weirdness to culture. Culture as object can be seen as a nested object within a selfie culture within a scope culture within a networked culture but the key insight of OOO is that this is not some context, something separate from the other objects.

Advertising is an industry object. It is also a cultural object. Adverts form part of our culture and cultural literacy. The ads we remember and quote form childhood; the ones we mashup and turn into Photoshopped comments on the latest news; the ones that we block. Advertising is a media form, a media we consume and read/write along with news, soaps and streams. Just as the Super Bowl ad is as much a part of the day as the football game, so consuming, talking about, remixing and struggling against adverts is a cultural practice. And professional advertising is a culture too. Remixed as Mad Men, the industry, its iconic figures and tall tales is a culture. It has its trade
press, industry conferences, ways of doing things and ways of seeing, its habits and habitus. It has its own ‘structure of feeling’ (Williams, 1984). This advertising culture object is power full. It connects with the new intern (human) object, the adblocking (software) object and the global neoliberal capitalist (structural) object alongside a mess or mesh of others.

In my third experiment I brought that advertising industry cultural object and myself as networked imager object into my laboratory, along with various software and hardware objects to build an advertising machine based around an icon of advertising culture: Apple’s Think Different.

In 1997 a series of ads began. Starting with Amelia Earhart, Alfred Hitchcock, Pablo Picasso, Mahatma Gandhi and Thomas Edison, the simple portrait, Apple logo and the words “Think Different”, created by the same agency as the also seminal/mythic 1984 TV ad, became part of Apple and advertising mythology and the ad industry culture. Rob Siltman remembers: “While several people played prominent parts in making it happen, the famous ‘Think Different’ line and the brilliant concept of putting the line together with black and white photographs of time-honored visionaries was invented by an exceptionally creative person, and dear friend, by the name of Craig Tanimoto, a TBWA/Chiat/Day art director at the time.” (Siltman, 2011)

Tanimoto created the ad. He was the auteur. Siltman goes on to tell the story of the ads creation, painting a picture of an ad industry culture at work - connecting objects, creating relations and meshes, acting. The Think Different poster is part of the history of advertising, part of its sense of itself as an industry, a culture, perhaps even an art. This is an Apple ad, a Chiat/Day ad, a Tanimoto ad. They crafted a message, to be delivered to an audience, a clear statement about what Apple is. You don’t need to be semiotics professor to read this text. Tanimoto the auteur has told a single, simple story. Apple, not just Apple products but the brand, the essence is “different”. The singular vision matches the singular brand through a singular message. A singular way of seeing. Tanimoto and his Apple ad are objects within that complex cultural object: advertising. That object was power full in 1997 and it is power full today, taught on Advertising degrees, feted in Top Ten lists that demarcate
the advertising culture.

I looked to create a “Think Different” advertising machine not in order to simply find out about that culture then and now, nor simply as a contemporary ad practice alongside a political-economic or even cultural studies investigation of 1990s or contemporary advertising. I looked to create a machine as research.

I worked with the image (object), the network imag(in)ing object and the advertising cultural object to create an advert that rather than using a singular, authorial, stable imagin(in)ing of Apple pulled in the stream of distributed imag(in)ings of Apple from the server farms and databases of Twitter.

The original ad can be seen as being in three parts: the photo - of Ali, Henson or Einstein, the Apple logo and the slogan. These nested objects form the print ad object itself nested within the advertising cultural object under investigation. With a simple web application, widget and CSS trick I remade the ad as a networked, streaming advertising machine that brought images of “Apple” from Twitter into the space where the authored image of the great and famous had been. Here the stream of Twitter imag(in)eers created the message. The network was the author. The objects being connected were determined by algorithm not auteur.

The first step was to pull the images tagged with “Apple” posted to Twitter into a slideshow. While it is possible (and more powerful) to use Instagram’s API and server side coding to do this, I chose to bring other objects into the laboratory: a service/company/business called Twitwidget (http://twitwidget.com). Twitwidget is a simple widget creator. A widget is a bundled code (object) that a user can put on their own website or social media object. All of the code, API calls and consequent relationship engine data work is hidden from the user. She puts in some variables and gets a line or two of code to make a stream of images from Twitter appear in a window. Twitwidget is an object. It is a simple job to map the objects nested within that techno-corporate object. There are software objects (some 25 active technologies and 3 technologies no longer active according to https://builtwith.com/twitwidget.com); hardware
objects (the IP Address, 104.18.48.195, maps at the time of writing to latitude: 37.7697, longitude: -122.3933, servers in San Francisco; human objects (the person a www.whoisguard.com who processed the request for the person registering twit-widget.com to remain anonymous); structural objects (whatever that person's business plan is) etc. Some of these objects I bring into the laboratory. When I take the simple code for our Apple machine, my web page object connects with some of those software and hardware objects - I am in effect building with those objects.

