Fluid Dynamics: On the Representation of Water and Discourses of the Digital

Cadence Kinsey

Introduction

In 2012, the Palais de Tokyo in Paris presented *Evian Disease*, a 29-minute long digital animation by the British artist Helen Marten (*plate 1*, *plate 2*, *plate 3* and *plate 4*).[1] The video begins with a jellyfish, floating languidly across the screen in an ocean of deep blue. Air bubbles rise to the surface, situating the scene in a watery world. The viewer hears what sounds like a panting dog splashing in a deep puddle or pool and then footsteps, or perhaps a knock at the door, and the jellyfish fades to reveal the bright blue rings of a burning gas hob. As the camera pans across a domestic scene, an agitated narrator describes how metropolises exist to protect us from 'the horrible cosmic event known as "Nature"'. Keeping people safe from storms and floods, 'in metropolises', the narrator says, 'water is kept quiet in pipes and there are umbrellas if it rains.' Later, a glistening bottle of Evian mineral water becomes slowly encased in a brown skin, while a different voice directly addresses the viewer with the invitation 'change your name, hijack your logo, treat business as a found object, mainline dry-cleaning fluid and watch the cells burst'. Described as 'a wild chase in search of

the place and the speed of the contemporary individual', *Evian Disease* introduces us to six characters who each describe how humans protect themselves against nature through the trappings of everyday life: luxury apartments and artificial flowers, vegetable patches and goldfish ponds, videotapes of childbirth and Walt Disney. Structured around the motif of the Evian mineral water bottle, *Evian Disease* depicts water as playful and threatening, bottled and branded, setting the organic against the artificial and nature against the commodity.

Although known primarily for her work in sculpture, Marten created *Evian Disease* and two other digital video works using CGI animation techniques between 2011 and 2013. Working in partnership with the animator Adam Sinclair, each of these was a response to a specific commission or invitation from a major European institution: *Evian Disease* was commissioned by the Palais de Tokyo; *Dust and Piranhas* for the Serpentine Gallery in London for their summer pavilion programme in 2011; and *Orchids, Or a Hemispherical Bottom* was created for the 55th Venice Biennale in 2013 at the request of curator Massimiliano Gioni. Yet despite this institutional interest in her digital video works, Marten has expressed a dislike for the medium. In an interview from 2016, the year in which she won both the Turner Prize and the inaugural Hepworth Prize for Sculpture, the artist went so far as to state:

> I'm really not into technology at all, or in media in that sense. I like handling material, physically constructing, rather than working with an interface which really holds you hostage […] I have no patience, and no theoretical interest in it; more simply put, it's not fun for me.[2]

It is perhaps unsurprising that the artist's dislike of CGI should pivot around the issue of materiality. Indeed, what Marten seems to describe is a sense of loss at no longer working with some*thing*. We might read this as a distinction between a material, physical, world of objects and what goes on 'behind the screen'. This is a distinction that can be traced through early interviews with the artist. For example, in a 2012 conversation with Maurizio Cattelan about the popularity of animation amongst a young generation of artists, Marten suggested that:

> I think it's all to do with how miraculous [CGI] is as a "substance," the infinity potential; there is a gorgeous fluid ease to the look of it, a blasé terror that is addictive. It's weirdly ectoplasmic […] There is nothing to touch, no smell, just this weird rubbery shell that at the same time is both materially dead and data-osmotic. In some ways, it is more code than text, and strangely weightless, genderless.[3]

Here, again, we see what appears to be an opposition between CGI and the notion of material: CGI is described as flat, binary 'code' rather than text; it is 'weightless' and 'dead'. Yet the language that Marten uses in this earlier interview is far more ambiguous in how it figures the relationship between the digital image and artistic work. There is a poetics at play in this passage, and Marten explicitly reaches for a vocabulary of materials in order to express the enigmatic qualities of CGI. Far from being simply a non-thing, the digital image is here given material properties and behaviours: Marten describes it as 'rubbery' and 'osmotic', 'fluid' and 'ectoplasmic'. Through this vocabulary, an ambivalence emerges in which CGI is understood both as something resolutely not material, not physical, but also a fantasy space enriched with material metaphors. Strikingly, these material metaphors are associated with liquids – 'osmotic', 'fluid', even 'ectoplasmic' – and in this they resonate with the core motif of *Evian Disease*, in which the mineral water bottle signifies both the elemental materiality of the natural and the crystalline perfection of the artificial. As such, the very ambivalence that surrounds CGI comes to be inscribed in the work at the level of the image.

In this essay, I want to explore the representation of water and its relationship to digital technology through a range of contemporary artworks made in Europe and the US in the first half of the 2010s.[4] Focusing primarily on *Evian Disease* and the

German artist Hito Steyerl's major video *Liquidity Inc.*, as well as lesser-known works by artists including Josh Kline, Pamela Rosenkranz and Adham Faramawy, I consider artworks that not only use digital technologies as a tool or a medium but also thematise them. At the heart of this discussion is an analysis of how and why the representation of water has provided such a powerful visual metaphor for digital technologies from CGI to the Internet. As I will argue, this is rooted in water's multivalent associations with notions of both immaterality and materiality, and is symptomatic of a historical moment conditioned by economic and ecological crisis. In what follows, I ask why the motif of water has become so prevalent and, crucially, what it might tell us about our critical approaches to the relationship between technology and society in the twenty-first century.

Water as Interface

In describing the digital image as 'materially dead' and 'weightless', Helen Marten evokes a longstanding and well-established narrative in which the digital has been conceptualized as something fundamentally immaterial and, therefore, not real. Although this narrative would come to be developed through the work of theorists of postmodernism, such as Jean-François Lyotard and Jean Baudrillard, it initially emerged in the immediate postwar period from the then-nascent discipline of cybernetics. In her pathbreaking study of 1999,

How We Became Posthuman, N. Katherine Hayles has told the story of 'how information lost its body', arguing that the idea of the digital as immaterial can be traced to the work of the mathematicians Norbert Wiener and Claude Shannon during the famous Macy Conferences, which ran from 1943 to 1954.[5] Sponsored by the Josiah Macy Foundation, this series of conferences was attended not only by mathematicians but also anthropologists and artists, including Gregory Bateson, Margaret Mead and Marcel Duchamp, and it was in these discussions that Wiener and Shannon focused on the cybernetic notion of homeostasis in order to develop a general theory of communication that could apply equally to humans, animals and machines. The theory that they developed, Hayles argues, relied on a definition of information as an entity that was distinct from the material substrates that carried it. By defining information in this way – as something separate from the medium that conveyed it – Wiener and Shannon conceptualized it as detached and free-floating, able to travel across time and space unaffected by any changes in context. 'Information is information, not matter or energy' wrote Weiner in his book *Cybernetics: or, Control and Communication in the Animal and the Machine*, published in 1948.[6] As Hayles demonstrates, Wiener and Shannon's model of information as 'not matter' was merely one of several models of information generated during the Macy conferences. The British physicist Donald MacKay,

for example, proposed the inseparability of form and content, and of message and receiver, thus stressing a fundamental attachment to a material world. Yet it was the Wiener-Shannon model that would come to have wide-reaching effects in the fields of art, sociology and critical theory, informing discussions around the dematerialisation of the art object in the 1960s, the formulation of postmodernism in the 1970s and '80s and theories of immaterial labour in the 1990s.[7]

In thinking about how this plays out in relation to the central motif of *Evian Disease*, it is notable that Hayles uses the metaphorics of water to describe the Wiener-Shannon model of abstraction, arguing that 'it was a small step to think of information as a kind of *bodiless fluid* [my italics] that could flow between different substrates without loss of meaning or form.'[8] Thus, right at the heart of the historical association between information and immateriality is the idea of a substance that flows, something that is not solid and that is adaptable. Of course, a fluid is not the same thing as a liquid, nor is a 'bodiless fluid' simply water. While the term 'liquid' refers to a phase or state of matter, a fluid is something that has the property of flowing. In a liquid, particles move freely over each other but do not tend to separate as do those of a gas. A fluid, on the other hand, can be either liquid or gaseous. This distinction is important because fluids have long provided a powerful set of metaphorics for thinking about media, whether conceived as

signals of communication (in the sense of information or content) or as an environment through which those signals travel (in the sense of medium).[9] For example, for Raymond Williams writing in the early 1970s 'flow' was used to refer to the streams of content broadcast by television, while for philosophers and scientists in the nineteenth century, 'ether' was a mysterious, mobile, space-filling substance that was thought to carry the planets around the sun and waves of light from one point to another; it was a fluid medium through which electricity and magnetism might pass.[10] But what I want to suggest here is that it is not fluids in general but liquids in particular, and specifically water, that move us from thinking about media in general to digital media in particular.

