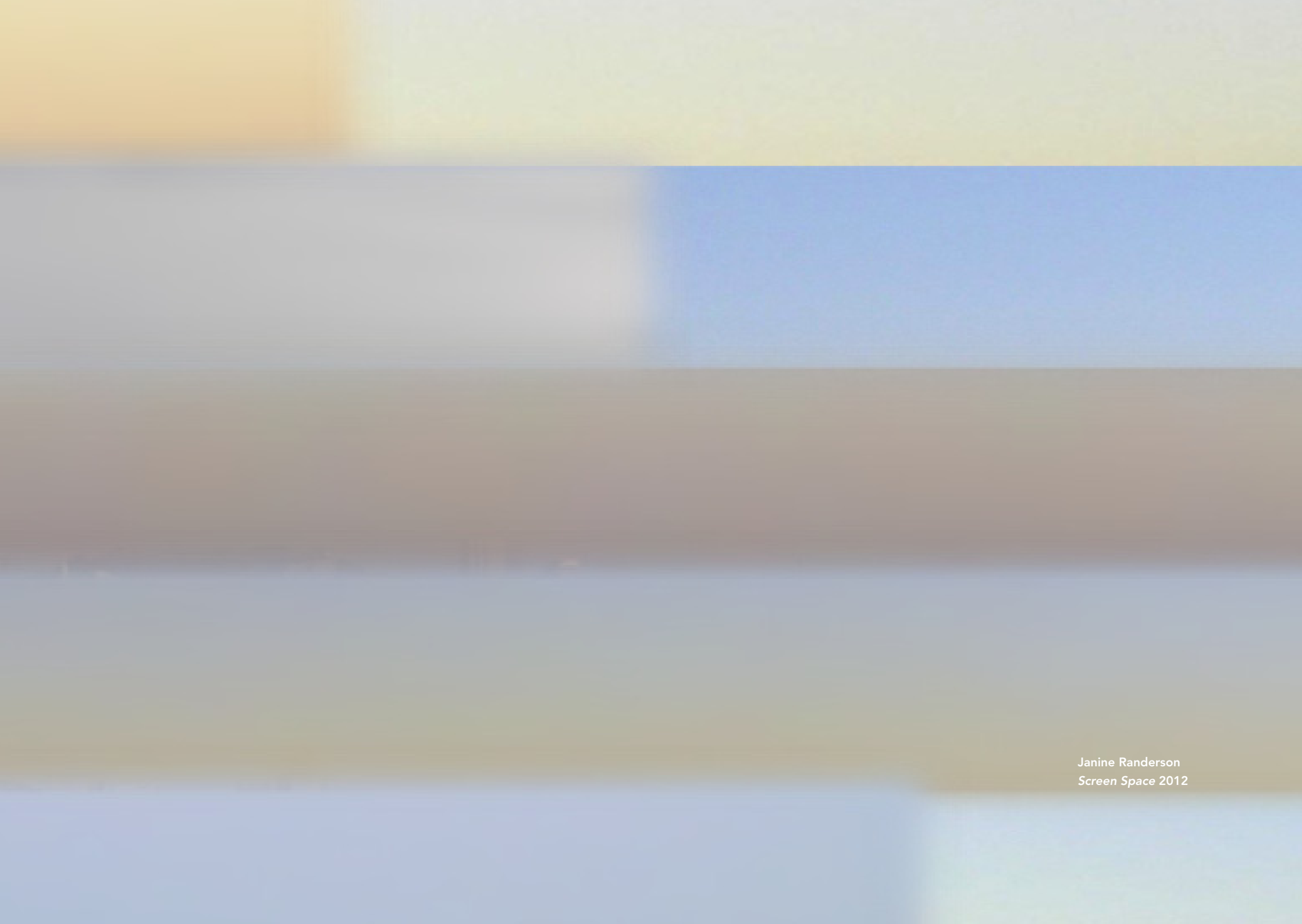


Janine Randerson
Screen Space 2012

Janine Randerson
***Screen Space* 2012**

The artworks *Albedo of Clouds* (2008) and *Neighbourhood Air* (2011-2012) presented at *Screen Space* are part of a series including *Stormchasers* (2008) and *Cascade* (2009-10) that adopt weather and atmosphere as primary medium. The installations transpire from collaborative relationships with atmospheric scientists, instrument-technicians, social online networks, weather enthusiasts, storm-chasers and the weather itself. As propositions for a 'Meteorological art', the shared digitality of the projects with emergent technologies of meteorological science creates opportunities for reciprocal exchange.

