

## Main points for “lightscape”: A new discipline<sup>†</sup>

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Soundscape [2] refers to a landscape which is constructed through sound and hearing as a counterpart of an ordinary visual landscape. The concept of soundscape has attracted much attention and has become a hot topic for research in the academic circle. It has also played an important role in designing and planning of built-up environment.

The concept of lightscape demonstrated in this article can be seen as a special facet of landscape. It refers to those landscapes formed by various light sources, lights, or the changing of light and shade [3]. Both lightscape and soundscape are main components of nostalgic atmosphere.

Soundscape is defined as that an environment of sound (or sonic environment) with emphasis on the way it is perceived and understood by the individual or a society. The author of “The history of Chinese classic gardens” indicated that visitors obtained the information of a garden not only from visual perception or literature, but also from hearing and smelling. Therefore, from the view point of the designing or planning of a garden or other human settlement environment, soundscape, smellscape (proposed by Canadian scholar Porteous in 1985) and lightscape are all important. It is the time for lightscape being proposed. Usually, traditional architectural optics or other science of illumination concern more on the physical aspects or objective aspects of lighting, especially artificial lighting and less concern on subjective and social aspects of lighting and on natural lighting. When considering daylight, usually illuminance or luminance and

other objective quantities are studied, but do not emphasize on the way photic environment is perceived and understood by the people and on the way how to design and plan a photic landscape. Lightscape is proposed as a supplement or enlargement of architectural optics to emphasize on the way light (or photic environment) is perceived and understood by the individual or a society and to suggest a multidisciplinary study way including history, folklore and environmental psychology and so on. As a new discipline lightscape will advance new research direction and expand new area about the relationships between human, light and environment.

The logic and reasons of the development from traditional architectural acoustics to the new discipline of soundscape can be applied as similar logic and reasons why architectural optics should be developed to a new discipline of lightscape. Traditional architectural optics does study on subjective responses of people to light or luminous environment, but usually concerns more on the subjective responses from natural or physical persons. By comparison, lightscape will pay more attentions on the emotional responses of social people to lightscape or luminous environment. In fact, a same or similar lightscape can produce quite different emotional responses from different persons due to their different living time, locality or social status. In short, lightscape will investigate on and explain why and how a lightscape can induce homesickness.

The idea of lightscape, just like soundscape, can be expected to play important roles in the designing and planning area for improving human settlement, especially in the area of landscape and garden designing. Paying attention to the design and construction of lightscape has some important

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values. For example, it emphasizes regionalism, nationality and historic characteristics when designing and constructing lightscapes for historic spots, tourist areas, gardens or parks in traditional cities or villages.

Lightscapes can be divided into natural lightscapes and artificial lightscapes. Of course there can also be a mixed lightscape which encompasses both natural and artificial illumination.

Natural lightscapes indicate the lightscapes formed mainly by natural light sources which include sun, moon, stars, aurora, firefly, phosphorus, etc. Artificial lightscapes indicate the lightscapes formed mainly by artificial illumination. Accordingly, the mixed lightscape is formed by both natural and artificial light sources which are available in the surrounding environments.

Ever since ancient times, people all over the world have been enjoying lightscapes. Many references, construction practice and folk customs are related with various lightscapes. Some typical examples of lightscapes will be adduced for further illustration and analysis.

**Sunlight appreciation.** Sun is the most important light and energy source to the world. Thus the lightscape formed by the sun is indisputably one of the most well-known lightscapes enjoyed in the world. Sunrise and sunset are considered beautiful and grandeur. In the ancient Chinese literature 《诗经》 (*The Book of Poetry*) [4], one can find poems entitled “东方之日” (The Sun in the East) and “东方未明” (Before Dawn). The poem entitled as “伯兮” (My Hu Shand) describes “杲杲出日” (Shining brightly is the sun). High mountains, such as Mount Tai and Mount ErMei, are preferred sites for viewing sunrise or sunset. One of the four wonders in Mount Tai is the view of sunrise at the peak, also known as YuHuang Ding (jade emperor top), where a long corridor is built just for people to enjoy the sunrise.

