Beyond hot air: Anthropocene art and speculative practice

(unpublished manuscript)

Abstract:

In this paper I focus on creative and speculative practice mobilised in response to disturbing Anthropocene forecasts. I encounter and examine the work of artist Tomás Saraceno which explores elemental forces and spatial relationships, harnessing the potentials of atmosphere in response to impending social, political and energetic challenges. Decidedly experimental, his work moves beyond representation, being overtly performative and interactive, seeking to viscerally and affectively reorient and reconnect people through multiple relational dimensions. Commonly categorised as 'eco-art', I argue the work is better read through a speculative lens, by which it demonstrates 'polyarchic' capacities of creative experimentalism, provoking both imaginative and political possibilities for planetary dwelling and, indeed, being. While not without limitations, such work shows not only how speculative methods can be employed as catalyst for change, but can do so in highly generative ways.

Introduction

In this paper I am concerned with speculative practice enrolled in alternative projects of world making; projects seeking to inspire divergent responses to critical social, political and energetic challenges collectively faced. To do so I focus on the work of artist Tomás Saraceno which explores spatial relationships and elemental forces, harnessing potentials of atmosphere in response to the deep unsettlement of Anthropocene dwelling. Decidedly experimental, his work engages multiple relational sensitivities: material, energetic, social and political. Saraceno's art moves beyond representational expression, being overtly performative and interactive. Such work, I argue, demonstrates the 'polyarchic' capacities of creative experimentalism, opening up new potentials for practices of planetary dwelling and, indeed, being.

I start with an overview of Saraceno's artistic practice, introducing ideas which inform recent Anthropocene-related work. Relational sensitivity and attunement are essential, leading to outcomes as multi-layered collaborative performance of energies, materials, and imaginative potentials. I draw on my own experience of his aerosolar work, documenting a 'launching' event in Berlin, which provides insights into the work's visceral qualities. And, while the work proves to be both provocative and generative, I critique problematic attachments to technological solutionism, as well as to unrealistically composed and settled future conditions.

Navigating unsettled futures

My entry point into speculative practice comes both from a concern with current global social, political, and environmental disturbances, as well as a professional background as a social designer working on projects engaged with such issues.

The Anthropocene is a recently proposed designation argued to mark the onset of a new geological epoch wrought by human activity (Crutzen and Stoermer 2000, Crutzen 2002). Emerging from work in the earth and physical sciences, this idea is supported by evidence of disrupted biochemical cycles (carbon, nitrogen, phosphorous, etc), permanent changes to the distribution of living organisms as well as impacts on biodiversity, and material shifts and deposits registering in the stratigraphic record such as increased sedimentation, accumulation of synthetic materials such as plastics, trace elements, and nuclear residue – all resulting from anthropogenic activity.

Beyond material shifts, the Anthropocene unsettles key tenets of modern Western thought and established ideas of what it is to be human (Rose et al 2012, 3; Steffen et al 2011a, 862). Ideologically, the categorical human is unseated from having ascendency over 'nature', and pulled into a proximate and entangled relationship. Both materially and conceptually an Anthropocene world is one fundamentally different to that which has been assumed. It is a world both unfamiliar and unsettling, and one in which humans must reorient themselves and rethink how to live within planetary boundaries.

Modern narratives used to understand the world and steer future trajectories unravel under the Anthropocene. New narratives are needed (Davidson 2015, 302; Rickards 2015, 7; Scranton 2016, 19): accounts which express more appropriate relationships and pathways – through the past, the present, and the future (see Bonneuil 2015). While science is able say something about past and current

conditions, it less effectively deals with future concerns. Creative and speculative methods are better suited to this task (Bai et al 2016; Braun 2015). Speculative narratives can aid thinking through vast timeframes and unknowable futures, expanding the scope of response to novel and unfamiliar conditions, both politically and practically (Strauss 2015, 348).

The Anthropocene's disruptive constitution therefore invites responses that explore diverse approaches to grappling with planetary emergency (Palsson et al 2013; Lorimer 2016, 133), as well as subsequent 'unsettling' and 'weirdness' (Morton 2010, 2016) argued to permeate futures deviating from those expected. Speculating about plausible futures helps us to not only *think* about conditions that may arise, more viscerally we are invited to imagine what it might *feel* like to dwell in such futures. Speculation has long been the purview of science fiction writers, and emerging concern with environmental catastrophe has inspired a climate fiction (cli-fi) sub-genre, explored by prominent authors including Kim Stanley Robinson, Ian McEwan, Margaret Attwood, and Barbara Kingsolver.

Such disturbed conditions, along with a developing focus on speculative methods (see Wilke et al 2017; Moffat 2019) has led to speculative work also being explored by researchers concerned with planetary issues and the human-nature nexus. For example, geologist and convener of the Anthropocene Working Group, Jan Zalasiewicz (2008), takes a future-speculative approach in his book 'The Earth After Us', exploring scenarios of the legacies that humans might leave after their extinction. Prominent climate scientist James Hansen (2009) employs fictional scenarios in his book 'Storms of My Grandchildren' not just as a means to better illustrate the findings of climate change research but to evoke deep emotional response. Speculative methods have additionally been employed by social science and humanities scholars (see for example Negarestani 2008; Oreskes and Conway 2014; Szerszynski 2015), including a series of presentations at a recent IBG/RGS Conference that invited geographic work exploring 'future fossils' from the year 5000AD (Greenhough et al 2015). Other work has emerged within feminist and postcolonial scholarship: Swanson, Bubandt and Tsing (2015) invoke science fiction's ability as a provocative thought-experiment; while Haraway's (2016) Chthulucene emerges from an interest in "SF: science fiction, speculative fabulation, string figures, speculative feminism, science fact, so far" (Haraway 2011, np), dramatically rendered to evoke a sense of monstrous dread.