Everyday weather sustains our lives by providing the particular circumstances for our survival. But as we face massive transformation in the earth's atmosphere, a new demand to link techno-scientific representations to quotidian experience emerges. The latter projects *Cascade* and *Neighbourhood Air* attend to non-professional weather networks from video-sharing forums, the posting of stories to weblogs and open source data from the *WeatherUnderground* network. The projects are less about overcoming differences in perspective between a science of the 'out there' real world and the 'in here' of the subjective, social life-world, than moving on from the separation of knowledge into discrete categories.[1]

Practicing meteorologists have also been central to the projects' development; including climatologists at the National Environmental Research Institute in Denmark, a satellite meteorologist at the Bureau of Meteorology for *Albedo of Clouds* and an ongoing exchange with an urban meteorological study of Auckland's photo-chemical smog for *Neighbourhood Air*. Climate and meteorological research institutions are sites of constant, dynamic data production of large amounts of specialized knowledge. There are political implications to the world-building work of scientific centres that generate facts about natural phenomena. While everyone 'knows' weather in the experiential sense, the sciences are just as implicated in social life when they produce our reality through instruments and data.

Our immediate interactions with weather are extended temporally and spatially through global atmospheric sensors, at both the micro scale and the macro scale of the satellite. The artworks might suggest that a specific weather encounter is not necessarily local, human or inter-subjective. Rather, philosopher Bruno Latour's concept of *interobjectivity* could be a more useful way to account for the tracing of weather and art through instruments where there is no abrupt threshold between the human phenomenological experience and the senses of machinic agents.[2] For instance in *Stormchasers* (2008), the thrill-seeking storm-chase is suffused with non-human participants; cars, video-cameras, lightning, hail, dust and cyclones. The 'bio-meteorological' artwork, *Cascade* (2009-2010), enfolds migratory birds, satellite tracking systems, seasonal climate variation and citizen YouTube posts of the arrivals of bird swarms. The final artwork in the series, *Neighbourhood Air* assembles urban meteorological information by meshing everyday stories about air quality with sensor-instruments, chemical compounds, engines, and web-servers.

[1] Bruno Latour, "On Recalling ANT." in John Law and John Hassard, *Actor Network Theory and After* (Oxford: Blackwell Publishing, 1999), p. 15-22.

[2] Bruno Latour, "On Interobjectivity." *Mind, Culture and Activity*, (3, no. 4, 1996), p. 240.

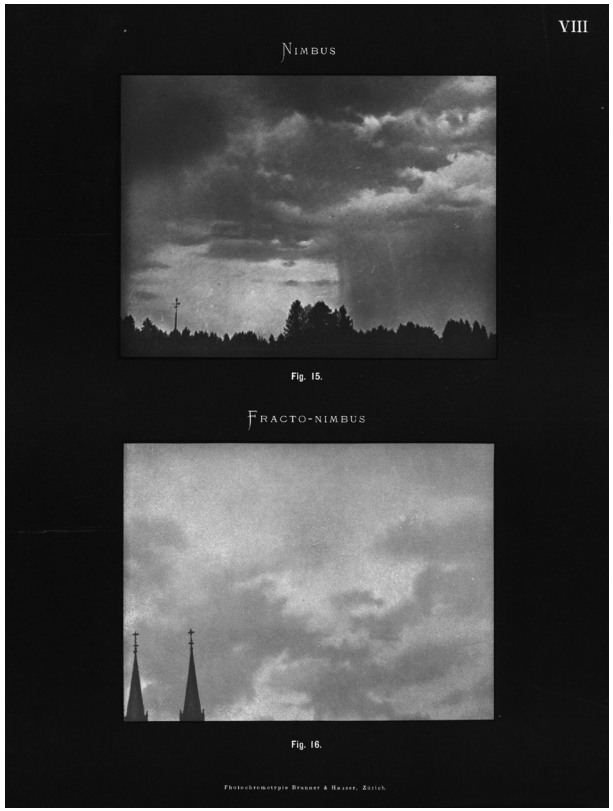
Albedo of Clouds

collaborators:
Jason Johnston (audio composition)
Mike Wilmott (Satellite Meteorologist, Australian Bureau of Meteorology)

