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Representing the microscopic: new ecological thinking in art and science

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Abstract
An impressive range of competing and complementary visual renditions helps us understand the immaterial and the invisible by assigning a visual appearance to microscopic and submicroscopic substances. However, the sheer variety that dominates visualization of the microscopic suggests that a represented object may be so complex that it cannot be reflected by a single artefact. That is to say, it is not a monolithic given, a pristine entity or a "thing in itself" waiting to be dismembered and represented. I analyse mixed media installations by bioartists Tagny Duff and Elaine Whittaker, contending that their method constitutes a recent media art trend towards ecological (re)thinking. By examining specific arrangements of objects and artefacts and the scientific processes used to manipulate, prepare and make the microscopic visible and by placing them side by side in the same execution, these artists unveil new alternative economies of nature that may reshape the way we understand the microscopic.

Keywords
Ecology, microscopic, bioart, virology, epidemiology, affect

Representar lo microscópico: nuevo pensamiento ecológico sobre arte y ciencia

Resumen

Una variedad impresionante de representaciones visuales que compiten y se complementan nos ayuda a entender lo inmaterial y lo invisible, al asignar una apariencia visual a las sustancias microscópicas y submicroscópicas. No obstante, la gran variedad que domina la visualización de lo microscópico sugiere que el objeto representado manifiesta una complejidad que no puede resumirse a través de un solo artefacto. Es decir, que ni se trata de algo monolítico, de una entidad prístina, ni de la «cosa en sí», que está esperando que la desmiembren y representen. Analizo las instalaciones de medios mixtos (mixed media) creadas por bioartistas como Tagny Duff y Elaine Whittaker, y sostengo que el método que proponen constituye una tendencia reciente en la historia del arte multimedia vinculado al (re)planteamiento ecológico. Al examinar disposiciones específicas de objetos, artefactos y procesos científicos empleados para manipular, preparar y hacer visible lo microscópico, y al situarlas juntas en el mismo proyecto, estas artistas desvelan nuevas economías alternativas de la naturaleza que pueden modificar el modo en que entendemos lo microscópico.

Palabras clave

ecología, microscópico, bioarte, virología, epidemiología, afecto

Introduction

An impressive variety of visual renditions helps us comprehend the immaterial and the invisible. Electron microscopy images, two- and three-dimensional molecular models and scientific illustrations are just a few of the expressions that can assign a visual appearance to microscopic and submicroscopic substances. Following the traditional notion that "seeing is knowing", this variety represents the desire to conquer perceived immateriality by characterizing the microscopic. The technical image frames and quantifies an object that cannot be seen and so cannot be known, unless it is made visible using visual aids such as microscopes and ad hoc software. Barad (2007) suggests that this reflects a general assumption that representation merely mediates between the knower and the known, the observer and the observed, and also that the object depicted is nothing but the product of direct scrutiny using a high-resolution device.

However, the sheer variety that dominates the visualization of the microscopic betrays the above assumptions. This very variety, in fact, implies that the represented object can manifest a complexity that cannot be summed up by a single artefact. That is to say, it is not a monolithic given, a pristine entity, or a "thing in itself" waiting to be dismembered and represented. It is, rather, a puzzle: each piece stands for a different facet of the object, the different parts are entangled and mutually dependent, with each describing the object from a different angle. Tufte (1991) observes that various degrees of selection and reduction supersede all forms of visualizing and mapping because they help frame and highlight the specific details of the object that require attention depending on the circumstances. However, this method leaves us with a handful of fragments often interpreted as a whole. The question here is not whether it is possible to find new analysis, dissection and representation methods that will more precisely and effectively reproduce microscopic substances in their entirety and with all their inherent complexity, but whether arranging methods differently may alter the way in which we interpret objects.

Tagny Duff and Elaine Whittaker's extensive installations titled *Living Viral Tattoos* (2008) and *Ambient Plagues* (2013), respectively, put forward a series of strategies that effectively dismantle the current essentializing habits that radiate from visualizations and scientific illustrations. The works of both artists expose the limitations of visual and material renditions of microscopic substances like viruses and bacteria and invite us to look at these differently – as specific arrangements of objects, artefacts and processes used to manipulate, prepare and make the microscopic visible and placing them side by side in the same execution. In doing so, these bioartists reveal how microscopic and submicroscopic substances, by their nature, exceed the visual and structural constraints assigned to them by science and conventional aesthetics. Furthermore, they unveil the relationships existing between the different parts on display and show that these, in turn, are intertwined, affectively or materially, with the human and the natural world.