Indeed, it is water that gives the English language its core verbal and visual vocabularies for articulating the experience of interacting with digital realms. Ripples, droplets and splashes populate our desktop backgrounds and screensavers, and oceanic metaphors proliferate: 'surfing' has been used to describe the activity of navigating the Web according to the intuitive processes and chance associations formalised through hyperlinks; when systems of data capture and control break down, information is said to have been 'leaked'; distributed denial of service (DDoS) attacks are understood in terms of 'flooding'; and even hardware uses the language of the ocean when we speak of 'docks' and 'ports'. These terms are

specifically tied to digital technologies such as computing and the Internet, but also connect to wider histories of thinking about water and the ocean within cybernetics, a field that takes its name from the ancient Greek term for 'steersman' and which, with the development of SONAR, gave rise to a fascination with marine mammals in the arena of military bioacoustics and communications engineering since these animals engaged in forms of open communication on a global scale.[11] Notably, while some of these terms are meant to suggest positive associations (surfing, for example, is supposed to be fun), there are clearly metaphors of disaster and catastrophe at play here too – a key point to which I will return later in the essay.

It is perhaps easy to understand why water, both in its elemental and its oceanic forms, should provide a suitable set of metaphorics in this context. As H_2O, water's properties of transparency and fluidity represent an idea of freedom that has come to be central to dominant narratives about digital technology, such as direct and unmediated access to the world's information, and the unimpeded flow and endless circulation of images. Water flows: it is seamless and efficient. Water has no sides: it is unbounded, all-encompassing and neutral. Water is pure and 'information is information'. To be clear, information is almost certainly none of these things: as a number of studies published since the 1990s have shown, information is messy, contingent and highly ideological.[12] But these qualities

nonetheless constitute popular and enduring narratives. Likewise, with its vast scale and unfathomable depths, the ocean has also been used to mobilize related concepts around freedom and access. But, unlike H_2O, the ocean is understood as a site of expansion or exploration: described as a container or a void, the ocean becomes a database, perhaps, or even a site of projection – a featureless blank on maps of the globe that simultaneously stands for and yet conceals the fact of its unknowability.[13] Thus, in its various forms, water has been central to the development of thinking about information and communication in the post-war period, and its metaphorics have expanded with the advent of new technologies such as mobile Internet and Cloud computing, which enhance portability, ease of use and, hence, the perception of freedom. Little wonder then that the Googleplex campus at Mountain View, California, features statue busts of notable oceanographers and ocean explorers such as Sylvia Earle and Jacques Cousteau.

It is precisely such metaphorics that at least in part inform Marten's *Evian Disease*: a study of retreat into technological mediation and away from the horror and uncertainty of nature. But Marten is not alone in her exploration of how digital media might be inflected through the representation of water in this way. Indeed, the pairing of water and the digital is evident in the work of a number of young artists – the majority of whom cluster around the traditional art world centres of London,

Berlin, New York and Los Angeles – who are engaged with how new technologies are re-shaping not only the production of art but everyday life. Take, for example, the installations and artworks *Hydra* (2014) by Adham Faramawy, *Highly Liquid* (2013) by Magali Reus, *Screening* (2012) by John Lawrence and Joe Watling, or *Warm Warm Spring Mouths* (2013) by Ed Atkins (*plate 5*, *plate 6*, *plate 7* and *plate 8*), all of which were made at around the same time as *Evian Disease*. In each of these works, droplets of water come into contact with screen and skin, suggesting luxury, perfection and high-definition living. In these artworks, water is used to engage a thematics of abstraction and immateriality that goes right to the core of the cultural mythology around digital technology: a 'better-than' version of real life.[14]

This, I argue, finds its most essential expression in the bottling and branding of water, exemplified by Evian. Here, a once-natural resource is purified and packaged, and in so doing becomes commodified and spectacularised. Selling notions of health and wellbeing, and connected to an ever-expanding fitness market, bottled water has been the fastest growing drinks sector for the last two decades: in the US, 1,500 bottles of water are opened every second and nine billion gallons are sold annually.[15] Given its current historical prominence, it is perhaps unsurprising that bottled water has featured prominently in a number of artworks and installations made during the same

period, such as Pamela Rosenkranz's *The Most Important Body of Water is Yours* (2010), Yngve Holen's *Parasagittal Brain* (2011) and Josh Kline's *Its Clean, Its Natural, We Promise* (2011) (*plate 9*, *plate 10* and *plate 11*). In its sterile commodity form, the image of bottled water both in these works and in *Evian Disease* serves as a cynical representation of the supposed certainty and security of modern life, whether through the mundaneness of the office water cooler or the perpetual hope of self-improvement.[16] There is, of course, a critique of this at play in Marten's work: suggested in the title of *Evian Disease* is a striking reference to impurity and infection that reminds us of the potential of water to be a carrier of illness.

Art's *work* is central here, and many of these artists do not simply illustrate the associations between water and the digital but actually engage with the problem of representation as immanent to them. In other words, although water has historically been used to represent the digital, we might say that, in fact, it is representation itself that is at stake. Afterall, water poses a fundamental problem for representation: how does one give visibility to something that is transparent? Although this problem is not specific to digital media, it does have a particular valency in this context since water is one of the most difficult subjects to render using digital tools of production. This is because the refraction of light through water produces complex optical effects, such as caustics, that require sophisticated

rendering techniques like ray tracing that are computationally demanding and expensive. I suggest that it is precisely this aspect of unrepresentability that serves to signify our idea of digital technology as something immaterial and unknown. Thus, it is somewhat paradoxically a material substance, that is to say water, and its material properties of transparency and fluidity, which have historically helped us to formulate and give shape to an idea of immateriality: water provides a representation of some*thing* that historically has been thought of as *nothing* ('not matter').

Gaseous metaphors of atmosphere, ether and the cloud have, of course, also featured in discourses concerning art in so far as they have posed the problem of how to represent that which is unrepresentable, and remain relevant in current terminology such as 'Ethernet' and 'Cloud computing'.[17] But, as the work of Hubert Damisch and T. J. Clark has usefully laid out, gaseous metaphors are attached in important ways to painting and chiefly take as their focus the forms of abstraction that mediate the relationship of modernity to modernism, of medium to post-medium, or of modernism to postmodernism.[18] By contrast, what I am setting out here is the significance of liquid metaphors, of water, to thinking specifically about the digital and, as I will go on to show, a new set of discourses that have developed around it in the last decade.

While the media theorist John Durham Peters has discussed at length how water serves as a medium in his fascinating study *The Marvelous Clouds: Towards a Philosophy of Elemental Media*, what I would like to propose instead is a way of thinking about the iconography of water as a site of mediation, and here water's relationship to the computer screen as a form of interface is historically significant. As the architectural historian Branden Hookway has detailed, it is from studies into fluid dynamics that we owe the very emergence of the concept of the 'interface', a term used to describe the point at which two things (surfaces, ideas, bodies) are brought into contact with one another. In his book *Interface*, published in 2014, Hookway recounts how, in the 1880s, the Scottish engineer James Thomson coined the term to describe a dynamic boundary condition that separates one distinct fluid body from another. For Thomson, the 'interface' is the point at which liquid in a state of turbulence meets with liquid in a state of laminar flow.[19] In his 1882 book *Hydrostatics*, Thomson writes that 'A perfect fluid may be defined as a body, the contiguous parts of which exert pressure upon each other perpendicular to the interface which separates them.' He goes on to define the interface as 'a face of separation, plane or curved, between two contiguous portions of the same substance.'[20] Thus, it is the study of fluid bodies, such as water, that gives us the terminology for a key aspect of computing technology, used to

refer to both hardware and software. But it is also water that serves as the site of mediation, in other words as an interface, for our interaction with, and understanding of, digital realms. This is perhaps especially relevant in the context of the artworks that I consider in this essay, which are primarily screen-based.