The constitution of future worlds has long been a concern with creative disciplines. Recent work in art (Davis and Turpin 2015), architecture (Turpin 2014), and design (Dunne and Raby 2013; Anderson 2015) explores future, post-human, and Anthropocene reverberations. Creative methods bring with them a provocative capacity which exceeds the imaginative limitations of scientifically-impelled visions, given attachments to factually-based renderings. Creative practice, Davis and Turpin (2015, 4) argue, offers alternative modes with which to conceptualise and sense the Anthropocene; pathways of 'polyarchic' experimentation able to generate unconventional responses for living within this new era.

In this paper I am concerned with what speculation can offer us, not just as an intellectual exercise but as a practice of opening up possibilities at a moment when those familiar future-pointing pathways appear to lead to deeply troubling destinations.

Becoming Aerosolar

Saraceno's art is difficult to categorise, drifting across disciplinary boundaries. Although called an 'eco-artist' (Obrist 2010, 4) – given his work draws on ecological-environmental themes – such a label is limiting. Spatial connectedness is an unmistakable concern, but projects grapple with more than just ecological issues. Architectural training informs Saraceno's interest in how space is used and how relationships are formed through spatial experiences. Such ideas are explored within structural forms and through novel relationships. His work with spiders, for example, investigates structural qualities produced through web building, ideas expanded to the human scale in his work '14 Billions (working title)' (Figure 1). Other projects take the form of large-scale installations, such as 'On Space-Time Foam' (Figure 2) and 'In Orbit' (Figure 3), where structural membranes form suspended openings, allowing people to become aware of their own spatial relationships, as well as experiencing a 'radical togetherness' with others (Engelmann et al 2015, 68).

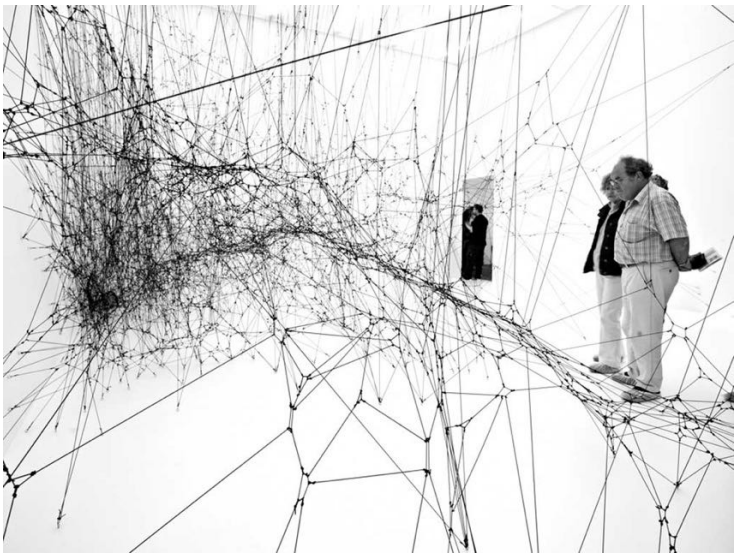

Figure 1: 14 Billions (working title), 2010. A large-scale installation depicting a Black Widow spider's web at a scale of 1:17. The sculpture is composed of 8,000 black strings connected by over 23,000 individually tied knots spanning 400 cubic meters. (Source: Studio Tomás Saraceno.)

Figure 2: On Space Time Foam, 2012. Based on a cube, the geometric form often used by scientists to represent the concepts of space and time, visitors' movements in the installation enact the time variable, thereby introducing the concept of the fourth dimension within the three-dimensional space. (Source: Studio Tomás Saraceno.)

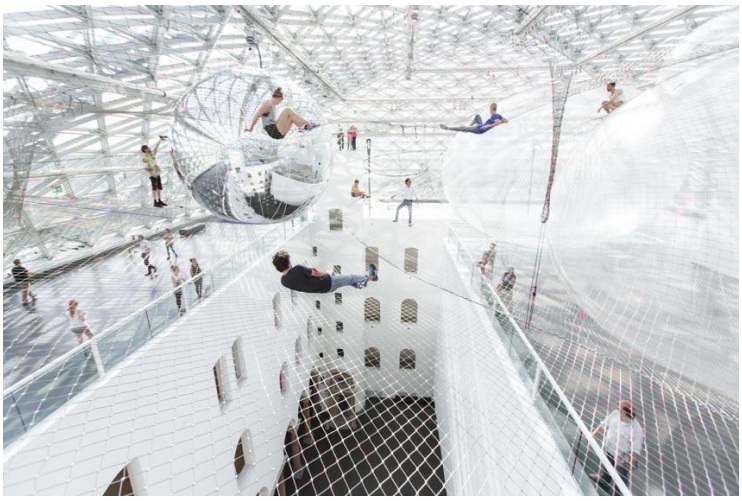

Figure 3: In Orbit, 2013. Layers of safety nets installed at a height of 20 metres. Inspired by network relationships, neural pathways, and synchronous communication, the work is designed to allow visitors to experience these phenomena as a physical geography. (Source: Studio Tomás Saraceno.)

Saraceno's more recent work, employing what he calls 'aerosolar' potentials, takes concern with connectedness to another level, investigating ways of both sensing and collaborating with elemental forces. The work explores technologies able to harness the power and capacities found within air and space: kites, balloons, kitoons (hybrid kite balloons), and tensegrity structures (forms made of floating compression elements). An aerosolar sculpture is a structure able to become airborne, using only air and solar potential (see Figure 4). The buoyancy produced by a thin membrane enveloping air and warmed by the sun provides an understated potential. Apart from providing lift it opens up possibilities for reconsidering relationships with the world: relationships to others, to space, and to power.