The *Albedo of Clouds* is a conversation between three cloud observers; an artist, a sound artist and a meteorological satellite. Although the performance-dialogue took place in May 2008, the premise is an historic experiment for two cloud observers and their instruments in Nineteenth century Melbourne. The early meteorological experiment, uncovered in archival research at *Museum Victoria*, measured cloud parameters with early photographic and telegraphic technology. The ground-based observation is triangulated with satellite-based imaging of the same clouds from above, in collaboration with Melbourne's Bureau of Meteorology (BoM). As well as mediating between modes of cloud observation using surface-based and remote perspectives, the project speculates on why clouds reflect and how different technologies 'see' clouds.

The effect of cloud albedo (brightness of reflectivity) on global warming or cooling is one of the more controversial issues among climate scientists. Cloud cover depends in a complex way on the number of nuclei in the water vapour that, in turn, depends on temperature and humidity. Clouds often feature in 'Big Science' geo-engineering projects to ward off atmospheric warming. Some scientists speculate that an increase in cloud could reflect sunlight back into space with a cooling effect. However, whether the total effect of increased cloudiness would be to cool or warm the climate is regarded as uncertain by many meteorologists.[3] Although much is unknown about clouds in physical terms, they are still experientially familiar to everyone who watches the passing clouds. From childhood cloud-gazing to the modernist cloud photographers, such as Alfred Steiglitz's notion of psychological equivalence,[4] and forward to computer-generated cloud simulations, clouds are 'operators of elevation' for the imagination in Gaston Bachelard's words.[5]

FIGURE 1.1 *Atlas International Des Nuages* (Paris, 1896, plate 8)



[3] Dr Jennifer Salmond, Urban Meteorologist, in an interview with the author, University of Auckland, February 26, 2011.
[4] In Alfred Steiglitz's silver gelatin photographs of clouds taken from 1923-1933, the symbolist idea of 'equivalence' implied that inner states, emotions and intuitions correspond to abstract forms, lines, and colours.
[5] Gaston Bachelard. *Air and Dreams: an essay on the imagination of movement.* (Dallas: Dallas Institute Publications, 1988), p. 185.

Although clouds signify in many ways, scientific terms such as 'cumulus' and 'strata' have become the dominant language for describing cloud types. The scientific quest for a global codification of clouds in the Nineteenth century extended to the Antipodes. In July 2008, Dr Richard Gillespie at *Museum Victoria* introduced me to the *Atlas International Des Nuages* (1896) that was used for classifying clouds by government astronomers in Melbourne (figure 1.1). The cloud atlas introduced a universal system of cloud classification, originating from the work of British chemist Luke Howard in 1802-3 and popularised by the poet Goethe. A major International study, where all countries were invited to contribute cloud photographs for the Atlas over the duration of one year, began in May 1, 1896.[6] A report written by P. Barracchi, the Victorian Government Astronomer outlines Melbourne's contribution to the International Cloud Observation project.

In order to document the same cloud from two different locations at precisely the same instant to determine it's height, motion and brightness, P. Barracchi stationed two cameras at different points in Melbourne; one at Melbourne Observatory and one with a colleague on the roof of the Victorian Parliament House. He writes,

"The two stations are connected by telephone, and are also provided with a telegraph key and sounder, through which time-signals or clock-beats are transmitted by the Observatory according to a code, and the last set of five beats by hand indicates the instant of exposure, which is made simultaneously by the two observers by means of a Picard shutter worked instantaneously by the usual india-rubber ball method."[7]