For Hookway, and subsequently for my argument here, it is significant that Thomson's use of the term interface referred specifically to the point at which liquid in a state of turbulence met with liquid in a state of relative calm, since it is suggestive of the role of the interface in negotiating the forms of unrepresentability that I have associated with the digital. Hookway writes, 'In essence, the interface would emerge as an analog of the boundary that separates dynamic stability from instability, or rather, from the need to find within those behaviors or events once thought to be unstable and unknowable a kind of knowing and stability.'[21] In other words, Hookway is interested in how the interface comes to organise and order information, to shape it for human engagement and in so doing mitigate against the idea of 'information overload' or a deluge of data that is incomprehensible to the human brain.[22] In a similar vein, it is my argument that, as a type of interface, the metaphorics of water serve to stabilise something that otherwise presses at the boundaries of comprehension: the metaphorics of water organise and order our relationship to digital technology

and, crucially, they do so through the concepts of purity, neutrality, freedom and unknowability.[23]

This way of thinking about the interface, and specifically of thinking about the metaphorics of water as itself a kind of interface – whether in elemental, oceanic or bottled form – crystallises the sense of organizing and controlling nature through technology that is at the heart of Marten's *Evian Disease*. The metaphorics of water both poses and resolves a problem of representation, of finding ways to represent invisible forces or concepts. But, in so doing, the metaphorics of water also raise the spectre of control, a concept that is repeatedly thematised in *Evian Disease* through the appearance of various devices for catching and containing water: pipes, umbrellas and the Evian bottle itself. Control has, of course, been central to the debates of information technology. Specifically, in key works such as Lyotard's *The Postmodern Condition: A Report on Knowledge* and Gilles Deleuze's essay 'Postscript on the Societies of Control', the abstractions of code have been seen to produce a framework of control.[24] At stake in Deleuze's analysis of control, as in Lyotard's analysis of knowledge, are the forms of power exerted over the late-twentieth century subject, and this triangulation of knowledge, control and power continues to inform recent debate, having been developed in important ways in the last fifteen years by Alexander Galloway, Wendy Hui Kyong Chun, and Seb Franklin.[25] Yet while these texts focus on

the way in which the abstractions that are fundamental to thinking about information technology come to be directed towards the exertion of control over the subject, what I am describing here is the way in which the representation of the informational realm through watery metaphors might in fact serve to reflect a desire for control over technology. In other words, by giving form to something that is otherwise unrepresentable, water both stands for *and* works to conceal the traditional model of information technology as a black box, in which power is constituted through a condition of relative invisibility.

Laminar Flow and Turbulence

Order and chaos; control and freedom; Evian and the ocean: these are the axes through which the relationship between the metaphorics of water and the digital appear to be organized. In what follows, I therefore want to move from thinking about the historical and metaphorical intersections between water and information technology to look in more detail at these two different notions of laminar flow and turbulence and consider what they signify in the context of recent art. To do so, I want to consider a second major work in which this pairing of laminar flow and turbulence has been explicitly thematised: *Liquidity Inc.*, a 30-minute digital video by the German artist, filmmaker and writer Hito Steyerl who in 2017 topped the annual

ArtReview Power 100 list as the most influential person in contemporary art (*plate 12*). Although, as we have already seen, *Liquidity Inc.* was not the first artwork to triangulate digital technology and contemporary culture through the representation of water, it arguably remains the major, sustained exploration of those intersections and, as such, forms an important case study for this discussion.

Opening to the sound of crashing waves, *Liquidity Inc.* follows the story of Jacob Wood as he recounts his early experiences as a refugee from the Vietnam War as part of 'Operation Babylift', a US programme to evacuate its enemies' orphans for adoption in America. Wood grew up to become a financial advisor and, after losing his job in the financial crash of 2008, found a new calling as a professional fighter and pundit in mixed martial arts. This story is interspersed with economic 'weather reports' delivered by individuals wearing balaclavas and owl t-shirts in which trade winds are reimagined as prevailing patterns of debt and power, as well as with footage from Hurricane Katrina and screen captures from an online lesson for generating CGI water (*plate 13*). Bruce Lee's Tao 'be water my friend' is a constant refrain throughout, a mantra not only for mixed martial arts but for the constant processes of assimilation that Wood has undergone throughout his life.

In *Liquidity Inc.*, the image of water is repeatedly used to symbolize fluidity as a guiding principle – the flexibility of

labour, the unimpeded and endless replication and translation of information, the malleability of the subject – so that the Zen doctrine of fluidity is attached to the protean subject of neoliberalism. However, as in Marten's *Evian Disease*, storms and floods loom large, so that *Liquidity Inc*. is characterized by themes of turbulence and instability as much as of seamless, streamlined flow.

At the heart of the work is an exploration of the entanglements of capital with the circulation of digital images. But, whereas once the notion of the 'copy' signified mass reproducibility and the commodification of the image, in *Liquidity Inc.* we are instead confronted with the perpetual de- and re-contextualisation of the image within an online attention economy.[26] This can be seen, for example, in a passage of *Liquidity Inc.* in which we are presented with an image of a Tumblr feed featuring multiple colorized, animated reproductions of Hokusai's *Under the Wave of Kanagawa*, commonly known as *The Great Wave* (1829-1832) (*plate 14*). The choice of subject matter here is central: as one of the most widely reproduced non-western artworks, Hokusai's woodblock print has been described as an icon of the globalized flows of capital, commodities, ideas and technologies.[27] Now digitally altered and reproduced in endless variations within the seemingly infinite scroll of Tumblr, *The Great Wave* is used as a motif in *Liquidity Inc.* to signify not simply a stream of digital

images but a deluge of them. Like the Evian mineral water bottle, the digitally-reproduced image of the wave here functions as something more than a serial commodity, inserted into ever-new flows of circulation and registers of value.

As is apparent from the Hokusai motif, *Liquidity Inc.* establishes a direct correlation between the way in which the metaphorics of water function in relation to digital technology and the way in which they function in relation to capital. Indeed, financialised capitalism is central to this story about the relationship between water and the digital, and its own abstractions are frequently expressed through the same metaphors of liquidity and flow. We talk about liquidity when we mean a high volume of activity in a given market, but there is also the liquidation of a company, or the close relationship between liquid assets and ready cash. Assets can be 'frozen' and market liquidity can 'dry up'.

In this context, it strikes me that watery language and metaphor is not simply an abstraction but, as with the historical conceptualisation of information as a kind of 'bodiless fluid', is rather used to signify the very idea of abstraction and/or immateriality. And here it is important to note that the forms of abstraction associated with digital modes of representation – bit values represented through the arbitrary signs /1/ and /0/ – correlate in important ways to the forms of abstraction that characterise financialised capitalism, from the substitution of

material value in fiat currencies to the blackboxing of financial markets to derivatives trading, collateralized debt obligations, sub-prime mortgages and quantitative easing. It is, I argue, through being conceptualized as abstract or immaterial that both the digital and capital have come to be understood as free flowing and that, crucially, it is through the metaphor of flow that the movements of both the digital and capital have been naturalized.[28]

In this respect, *Liquidity Inc.* works with a familiar narrative about the reproducibility of the digital image and its detachment from any original context or medium, such that the circulation of the digital image is treated as like or complicit with the flows of capital, whether in the context of thinking about globalized relations of trade and finance or in the exchange and circulation of commodities. This pairing has been an important framework through which the digital image has been understood in art history. For example, in his 2016 book, *In the Flow*, Boris Groys has described how the Internet has precipitated the transmutation of art into documentation in the service of the museum as an extension of the experience economy. And, in *After Art* published in 2012, David Joselit has described a condition of 'image neoliberalism' in which digital modes of reproduction occasion a detachment of the image from any essential or original context in the same way that money makes commodities mobile. Joselit writes:

> Currencies are universal translators: they can assign a value to every kind of commodity, whether goods or services. In the 1990s a second type of universal translator gained prominence: digital technologies with the capacity to transpose any work in sound, image or text into numerical sequences – into code. Contemporary art and architecture are produced at the intersection of these two universal translators – one that specifies value, and the other that specifies form.[29]