At the outset, becoming aerosolar is about "the engineering of a certain affective capacity: the capacity to be affected by the elemental; about the coming into being of responsiveness to the circumstantial variation of an elemental medium" (Engelmann et al 2015, 73). To engage with aerosolar technology requires one to be cognisant of, and sensitive to, raw elemental qualities. At its most basic these are physical properties: of materials, and of structural and thermal dynamics.

Figure 4: Aerosolar sculpture. (Source: Studio Tomás Saraceno.)

'Affective capacity' is an attunement to circumstance, a theme explored by philosopher Michel Serres (2008). For Serres, attunement is the gathering together of the local, in ways formed and shaped responsively by – and to – the contingent set of variations from which it emerges. Affective capacity involves being responsive and being shaped by the environment, and the qualities and potentialities that they afford (Instone 2015). Following such ideas, becoming aerosolar is an attunement which avoids forcing, being forceful, or 'in control'; rather, it is an approach of working *with* qualities and circumstances presented, and of being accommodating towards these. To become aerosolar, therefore, requires letting go of the desire to control.

Additionally, being aerosolar is an orientation foregrounding a blended relationship of elemental properties: material, dynamic, associational. Aerosolar potential draws on the generative power of the solar – a force on which all life on the planet is beholden – as a capacity with elemental, earthly potential:

> [Becoming aerosolar] reminds us that the refrain of the wind emerges from the relation between solar and earthly milieus, between radiation, rotation, gravity, and fluid dynamics. At the same time, as a concept that favours a mode of emergent organisation defined by the movement between clustering and dispersal, scattering and gathering, the refrain of becoming aerosolar is a call of sorts: a call for new forms of associative elementalism, an invitation for us to imagine and invent forms of novel togetherness. (Engelmann et al 2015, 65)

Air, atmosphere, and energy are properties indelibly attached to current planetary concerns, entangled within anthropogenic environmental impacts such as air pollution and climate change. These are issues that Saraceno's elementally aligned aerosolar experiments are effectively attuned to explore. Artistic experimentation expands the kinds of sensibilities able to be drawn into conversation with environmental, as well as Anthropocene, politics. Creative and unconventional responses open up the potential for new kinds of relationships, not just between elemental agencies and technology, but through novel spatial relationships and political arrangements. Saraceno explores such potential through a series of projects under the name 'Aerocene'.

Aerocene trajectories

Aerocene takes many different forms, and is realised as more than a just an artistic project. Saraceno defines Aerocene as:

> …a multi-disciplinary project that foregrounds the artistic and scientific exploration of environmental issues. In the wake of the Anthropocene, the project promotes common links between social, mental, and environmental ecologies. Inflated only by air, lifted only by the sun, carried only by the wind, towards a sustainable future. (Saraceno 2017, np)

The project has a catalytic simplicity: elemental constituents regulated by basic thermodynamic laws. The uncomplicated combination of a holding membrane, air and sunlight, with its potential to create lift, opens diverse possibilities. Aerosolar ideas provide the means for the inhabitation of other-dimensional space, opening up potential for exploring new socio-political configurations. The ability to reclaim and occupy atmospheric space is, from an ecological standpoint, a counterproposal against planetary geoengineering schemes, focusing technocratic fixes to anthropogenic climate forcing – such as through the release of chemicals, micro particles or other technological interventions.

The fundamentals of aerosolar technology is not new. The use of solar can be traced back many thousands of years to the Egyptians and Greeks, with current focus largely on conversion of solar potential into electric charge. However, 'passive' use of the aero-solar energy relationship was first explored by the French National Space Agency (Centre national des études spatiales – CNES) for balloon-powered flight in the 1970s. InfraRed Montgolfiere (MIR) was a balloon technology developed for autonomous meteorological research (Letrenne et al 1999). A balloon with instrumentation was able to maintain an altitude of between 18km and 32km flying day and night. The balloons could remain aloft for many weeks on end, being steered by high-altitude currents, with the only limitation being aviation laws.

Aerosolar technology unsettles the technological associations that have come to dominate modern life, and a reliance on petrochemical power. Aerosolar provides an alternative means of propulsion that removes Saraceno's Aerocene devices from the grip of the petrochemical industry, both physically and politically. Aerosolar is more than just a technological gimmick, it is a configuration which provokes a rethinking of relational engagements with energy, elemental forces, space and each other. Aerocene's areosolar potential allows us to:

> …imagine a metabolic and thermodynamic transformation of human societies' relation with both the Earth and the Sun. It is an invitation to think of new ways to move and sense the circulation of energy. And, it is a scalable process to re-pattern atmospheric dwelling and politics through an open-source ecology of practices, models, data—and a sensitivity to the more-than-human world. (Saraceno et al 2015, 59)

Aerocene projects explore many configurations. Museo Aero Solar is one project which mobilises aerosolar ideas as public art (see Figure 5). Taking the form of a large sculpture, the skin is constructed completely from used plastic bags. The project has been circulated around different countries and groups are invited to contribute to the sculpture, each adding to the skin with their own collected plastic bags. Museo Aero Solar is therefore a collectively assembled artefact and an archive of poignant Anthropocene objects. Each addition alters the sculpture in texture and size, but also through collective narrative, expanding the constitutive stories of the object.

Figure 5: Museo Aero Solar launching. (Source: Studio Tomás Saraceno.)

Beyond the material outcome, the Museo performs as a collective experience of experimenting and making: a process which galvanises local inventiveness, bringing this into a conversation with others globally. Additionally, the collective action of making brings people together, inviting them to engage with Aerocene project ideas. Through the Museo people become actively involved in the artwork rather than being simply observers. They bring their own stories which then mingle with the larger collective narrative. Through this process participants and their personal stories are affected and altered, allowing new performances to emerge in the world.