On the contrary, Mount ErMei is the place to enjoy the view of a perfect sunset. As one of the famous poems goes, “smoke lonely rises directly up and the sun is falling down into the long river.” In Tang dynasty, another place famous for sunset view during Tang dynasty is Qinglong Temple, which locates on the Leyou Plateau outside of the capital city of Chang’an. Poet Zhu QingYu even wrote a poem, “On Qinglong Temple” just to describe the beauty: “Temple is beautiful due to the height of mountain, I climb up also the sun is falling.” Another famous poet Li ShangYin also contributed his praise in Leyou Plateau: “In dusk time I feel some discomfort, so I ride a carriage going to the old plateau. Oh how breathtakingly beautiful is the falling sun, yet sadly the night is pressing close.”

Viewing the sunlight through an opening of rocks or caves provides a rather different aesthetic experience. During Qing dynasty, many temples on Mount YuQing outside Beijing were built in adjacent to stone caves. This forms a special characteristic of the local landscape. For example, a cave

called Lugong is found to be a good place for viewing the sun. Poet Cheng YiZhen of Qing dynasty wrote a poem entitled “Lugong cave” which goes, “Since when this stone cave came to exist, with its opening just opposite to the Yujian bay, ... the dark cave might be directly connected with the deep sea, ... From afar the sun is brought gently down to the sea.” It must be an extraordinary grandeur view, seeing the bright sunset from a stone cave [5].

**Moonlight appreciation.** The moonlight scenery is usually nostalgic. In “Moon Rise” from *The Book of Poetry*, it reads, “How fair the moon shines in the sky. How lovely is the lady passing by!” The most famous poetry on moonlight scenery is “静夜思” (Meditating in a quiet night) by Li Bai where it says, “The moon shines on my bed. The moon light looks like frost covering the floor. I raised my head to see the bright moon, and then bowed down, missing my home town.” Moonlight can be appreciated everywhere. “三潭映月” (Three pools mirroring the Moon) is one among ten of the most famous sceneries in Hangzhou. It is a site specially designed for enjoying the full moon. Three stone towers, each 2 meters high, were put in the middle of the West Lake, forming a triangle structure. The middle part of each tower is made hollow, with five round apertures drilled into the wall of the cavity. During the Mid-Autumn Festival when the full moon is in the sky, a candle is lit up in each cavity of the tower. The candle light then radiates through those apertures, now covered with paper, and is reflected on the lake. The 15 moon-like shining spots on the surface of the lake correspond perfectly with the full moon on the sky, creating a harmonious and dream-like atmosphere. A poem describing this scenery reads, “Bright moon is reflected on the deep lake. The towers bring forth 32 moons altogether.”

Another scenery called “平湖秋月” (Autumn moon in Pinghu) is also famous for its Mid-Autumn moon appreciation. Another place is “瘦西湖”, the Slender West Lake in Yangzhou city. Famous poet Du Mu wrote, “Clear in the moon on the Twenty-Four Bridges, Girls white as jade are teaching flute-music.” These sentences describe a moving scene which combines both soundscape and lightscape. On the Slender West Lake there are many arch bridges. Their half-circled arches form beautiful full circles when viewed along with their reflections on the lake. These views are impressively more beautiful during a night of full moon. A poem goes, “A slip of the moon hangs over the capital; Ten thousand washing-mallets are pounding.” This also serves as a good example of combining both soundscape and lightscape [6].

**Stars appreciation.** Ancient Chinese has long kept a tradition of observing astronomical phenomena. Many examples can be found in *The Book of Poetry*.

For example, a poem entitled “小星” (Litter Stars) reads, “Little stars are winking, in the east sparsely twinkling. Little stars are twinkling; star-clusters are winking.” Another