At http://twitwidget.com/#getstarted, we set the options:

Username: blank (we don't want to connect with a particular human object nor her Twitter database object)
Twitter Hashtag: Apple
Widget Type: Slideshow
Thumbnail Size: 300
Background Color: blank

Then I press 'Get Widget' and I notice that the objects connecting do not connect with any filter objects, political objects or ethical framework objects. Whatever objects have been connected to Twitter's servers can appear and that includes image objects from porn sites and worse! The Twitwidget objects give me an embed code object that connects with the many software and hardware objects at Twitwidget and Twitter.

I create a simple HTML page on a server:

```html
<!doctype html>
<html>
<head>
<meta charset="UTF-8">
<title>Think Different Machine</title>
</head>
<body>
<iframe src="http://twitwidget.com/b/?h=YXBwbGV8dHd8c2xpZGVzaG93fDMwMHwxMHwxMHx8NQ==&v=19317" title="Twitter Photo Widget" allowTransparency="true" frameborder="0" scrolling="no" style="border:none; overflow:hidden; width:300px; height:300px"></iframe>
</body>
```
When a Browser (object) connects with/loads this HTML object, the browser opens an iframe which is essentially a window that nests a webpage object http://twitwidget.com/b/?h=YX-BwbGV8dHd8c2xpZGVzaG93fDMwMHwxMHwxMHx8N-Q==&v=19317 on its server, in the webpage on my server. My object connects with their object which in turn connects with Twitter’s API to search and deliver imag(in)ings from the stream - distributed views/communications/adverts of “Apple”.

To complete our Apple Machine we can add the Logo and ‘Think Different’ strapline in its correct place over the image. We could make our own Logo/Strapline image but why bother - let’s just pull one into the laboratory and into the machine. A simple Google Image search finds one (with a suitable transparent background) at http://freevector.co/wp-content/uploads/2013/01/apple-think-diff.png. This PNG-encoded object sits on hardware server at freevector.co which maps (at the time of writing) to latitude: 33.448379516602 longitude: -112.0740432793 in Phoenix, Arizona. Thanks to cable objects and router objects and… we can pull that image object in every time the page loads, by adding:

```html
<img src="http://freevector.co/wp-content/uploads/2013/01/apple-think-diff.png" width="100">
```

In order to position the Logo/Strapline object with authorial precision we add a CSS style. The browser then connects with that piece of code and positions the image object precisely. The complete Apple Ad Machine looks like:

```html
<!doctype html>
<html>
<head>
<meta charset="UTF-8">
<title>Think Different Machine</title>
<style type="text/css">
img {
  position: absolute;
  top: 20px;
  left: 20px;
}
```
The Machine will run as long as the objects keep connecting. If Twitwidget or Freevector pull the plug or San Francisco’s electricity supply fails, if Twitter changes its API code or T&C, if any of the objects fall out of alignment, the Machine will fail or more correctly work differently. While it runs it creates adverts, it positions Apple, it tells its story, it crowdsources its brand, it connects with an advertising culture struggling with the death of the Author, the “people formerly known as the audience” (Rosen, 2006); algorithmic creativity and everyday remix (Capan, 2015).

Step-by-step I built an advertising machine, not to crank up the practice-research cycle in the hope of reaching knowledge and a research output, nor as part of an assemblage of research methods designed to add heft to a research output. The machine is the research.

Object-oriented practice-research, building machines and objects with objects is not simply a route to knowledge nor part of a multi-pronged strategy, a part in a jigsaw. Object-oriented practice-research maps the mesh in a powerful (and power full) way. It is a new form of research practice but it also offers new forms of research object and also creative practice and objects. The machinic objects I made in the laboratory were not a means to an end, they were ends in themselves - pieces of cultural critique and analysis, philosophy, even research outputs. They are my findings about objects, assemblages, techno-capitalism, new scopic regimes and forms of governmentality, location and materiality and advertising. They are also new forms of creative practice: my JPEG experiments open up new forms
of photographic practice I call object-oriented photography (OOPh); my app experiments open up new forms of mobile media; my advertising experiments up new forms of communication I call ‘content improvisation’.

We began in awe of the complex assemblage we find ourselves in as critical thinkers, creators and advertisers. OOO offers a way of mapping that complexity without the dangers of overmining or undermining. It demands that we widen our analysis, to see new objects and new relations and to acknowledge and work with the unreachable dimensions of those objects. Object-oriented practice-research takes that theoretical framework and works with it. Where it pushes beyond traditional models of practice-led research or even practice as research is in its willingness to open the idea of the research object itself. Practice (the outputs or machines) is not a step towards research or even a contribution to that research but the output, the thing - perhaps object - itself.
Notes:
There is an interesting object-oriented parallel with the way JPEG compresses space and data through DCT and Huffman coding.
For a more detailed account of making a mobile Web App within the context of ‘every remix’ including the Cache manifest and rendering the web page mobile friendly, see (Caplan, 2015).
http://www.dreamdealer.nl/tutorials/using_geolocation_to_automatically_generate_a_route_and_directions_in_google_maps.html
Bogost tells of similar issues when he used a similar machine for a feminist conference (2012, pp. 96-99).
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