At the end of each new addition to the Museo it is launched. The launch becomes an intimate performance between the elemental, the atmospheric, the self – and the social. More than just public or community art, the experiment functions as a global collective, and proof of how technology can be collaboratively assembled. The project is intended not to be confined as an 'artwork' or be categorically limited:

> [Neither] a brand, [nor] a copy-righted artwork […] neither a flying sculpture, nor a symbol or an aesthetization of some good, politically correct eco-sustainable practice", Museo Aero Solar is firstly a community. (Chabard 2015, np)

The labour involved in the Museo's assembly is distributed globally, across international and political borders, but is simultaneously collaborative. The collaborative form of the project is realised beyond the physical configuration of the sculpture, extending through online networks and platforms: a blog, website, social media groups, hashtags and shared cloud services. The 'shape' of the project can therefore be understood as more than just a single object: the sculpture acts as a focal point for the many relational lines enmeshed through the work.

The Aerocene project navigates an iterative pathway ultimately towards reconfiguring the ways in which humans collectively dwell (see Figure 6). After proving the practical application of aerosolar technology the plan follows multiple exploratory phases, each increasing in ambition. The first stage experiments with payloads, and sensing instruments such as cameras have already been successfully tested (Figure 7), as have human payloads (Figure 8). Controlled solar-powered human flight stands as the next challenge. Atmospheric habitation is the ultimate goal: development of aerosolar platforms that break

free of terrestrial entanglements, harnessing the currently untapped potential of air-space for longer-term residency (Figure 9).

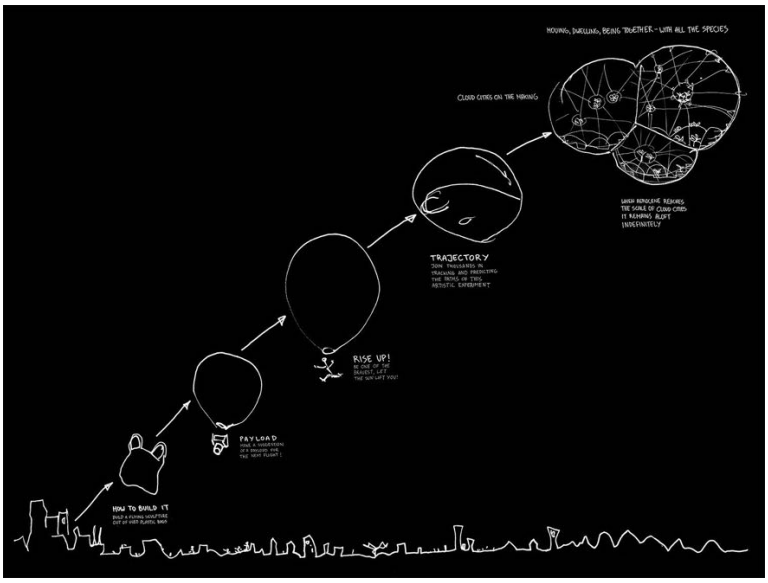

Figure 6: Map of Aerocene trajectories showing the progression from aerosolar experimentation towards the potential of atmospheric dwelling. (Source: Studio Tomás Saraceno.)

Figure 7: Becoming Aerosolar. Free Flight, 2015. (Source: Studio Tomás Saraceno.)

Figure 8: Aerocene launch with human payload at White Sands Dunes, 2015. (Source: Studio Tomás Saraceno.)

Figure 9: Rendering of Aerocene habitation. (Source: Studio Tomás Saraceno.)

The challenge of atmospheric dwelling is one informed by Saraceno's previous experimental work with networked spatial structures. Additional stimulus for the design of platforms allowing different configurations of living and community comes through lines of radical politics. Aerocene dwelling draws on a lineage of spatial experimentation exploring political autonomous communal forms. Temporary Autonomous Zones (TAZ) (later expanded to Permanent Autonomous Zones (PAZ)) are spaces designed to escape formal structures of control (see Bey 1991; Bey 1994). PAZs can take different forms: a commune with its own distinct organisation and social rules; the occupation of a site, such as to protest or block development; a festival site which temporarily reconfigures space and social rules, such as the Burning Man event; online spaces and virtual worlds in which people can congregate and interact.

Aerocene aims have an air of off-beat boldness somewhat reflective of aviation's own rebellious tradition (see Anderson 2004). Early balloonists and aviators were viewed at best as adventurous and

worst as oddball: innovators willing to experiment in radical ways to explore possibilities of the then-unimaginable idea of human flight. Saraceno's work has a similar character but different political, technological and relational concerns propel it in revolutionary directions.

Launch potential

An Aerocene encounter helps to flesh out appreciation of aerosolar performance. Such an opportunity arose during the Anthropocene Campus I attended held at Haus der Kulturen der Welt (House of the World's Cultures) in Berlin during 2016, and at which Saraceno was an invited practitioner.

The invitation to the aerosolar launch was given with a proviso: it was very much dependent on the weather. We would have to check our emails late in the evening for confirmation, and then again in the morning before sunrise. If conditions were clear, we would need to collectively organise and navigate the Berlin underground system to find the launch location south of the city.

Only a small group of the 50-or-so session participants appear at the designated hotel lobby – the cold, early-morning start appears too much of a deterrent for some. Leaving the warmth of the lobby we walk to the nearest underground train station and navigate our way on different route lines. I have no directional sense of where we are headed, only that the launch site is a large park to the south of Berlin. As we travel conversations begin. Only later do I realise that such sociality is an integral component of the event's affective atmosphere.

