

REMAPPING THE CITY WITH THE EPHEMERAL NIGHT SKY

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ABSTRACT

The materialisation of the night sky resplendent with stars, constellations and galaxies has had a long association with the 4.5 billion year history of the Earth. This spectacle has inspired contemplative questions about our universe and our relation to it. Today due to increasing light and air pollution, most people living in cities are not aware of the gradual disappearance of the night sky, although it is still observable in unpolluted regions. In response, this paper explores unique methods of engagement with the celestial and terrestrial giving examples from historic and contemporary sources to re-establish the human connection with the firmament. Memorable public spaces always have an integral relationship between the earth, the sky and nature. They create a sense of belonging and assurance giving space to reflect on life, time and culture. To experience a full view of the night sky is where we measure ourselves against the immensity of the universe.

INTRODUCTION

I became involved with the multifarious *International Starlight Initiative* in 2007 in Spain, where I was asked to address the cultural significance of the night sky, along with colleagues who presented the scientific and environmental issues associated with the preservation of the night sky. [1] The same year, my artwork was selected as part of a public art project of light projections onto the surface of the 5000 square foot upturned dish of the Jodrell Bank Lovell Radio Telescope as part of its 50th anniversary celebration in the UK. It was a year that made me think about the two opposing activities the first to save the night sky and the other to project artificial light into the night sky, although the latter was an ephemeral event, I am still thinking about the two extremes. Today technology gives us the ability to see into deep stellar space and to look back at ourselves and our planet from space figure 1, below shows an image from NASA of the Earth at night, displaying the difference between the illuminated South Korea and the dark region of North Korea. Apparently, 'Earth is the only planet in our solar system that glitters at night' and it is expected to increase substantially over the next 40 years. [2]

THE SHADOW OF NIGHT

What is night actually and how is it formed? Walter Seitter, sets out an explanation beginning with the shadow of the Earth, known as the central umbra shadow. This shadow can be viewed from a higher ground after sunset in a clear evening sky, one may see a light to the west and yet the horizon and everything beneath it casts a sharp shadow, while to the east a grey cloudbank is visible above the horizon. This is the umbra shadow cast by the Earth, not yet clearly visible. A penumbra, a lighter shadow enfolds around the umbra shadow, which creates the vast dark shadow that we refer to as the night, covering

everything including an immense area of sky. This event creates two effects, the first is to remove sunlight from a large section of the surface of the Earth including the section of space above it and secondly it reveals starlight to the human eye, 'so the night on Earth functions as an optical basis for a view into space.' [3]



Fig. 1. The region of North and South Korea, 2012, Jessie Allen and Robert Simmons, Visible Infrared Image, courtesy of NASA Earth Observatory.

Seitter also posits that humans reproduce and multiply additional night spaces in the built environment using opaque building materials creating 'three dimensional nocturnes,' that are lit with artificial light. [3] This replication of interior night-time and artificial lighting can be applied to cinemas, theatres, planetariums, art galleries, art installations. The human fascination with light, today in all its forms, continues with the rise of contemporary light festivals conducted outdoors most likely have ancient origins with fire rituals and ceremonies. Along with the increased use of artificial lighting in cities, which includes the illumination of buildings, gardens, parks at night and sea fronts.

There are growing health concerns for humans, animals and all species living under the glare of the 24/7 day with the loss of the circadian rhythms of the daily cycle of day and night, issues like sleep disturbance and certain types of cancers may be related. There has been large-scale mortality of wildlife due to increased use of artificial lighting. As one example the migration patterns of birds are disrupted when flying over cities at night where flocks become disorientated in artificial light, reproduction and feeding are all affected. In response to disrupted flight paths the Tribute in Light Memorial in New York and numerous buildings shut down the lights on several occasions to allow birds to find their traditional flight orientation, using the and the horizon stars. Michael Rosenzweig speaks of 'reconciliation ecology' and advises 'fence mending and coexisting in harmony' to protect and strengthen the ecosystems/biodiversity within cities. [2] In addition the timing and duration of brightly lit

outdoor events need to consider ways to reduce the impact on the local nocturnal species. The manipulation of light and dark within the terrestrial environment overshadows the ancient human connections of cosmic alignment, which can still be found in cultural and spiritual practises, such as the following examples from Islam.