poem entitled “女曰鸡鸣” (The Cock Crows) reads, “Rise, sir and watch the night; The morning star is shining bright”. “东门之杨” (The Poplars) goes, “At dusk he is to meet me here, but meanwhile Venus stars to peer ... At dusk he is to meet me here, but meanwhile Venus glistens clear.” And in “七月” (The Seventh Month) we can read sentence like “In Month Seven the fire star is hardly spotted”. According to the annotation to *The Book of Poetry*, “Fire star refers to Mars”. So this sentence means that after June, the planet Mars declines westwards. In the poem “大东” (The Far East), one reads, “The Weaver Maiden Stars there stay. And travel seven times a day ... There also shine the Crowherd Stars, which river draw the traveller’s cars ... The east presents the morning star. The spoon-like Hyades quietly lie. ... The Winnow Star in southern sky” and “The Ladle Star in the north ashine”. These sentences clearly describe the ancient tradition of appreciating the views of stars. The poem “云汉” (The Milk Way) gives a clearer description, “The Milk Way is shining bright, from the sky endowing its light ... I look up at the boundless sky, and see the stars gleam on high”. This tradition of enjoying star light has been kept all through the history. For example, Du Mu, a poet lived hundreds of years later in Tang Dynasty wrote in his poem “Autumn Evening” that “On the stairs, moon light seems cool, people sit down to see the Crowherd Star and Weaver Maiden Star.”

**Sky light, lake light and snow light appreciation.** In ancient China, sun, moon and stars are mentioned together as “三明” (three bright objects), namely, they are the main light sources in nature. When the light from these light sources irradiate or reflect on its surroundings, such as air, water surface or snow field, it can create some special lightscapes which usually become the object of aesthetic appreciation. For example, people found gazing at the huge water surface of West Lake in Hangzhou enjoyable mainly because the reflections of light from either the sun, the moon or the stars creates glittering and shimmering wave which can be mesmerizing. As the poetry “公宴诗” (The Banquet) by Cao Zhi reads, “Bright Moon is reflected on the lake, and the stars shine irregularly.” Another famous poetry by Su Shi described a similar scene: “In a sunny day, the lake seems glittering. And in a rainy day, the color of mountain also looks dimming”. Another example which can be given is a special site located in the Imperial Summer Palace built during Qing dynasty. The site is named “千尺雪” (Snow of a thousand feet). This place is designed to enjoy the snow lightscape which looks white and flashing during sunny days.

**Rainbow and rosy clouds appreciation.** People in ancient times also enjoyed the lightscape of rainbow. References of this can be retrieved back as early as *The Book of Poetry*. A poetry entitled “蜺蜺” (Red Sky) reads, “In the west, the sky is red. A sign of rain for the day”. Other lines describing rainbow, “On the high place we can see the

rainbow, and we also can look down to see man’s cultivation”. Famous poet Wang Bo had a famous line which says, “In autumn, the color of river is as that of the sky, and the lone crane is flying with the falling rosy clouds.” These poems are all famous for describing beautiful rosy clouds lightscape.

**Mirage appreciation.** Mirage is one of the most interesting lightscape which has captured attention and induced legends about celestial mountains. Mirage is produced by the refraction and reflection of lights through atmosphere with irregular density distribution. Sometimes mirages can be seen on the sky of a calm sea or desert surfaces. Penglai of Shandong province and Putuo of Zhejiang province are well known for the frequent appearance of mirages.

In addition to mirage, aurora can also be given as another typical lightscape. Aurora appears when charged particles radiated from the sun entering the magnetic field of the Earth and induce bright and beautiful lightscape on the sky near south or north poles of the Earth.

Aurora is considered as one of most beautiful wonders in the world. In Chinese ancient literature “山海经” (Shan Hai Jing, Scripture on mountain and sea), aurora is mentioned as a dragon of light. Nowadays, Finland, Norway and Iceland are the most famous spots for appreciating aurora.

**Firefly appreciation.** One special lightscape is formed by firefly as light source. As mentioned above, Du Mu had a poem “秋夕” (Autumn Night) which reads, “Silver candle, autumn moon light shine the cool colored bing. The ladies flutter the firefly with small silk fan.” Another poem by Wang Ji entitled “秋夜喜遇王处士” (A Happy Encounter with Mr.Wang at an Autumn Night) reads, “Happily meet him at full autumn moon night, while seeing clearly the fireflies flying by.” From these poems one can tell the attention ancient Chinese showed towards the firefly lightscape. In the suburb area of Tokyo there is a place called Tatsuno-cho (辰野町) where local residents built a Firefly Fairy Tale Park, skillfully taking in the advantage of natural environment such as forest and river, etc. Now this park has become a famous scenic spot, attracting many families with children to come.

Next comes the introduction of some typical artificial lightscape or lightscapes in built-up area.