Under this analysis, digital technologies of reproduction become complicit with the levelling principle of the commodity, giving rise to an idea of infinite reproducibility and exchangeability. To make my own position clear, I do not subscribe to the idea that digital technologies are simply mechanisms of perfect, seamless reproducibility – that they are 'universal translators' in the mode of cash – and instead prefer to attend to the limits of that narrative, whether through the ever-present threat of failure, glitch and breakdown, or through the way in which the reproduction of digital content, especially on the Internet, is circumscribed by any number of technical, social and political frameworks.[30] Nevertheless, the fungibility of the digital image, based on the fungibility of the commodity, has been a powerful and persistent narrative and is important in the context of my

wider argument because of its association with the idea of flow. Indeed, this way of understanding digital modes of reproduction connects to the perceived qualities of seamlessness and efficiency that are embedded in water's properties of transparency and fluidity, when it is in its elemental form as H_2O.[31] In other words, the historical abstraction of information through the metaphorics of water enables a commensurability between the digital image – which, in so far as it is a sequence of numerical code, might also be called an information image – and the flows of capital. Crucially, as Joselit argues, this extends beyond the digital image to thinking about contemporary art more generally.

Although *Liquidity Inc.* is perhaps the most widely known example of a work that uses the concept of flow to suggest this commensurability, it is far from unique in doing so. For example, when *Liquidity Inc.* opened at Artists Space in New York in March 2015, the project *Real Flow* was also launched nearby at K. on Broome Street (*plate 15*). A collaboration between the artists, theorists and curators Diann Bauer, Victoria Ivanova, Christopher Kulendran Thomas and Suhail Malik, *Real Flow* was a research and development company dedicated to the release of artworks as financial instruments. At K., two financial instruments associated with artworks were made available for sale, outlined in a prospectus: a certificate of ownership (but which did not include physical possession of the artwork itself)

and an exhibition-loan agreement. ‘Re-engineering the artwork’s commodity form’, a statement reads, ‘[*Real Flow*] tactically integrates art into its diverse channels of exhibition, circulation and marketization.’[32] However, unlike *Liquidity Inc.*, *Real Flow* purposefully sought to displace the concept of liquidity in favour of a more aerobic metaphorics for finance, moving from water to air as the primary element or medium through which to understand the possibilities of financialisation: the instantiation at K. included a video presentation that was tellingly entitled *Beyond Liquidity*.[33] *Real Flow* is an interesting point of comparison to consider alongside *Liquidity Inc.* because the project serves as something of a provocation to think about the ways in which Steyerl actually refuses certain forms of flow. Afterall, it is striking that, while *Liquidity Inc.* thematises a narrative of the neoliberal (digital) image through the metaphorics of water, the work itself is not easily or readily reproducible: in the collections of MoMA, the Guggenheim, the Musée d'Art Contemporain de Montréal and ICA Boston, and not freely available to stream via the Web, the artwork is circumscribed by traditional institutional structures and sequestered within the proprietary logic of the museum. We might note here that, in this respect, *Liquidity Inc.* functions more like a product rather than a commodity.

Although I have so far been focusing on the notion of smooth or laminar flow within *Liquidity Inc.*, and on how this

connects with neoliberal attitudes of assimilation, flexibility and circulation, it is also important to attend to the video's narratives of turbulence, which are primarily thematised through visual and audio references to crashing waves. To return to the motif of Hokusai's *The Great Wave*, we might think of this not just as an icon of globalised flows of images or capital but also as an icon of disaster: *The Great Wave* moves us from thinking about laminar flow to turbulence, from order to chaos, calm to crisis.

The metaphorical crashing wave at the heart of *Liquidity Inc.* is, of course, the global financial crisis. As a viewer, we are introduced to the crisis through the main protagonist of the video, Jacob Wood, who lost his job at the investment bank Lehman Brothers after it collapsed on 15 September 2008. Wood's journey from assimilation into American society as a young child, through redundancy in adulthood, and into a new career as a sports commentator after failing as a professional fighter, is framed by Bruce Lee's slogan 'To be like water in the face of adversity'. In *Liquidity Inc.*, water therefore takes the form of both the crashing wave that destroys as well as the model for (perpetual) renewal. This is true in the context of Wood's personal narrative as well as in the context of the financial crisis, in which the oceanic metaphor of crashing waves is as important as the elemental metaphor of flow. Afterall, when the wave of capitalism crashed, the mainstream explanation focused on a problem of liquidity: liquidity had

been lost from Anglo-American money and capital markets, most notably in relation to portfolios of sub-prime assets, and thus the presumed answer was to inject liquidity into those markets in the form of interventions such as quantitative easing.[34] Smooth flows associated with growth alternate with turbulence associated with a crash; boom and bust. This narrative within *Liquidity Inc.* resonates in important ways with how the ocean has been conceived as central to the imaginary of capital in other contexts. As scholars such as Janine MacLeod, Chris Connery and Cesare Casarino have argued in relation to works of literature, the ocean is the home of capital: the site of the fishing industry, global trade, travel and warfare, the ocean has been both a resource for capitalist exploitation and a mechanism of colonial expansion. But the ocean does not simply give; it can also take away, and here we might think of the South Sea Bubble, which has been compared to modern financial crises.[35] This duality has always been fundamental to its metaphorics: while the conquest of the ocean was coterminous with the rise of capitalism, it was also understood as a place of necessary uncertainty and risk.[36]

The global economic downturn is, of course, not the only crisis that *Liquidity Inc.* invokes through the metaphor of the wave. In the video there are repeated references to natural disasters, in particular floods and tsunamis. As in Helen Marten's *Evian Disease*, the threat of environmental catastrophe

permeates *Liquidity Inc.*. For example, screened on a television in the corner of Wood's office is news footage of devastating waves breaking the sea wall of New Orleans during Hurricane Katrina. The third major hurricane during the unprecedented 2005 Atlantic hurricane season, Katrina resulted in the deaths of around 1,800 people – many a result of the fact that the US Army Corps of Engineers, contracted to design and build the levee system for surge protection in a city that sits below sea level, had used shorter steel sheet pilings than were required in an effort to save money. In such passages, nature is configured as a threatening and disruptive force through the turbulent properties of water. But what is notable here is that the repeated references to storms, floods and torrential rains signify disorder and instability in both environmental and financial realms. This correlation is made explicit in another passage of the video where the words 'capital', 'risk' 'tsunami' and 'flood' appear in bubble writing against the backdrop of a wave, locating the theme of disaster both in relation to the economy as well to the environment (*plate 16*). In this same passage, we also see the words 'blood', 'sweat' and 'tears', appear against the background of a crashing wave before being washed away by the fast-paced editing. Used to refer to the idea of hard work, these terms undo the neoliberal ideology of freedom and are suggestive of a critique of immaterial labour.

Putting together the relationship between the financial and the environmental in the context of crisis in this way corresponds to what the media theorist Tom Cohen has described as an economic-ecological crisis. In the introduction to the 2012 edited volume, *Telemorphosis: Theory in the Era of Climate Change*, he writes:

> Warnings regarding the planet earth's imminent depletion of reserves or 'life as we know it' arrive today more as routine tweets than events that give us pause, particularly as the current wars over global 'sovereign debt' and economic 'crises' swamp attention. The intensifying specter of megadebt – at a time of 'peak everything' (peak water, peak oil, peak humans) – dumped into a future despoiled of reserves and earning capacity has a specific relation to this white-out – the 'economical' and 'ecological' tandem shift all attention to the first term (or first 'eco').[37]

Derived from the ancient Greek *οἶκος*, meaning a house or dwelling, this 'eco eco crisis' is a crisis within the structures and systems that we inhabit, and here the ecological and the economic are not just parallel but, crucially, intersecting. Indeed, it is the way that they are yoked together that is central to my argument. While in *Evian Disease* the threat of disaster

seems to come, at least superficially, from ‘Nature’ – to be mitigated against only through artifice and mediation, symbolized by the Evian mineral water bottle – in *Liquidity Inc*. such disasters are explicitly neither natural nor inevitable: the threat appears to be entirely man-made. More specifically, it is the result of capitalism. To return the passage of the video that featured scenes from Hurricane Katrina, the increase in the severity and frequency of tropical cyclones since 2005, including Katrina, has been connected to effects of climate change such as rising sea levels and sea temperatures, which, in turn, are connected to the development and proliferation of industrial capitalism from the mid- to late-eighteenth century onwards. As such, we might say that the central argument of *Liquidity Inc.* resonates with the work of Jason Moore who, in his 2015 book *Capitalism in the Web of Life*, showed how the multiple and various crises of the twenty-first century – from finance to climate to food, work and energy – all stem from a common cause: capitalism as a way of organizing nature.