The sun has risen when we finally arrive at the venue. Tempelhofer Feld is a large recreational park in the borough of Tempelhof-Schöneberg in south-central Berlin. Now retired it served as an airport from 1923 until its closure in 2008. Proposed plans for development were halted after protests, and the space was reallocated for recreation. Large and flat it is the perfect location for the morning's activity. Runways are still in place, as is some of the infrastructure such as aerial navigation lighting and raised observation towers (see Figure 10).

Figure 10: Panoramic view of the launch site, Tempelhofer Feld, Berlin. (Source: author.)

We see members of Saraceno's studio also arriving carrying equipment. As both groups meet and mingle a flask of coffee and large bag of freshly cooked donuts appears and is passed around. Such offerings supplement the sense of sociality and hospitality. Throughout the morning other people show up to watch and chat: friends of Studio Saraceno it seems.

Figure 11: Tomas Saraceno prepares one of the sculptures for inflation. (Source: Aerocene launch group collective photo pool.)

Saraceno and his team unpack equipment from large duffel bags: large nylon membranes, ropes, small boxes of tools, tape, an electric fan and a car battery, and other paraphernalia. Conversations focus on the weather. The morning conditions are perfect. Surprisingly, the rain of the last few days has cleared, and the sky is cloudless. Just after sunrise the air is completely still; though this will change as the sun gradually warms the land creating a thermal differential.

Saraceno and his team begin the work of preparing two Aerosolar sculptures for flight (Figure 11). These are made from nylon fabric sewn together into large round-edged triangular bipyramid shapes with sides approximately three meters long, with a vent at one corner. Filling the membranes with air can be achieved quite simply by someone holding open the vent and running, forcing air in, and a group from Saraceno's team does just that. Once inflated the sculptures are positioned on the runway where they sit, waiting for the sun's heat to warm them. They look otherworldly in this urban landscape (Figure 12) and, as the surrounding air begins to warm the sculptures stir, moving gently in the early-morning breeze.

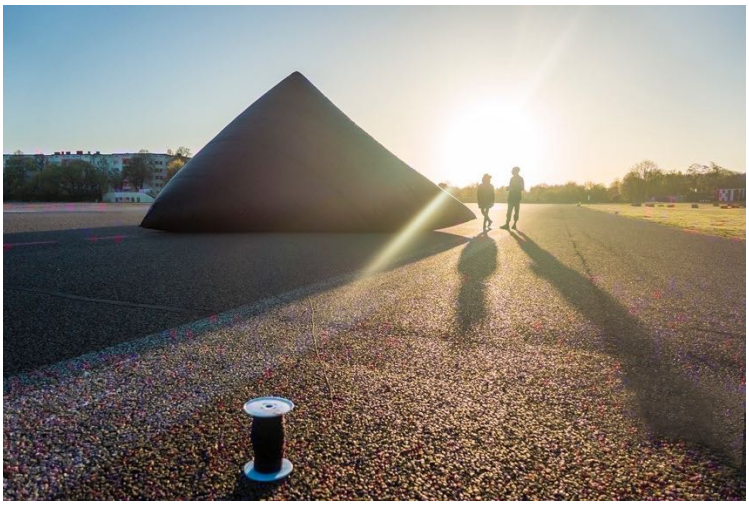

Figure 12: Members of the launch group wait and talk beside one the sculptures. (Source: author.)

It will take another hour before the sculptures are ready to take flight. Those of us invited to the event continue conversations, but for those attending to the devices there is still work to be done. I watch the continued attention required to nurture the sculptures to life: the process is highly tactile. There is much touching, stroking, and prodding, providing feedback on qualities such as temperature and pressure. At one point I see a fan and car battery used to help circulate air (Figure 13). Such technology, with its relationship to elemental forces and sensitivity to conditions, calls for a disposition that is both empathetic and nurturing, and an ongoing attentiveness to changing states.

Figure 13: A member of Saraceno's team tends to a sculpture as it is readied for launch. (Source: author.)

Such attunement to elements and conditions reminds me of my own experience surfing, which requires close attention to weather patterns and local conditions, including temperature, swell, sandbar states, water currents and rips. And it is also best undertaken during the early-morning liminal period when conditions are calmest. The impact of such attentiveness has two outcomes. First, is an ongoing

attunement to elemental conditions; an enhanced awareness of environmental circumstances: weather in relation to season, also geography, and how different elemental states influence activity. Second, is the need for patience and timing. One must wait for suitable conditions – and there is no guarantee they will occur when you want.

At around the one-hour mark there are signs of launch-readiness. The sculptures are visibly buoyant with edges lifting sluggishly from the ground and descending just as slowly. However, just as launch potential seems near, I notice additional movement on the runway. A park security guard has noticed the unusual activity. He drives his vehicle down the runway and parks in front of one of the sculptures. The timing is unfortunate. The guard exits his car and Saraceno, along with members of his team, approach him to talk.

The discussion continues for some 15 minutes, and involves much pointing and gesticulation. Eventually Saraceno returns and informs the group that discussions did not go well, and security has ordered the sculptures to be deflated and removed from the field. The problem, it appears, is the lack of a permit for the activity – although it is unclear how one could be procured for this unique event. I am told this is 'very German', and just an excuse to shut down unanticipated activity. The irony is not lost on us: on a site used as an airfield for almost 100 years, the launching of aerial objects is regarded as irregular – more so, because kites, model aeroplanes, and drones are still flown here. Saraceno and his team are not happy but agree to comply.

Of course, the guard is not familiar with the operation of such novel contraptions. Taking advantage of his ignorance, Saraceno has suggested that deflation will take some time, meaning the sculptures can be left to continue their preparation. As the guard looks on from a distance, unsure of what is going on, the black sculpture that was threatening to rise finally leaves the ground (Figure 14). It sluggishly ascends and is held in place by a tether just a few meters above the runway. The launch is small one, but a mini victory. We share furtive glances, quietly celebrating the poignant moment of aerosolar potential.