**Fire appreciation.** For a long time in human history, fire has been made to be the main source of light and warm sources. So it is quite natural that fire also has become an object of appreciation. There are different kinds of fire, such as candle fire, torch or bonfire made by burning something combustible, bamboo shoots, wood, straw and so on. In *The Book of Poetry*, one can easily find description of the lightscape of burning candles in the palaces, or burning straws in the field. For example in “庭燎” (The Torches), one reads, “Still a long time to go before daylight; The torches are now burning bright”. And also “It is not yet daylight; The torches

are blazing bright". "It is approaching day light; The torches are gleaming bright". In "大叔于田" (The Elder Hunter), one reads, "My brother hunts the game in the marsh; The prairie fire is burning harsh". This is a description of the bonfire or field fire lightscape. In another ancient reference "楚辞" (ChuCi, The Songs of Chu), one can also read, "Orchid cream burns bright candle, and light lanterns are distributed irregularly". These traditions of enjoying candle and bonfire lightscape remain up till now in many ethnic minorities areas. Also in some areas where mainly Han people live, festivals such as Torch Festival, Bonfire Party and Candle Party are celebrated. In the village of MoSuo nation near the LuGu Lake, villagers regularly hold bonfire parties during which villagers sing and dance around a bonfire. It later has become a medium for conveying sense of nostalgia.

**Lantern appreciation.** The custom of lantern appreciation is another Chinese tradition. The Lantern Festival at the night of the first full moon of the lunar calendar is one of the most celebrated festivals. Famous poet Xin Qiji wrote in "元宵" (The Lantern Festival Night), describing the night as "Colorful pipe is sounding, jade pot radiates light the dragon and fishes are dancing all night." This poem vividly presents the bustling scene of a Lantern Festival. Sentences such as "The sound of Sheng pipe is full in the courtyard, the light of lantern casting down on the doorsteps" also gives a vivid description. For people to appreciate various lantern lightscares, various lanterns and fire works have been invented, such as lotus lantern, paper ship lantern, hose lantern and Kong Ming lantern and so on, so that lanterns can not only be hung on trees or buildings, but also be laid on water or be launched into the sky. In Ming dynasty, people liked to place lotus lanterns on Jing Ye Lake of Beijing while burning fireworks at the same time. As Liu Tong and Yu YiZheng in "帝京景物略" (Dijing Jing Wu Lue, About the landscape of Capital City) describes, "No sense of night at the party of a YuLan Festival, monks of every temple gathered and placed lanterns on the lotus pond, sprinkling water to each other and shooting fireworks into the sky with various forms of birds, fishes and turtles. And their gorgeous images are reflected on the water." What a spectacular sight!

Fish fire is another typical lightscape we have to mention. Famous poem entitled "枫桥夜泊" (Mooring at night by the maple bridge) by Zhang Ji reads, "The moon setting, crows cawing, frost overfilling the skies, the maples riverside, lamps aboard, sad the fishermen's eyes. The toll from the Cold Mountain Temple outside of Suchow, reaches my boat at midnight and floods my sleepless sorrow." Here we can feel a kind of nostalgic atmosphere through both the soundscape and lightscape. Along QinHuai River of Nanjing City, people keep a tradition of enjoying fish fire and lanterns. As Zhu ZiQing describes in his prose "桨声灯影里的秦淮河" (QinHuai River immersing in lantern light and

paddle sound), "Under all boat ceilings hang colorful lanterns. When the curtain of night falls, the lanterns start to shine brightly. ... We were charmed by those brilliant traces of light on the river. They looked just like what "桃花扇" (Peach Blossom Fan) and "板桥杂记" (Miscellaneous Writings by Zheng BanQiao) described. It is as if we were actually seeing the beautiful scene of those times. ... The moon and the lanterns shone side by side with each other. Their lights blended so that the moon becomes a lingering one and the lanterns radiate hazy light. This is the QinHuai River which is a nature's gracious gift."

JiuFen Town locates in the north-east suburb of Taipei. Recently this small town is promoting a tourist campaign called "越夜越美丽" (Deeper and Prettier Goes the Night) in which lots of lanterns were placed irregularly along a winding road to form a warm nostalgic atmosphere. The city of "和歌山" Wakasan, which is 70 km from Osaka also keeps a festival called "Bamboo lantern night" which use the local specialty of bamboo. 8000 bamboo lanterns were lit up at the festival to form various beautiful patterns. These lanterns construct an impressive lightscape [7].