What I would like to propose is that this intersection of capitalism and environmental catastrophe is an important context for understanding the representation of water in a number of artworks made during the last decade, and operates across very different formal registers. For example, in *Its Clean, Its Natural, We Promise*, Josh Kline boiled 24 Duane Reade bottles in their own water before refilling them (see *plate 11*).

Infusing the water with plastic, and making it unfit for consumption, the sculpture is suggestive of the massive trash vortex that circulates in the North Pacific Gyre, whereby microscopic particles of plastic are ingested by aquatic organisms and enter the food chain. And in *Ocean Living* (2013), Holly White and Megan Rooney took as a starting point a post-apocalyptic scenario in which all the ice caps have melted and people have had to resort to living on a giant ocean liner (*plate 17*). Comprising a series of digital videos, a book and an installation presented at Arcadia Missa gallery in London, *Ocean Living* evokes real-world initiatives such as *The World*, the largest private residential ship on the planet where people live full-time on an ocean liner, or else the *Seasteading Institute*, a techno-libertarian community in French Polynesia funded by the billionaire founder of Paypal, Peter Thiel, as a response to impending environmental catastrophe. Notably, both Kline and White are artists who, in other contexts, have extensively examined the transformations of everyday life through digital technology.[38] Thus, we might say that what we see in the representation of water in recent art is the way in which the seemingly smooth flows of capital (the circulation of commodities, or information, or images) continually give way to turbulence in the form of crisis and catastrophe (the ecological cost of bottled water, the melting of glaciers, the economic downturn).

From Metaphor to Materiality

At this juncture, we might return to James Thomson's definition of the interface as the point in which liquid in a state of turbulence meets with liquid in a state of laminar flow and ask what can we conclude from the fact that, in these artworks, competing metaphorics of water are placed side by side, in the manner of an interface? Or from the fact that these metaphorics do not only refer to water in its 'pure' elemental form as H_2O, transparent and free-flowing, but also to it in its turbulent oceanic form, as well as in its static but serialized bottled form? Is the representation of water in these artworks merely a means through which to draw together a range of contemporary issues or can it, in fact, help us to reflect on the very mechanisms through which we understand them?

One possible way to think about this is that if, as I have been arguing, the verbal and visual metaphorics of water serve as a kind of interface that mediates our relationship to technology, then that relationship is necessarily entangled with the economic and the ecological. Indeed, at the heart of both *Evian Disease* and *Liquidity Inc.* is a preoccupation with crisis: a 'meltdown' that is at once both metaphoric and all too real. Through references to water as a potential site of both smooth and turbulent flows, what these artworks do is draw to the surface the way in which those things that are apparently

immaterial and abstract are coming to have a tangible impact on our daily lives and, even more alarmingly, on our future. In the context of thinking about the digital this is a small but important point, and one that I would like to suggest marks a shift in discourses of the digital from the immaterial (the metaphorical abstractions of a bodiless fluid) to the material (the real-world effects of these abstractions, if you will). Thus, in this final section, I want to set out what the stakes of this shift are in terms of its wider historical and art-historical significance. As such, I move beyond focusing specifically on how and why artists have engaged with the representation of water in the context of digital media to situating this within broader discursive tendencies.

In proposing that there has been a discursive shift from thinking about the digital as immaterial to thinking about what its material aspects might be, we might perhaps be reminded of Helen Marten and her ambivalence – her dis-ease, even – about the digital image described at the very beginning of this essay. As we have already seen, Marten has, on one hand, described the digital image as ‘flat’, binary ‘code’ that is ‘weightless’ and ‘dead’, while, on the other, it is also at the same time ‘rubbery’ and ‘osmotic’. With these terms, Marten has articulated a tension between the digital image as immaterial and material and, crucially, she has used the metaphorics of water to do so. What I would like to suggest is that this approach characterizes a widespread tendency in thinking about the digital that has

emerged in the last decade, in which a generation of artists and theorists are now working *beyond* the narratives of immateriality and the abstraction of content from context that flowed from Wiener and Shannon's work on cybernetics and information theory in the 1940s.

How artists and theorists have shifted attention to what we might call the material aspects of digital technology has taken many forms. For example, artists such as Trevor Paglen, Yuri Pattison, Ingrid Burrington and Tyler Coburn, have all produced work that utilises documentary strategies of representation and mapping practices in order to depict the underground server farms or deep-sea cables upon which our Internet service provision relies, thus locating the otherwise apparently immaterial technology of the Cloud in the physical infrastructures of the Internet. Likewise, Leslie Kulesh and Iain Ball have explored the central role of rare earth mineral deposits in the production of smart phones and tablets by incorporating specimens of minerals such as cassiterite and neodymium into their installations. In so doing, they not only emphasize the dependence of new technology on geological matter but also the way in which such technology is entangled with geopolitical conflict and inequality, since these minerals are predominantly mined and processed in the Global South, with often devastating environmental or social effects.[39] Beyond the discourses of art, recent scholarship in science and technology studies,

anthropology and sociology has attended to the social and environmental impact of new technology, the physical infrastructures required to support Web technology, and even the idea of code as a material artefact in and of itself.[40] And this is commensurate with a wider pattern across the arts and humanities and the social and historical sciences as a whole, which have become increasingly attuned to the material aspects of their objects of study. Perhaps most prominent has been the development of the so-called 'new materialisms', an area of enquiry that grew out of the traditions of both feminist epistemology and analytic philosophy and that is associated with figures as intellectually diverse as Quentin Meillasoux and Rosi Braidotti, Graham Harman and Karen Barad.[41]

Thus, although the recent attention to questions of materials and materiality is not specific to the discourses of information technology, it does, however, have a particular resonance for them because it represents a profound shift away from longstanding and deeply entrenched narratives of immateriality and abstraction that have become attached to the notion of information and, indeed, the digital more broadly.[42] If ways of thinking and speaking about digital technology have predominantly been framed by the languages of postmodernism and neoliberalism – of immateriality, simulacra and fluidity – then this turn towards materials and notions of materiality, figured in these artistic and theoretical projects as that which is

physical, tangible, earthbound and bodily, gives us a new framework for thinking about the digital.

One striking observation to be made is that this 'material turn' gained momentum in the second half of the 2000s, specifically around 2008. Although there have historically been a number of influential intellectual projects that have long challenged this narrative of the digital and/or information as immaterial – as in the work of N. Katherine Hayles, as well as Richard Coyne, Anna Munster and Matthew Fuller – it is really only in the last decade that such a narrative has entered artistic and theoretical debate in a substantial and sustained way.[43] One way to account for this, at least in the context of digital technology, is that the period around 2008 marks a moment when we see the development of new Internet technologies that would profoundly change the scale and shape of Internet usage – from mobile Internet (such as Apple iOS, first released in 2007 for the iPhone) to Cloud computing services (such as Software as Service and Platform as Service applications like Amazon Web Services launched in 2006) to the popularisation of social media platforms (which, although present on the Web since the early 2000s with sites such as Friendster and MySpace, accelerated following the introduction of Facebook, Twitter and YouTube in 2006, Tumblr in 2007 and Instagram in 2010). By enabling greater access to the Internet through portability or ease of use, these technologies integrated the Internet into the

fabric of life and labour. This increasing ubiquity and presence of Internet technology in our everyday lives has been reflected in the development of concepts such as ‘post-Internet art’, a term coined by the New York-based artist Marisa Olson in 2008 and which has been applied to virtually all of the artists discussed in this essay at one point or another.[44] Central to this concept was the use of artistic means that were not necessarily technological in nature: through drawing, painting, performance, poetry, and sculpture, artists turned to traditional media in order to assert the fact that by the mid-2000s, the Internet had become assimilated into everyday life to such a degree that any distinction between online and offline, or the ‘virtual’ and the ‘real’, made increasingly little sense. In other words, at a historical moment in which we can no longer ignore the environmental impact of new information technology or the increasing infiltration of it into everyday life, it simply does not make sense to think of that technology as something abstract, detached and immaterial but as a materially constituted entity with social, political and environmental causes and consequences.[45]