Figure 14: Tomas Saraceno holds the tether as one of the sculptures lifts off the ground. (Source: author.)

The sculpture hovers unsteadily in the air for a short while. Although it is still early morning there are now many more people in the park: running, walking dogs, some cycling to work. The sight of an unusual floating black object attracts a good deal of attention. The waiting guard, however, has keyed in to the ruse and issues another order for the sculptures to be deflated and removed. Relenting, Saraceno's team begin the process. Opening the corner vent, the warmed internal air escapes. The sculpture loses its lift and slumps to the ground, its shape slowly deforming as internal pressure is lost. A group of us surround the sculpture to witness its demise. I take the opportunity to put my head inside. The inside air is noticeably warmer than outside – similar to that inside a car on a hot summer's day. From within, the black nylon fabric appears translucent against the sky, and I can see the shadows of those surrounding the balloon. Holding the membrane, people begin compressing and folding it, expelling the warm air. Very soon the sculpture has been transformed back into a pile of loose fabric on the ground.

Beyond hot air

Discussing the Aerocene project Saraceno provocatively propounded aerosolar flight as an alternative to modern jet-fuelled travel: 'Aerosolar Airlines' – the airline for the Anthropocene (Saraceno 2016). The suggestion was at least half-serious and, exploring the potential, Saraceno has developed a 'flight planning' tool in which point-to-point journeys can be mapped. The tool uses data of tropospheric jet stream currents to trace delivery vectors for aerosolar airships. Where one can 'fly' to, however, remains limited by the bounds of atmospheric currents and by seasonality – air currents change orientation and vary in intensity. A trip from New York to Paris is theoretically possible, although could take many days, and may not terminate exactly where intended (see Figure 15).

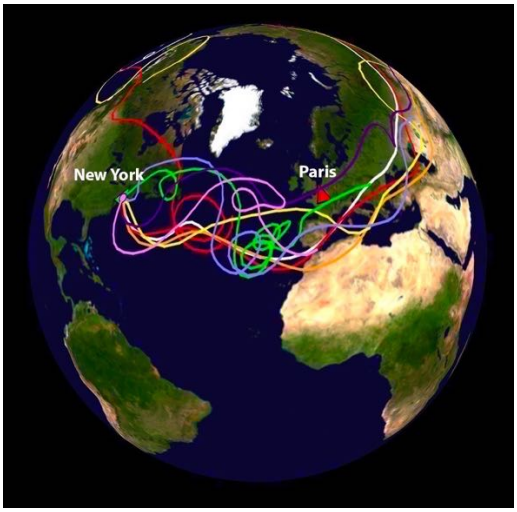

Figure 15: A map showing flight pathways from New York to Paris calculated by the online Aerocene flight planner tool. The coloured lines indicate flight paths over a seven-day period based on projected weather patterns. In the flight projection none of the trajectories manage to deliver the flight directly to the destination, with the closet landing in the south of Spain. (Source: Studio Tomás Saraceno.)

Such a provocation disrupts common notions of travel: the uncertainty of factors, such as sun, weather, and wind direction make the prospect of point-to-point flight highly uncertain and far less accurate than that to which we are accustomed. Travel journeys would become almost impossible to accurately determine. 'Destination' might be better defined statistically, suggesting a range of probabilistic outcomes. But it is entirely feasible, and such potential prompts us to grapple with radical possibilities for ways in which human activities could be rewritten.

Additionally, aerosolar technology has been explored in more down-to-earth ways which demonstrate the project's broader potential. The development of a social network around the project has been one outcome. An Aerocene community has formed, both online and off, and acts as a self-organising collective, where diverse lines of interest meet, mingle, and allow new possibilities to develop. One practical outcome has been the development of an easy-to-transport, configurable aerosolar 'balloon', which emerged from collaborative work undertaken with the International Red Cross and Red Crescent humanitarian agency (see Suarez 2015). The simplicity and cost-effectiveness of aerosolar technology provided an effective solution to developing a lighter-than-air mechanism to survey areas impacted by natural disaster. A simple aerosolar kit was collaboratively developed using open-source design – as well as employing other open-source technologies. The self-contained, portable kit is designed to be able to deploy a camera, or other environmental sensors, within an impact zone.

The Red Cross project further suggested that a generic version of a self-contained aerosolar kit might be useful for more general application, and an 'Aerocene Explorer' kit was recently developed. Drawing on strategies from open-source communities, participants were invited to engage in Do-It-Together (DIT) techniques, and to share results through the Aerocene online platform, to: "change how people see the world in environmental, social, and political terms" (Saraceno 2017 np). Build instructions have been made available on the Aerocene website, which detail materials required and steps to construct a tethered-flight balloon (see Figure 16). The Aerocene Explorer kit:

> enables anyone to personally launch their own Aerocene solar sculpture and start exploring the skies. A tactile and engaging way to experience the Aerocene, the Explorer allows participants to take aerial photographs and videos and to collect atmospheric data using non-intrusive, emissions-free scientific exploration tools that measure air quality, temperature, humidity, and pressure. (Saraceno 2017 np)

This emergent arm of the Aerocene project remains clearly in line with the associated politics and sociality. The kit provides a simple mechanism for people to directly engage with ideas but, importantly, allows them to engage and undertake their own experiments, which can be shared through the website, contributing to the wider project.

Such practical outcomes are small in scale to the project's loftier ambitions, but show the utility of not just the technology, but the efficacy of inviting others into unconventional and speculative projects of world-making.