P. Barracchi's description and photographs of his contribution to the cloud atlas became the starting point for the performance of *Albedo of Clouds*. The re-staging of the astronomers' stereo perspectives led me back to the steps of the Victorian parliament and second camera operator Jason Johnston to the Melbourne Observatory to video the clouds. Through verbal descriptions on mobile phones, we tried, and sometimes failed to 'quasi-stereoscopically' record the same cloud at the same time. While the neutral scientific frame encoded in Barracchi's report may be lost, the desire to simulate his experiment, conceptually at least, shares a fascination with how technologies can produce knowledge. Barrachi was experimenting with meteorological questions about cloud by negotiating new technologies of telegraphy, photography and the nascent discipline of meteorological classification. In the contemporary performance, video cameras, our compass, mobile communication and satellite meteorology become technological agents.

The triangulation of stereo perspectives for *Albedo of Clouds* was furthered in simultaneous research for the project with meteorologist Mike Wilmott at the Australian Bureau of Meteorology (BoM), Satellite division. Wilmott extracted the digital satellite data, from a remote perspective in space, of the same clouds that we had recorded in the week of May 2008 with our surface-based observations. The pairing of the latest in meteorological imaging and earthbound observation produces a new map. The human performers attempt to reconcile our fugitive responses to cloud in an immediate verbal mapping of what we see, while the machinic vision of the satellite locates the clouds in the global atmospheric system.

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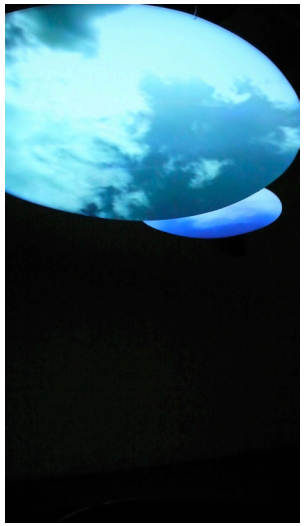
[6] H. Hildebrandsson, A. Riggenbach and L. Teisserenc De Bort, *Atlas International Des Nuages*. (Paris: Gauthier-Villars Et Fils, Imprimeurs-Libraires, 1896).
[7] P. Barrachi. "Cloud Observation in Victoria."*Australian Association for the Advancement of Science Report, The Seventh Meeting*, (Sydney, 1898), pp. 259-273.

Satellite 'vision' has been argued to both extend and control human perception. The binary code that makes up the BoM images of cloud passes through space via the scans of Japanese geostationary satellite MET-SAT-1R, through trans-governmental meteorological institutions to be disseminated in popular weather media. Satellites have been positioned as mechanisms for coercive control, after Foucault's analysis of panoptic knowledge-power relations (1979) or Virilio's sketch of the satellite as a blind producer of data (1994). While more recently, the spatial mobility of the satellite has been situated as an agent for circulating remote community engagement and creative activity, such as the trans-global performance art pioneered by Nam June Paik. Lisa Parks argues that satellites produce meanings that exceed their surveillant, paramilitary function.[8] Satellites extend the senses, not only through sight, but also through touch. Remote sensors make it possible to sense the density of cloud, without being physically in contact with it.[9] Weather satellites provide information to us, but earthbound observers also recursively send weather data to the remote satellite from personal weather stations as one example.

For *Albedo of Clouds*, three instrumental means of seeing cloud supplied by BoM have been animated; first, *visible images* where the visible light scattered towards the satellite from the Earth and clouds is recorded. In the visible image animations there is an observable shift from night to day. The second sequence has been animated from *infrared images* that are produced from the temperature of the underlying surface or cloud that radiates thermal-infrared wavelengths. The darkest areas of the infrared image are the hottest while the white areas are cold; the Australian continent can be discerned beneath the clouds as it heats and cools. The third sequence consists of *water vapour* images that are produced by radiation emitted by water vapour when it is taken as the dominant absorbing gas. Many of the original still images contain some form of 'noise' or interference from the satellite's radiometer. These inconsistencies are missing information or moments when the sun's light has reflected back into the lens of the sensor that scientists 'clean up' and eliminate.