As such, we might position 2008 as a centre of gravity, a focal point through which we see not only the development of new digital technologies but also new critical and artistic responses to them. However, of unavoidable significance is the fact that 2008 is also the moment of the global economic

downturn and, thus, we might say that these new discourses have been forged in the white heat of crisis. Indeed, I argue that it should not be seen as simply a coincidence that the development of new Internet technologies (as well as new artistic and theoretical responses to them) should emerge in the context of global economic failure but, in fact, as symptomatic of a generalised complementarity between digital technology and the economy. Crucially, this complementarity is distinct from the kind proposed by Joselit in his discussion of image neoliberalism, in which the fungibility of the commodity can be seamlessly mapped over the conceptual fungibility of the digital image. Rather, it hinges on the substantial structural role that new Internet technologies played in the context of the economic downturn, and has little to do with the ontology of binary code. For example, Cloud computing changed the way that businesses worked by offering computing services, such as server power, on an on-demand basis that obviated the need for significant capital expenditure. Offering flexibility and scalability at an accessible price point, this was fundamental to new business start-ups at a time when business loans and investment were dramatically paired back due to the crash. Similarly, platforms such as Airbnb or Uber purported to ameliorate the everyday symptoms of the crisis, such as the triggering of austerity measures and the loss of secure employment conditions, by expanding access to the flexible working conditions of the so-

called ‘sharing economy’ (even though, in reality, they arguably exacerbated these problems by normalising precarious forms of work). In other words, the emergence of discursive frameworks of materiality that respond to new manifestations of digital technology are inextricable from the conditions of crisis capitalism.[46] This is important because it potentially complicates the forms of epistemological value that we might ascribe to such discursive frameworks. Indeed, we might reasonably question whether, at least in the context of thinking about digital technology, the discourses of materiality could in some way be symptomatic of the eco eco crisis and not simply or straightforwardly a way of trying to understand it. Although it is beyond the remit of this essay to do so, it seems to me that there is work to be done in thinking about the emergence of discourses of materiality as a historical phenomenon located in conditions of crisis.

One area in which the emergence of new discourses around digital technology has been critically examined in such a way is in relation to art, and specifically post-Internet art. While the emergence of the term can be understood as a response to the sheer change in the scale of the Internet and its centrality to major global events such as the financial crisis, as I have been describing, it has also been understood in terms of a privileging of the digital precisely because of this generalized complementarity with the economic. In a talk given at the major

Lunch Bytes Conference held at the Haus der Kulturen der Welt in Berlin in 2015, the art historian Kerstin Stakemeier argued that the economic downturn made it clear that digitised forms of value now occupied every area of life, with the result that the digital went from simply 'being *a* medium to being *the* medium'.[47] As a new ontological ground, it was now the digital, rather than the human, that would come to condition the aesthetic regime of post-Internet, which, for Stakemeier, is associated with the 'perceptive affinities arising from and dedicated to an infinite present tense'.[48] In this infinite present tense, time is detached from human faculties so that art becomes limited by its relationship to labour and its emergence as a commodity form. This analysis provides a powerful account of the prevalence of artists making work with, for, or about digital technologies and the emergence of terms such as post-Internet, since, Stakemeier argues, 'the aesthetic value of post-Internet is more appealing than its commodity form because the abstractions entailed in it are homological to financialised capitalism.'[49] By privileging the digital, post-Internet thus existed in a frictionless coherence with financialised capitalism and this accounted for its widespread appeal: post-Internet art was not simply about the current world order, but was made of it.

I think it would be difficult to read this assessment of how artworks that engage with the digital have a particular

mode of appeal built into them and not think about the aesthetic strategies at play in the two major case studies that I have considered in this essay. After all, a characteristic feature of both *Liquidity Inc.* and *Evian Disease* is their own 'gorgeous fluid ease', to use Marten's description of CGI: there is a smoothness to them which, in their use of high-resolution, high-definition imagery, seamless editing and exacting narration, reproduces something of the 'blasé terror that is addictive' in the digital image. In their mode of address, both *Liquidity Inc.* and *Evian Disease* exude a kind of slickness or polish that can feel uncomfortably close to the languages of spectacle that they are nevertheless also interrogating. Indeed, everyone and everything that appears within both *Liquidity Inc.* and *Evian Disease* seem to want to be like Evian in so far as they strive toward the condition of clarity, purity and fluidity through strategies of marketing, self-improvement and mediation. But this is also, to some degree, true of the artworks themselves and here, following Stakemeier, we might think about how the institutional success that these artists have enjoyed has been connected to their engagement with, and use of, digital media. In other words, there are strategies of absorption and assimilation at play, both within and beyond the image, and which have the potential to be felt as a sense of dis-ease in the viewer.

Conclusion

I want to conclude then with this affective register of dis-ease, and to use it to consider what the representation of water can tell us about our critical approaches to the relationship between technology and society in the twenty-first century. It is, I argue, precisely this sense of dis-ease that might be the most interesting thing to read into (or out of) these artworks since it is through the languages of absorption that we might come to reflect upon our own, individual forms of seduction by an often increasingly problematic technological infrastructure. After all, despite the difficult politics that frequently coalesce around digital technology, we are nevertheless continually drawn to its transformations in both art and life. This can be described as a kind of ambivalence toward these technologies and, as with Marten's own ambivalence about whether the digital image is 'flat', 'weightless' and 'dead' or 'rubbery' and 'osmotic', so is it thematized through the slippery metaphorics of water: at once free yet uncontrollable; seamless yet catastrophic; pure yet contaminating.

As a metaphorical and methodological schema, this slipperiness is essential to the production of meaning. As others have noted, particularly within the context of the 'blue humanities', water's varied metaphorical associations resist fixed interpretation. It has an unknowability whose politics are twofold: while Astrida Neimanis, for example, has suggested

that ‘a logic of unknowability […] has a capacity to safeguard infinity, and serve as a limit to mastery’, Melody Jue has argued that at its heart is an abstraction that serves as the prerequisite for the extension of empire, exploration and the logic of exchange.[50] Water, as Janine MacLeod has argued, possesses ‘a symbolic potency that can be engaged both to confirm and to challenge current systems of exploitation, domination and ecological devastation’.[51] Thus we might say that, like CGI, the very metaphorics of water has a ‘gorgeous fluid ease’ that smooths out the incommensurability of modern binaries.

This slipperiness is both a problem but is also a framework of possibility, and specifically so in two key arenas: firstly, in terms of *what* it can tell us about our relationship to technology; and secondly, in terms of *how*. As I have been suggesting, this slipperiness calls forth an affective register of dis-ease that signals an ambivalence about the function and status of these technologies that spread, albeit unevenly and differently, across much of the globe. However, such a slipperiness also reflects something fundamental to the understanding of digital technology’s social, political and environmental effects, and proposes the necessity of an instability in, and multiplicity of, approaches to it.

In both *Evian Disease* and *Liquidity Inc.*, as in many of the other artworks cited in this essay, the iconography and metaphorics of water, like the digital, are never simply one

thing. Rather, they hold in play the historical narratives of immateriality that have been attached to digital technologies of reproduction as well as to the material realities precipitated by the eco eco crisis. Water is suggestive of an ideology of the digital as immaterial and free, and associated with purity and neutrality, while at the same time it works to unravel that ideology through parallel associations with crisis, dirt and danger. We can read this as a proposition to better utilize concepts such as 'digital materiality' that have emerged in recent years to refer not only to a physical substance or substrate, such as the physical data carrier in which information is embedded, but simultaneously to how digital media *matter* in their metaphorical, political and social significance.[52]

As with many other artists who have been engaged in the project of representing, thematizing or questioning the Internet in the last decade, neither *Evian Disease* nor *Liquidity Inc.* offer straightforward critiques of digital technology or propositions for forms of resistance to it. But what they do offer, through the slippery metaphorics of water, is a critically useful diagnosis of dis-ease, as well as a methodology for recognizing and representing both the very tangible effects that information technology produces across the social, political and environmental realms, as well as the enduring power and utility of metaphors of abstraction for making sense of such effects.