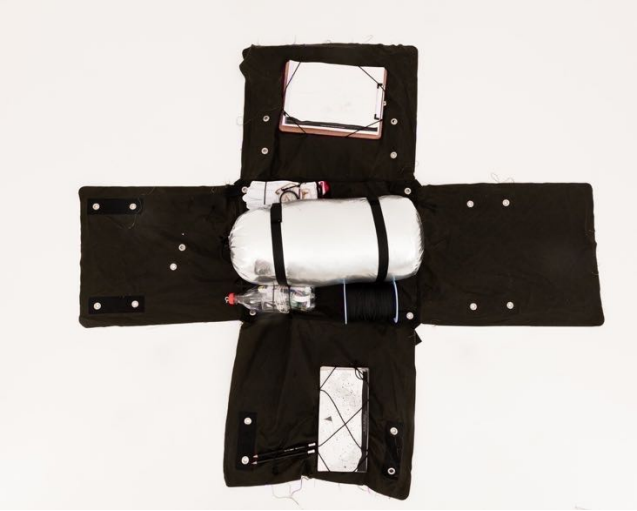

Figure 16: Aerocene Explorer kit. (Source: Studio Thomas Saraceno)

Navigating/riding turbulence

Before moving to conclude, I apply a critique of Aerocene activity, examining some of the project's limitations. First is the project's enrolment of romantic lighter-than-air imaginaries. The prospect of human flight has longstanding spiritual and otherworldly attachments, even before powered flight became a reality. For many cultures the sky has historically been seen as a heavenly realm inhabited by gods and supernatural beings. The advent of powered flight in the early twentieth century was viewed by many as a 'miracle', and large numbers in the West were convinced it would transform modern life, ushering an 'air age' bringing greater prosperity, cultural 'uplift', and eventually social harmony and peace (Corn 2002, xiv). Of course, matters have played out quite differently.

Aerocene's lighter-than-air renderings and experiments remain idealistically attached to the possibilities of humans dwelling in a settled way within ethereal space above. Doing so relies very heavily on optimistic readings of human nature and political organisation: relying on our shared ability to collectively self-organise and cooperate. While I would like to align with such reassuring ideas (see for example, Rushkoff 2002) I find it difficult to accept upbeat techno-utopian attachments, and remain unconvinced that the spatio-political frictions we have on the ground will not simply follow us into, and be replicated in, the skies.

Such open occupation of airspace would appear, also, to bring with it political and economic discord. With current heightened concerns of state border security, I imagine the Aerocene would be taken as a deeply disruptive, revolutionary assault on existing terrestrially drawn political state boundaries. Similarly, the potentials of aerosolar aviation threaten existing commercial aerospace activity and the significant investments made by those in aviation and air-travel industries. This is not to say that revolutionary organisation could not – or should not – take place; history is littered with revolutionary political events which are now invariably accepted as key moments in the formation of the modern world, including the French and American Revolutions (see Fehér 1990, and Gould and Onuf 2009 respectively). The Aerocene as 'revolution' would, consequentially, transcend geopolitical borders: it

would be at once a global – and potentially globalising – uprising. But it is uncertain how the PAZ structure scales. It may be effective at small sizes but is untested at a global level.

Additionally, the socio-political potential embedded within Aerocene projects may not have the same sustaining energy as does aerosolar technology itself, given its vision of the future is by no means clear – or indeed practically attainable. Compared with, for example, the recent Occupy movement which sought to reshape social and economic justness but is criticised for not having any significant lasting impact due to a lack fo clear vision (Kreiss and Tufekci 2013; White 2017), Aercoene's ethereal projections may be too diffuse to generate lasting change.

Finally, a more fundamental concern arises in how Aerocene pathways fail to confront increasingly unsettled and turbulent planetary conditions forecast. Variations in upper-atmosphere water vapour and cloud coverage, as well as large-scale atmospheric circulation adjustments, are forecast to lead to increased air turbulence (Williams 2007) and result in more intense tropical cyclone activity (Trenberth et al 2007). However, visualisations, by default, reinsert humans into amiable conditions: clear and calm blue skies. Saraceno's architectural attachments here work against him. The style reminds me of optimistic architectural renderings of large-scale building projects showing idealised conditions and disregarding those problematic real-world frictions that are destined to emerge: weeds, graffiti, material deterioration, and other messy complications. By this measure the Aerocene starts to look more like a lighter-than-air Holocene designed by property developers and award-winning architects, and smacking more of neo-colonialism than eco-social uprising.

Such imagery also paints the Anthropocene not so much as an unsettled future but rather as an attractive destination. And, while we will need to find ways of living in, living though, and enduring conditions of the Anthropocene, I'm reminded of Anna Tsing's astute warning that the era will be one that humans need to move through as quickly as possible (Tsing 2015, np): the resulting disruptive and challenging conditions will not be ones in which we will want to linger. The effortless and dreamy qualities emerging from Aerocene renderings fail to address both the chaotic turbulence that will increasingly inscribe the planet, as well the speed that we need to collectively move with in response.

Speculative currents

Saraceno's aerosolar and Aerocene work provide an illuminating case of provocative speculative practice. Responding to concerns of systemic planetary disturbance, projects explore novel pathways enrolling multi-layered collaborative performances of energies, materials, relationships, and imaginative potentials.

While Aerocene work has the appearance of being manifestly utopian – self-organising and self-propelled floating cloud cities sketch a fantastically radical eco-friendly future – it is better understood as less about fixed plans and picturesque endings and more as a politics of possibility. Rather, such projects invite risky engagement and creative experimentation (Savransky et al 2017, 5), serving as both provocation and invitation to others to explore alternative pathways from current problematic vectors. In so doing, Saraceno blurs the Aerocene's simple 'art' classification, embracing diverse interdisciplinary influences, and being openly collaborative. Such strategy allows ancillary activities to emerge, and for the wider Aerocene undertaking to grow – and not necessarily towards a clearly defined destination.