By chance, the BoM satellite radiometer documented an extreme weather event on May 2nd 2008, when the severe cyclonic storm Cyclone Nargis made landfall in Burma causing great loss of life. As an inadvertent record of Nargis from that particular week in May 2008, the animated satellite imagery of the *Albedo of Clouds* project became more explicitly connected to the current climate crisis. Increasingly severe cyclonic events are generally accepted as an effect of global warming. The simulation models of the majority of meteorologists predict that there will be an increase in the number of storms and tropical cyclone intensity due to sea-level warming as a consequence of climate change.[10] Clouds, while still elevators of the imagination also operate at a level of anxiety, where cloud-gazing opens into speculation about the future of the earth's atmosphere.

FIGURE 1.2 Installation image from *Albedo of Clouds*, Campbelltown Art Centre, Sydney, 2008.



[8] Lisa Parks, *Cultures in Orbit: Satellites and the Televisual*, (Durham, London: Duke Univeristy Press, 2005).
[9] Caroline Bassett, "Remote Sensing" in Caroline Jones and Bill Arning, *Sensorium: embodied experience, technology, and contemporary art*. (Cambridge, Mass. MIT Press: The MIT List Visual Arts Center, 2006), p. 200.
[10] Dr Kevin Walsh, Meteorological Scientist, in conversation with the author, University of Melbourne, February, 2007.

Neighbourhood Air

collaborators:
Jason Johnston (audio composition)
Jeff Nusz (programming)
Chris Manford (sensor data programming)
Dr Jennifer Salmond (Urban Meteorologist, University of Auckland)
Greer Laing, John Wagner and Geoff Henshaw (instrument scientists from *Aeroqual*, NZ)

Neighbourhood Air is an online artwork that gathers live pollutant levels from city air. The collaborative project includes urban meteorologists, programmers, media artists, breathers of city air and the fluctuating chemical compounds that drive the movement of the interface. Sensor instruments in Auckland, New Zealand provide a community platform for continuously accessible, real-time information. Auckland air rates more poorly than most major Australian cities in levels of particulate matter and the effect on the populace is an issue of biopolitical concern.[11] When even the air in small island states is industrially altered, the global implications of the age of atmospheric toxins, to use Peter Sloterdijk's description, become apparent. We are no longer able to trust our primary surroundings, be it nature, homeland or the cosmos.[12]

A disused traffic control box on Auckland's Symonds Street in the CBD is currently functioning as an air quality monitoring station. The instruments are operated as part of an ongoing experiment in collaboration with urban meteorologist Dr Jennifer Salmond and are maintained by instrument technicians from *Aeroqual*. Numerical data is processed by a server that we have built for the instruments to control an interface where colour and sound indicate air quality levels. The colour bars represent five weather and gas measurements including (from top to bottom) relative humidity, temperature, Nitrogen Dioxide (NO_2), Carbon Monoxide (CO) and Volatile Organic Compounds (VOCs).[13]

[11] Using a measurement of particulate matter per cubic metre of air, Auckland had an overall rating of 15pm compared to 12pm in Sydney and 13pm in Port Phillip Bay, cities with much larger populations. Auckland's high Winter levels of particulate matter are caused primarily by pollution from motor vehicles and domestic fires. See http://www.who.int/phe. (World Health Organization Report, September: Geneva, Switzerland, 2011).
[12] Peter Sloterdijk, Terror from the Air. (Los Angeles, Cambridge, Mass.:Semiotext(e), 2009), p. 108.
[13] Volatile organic compounds (VOCs) and nitrogen oxides (NOx) often form Ozone (O3) in the photochemical reaction of primary pollutants associated with photochemical smog. VOC pollutants are produced mainly from combustion sources including motor-vehicle emissions, and industrial and domestic use of solvents and coatings as well as from organic sources . See, A Users Guide to Air Quality. (Auckland Council, 2011), p. 54.
[14] Brown haze is the scientific term for Auckland's periodic photo-chemical smog that appears in the mornings over the city in Winter months from May- September.