Notes

I would like to thank my colleagues at the University of York and the anonymous readers at *Art History* for their comments on this article.

[1] Full animation can be watched at https://vimeo.com/52069944

[2] Jan Kedves, 'Interview with Helen Marten', *The Travel Almanac*, 11, Autumn-Winter 2016. Published online at https://www.travel-almanac.com/blogs/travel-log/helen-marten-turner-prize-winner-2016-tta11

[3] Maurizio Cattelan, 'Helen Marten: A Little Bit Naked', *Flash Art Online*, 283 March-April 2012. Published online at http://www.flashartonline.com/article/helen-marten/

[4] I have previously written about water in relation to contemporary art and digital culture in the following essay: 'Frames and Liquids: Rebottling the (Infinity) Net', in *Open_Office Anthology*, eds. Rozsa Farkas & Tom Clark, London, 2013, 198-209. It has also been the subject of Amy Sherlock's essay, 'Something in the Water', which was published online by *Frieze Magazine* in 2014.

[5] N. Katherine Hayles, *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature and Informatics*, Chicago, 1999, p.2.

[6] Norbert Wiener, *Cybernetics; or, Control and Communication in the Animal and the Machine*, Cambridge MA., 1948, p.132.

[7] This formulation of information as immaterial has informed, either directly or indirectly, the following key critical texts in the History of Art: Lucy Lippard (ed.), *Six Years: The Dematerialization of the Art Object from 1966 to 1972*, Berkeley and Losa Angeles, 1997; Jean-François Lyotard, *The Postmodern Condition: A Report on Knowledge*, translated by Geoff Bennington and Brian Massumi, Manchester, 1984; Maurizio Lazzarato, 'Immaterial Labor' in Paolo Virno and Michael Hardy (eds.) *Radical Thought in Italy: A Potential Politics*, Minnesota, 1996, 133-148.

[8] Hayles, p.xi. This imagery is particularly significant given that, along with cybernetic theory, Wiener is noted for his work on Brownian motion, which describes the random movement of particles in a fluid.

[9] On these two ways of thinking about media see John Durham Peters, *The Marvelous Clouds: Towards a Philosophy of Elemental Media*, Chicago, 2015.

[10] See Raymond Williams, *Television: Technology and Cultural Form*, Hanover NH., 1974/1992. The term is revisited in Sandra Barman 'Flow' entry in *Digital Keywords: A Vocabulary of Information Society and Culture*, ed. Benjamin Peters, Princeton, 2016, 118-131. For a discussion of ether as medium see Bruce Clarke & Linda Dalrymple Henderson (eds) *From Energy to Information: Representation in Science and Technology, Art, and Literature*, Stanford, CA., 2002; and Georges Canguilhem (trans. John Savage) 'The Living and it's Milieu', *Grey Room*, No.3, Spring 2001, 6-31.

[11] For more on this see Peters, *The Marvelous Clouds*, especially the chapter 'Of Cetaceans and Ships; Or, the Moorings of our Being', as well as Mette Bryld & Nina Lykke *Cosmodolphins: Feminist Culutral Studies of Technology, Animals and the Sacred*, New York, 2000.

[12] See, for example, Lev Manovich 'The Paradoxes of Digital Photography' in *The Photography Reader*, ed. Liz Wells, New York, 2003, 240–9; Wendy Hui Kyong Chun, 'Enduring Ephemeral, or the Future as a Memory', *Critical Enquiry*, 35: 1, 2008, 148-171; or Kim Cascone 'The Aesthetics of Failure: "Post-Digital" Tendencies in Contemporary Computer Music', *Computer Music Journal*, 24: 4, Winter 2000, 12-18.

[13] On the ocean as database see Grahame Weinbren 'Ocean, Database, Recut', in *Database Aesthetics: Art in the Age of Information Overflow*, ed. Victoria Vesna, Minneapolis, 2007, and, relatedly, on marine microbes as 'living data' see Stefan Helmreich, *Alien Ocean: Anthropological Voyages in Microbial Seas*, Los Angeles, 2009. On the historical construction of the ocean as something featureless, specifically within post-17th Century

cartographic practices, see Philip Steinberg, *The Social Construction of the Ocean*, Cambridge, 2001. Also relevant here, in the context of thinking through related metaphorics is Esther Leslie's *Liquid Crystals: The Science and Art of a Liquid Form*, London, 2016.

[14] The correlation between water and forms of digital abstraction has also served as a curatorial frame for exhibitions such as *The Fluidity Aspect*, held as part of the Todays Art festival in The Hague in 2014, or *Pool* (2014), held at Kestner Gesellschaft in Hannover in, interestingly enough, a former public baths. Similarly, the screening programme *An Oceanic Feeling* (2018), held at the Govett-Brewster Art Gallery in New Plymouth, New Zealand, offered a study of the oceanic within modern and contemporary cinema while MoMA's *Ocean of Images: New Photography 2015* sought to redefine photography in a post-Internet era.

[15] See James Salzman *Drinking Water*, New York, 2013.

[16] These themes were also at the heart of the exhibition *Safe to Drink*, held at Museum Kurhaus Kleve from November 2017 to January 2018 and featuring the work of Kate Cooper, Jenna Sutela and Juliette Bonneviot.

[17] For more recent work on the relevance of the image of the cloud in new media see also Peters, *The Marvelous Clouds*, especially the chapters 'Lights in the Firmament: Sky Media I (Chronos)' and 'The Times and the Seasons: Sky Media II (Kairos); David Joselit 'Dark Cloud: Shapes of Information' [keynote lecture], *Lunch Bytes Conference*, HKW Berlin, March 20th 2015; and Tung-Hui Hu, *A Prehistory of the Cloud*, Cambridge, M.A., 2015.

[18] On this see Hubert Damisch *A Theory of \Cloud\: Toward a History of Painting*, Stanford, CA., 2002; and T.J. Clark 'Modernism, Postmodernism and Steam', *October*, 100, Obsolescence, Spring, 2002, 154-174. On fluids and modernity see also Zygmunt Bauman *Liquid Modernity*, Cambridge, 2000.

[19] See chapter 'The Forming of the Interface' in Branden Hookway, *Interface*, Cambridge, MA., 2014.

[20] James Thomson, *Hydrostatics; or, Theoretical Mechanics Part II*, London, 1882.

[21] Hookway, *Interface*.

[22] For more on information as uncontrollable see Nick Levine, 'The Nature of the Glut: Information Overload in Postwar America' in *History of the Human Sciences*, 30: 1, 2017, 32-49.

[23] In this understanding of the interface, I follow something of Vilém Flusser's model of a 'significant surface', which Alexander Galloway has taken to mean a 'two-dimensional plane with meaning embedded in it or delivered through it.' In other words, an entity that is both material and metaphorical. Alexander R. Galloway, *The Interface Effect*, Cambridge, 2012, p.30.

[24] Gilles Deleuze, 'Postscript on the Societies of Control', *October*, 59, Winter 1992, 3-7. p.5.

[25] See Alexander R. Galloway, *Protocol: How Control Exists After Decentralisation*, Cambridge MA., 2004; Wendy Hui Kyong Chun, *Control and Freedom: Power and Paranoia in the Age of Fiber Optics*, Cambridge MA., 2005; and Seb Franklin, *Control: Digitality as Cultural Logic*, Cambridge MA., 2015.

[26] These ideas around the circulation of the digital image have been a central concern in Steyerl's writings. See for example the essays 'In Defense of the Poor Image' (2009), in which Steyerl argues against old oppositions of copy and original constructed around the high and the low and organized through the concept of 'aura', and 'Digital Debris: Spam and Scam' (2011).

[27] Christine M.E. Guth, *Hokusai's Great Wave: Biography of a Global Icon*, Honolulu, 2015.