INTERNAL AND EXTERNAL TIME

Islamic Time

Mohamed Hedi Ben Ismail, when writing about The Universe Awareness Program in Tunisia, reminds us that Muslim 'children are raised within a social and cultural environment where the sky and the cosmos are part of their heritage.' Astronomy is embedded into their daily life with actually being conscious of it. In traditional terms the sky has been a source of inspiration and used as a guide for 'daily tasks' and spiritual observance. The position of the sun is observed to set the times for prayer five times a day, the observation of the polar star for guidance of the crescent moon to estimate the beginning of Ramadan when Muslims fast from sunrise to sunset. [4] Prior to the invention of mechanical clocks, as it was necessary to establish time, sundials had a central role in the Islamic world, both vertical and horizontal sundials were used. According to the Ottoman scholar Attila Bir, external sundials are now rare, except those embedded into the walls of mosques. [5]

Solar Observatories in the West

In the west too, it was necessary to stabilise time, to set the city's clocks in public spaces and standardise the calendar, in particular to fix the time for Easter with the spring equinox. 'The key parameter in the Easter calculation was the time of return of the sun to the same equinox.' The most powerful and way of measuring this cycle was to lay out a meridian line. Cathedrals were convenient and inexpensive locations for meridians as they were '[...] large and dark and needed only a hole in the roof and a rod in the floor to serve as solar observatories.' [6] In 1795, Giuseppe Piazzi received a commission to install a meridian, required to be 'very beautiful' to be mounted into the marbled floor of the Palermo cathedral in Sicily. [6] At that stage, Sicilian time was calculated on a more 'intuitive' basis from sunrise to sunset and thus there were many time zones throughout the island. The design of the meridian with a small hole – an oculus, was constructed in a minor dome to allow a beam of sunlight to project onto the floor at noon in winter and at 1pm in the summer, when the sun was higher in the sky. This corresponded with a meridian on the floor of the cathedral consisting of an elongated bronze line positioned north-south with both endings measured with the winter and summer solstices. 'The accuracy of the results depended on the care taken in installation: correct positioning of the hole, proper orientation of the floor rod and exact levelling of the floor.' [6] The signs of the zodiac made from inlaid marble are positioned along the meridian to mark dates in the year. Towards the northern end is Capricorn (winter) and towards the southern end is Cancer the crab (summer).



Fig. 2. Palermo Cathedral Meridian. 2013 Marea Atkinson, Digital image. © Marea Atkinson.

The Sundial at Team Disney Building 1990, Orlando, Florida in collaboration with Florida Solar Energy Center, USA.

The architect Arata Isozaki, designed the Disney administrative headquarters in Florida with a large sundial in the open-air cylindrical atrium, which also functions as a public space free for visitors to explore the notion of time. Isozaki and his team considered that the concept of time was important to Disney, as expressed in the theme parks of Tomorrowland, Frontierland, etc. Tylevich points out that the 'sundial atrium' is the key to the concept of the building raising the questions on the notions of 'spirit, cosmos and existence.' The building described as a 'postmodernist design' intrinsic with its 'ambiguity and negative space,' whereby '[...] the atrium has no prescribed use; its meaning and function beyond telling time, transform according to the individual.' [7] Midway there is a stone bridge intersecting the atrium suspended high yet below the sundial, embedded with quotes on time. To some it serves as a functional walkway between sections of the building reflecting on the value of time. To others observing people being in time or transiting through time across the bridge open to the elements under the dramatic shadow of the sundial inspires contemplation about the transitory nature of being and existence in time and place and within the universe. Charles Jencks on writing about cosmogenic architecture interprets the design as '[...] the sacred in the middle of the Empire of Trivial Pursuits.' He makes a comparison with the evolution theory of 'punctured equilibria' long periods of morphological stability with rare bursts of change and the qualities of the sublime 'the universe as simultaneously horrific and harmonic.' [8]

The sundial was collaboration between Isozaki and Dr Ross McCluney from the Florida Solar Energy Center. Upon seeing the design plan, (Fig. 4) McCluney, pointed out that shadows cast by objects in sunlight exhibit 'penumbra and umbra' effects, which would cause a certain amount of fuzziness of the sundial's pointer called the gnomon. Extensive testing and calculations were undertaken for the sundial to operate accurately and also the decision was taken to change the gnomon to an opaque sphere. [9]

REMAPPING THE CITY WITH STARLIGHT

Marea Atkinson - Art Projects

In response to an invitation to participate in a project titled Dreams of a Possible City. My aspiration would be to observe starlight above the city. In response I began to conceive of the idea of a fictional remapping integrating the metropolis with the sky. This project was exhibited at the Hayden Planetarium conference.