When the bars reach the far right of the screen, the air quality is poor; while on the left, it is good. The sixth bar represents change over the duration of two days up to a current reading of air pollutant levels by scrolling along the bar. The colour bars are a distillation of an earlier process of 'sky sampling' using video. Over Winter 2011, when conditions were still and clear and the morning temperature was below 10 degrees, I used a local volcanic cone, Maunugakieie (One Tree Hill) as a weather station. The process of making the video *Table of Incidents* (2011) mirrored the urban meteorological process of photo-analysis to document incidents of brown haze.[14]

The tracing of the practice of meteorology, as it happens, particularly during the instrument installation became a part of the research process. The material connection between the scientist's handling

FIGURE 1.3 Video still from *Table of Incidents* (BSrown Haze from Maungakiekie, between 8:30-10am August 21st –July 1st, 2011)

FIGURE 1.4 Notes on Installation of SM50 VOC sensor.
(Symonds St, Traffic Control Box. October 3, 2011)

3:47 *I arrive at the former traffic control hut on Symonds Street where instrument technicians John and Greer are already installing the VOC (Volatile Organic Compound) sensor.*

3:48 *John:* So you pull that out. That's your earth. That's your power.
Greer: Yeah, I've done this a million times.
John: So do that, then do it for your coms as well.

Greer: But I put it through this module, right?

John: If you want, either way, it doesn't really matter. So that's the power and coms. Clearly this is the pump right? I think this is the exhaust. This is the manifold for the pump. So you need to tee that off to get the gas in, ok?
Greer: uh-huh

3:50 *Greer to Janine*: So this is your VOC sensor. The main part of it is the cap and base that holds the metal oxide sensor. So basically it's suspended in the middle of that round, there, by wires and its got a metal oxide layer on top of a platinum ridge. Basically the motherboard just stores the information. The controller here is like the mini computer of the system and runs the pump -- that runs the flow through the system. That's the NO2 and that's the CO there already.

3:51 *Janine:* And this bit on the outside. That's the cooler is it?
Greer: Yes, that's keeping the temperature stable inside the box. In the usual case we would have a heater as well to maintain it but this system doesn't have a heater because it's…economical (laughs)
Janine: Right, it's saving power?
Greer: You can't get more basic than this for a measurement device. There are certain budget constraints so the whole system is stripped back. Usually we would temperature control each module separately. In this system we don't.

3:53 Greer: There's a lot of things you have to get right. It's not hard to get them right but you have to get them right to get a really good measurement. It's not as fixed as people think. You know its not an absolute, it's relative.

3:55 *John returns with his computer:* I could do with a coffee.
Greer: Is that what the university brings out in you?
John: Yeah, a little bit…have you got the tube cutters?
Greer: Yes.

4:00 *John:* Did you bring tycon or silicon?
Greer: silicon
John: (sighs) ok.
John: Just be thoughtful about where you cut it. Because once you've cut it you are committed to that cut. Unless you want to come back tomorrow.
Greer: It's only the exhaust.
John: Don't knock it, it's a crucial part.
Greer: Since when has the waste air been a crucial part?
John: It pulls the flow across the sensor.

of specialised instruments was recorded with notes and video while they talked through their research hypotheses. I began to understand their relationships with their instruments. As I observed, recorded and sometimes lifted the instruments, the scientists and instrument technicians made suggestions for the online representation of the gases.

The formal cadence of statistical analysis dominates public communications about city air. Institutions such as the World Health Organisation focus on the impact of air pollution in human terms of illness or death rate, while scientists use instruments to quantitatively measure the amount of particulate. The Auckland Council exercise biopolitical control through the inaccessibility of immediate data from their thirteen monitoring stations regarding ambient air quality. As Foucault argues, the last domain of biopolitics is control over relations between the human species and 'their environment, the milieu' in which they live. The environment is no longer a 'natural environment'; it has been created by the population and therefore has effects on that population.[15] Auckland's state-controlled air monitoring network currently lacks the health advantages for asthma or respiratory sufferers that live air quality information could offer through digital connectivity in real-time.