I contend that the method mastered by these two artists constitutes a recent media art trend towards ecological thinking. This new trend originates from an increasing number of interdisciplinary

artists engaging with topics pertaining to the sciences, with the resulting sociopolitical and affective impact. Two major concerns are articulated: first, the inability (even failure) of single visualizations or illustrations, as produced by science and disseminated to the general public, to communicate the complexity of certain phenomena that have a substantial impact on social order and cultural understanding and, second, the desire to convey aspects of scientific and popular phenomena that neither science nor the media seem to effectively grasp or address. This new ecological thinking provides the observer with a birds' eye view of phenomena that would otherwise remain beyond comprehension and that only represent just one of many facets characterizing a phenomenon.

The current definition of ecology was coined in 1866 by Haeckel, who described it as the "economy of nature". Sonya Plutinsky (2009) argues that "this economy includes our own species" (p. 3) too, so is not necessarily limited to the study of natural forces, but also comprises human-made artefacts and human-caused phenomena that participate in making and transforming a specific environment. Thus, while there is a great deal of debate in the environmental sciences regarding "the patterns of interactions of organisms with their environments" (p. 2), ecology can also designate the dynamics formed by objects, forces and artefacts within other human-generated worlds.

The recent stream of media and cultural studies – self-identified as "media ecology" – has provided valid instruments for assessing the significance of the items populating these worlds, studied and problematized within network culture and contextualized into the general social environment that engages with them. This literature has succeeded in unpacking many of the aspects pertaining to this culturally dense economy of objects. By pointing out the importance of the notion of ecology in the media as a dynamic system, not as "a study of media to sustain a relatively stable notion of human culture" (Fuller 2007, p. 3), Matthew Fuller reproduces the dynamism that constitutes the "messiness" of networks. His view, which stems from Guattari's (1995) notion of machine, indicates not only the machine as a subset of technology but also the parts including the rest of the elements involved in the construction of a particular discourse or system of objects. For Guattari "social groups are … machines, the body is a machine, there are scientific, theoretical and informational machines. The abstract machine passes through all these heterogeneous components but above all it heterogenizes them" (p. 39).

In this apparently chaotic overlapping of the "mental, social and natural" (p. 107), every component of the machine is dynamically integrated within the whole and, at the same time, is connected to each part of the whole. Not only can this interpretation of ecology be used to assess an existing machine phenomenon, it can also function as a blueprint to build a new one. By assembling a variety of media, a conglomerate of practices, a mix of ineffably ordinary (and not so ordinary) affects, Tagny Duff and Elaine Whittaker use ecological thinking to explore and expose new territories of the microscopic.

Although Duff and Whittaker approach their subject matter from different perspectives, in their mixed media works they both explore scientific processes and mechanisms for representing viruses and bacteria. They also explore the assumptions that use of these mechanisms tend to perpetuate when used as standalone images or as a single product resulting from a lengthy series of processes. Duff has explored the rather aleatory ontological existence of viruses (their virology), making them visible using biomarkers "tattooed" on human and pig tissue; Whittaker, meanwhile, has focused on the proliferation of viruses and bacteria in the form of epidemics among human and non-human populations and in their surreptitious intertwining with scientific data and popular culture (their epidemiology). In both cases, viruses and bacteria exit their traditional places – as scientific illustration or as linear trajectory in a geographical map – to play more dynamic roles. They are transforming entities rather than static images, they are "special guests" in a fragment of popular film rather than a blurred micrograph, they inhabit several sites and artefacts simultaneously – appearing in a map, in a drawing, in the form of a giant sculpture, as a bruise etc.

Distributed virology

Generally, visualization and scientific illustration manifest an in-vitro tendency to separate the substance being portrayed from the rest of the environment in which it is found in nature. That is, the scientist separates the substance of study from its milieu and moves it to a controlled environment, such as the lab, for its growth to be analysed in a petri dish or on a slide (Latour 1983). Normally viruses and bacteria are immersed in a complex network of relations, linkages and other organisms. However, once turned into illustrations, viruses and bacteria (formerly profoundly entangled substances), become inert matter whose connection to the external world does not exist or exists as pure mechanics (Bennett 2010). In addition, data retrieval processes, the art of display and shape refinement and sharpening all suggest that these substances may never be visible as unfiltered objects. Chemical preparation and manipulation, marking and highlighting and digitization always intervene to direct the eye of the observer towards specific details.

So, should we carry on thinking that lying behind the technological layers and lab procedures are entities that can be defined and constrained in their biological purity? Or should we rather rethink microscopic substances as dynamic and hybrid substances? Duff defines her lentivirus – the synthetic retrovirus with which she experimented for *Living Viral Tattoos* – as simultaneously "entity" and "movement", as both "material" and "dynamic" (Duff 2009). The

substance is inevitably entangled with the organic and the inorganic, the latter a legacy of the technologies and modes of representation used.