Fig. 3. Sundial, 3:30 PM on an equinox, Team Disney Building, 1990, Arata Isozaki, Image courtesy of the Florida Solar Energy Center, USA.

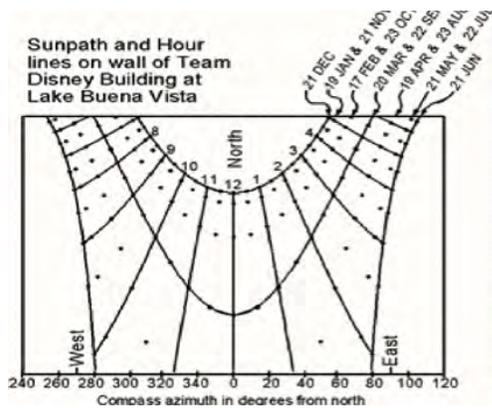


Fig. 4. Diagram of calculations for the sundial, Team Disney Building, Image courtesy of the Florida Solar Energy Center, USA.

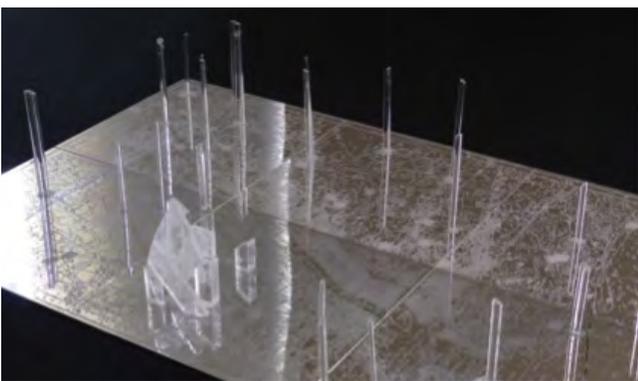


Fig. 5. *The City of Stars*, 2013, Marea Atkinson, Laser cut acrylic assemblage. © Marea Atkinson.

It was based on the Manhattan grid using a tourist map from 1929 collected by an Adelaide architect who had travelled to New York and walked the city. In 1929, a starry night sky would have been visible over New York. Today sometimes a star can be sighted at night from Central Park. The map was reworked and overlaid with a NASA image of an unidentifiable area of deep space, both images were laser cut onto acrylic glass (Figs 5, 6). In Stage 1 of the project, in the laser cut acrylic assemblage; the city map becomes the mirror of the sky, most of the buildings have been eliminated or repositioned underground and replaced with clusters of tall glass towers sensitive to capture light from ancient stars that may have dissipated; there are flat pools of starlight reserves collected on the ground and stored underground. These reserves will be used to create public spaces of underground chambers where people can reflect within and upon starlight. The light will also be stored as energy reserves to light the city. This project will be developed further in Stage 2.

Dubai Starfield (Fig. 7). As a newly established city in 1970's, the city has been remapped with zones of starlight reserves, eliminated the buildings and repositioned the cosmos to reflect in the ocean and the Creek. Fourteen tall glass structures are positioned with solar panels to gather energy.

Starfield Milan Digital print in figure 8, an antique map circa 19th century, of Milan is embedded with a NASA deep space image creating – a star field in the centre, the outer part of the map represents the terrestrial.

This work lead me to consider if at any stage in time, did city planners and architects consider the view of the night sky as an integral part of their planning? Today, city planning would not consider the consultation of the cosmos, except the solar cities projects around the world to relieve some of the congestion on reliance on certain energies. However there are examples from ancient practices whereby the city was designed to be in alignment with the cosmos, examples can be found in orientation of the Forbidden City in ancient China, the Egyptian and Mayan pyramids, Stone Henge, etc. This work lies in the field of archaeoastronomy, which examines the way people from the past have understood sky phenomena and how it manifested in their respective cultures. The following highlights features from the cities of Cusco and Machu Picchu.

Inca City Planning

The Inca cosmology was encoded into their city planning and architecture, as exemplified Cusco, the capital of the empire, which was planned by the emperor Pachacuti in 1440. The Milky Way was a key to their cosmology and was integrated into the city planning.



Fig. 6. Detail, *The City of Stars*, 2013, Marea Atkinson, Laser cut acrylic assemblage. © Marea Atkinson.



Fig. 7. Detail, *Dubai Starfield*, 2014, Marea Atkinson, Laser cut acrylic assemblage. © Marea Atkinson.