Experiential knowledge of Auckland's air from non-scientific members of the community became important to counter the facticity of the official accounts in the *Neighbourhood Air* project. As a process of getting beyond the distinction between social and scientific modes, the online interface pairs numerical information with community stories recorded in online social forums. *Neighbourhood Air* existed first as a blog where thoughts, memories and photographs of Auckland's brown haze were invited as an initial phase of research that later become the printed 'air samples.' To retain the stories about Auckland's air quality seemed to individualize and contradict rather than 'massify' in Foucauldian terms. Within the *Neighbourhood Air* interface, the blog stories contained in the

[15] Michel Foucault, *Society Must Be Defended: lectures at the Collège de France*, 1975-76. (New York, Picador, 2003), pp. 242-245.

air samples, from far beyond the sensor instrument cabinet, hover at the edges as a print 'peripheral'.

Weather as a continuous feedback mechanism in automatic, environmental sensor networks appears to have changed the way we understand sense itself. When information about humidity and temperature or particulate matter that is too minute for human detection is transmitted via machines, rather than directly to human skin or our respiratory system, interfaces become crucial mediators. Theorist Jennifer Garbys maintains that by managing urban environments, sensors effectively create orders of sensation that are sustained by the urban infrastructure itself.[16] In *Neighbourhood Air*, the slightest change in the city air is transmitted from sensors to an interface in formerly imperceptible detail. The interface then reconverts this information to levels of sound and colour that humans can perceive once more.

All software is a gathering, a neighbourhood of relations and an amalgamation as media theorists such as Adrian Mackenzie and Wendy Chun suggest. The online software for *Neighbourhood Air* amalgamates the pollutant gases in Auckland's air as quantitative information yet it also retains a link to the qualitative nature of the blog stories. In a simultaneous phase of development with two computer scientists, we moved back and forth between the now invisible numerical code and the visible interface. Jeff Nusz programmed the interaction and Chris Manford wrote the software for the server that harvests the data from the sensor instruments, both working intimately with the instruments to understand their numerical codes. As a means of navigation, the interface negotiates the uneasy border between new media as 'visual culture' and software as 'total information system' to convey scientific data.[17] *Neighbourhood Air* is neither entirely art as sensory-interactive value in-itself, nor solely a scientific application to record pollutant levels, but contains the possibility of both.

[16] Gabrys, Jennifer, "Automatic sensation: environmental sensors in the digital city." Senses and the city, special edition of the journal *The Senses and Society*. (Berg, Oxford, 2007), pp. 189- 200.
[17] Wendy Hui Kyong Chun, *Programmed Visions: Software and Memory*. (Cambridge, Mass.: MIT Press, 2011), pp. 3-6.

Even while concerned with informational dynamics and generative processes of climate science and meteorology, artists cannot approximate the granularity of environmental sensors or the complexity of supercomputers that produce climate projections. Yet art practice has a culturally expansive capacity to bring 'lay' knowledge and embodied experiences that are outside the gamut of science into the frame. A high degree of specialization in numerical data interpretation is often needed to understand scientific inscriptions but the phenomenological-affective processes of art imply ecological value at a different register. For many artists, a response to climate politics at the level of conscious-raising is no longer adequate, in part because the scale of the phenomena involved is no longer that of ordinary human experience. We are no longer dealing with information scarcity, but with articulating the hopes, anxieties and antagonisms that emerge from a crisis that is almost unrepresentable. However Meteorological art can seek forms of collective engagement by sharing instruments and practices with the sciences, community platforms and online networks.

Albedo of Clouds *was exhibited in 'Mirror States', Campbelltown Public Art Gallery, (Sydney) 2008. Satellite images courtesy of the BoM and the Japanese Meteorological Association (JMA).*
Stormchasers *was exhibited in 'Atmos: Weather as Media', at MIC Toi Rerehiko, 2008.*
Cascade *was exhibited in 'Rethink: Contemporary Art and Climate Change', Aarhus (Denmark), Cuernevaca, (Mexico), Hamilton (New Zealand), 2009-2010.*
Neighbourhood Air *is part of the forthcoming group show, 'Transitional Economic Zone of Aotearoa' (TEZA) in ISEA 'Machine Wilderness' in Albuquerque, New Mexico, 2012.*

FIGURE 1.5 – SM50. Volatile Organic Compound sensor installation. (October 3rd, 2011.)

http://neighbourhoodair.blogspot.co.nz/
http://neighbourhoodair.co.nz/