The artist reflects on the ambiguous nature of viruses. The virus, "as entity and event, straddles the threshold of living and undead. The virus is exemplary in that it proposes a complex threshold of liveness and exceeds it". Viruses are scientifically defined as "living" only when fused in cellular metabolism, it being impossible to visually capture them in their dormant or "undead" state. Yet viruses exist, even though they cannot be seen as simultaneously living and undead. In their undead state, they are virtual, as they exist liminally and only in terms of their potential activity. They simultaneously exist as objects when they are immortalized by means of visual markers and representations. Exploring the viral becomes a way to evoke all the forms in which viruses exist, whether as potentiality, as object or as movement.

Despite, by their very nature, escaping representation (as potentially non-living, submicroscopic, distributed substances), viruses are still portrayed as self-contained and isolated objects. Working with lentivirus, Duff (2009) explores "ideas of the viral through learning and applying biological synthetic viral vectors as both material and object of artistic creation" (p. 37). Duff used tissue culture protocols to produce "viral tattoos", transplanting viral host cells onto skin in vitro. Immunohistochemical staining (a process that causes a reaction of antibodies in skin cells stained with colour dyes) is used to inscribe the virus in the skin and make it visible. This procedure leads to the virus manifesting itself as bruises expanding across the skin. This is not, however, the type of refined visual materialization that we are used to admiring in journals. This procedure merely constitutes the culmination of the operation: although the presence of the virus is only recorded when made visible in the form of a bruise, it has been very present as an invisible and virtual or undefined substance since the beginning. The virus exists as invisible viral substance throughout the study of tissue culture, the purchase of the virus and its preparation. The final product – the bruised skin – is an objectified inscription of the virus. Thus, the documentation and the performance of the virus on the skin are complementary. The first is not secondary to the second, as the virus manifests itself through both practices: "Each practice is mutually reliant on the other to evoke a complex threshold of live encounters" (p. 38). Duff suggests that "the interrelation between performance and documentation can [itself] be seen as viral" (p. 39).

Living Viral Tattoos does not mean to "…to produce or prove a theory or hypothesis, let alone create a canon of artefacts and documentation" (p. 42). However, it does seek to expose the volatility of viral substances and to demonstrate the impossibility of embracing their full meaning and detecting their presence using a single image or individual product. In Duff's video documentary and in the tissue preserved and grown in sealed bottles, viruses take multiple forms and span across a temporal range that documents all the preparation, examination and visualization processes. A gallery exhibition or a lab performance alone would not succeed in gathering together such a complex agglomerate of actions, procedures and objects.

Image 1. *Living Viral Tattoos* (2008). Detail of bruise on tissue

Image 2. *Living Viral Tattoos* (2008). Detail of the installation

Affective epidemiologies

In examining scientific and medical images of the body from the 17th century, Barbara-Maria Stafford (1993) folds an early incarnation of affect into the notion of the unseen". The unseen can be interpreted simultaneously as what we do not and cannot see, thus unravelling an area that unsettles any scientific aspiration towards establishing clear or indisputable conclusions and a relative and generalized certainty. The unseen does not refer exclusively to the minuscule and the microscopic, the invisible and the incomprehensible, but derives from the absence of adequate technical instrumentation in that period. The diminutive material size of microscopic substances goes hand in hand with their unspeakable ephemerality and their silent effects on a population are as unpredictable as the emotional (potential or real) reactions of the individuals they affect.

The 17th-century iconographical tradition analysed by Stafford was keen to capture and transmit elements such as fear, pain, discomfort, insidious danger and terror. Only to a certain extent do these constitute subjective or aesthetic interpretations of the effects of disease on an individual. As an attempt to record and map a symptomatic course, they were, at that time, the only available observable evidence of the passage of a mysterious substance through the human body. These visual accounts were scientifically valuable in helping to diagnose and identify current and future similar diseases. In addition to their early scientific merits, these medical chronicles reproduced the practitioner's personal interpretation of the suffering of the patient, the distaste for the grotesque manifestations of the disease and the anxiety regarding a disease that could be potentially dangerous for the clinician and for other individuals. The obsessive attention to morbid details and the physical degradation caused by these diseases inspired compassion for, but also stigmatized, the patients, as if they were somehow responsible for their own ailments.

The illustrations, by focusing on bodily manifestations and by constructing the collective and medical narratives that helped understand various diseases, function as a primitive form of human epidemiology, the discipline that studies the incidence and the recurrence of given diseases in a population. Diseases are observed, their incidence is determined, they are classified according to their frequency and intensity over one or more samples of the population and lines of intervention and prevention are based on their potentials (Webb 2005). Scientific reports and geographical maps of epidemics tend to emphasize the statistical and objective aspects characterizing the course of an infectious disease based on past trends and recent dissemination rates. Mathematical models, statistics and surveillance methods are used to track down, map and control the course or emergence of an epidemic. Despite its relatively recent mathematical and technological turn and notwithstanding its claims to accuracy, epidemiology has not shed its affective qualities. The narratives and tropes that mostly accompany these data announce worst-case scenarios and substantiate the most damaging connotations. However, the narratives conjured up by the maps and data are "outbreak narratives": they do not allow room for alternative views and they do not accommodate the personal judgment, scepticism or anxiety of the epidemiologist (except indirectly) (Wald 2008).