[28] On watery language as naturalizing see Janine MacLeod, 'Water and the Material Imagination: Reading the Sea of Memory Against the Flows of Capital' in *Thinking with Water*, ed. Cecilia Chen et. al., Montreal, 2013, 40-60.

[29] David Joselit, *After Art*, Princeton, 2013. p.2.

[30] For discussion of some of these forms of restriction see, for example, Ronald Deibart et. al. (eds.) *Access Controlled: The Shaping of Power, Rights and Rule in Cyberspace*, Cambridge MA., 2010; or Margaret E. Roberts, *Censored: Distraction and Diversion Inside China's Great Firewall*, Princeton, 2018.

[31] Here I am working with the distinction between properties and qualities set out by Tim Ingold in the discussion article 'Materials against Materiality', *Archaeological Dialogues*, 14: 1, 2007, 1–16.

[32] Project statement available at: http://diannbauer.net/real-flow/

[33] *Beyond Liquidity* was also the title of a special issue of the *Journal of Cultural Economy* published in 2011. Developed out of a 2009 conference held at the University of Virginia, this special issue questioned the metaphorical models upon which thinking about money and finance relied. Another relevant project in this context is the exhibition *Liquid Autist*, held at what was then AKTNZ in Berlin in the autumn of 2013. This show not only proposed countering the flows of globalized finance with the withdrawal and dissociation of an autistic logic but argued that the metaphorics of liquidity were misplaced: 'The actual liquid asset (as it exists as an object within the the global financial system) does not look like a liquid at all', states the press release. 'Rather, it looks like an impossibly simple, self-contained unit within a system, both market and cultural, that assures its value to be universally understood as stable and regulated. […] The cube is the granular avatar of the global liquidity network — not a Getty image splash of mouthwash-colored fluid isolated on white.' Notably, it is the standardised unit of the shipping container that the exhibition cites as a model for this granularisation. Press release available at https://k-t-z.com/liquid-autist/

[34] See Paul Langley, *Liquidity Lost: The Governance of the Global Financial Crisis*, Oxford, 2014, especially chapter 3 'Liquidity'.

[35] See, for example, D'Maris Coffman 'How bitcoin resembles the South Sea Bubble', *New Statesman*, December 2017. Available at: https://www.newstatesman.com/politics/economy/2017/12/how-bitcoin-resembles-south-sea-bubble

[36] Chris Connery, "The Oceanic Feeling and the Regional Imaginary", in *Global/Local: Cultural Production and the Transnational Imaginary*, ed. Rob Wilson and Wimal Dissanayake, Durham, 1995, 284-311; Cesare Casarino, *Modernity at Sea: Melville, Marx, Conrad in Crisis*, Minneapolis, 2002; and MacLeod, 'Water and the Material Imagination'.

[37] Tom Cohen, 'Introduction' in *Telemorphosis: Theory in the Era of Climate Change, Vol.1*, ed. Tom Cohen, Ann Arbor, Michigan, 2012, 13-42. pp. 13-14.

[38] For example, Josh Kline's 2015 installation *Freedom*, at Modern Art Oxford, explored contemporary media landscapes in the context of questions of privacy. And Holly White has worked extensively across and with online platforms such as YouTube and OKCupid and has participated in projects such as *Net Narrative*, held at Carlos Ishikawa in London (2012).

[39] Examples of relevant works here include Trevor Paglen *NSA-Tapped Fiber Optic Cable Landing Site, Mastic Beach, New York* (2014), Yuri Pattison, *Colocation, Time, Displacement* (2014), Ingrid Burrington *Seeing Networks* (2015), Tyler Coburn, *I'm that Ange*l (2012–13), Leslie Kulesh *It's What's Inside that Counts* (2015), and Iain Ball *Neodymium (Energy Pangea)* (2011).

[40] For example, the new sociology of finance provides an interesting case study in the context of this article since it largely critiques the idea that the world of stocks, bonds and derivatives is comprised of disembodied and disembedded flows, focusing instead on the infrastructures and broader materialities that are the operational substrate of the markets. On money, materiality and abstraction see Bill Maurer, 'Does Money Matter? Abstraction and Substitution in Alternative Financial Forms' in *Materiality,*

ed. Daniel Miller, Durham, 2005, 140-164; Bill Maurer, Taylor C. Nelms & Lana Swartz, '"When perhaps the real problem is money itself!": the Practical Materiality of Bitcoin', *Social Semiotics*, 23: 2, 2013, 261-277; and Juan Pablo Pardo-Guerra, 'Trillions Out of Ones and Zeros: The Sociology of Finance Encounters the Digital Age' in *Digital Sociology: Critical Perspectives*, eds. K. Orton-Johnson, & N. Prior, Basingstoke, 2013, 125-138.

[41] Key texts include Quentin Meillasoux, *After Finitude: An Essay on the Necessity of Contingency*, London, 2009; Graham Harman, *Towards Speculative Realism: Essays and Lectures*, Ropley, Hants., 2010; Levi Bryant, Nick Srnicek, & Harman (eds.) *The Speculative Turn: Continental Materialism and Realism*, Melbourne, 2011. The distinctions between these new materialisms and those that emerge from feminist epistemology are foregrounded in texts such as R. Dolphijn, & I. van der Tuin, (eds.) *New Materialism: Interviews & Cartographies*, Ann Arbor, Michigan, 2012; and N. Katherine Hayles, 'Speculative Aesthetics and Object-Oriented Inquiry', *Speculations: A Journal of Speculative Realism*, V, 2014, 158-179.

[42] Here I am using the distinction between materials and materiality established by Tim Ingold in 'Materials Against Materiality'.

[43] See Richard Coyne *Technoromanticism: Digital Narrative, Holism and the Romance of the Real* (1999);Anna Munster, Materializing New Media (2006); and Matthew Fuller, Media Ecologies: Materialist Energies in Art and Technology (2005).

[44] Steyerl, for example, was included in the major exhibition *Art Post Internet* at UCCA Beijing in 2014, and Marten has discussed her association with the term in several interviews such as Alastair Sooke 'Helen Marten: the artist searching for menaing in bric-a-brac', *The Telegraph*, September 2016. Available at https://www.telegraph.co.uk/art/what-to-see/helen-marten-the-artist-searching-for-meaning-in-bric-a-brac/

[45] See, for example, Marianne van den Boomen et. al. (eds), *Digital Material: Tracing New Media in Everyday Life and Technology*, Amsterdam, 2009.

[46] On the relationship between crisis and capitalism see David Harvey, *The Enigma of Capital: And the Crises of Capitalism* (2011). Notably, Harvey's work on the centrality of crisis to capitalism is grounded in an argument about cycles of laminar and turbulent flow.

[47] Kerstin Stakemeier, [untitled talk] in 'Structures & Textures' panel discussion, *Lunch Bytes Conference*, HKW Berlin, March 21st 2015.

[48] Kerstin Stakemeier [untitled talk].

[49] Kerstin Stakemeier [untitled talk].

[50] Melody Jue 'Proteus and the Digital: Scalar Transformations of Seawater's Materiality in Ocean Animations' in *animation: an interdisciplinary journal*, 9: 2, 2014, 245-260. Astrida Neimanis, 'feminist subjectivity, watered', *Feminist Review*, 103, Water, 2013, 23-41. p. 32. Something of this unknowability can also be seen in Jeff Wall's 1989 text 'Photography and Liquid Intelligence', which set the wet/natural against the dry/technological.

[51] MacLeod, 'Water and the Material Imagination', p.40.

[52] For discussions of the term 'digital materiality' in different contexts see, for example, Ed Halter, 'The Matter of Electronics' in *Playlist: Playing Games, Music, Art*, ex.cat., Gijon, 2009; Paul Leonardi, 'Digital Materiality: How Artifacts without Matter, Matter', *First Monday*, 15: 6 – 7, June 2010. Available at http://firstmonday.org/article/view/3036/2567; van den Boomen et.al., *Digital Material*; and van den Boomen, *How Metaphors Matter in New Media*, Chicago, 2015. Wendy Chun has also spoken about this notion of *mattering* in *Updating to Remain the Same: Habitual New Media*, Cambridge MA., 2016.