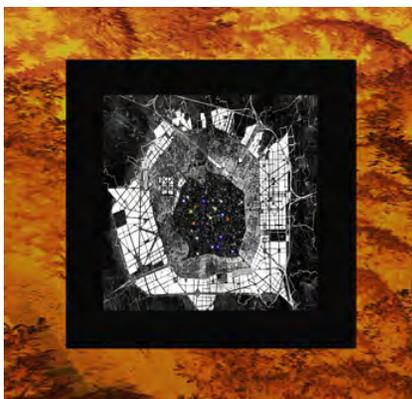


Fig. 8. *Starfield Milan*, 2014, Marea Atkinson, Digital print on paper. © Marea Atkinson.

The buildings as shown in figure 9, were laid out in a grid pattern, with straight lines *ceques*, emanating from the centre to four main regions in the empire called *syus*. [10] Gary Urton explains that the notion of a quartered cosmos was common across the Andes, as the division of the Milky Way was observed to change, from splitting into two during one season and then in another to divide

in a vertical fashion. [10] As the Incas believed that they were descendants from the Sun, the Temple of the Sun was prominent in Cusco and connected to a courtyard surrounded with separate sanctuaries, dedicated to the Moon, Stars, Rainbow, Thunder and Lightning. [11] Garcia Ferrari, posits that the topographical position of Machu Picchu, in figure 10, set high up, amongst a mountain range and near the clouds and elements, would allow 'a variety of viewpoints and connection to the surrounding landscape' and sky and thus many of its buildings were designed for 'solar, lunar and stellar observations.' Large public squares were a common feature in Inca cities, which were used for markets and festivals and demonstrations of justice. [12]

Manhattan Henge in alignment with the street grid, New York, July 2013.

It was surprising to find a contemporary event in New York recently that engaged the city plan, the public and astronomy. Around 7 pm on July 12th 2013, New York City police closed and cordoned off part of Forty-Second Street, for *Manhattan Henge*. Some time prior to sunset, people gathered excitedly and as the crowds grew each jostled for good viewing positions. They had come to witness the alignment of the Sun passing low in the sky and shining onto the city's east-west grid patterned streets on the Upper West Side. An annual event instigated with the timing and orientation calculated by the American Museum of Natural History and the Hayden Planetarium, whereby the street is littered with human arms holding up cameras, akin to ancient sun worshippers, following the movement of the Sun, thus the city street became a temporary public space to view the Manhattan solstice.

The Restoration of Starlight - Thierry Cohen - Darkened Cities Series.

There is a eerie quality about Cohen's work in the Darkened Cities Series, a pervasive ghostliness that evokes our ancient collective memory, with various reactions from shock to amazement and recognition of what we perceive and of what we have lost, the knowledge, beauty and contemplation of the night sky, as seen by our ancestors. Cohen reveals the invisible. There are layers of revelatory depths in his work exposing the visibility of the night sky above the world's contemporary cities, in the 21st Century.



Fig. 9. Plan of the city of Cusco, showing the central plaza and the division of the four quarters.



Fig.10. Machu Picchu, at twilight Martin St-Amant, 2009, Digital Image, Courtesy of Wikipedia-CC-BY-SA-3.0.



Fig. 11. Shanghai 31° 14' 39" N 2012-03-19 LST 14:42 , Thierry Cohen, from the Darkened Cities series. Courtesy The Danziger Gallery, New York & East-Wing Gallery, Dubai © Thierry Cohen.

Firstly, the shock and almost dis-belief of the images showing the magnificence of the night sky brilliant with stars, constellations and the Milky Way, over the contemporary cities of Shanghai, Tokyo, Berlin, Rio, Sao Paulo, Paris, etc. In Figure 11, Shanghai appears to be in deep slumber, as the night quietly passages over the city revealing its brilliant jewels of light encrusted in blackness. These images are carefully composed and not just constructed with a random image of a night sky, superimposed over the city. As noted by Francis Hodgson, Cohen photographs the city in daylight to avoid artificial light and travels to a remote location on the same latitude as the city and photographs the night skies in remote areas like Mongolia, Mojave Desert, which '[...] are the very ones visible above cities a few hours earlier or later.' [13] Cohen as a contemporary pilgrim makes journeys to restore the starlight above cities reuniting the firmament with the metropolis for the contemporary audience. The work becomes a witness to what humanity has lost. The Milky Way still has a significant role in the enduring indigenous world cultures and in spiritual beliefs of the past.