Elaine Whittaker's mixed-media installation, *Ambient Plagues*, engages with the popular elements and symbols converging in the creation of the narratives of viruses and other infectious diseases but refuses to submit to the official messages of the epidemiologist and the univocally bleak and near-apocalyptical scenario supported by the media. By proposing and mixing objects from science and popular culture, she lays bare the resulting overlap and ambiguities – similar to 17th-century images and how they confused clinical, documentary and personal (doctor and patient) information.

The rich collection of objects included in *Ambient Plagues* symbolically and materially combines science and culture: symbolically, because the scientific study of viruses, bacteria and their epidemiological dissemination is heavily influenced by the memories and the stereotypes that have historically determined their cultural significance, and materially, because our scientific and cultural visual imaginaries of infectious diseases are literally juxtaposed, with microscopic visualizations and stills from movies on plagues and infectious outbreaks situated side by side or overlaid one on the other. The visitor to the installation is forced to constantly draw comparisons between these two areas and to reflect on the impressive resemblance between the images disseminated by the entertainment industry and the supposedly objective scientific images obtained through microscopes and other scientific display items such as test tubes and vials.

The combination of movie stills, scientific artefacts, laboratory objects and iconic images in the same space shows the extent to which aesthetics and narrative can follow parallel paths. For instance, movie stills and bacterial formations keep each other company as the latter are allowed to grow on top of the former inside petri dishes. The dish consolidates the connection between the two items in the same physical and cultural space, an operation that we, as observers, tend to realize almost instinctively: the strange recurrence of intersecting motifs, indistinct cinematic and popular memories and the sudden realization of our inability to identify and name the items guide us to collapse fiction and reality, popular references and the scientific object. Are those illuminated microbes real? To what degree are they manipulated? Are those stills truly from a movie or are they rather repertoire images from the news? Are those objects in the tiny containers carrying real biological samples and scientific specimens or are they impersonations? It is not until we look closer that we can make conjectures about their nature (movie? fiction? reality?) and origins (which movie? which particular microbe? which other organism?). Yet they remain conjectures. Whittaker, incidentally, titled this series "I caught it at the movies", a perfect title summoning up

Image 3. *Ambient Plagues* (2013). *I caught it at the movies.* Bacterial growth and film still detail.

Image 4. *Ambient Plagues* (2013). *The plague doctor.*

the very ambiguous distinction between reality and fiction, objectivity and personal experience, technical display and spectacle.

Admittedly, the above counter-narratives in no way substitute current official data analyses and reports circulating regarding viral pathogens. However, when examined in relation to technical reports and popular accounts, they help us decipher the politics of fear that emerge from official documents and so facilitate a more sophisticated reading, not just of their ambivalence, but also of the extent to which personal perspectives and emotional reactions can transform and, at the same time, diversify their significance.

Conclusion

The objects that Duff and Whittaker include in their installations suggest that our relationship with viruses and bacteria is not at all one-directional. These invisible guests travel, live and survive thanks to their proximity to other organisms and species and to how we interact with them. As a result, microorganisms and submicroscopic substances are inevitably part of who we are. Furthermore, they are not only responsible for diseases but also for generating memories and the personal and collective narratives that come with them. These themes inevitably shift our attention away from fear and anxiety regarding invisible infectious threats and from the desire to single out and isolate the microscopic as one and self-contained. While Duff reveals the intimate and symbiotic relationship between viruses and other organisms and their stunning dynamic ubiquity across media, Whittaker elicits a personal interpretation based on the coexistence of viruses, human beings and narrated objects. Through their ecological thinking and execution, Duff and Whittaker unveil alternative economies of nature, introducing audiences to a world that is no longer divided in two – between, on the one side, pathogens, and, on the other side, humans as inert and clueless victims. In their readings, viruses and bacteria are profoundly relational objects that shape and are, in turn, shaped by the personal and the collective, by a plethora of media and instruments and by mainstream and personal interpretations.

What these artists do is "explode" – into many fragments – a phenomenon that has been traditionally been contained in a single representation, with the combination not only showing us different alternative ecologies but also demystifying the monolithic and authoritarian ecologies disseminated today. This is not to confuse or to duplicate the object but to understand it better, to shed light on it and to correct inadequacies, misreadings and assumptions arising from a long-time sedimentation of customary scientific practice.

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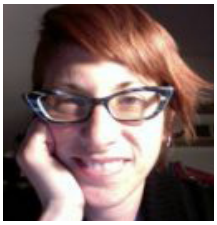

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