Aerocene projects perform acts of both physical and conceptual suspension. Responding to the atmospheric conditions of the Anthropocene, quite literally, calls for cognitive suspension: opening up new lines of thinking and possibility (see Choy and Zee 2015). In the first instance this is a concern with anthropogenic alteration to atmospheric load, but additionally draws on more intimate and affective attentiveness to dwelling, what Stewart (2011) refers to as atmospheric attunements. Suspension, in this way, becomes a method of noticing:

> a form of attention that is also a mode of relation, a way of being suspended. This form of thought looks up and around, at plumes, clouds, and sky. It looks inward through the vital interiors that render bodies channels, containers, and filters for airs and the things they hold. More significant than the directionality of its gaze, however, is its manner of attunement to the potentials of substances to shift from states of settlement or condensation to ones of airborne agitation, to settle again in time, or to activate a reaction, somewhere else. (Choy and Zee 2015, 211)

Conceptually, suspension also becomes an opening for imaginative reconfiguration, helping to discharge "assumptions and disbelief… that not only describes worlds but holds them in such a way as to allow them to settle into different arrangements, possibilities." (Choy and Zee 2015, 212)

Working with elemental and physical atmospheric properties, as well those more intangible but significant affective qualities, the Aerocene is a comprehensive performance of suspension; and in ways that ultimately seek to rearrange and renarrate lines of world-making.

In this way I read the end goal of floating sky cities as *aspirational* possibility rather than a *practical* end-point or solution to Anthropocene living (I am certainly open to the possibility that it might be, but have concerns with its ultimate effectiveness). While the Aerocene manifesto has the appearance of a clear action plan with specific goals, it is wholly untested. Approaching the work in this way helps answer a key practical question: does the Aerocene provide a coherent and effective trajectory for navigating unsettled conditions of the Anthropocene? The simple answer is no, I do not believe it does. But I find the work a usefully provocative response to Anthropocene challenges. Resultantly, I am less concerned with the utility of projects and, rather, find the conceptual reorienting undertaken more significant. This is not to discount the importance of practical outcomes, but for the Aerocene these are perhaps better understood as serendipitous consequences of experimental and speculative performance.

The Aerocene, therefore, performs as a map for experimentation; an opening glimpse towards what Lefebvre (2003:16) called the 'virtual horizon' of as yet unknown liberatory possibilities. What is less important on such maps are known destination points: virtual horizons are imagined; the wayfaring vectors required to reach them are as yet unknown. In tracing new pathways, new lines are found leading to potentially more interesting destinations.

Importantly, for Saraceno's work, it is the performance through his sculptures, experiments, and devices which bring substantial agency to ideas. Such objects become speculative fabrications – tangible elements hinting at as-yet unexplored worlds. As Bruce Sterling, science fiction writer and speculative design proponent explains, the potency of fictional objects is their ability to "tell worlds rather than stories" (quoted in Bosch 2012, np).

The ingenuity of speculative fabrication – in either speculative literature, cinema or design – is that fictional worlds can be creatively inferred through the production of simple objects. Such devices prompt the viewer to imagine the kinds of worlds that these might exist within. In this way, the multiple

Aerocene projects have a speculative capacity, prompting contemplation of the imagined world in which such fabulated devices – or variations of them – could exist.

The performative and imaginative capacity of speculative objects, however, relies heavily on the active participation of a willing viewer, without which the 'story' loses its potency. As in any theatrical performance the effective creation of imagined worlds comes through effective suspension of disbelief. Such willingness becomes even more important when the story being told is in some way confrontational: where the audience is invited into a world different than that taken to be 'normal'. In this way we might read refusal by the park's security to allow the launch of a pair of large, strange-looking 'balloons' as proving too difficult to write into the procedural narrative in which the guard was operating. Re-writing worlds, however, is not a process without friction or confrontation. Conceptual unsettling, though, is the point, and the reason why speculative methods are looked to for attending pressing planetary themes and exploring radical response trajectories. Fiction's 'suspension of disbelief' is perhaps the ultimate leap of faith (see Schaper 1978)

Critically, Saraceno's work does not just deliver an alternative futural narrative but invites others into its story- and world-making. Such engagement has two significant outcomes: it provokes experiential reorientation, and propels a change-politics. Engagement with Aerocene and aerosolar projects has the potential to prompt greater coexistential awareness – the reciprocal and co-constitutive make-up of the world (see Mickey 2016) – as experiences call on greater sensitivity to energetic and relational conditions. More broadly the projects are infused with an inviting conviviality. To have an attitude of conviviality is to be open and welcoming to others of all kinds. Conviviality emerges through a politics of the body and through identity politics: a posture of openness rather than one of opposition or resistance (Puar 2009), and it is argued to be a necessary condition in response to the troubling and unsettling ontological flattening of the Anthropocene (see Haraway 2014, 2016; Hartigan 2014). Thus, rather than being given a fixed story, or fed information about environmental conditions, participants are invited to experience a potentially world-changing performance, and one which, counter to many future grim prognostations, traces upbeat and diverging pathways.

Enrolled into this performance is an effective change-politics, one which Diprose (2017) argues is a crucial outcome from speculative work. Drawing on Whitehead, Merleau-Ponty, and Arendt, Diprose reminds us that political thinking is impotent in isolation, it must involve others and it must be performed with and through others (2017, 45). Saraceno's speculative experimentation is therefore a political performance. Responding to deep unsettlement of Anthropocene dwelling, his performative and interactive art is a convivial invitation for others reorient themselves and see the world and its potential futures differently. It performs an ontological unsettling, but one respondent to that of planetary Anthropocene transfiguration. Such work is not without problems, but it effectively demonstrates the 'polyarchic' capacities of creative experimentalism, opening up new political potentials for planetary dwelling and, indeed, being.

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