Pilgrimages and the Milky Way

Cohen's expeditions evoke the ancient pilgrimages when the Milky Way was used as guidance for pilgrim routes, at times connected with the Haji in Islam and the Christian pilgrimages in Europe. One example is the route along the northern section of the Iberian Peninsula to Santiago de Compostela in Galicia, the Milky Way was used to guide the pilgrims in an East-West direction, to their destination. [14] This particular route was revived in the 1970's and is still named The Way and there are many symbolic references to the significance of stars and constellations, associated with the route, where the night sky had a significant role with the belief systems at the time.

PUBLIC SPACE AND PUBLIC SKY IN DUBAI, UAE.

The relationship between settled and transitory communities has a long history in the Bedouin culture. The word Bedouin actually means desert dweller. The Bedouins held the belief that the transitory lifestyle maintained the dignity of the human spirit, rather than leading a settled life. [15] This culture of the transient where temporary shelter is used for rest, relaxation and the hospitality given to strangers can be linked to the mobility of people today who work and travel the globe and where people feel at home in a number of places.

Dubai has created an extraordinary city within the desert. The Dubai Museum has a section about the Arabic relationship to the sky, the Arabic names for stars, used for location, navigation, planting, timing for prayers, water irrigation, tent orientation, etc. The Arabic contribution towards knowledge is significant, in particular astronomy. The museum makes a concise statement about the quality of clear skies in the UAE. The country can become a leader in the region to protect the acknowledged resplendent views of the night sky and the Milky Way in the remote desert. It is important for the young generation to be educated in the traditional and contemporary knowledge of astronomy and to be given regular experience of these magnificent skies. Recent initiatives to protect the firmament have arisen and the UAE can consider creating partnerships with the International Dark-Sky Association formed in 1988, to bring public awareness to combat light pollution, with alternative forms of artificial light, the use of down lighting, as opposed to up lighting, low sodium lighting to reduce glare, etc. In 2001, the city of Flagstaff, Arizona, USA became the first International Dark Sky City. In 2007, the International Starlight Initiative was formed to defend the quality of the night sky and the right to observe the stars for future generations. The UAE can consider setting up a particular region as a Starlight Reserve, using the example of the New Zealand enterprise that created the Aoraki Mackenzie International Dark Sky Reserve, which received UNESCO World Heritage status in 2012 to protect the skies in association with the Mt John University Observatory. Figures 12 and 13.

The design and location of public space in Dubai will be subject to climatic conditions and could engage both exterior and interior

spaces. The abundance of sunshine in the UAE creates the perfect location for a large open-air sundial, as discussed in the example from the Disney Sundial in Florida. It is essential that artists be involved in public space and working with multidisciplinary teams, lighting designers, scientists, writers, ecologists to investigate the relationship between the city and the desert, to explore ideas, in sound, installation, performance, video, kinetic art, visual art, etc, to create a comprehensive and continuous engagement of knowledge using contemporary art in public spaces to act an instigator of questions and new knowledge, drawing on a range of multi-disciplinary fields and taking into consideration the ecological impact.



Fig. 12. Mount John University Observatory, Maki Yanagimachi/Earth&Sky Ltd, New Zealand. Digital Image, © Maki Yanagimachi.



Fig. 13. Sunset at Mount John University Observatory, Dallas Poll/Earth&Sky Ltd, New Zealand, Digital Image, © Dallas Poll.

The most remarkable public spaces always have the presence of nature and a relationship between the earth and the sky. I am reminded of the great courtyards in the grand mosques, where people transit through the elements of air, wind, sun and heat, to the protection of the interior. The use of Islamic screens to give privacy and protection from the sun, with the filtered patterned light creating an ambience of contemplation. I think of the public squares of Spain and Italy, where there is a changing nature of events - markets, music, performances, art installations, open-air

cinemas, festivals, etc. There are places to sit, read, write, think, converse and observe, while the space functions throughout the passage of the day to night. Well-designed public spaces are always engaging, memorable, welcoming and free to enter. We use public space for reflection on time, life and culture.

Today, as a large percentage of the world's population have never seen the Milky Way and once sighted, the visceral experience is transformative, it is worth fighting for its preservation for future generations. It is important for countries like the UAE to educate the young with the knowledge of the night sky creating a link between the city and the desert. Standing on the earth looking up at the sky is the moment when people are reunited with their 'evolutionary' and 'cultural inheritance' [...] 'where we measure the scale of our being against the dimensions of a deep night sky under the arc of the 'Milky Way.' [16]

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