There are numerous lightscares in built-up environment. Due to limited space, we just want to give two examples. One is the lightscape of the gothic cathedrals in Europe at middle ages. Inside these cathedrals, colorful light shone through the rose windows with red or blue glasses constructs a sacred and mysterious atmosphere which is unforgettable to the audience.

Famous architect Ando Tadao applied this inheritance in his design of the "Church of Light". It has thus become one of his representative masterpieces. On the front wall of this church, he designed an opening with the shape of a cross so that the sun light can shine through this opening to form a splendid light of cross which is stunningly grandeur. This church has become one of the most famous buildings in Japan. This example illustrates that promoting lightscape design in architecture designing is important for producing more excellent works.

Another lightscape example can be found in Hongzhuang village of Anhui province, which locates in the south YangZi River delta. Many houses in this village have indoor courtyards. Usually these courtyards are not covered by roof so one can directly see the starry sky. The roads of this village are usually very narrow. When the sun light shines through the thin strip line formed by the houses on two sides, it casts irregular shadows on the white high walls on both sides of the road. This scenery has become a special lightscape in the village.

Nowadays, with the development of science and technology, LED light, laser, 3D-holographic projection, water curtain movie, music and light fountain as well as fireworks provide numerous methods for constructing new lightscares. We need to pay more attentions to traditional lightscape

scenarios and at the same time use new techniques to create more excellent lightscares to embellish our living environment.

As mentioned above, the discipline of lightscape will be a new area of crossing and blending interest. The relationship between lightscape and architectural optics is just the same as the relationship between soundscape and architectural acoustics. The discipline of lightscape is the kind of discipline which deals mainly with the relationship among light environment, the people and society from a much wider point of view. It combines architectural optics with sociology, folklore and history. The research contents will cover wide ranges such as collecting and analyzing various typical lightscares in the world from ancient time up to now, and the relationship between these lightscares and the life of local people; how we can maintain and save traditional lightscares and the processes or techniques of designing and constructing new lightscares; the evaluation of lightscape; the simulating methods for lightscape and soundscape as well; the method of recording, copying and recovering lightscape and the establishment of lightscape database; the combination of GIS system with lightscape; the application of new techniques and new methods into the planning and designing of lightscape, especially in the historical gardens, traditional villages and town and other tourism areas.

To study the way an environment is perceived and understood by people, usually social survey must be taken, but for ancient time, literature survey becomes a realistic way. Therefore, poetry and literature not only reflect human's appreciation on a lightscape, but also reflect their perception and understanding on it [8].

Lightscape is a multi-discipline research area including

history, literature, sociology, folklore and environment psychology. This is the main new methodology development. Therefore, some methods or tools from above relative areas, for example, philology, social survey, big data, GIS technique, analytic hierarchy process and so on will become main stream methods or tools comparing to architectural optics in lightscape. Some soundscape research methods or practices such as soundscape travelling and soundscape application on healthy buildings or gardens also can be applied in the research or practices of lightscape. The author believes that with the research development of lightscape, more research methods and practices will be produced.

We hope that through these efforts we can keep our traditional values and at the same time open up new views and possibilities for constructing beautiful inhabitant environment. We hope that more colleagues can participate in this new research area and more achievements can be achieved to benefit the people all around the world.

- 1 Wu S X. Main points of lightscape (in Chinese). *South Architect*, 2017, 3: 4–6
- 2 Marray Schafer R. *The soundscape: Our sonic environment and the tuning of the world*. 2nd ed. Rochester: Inner Traditions & Bear, 1993
- 3 Qiu J Z, Wu S X. Lightscape and architecture (in Chinese). *Architect J*, 2017, 9: 115–118
- 4 *Library of Chinese Classics (Chinese-English)*. *The Book of Poetry*. Changsha: Hunan People's Publishing House, 2008
- 5 Zhou W Q. *History of Chinese Classic Gardens (in Chinese)*. 3rd ed. Beijing: Tsinghua University Publishing House, 2008
- 6 Qiu J Z, Li Y T. Lightscape in Chinese traditional garden (in Chinese). *Chin Landscape Architect*, 2018, 34: 136–139
- 7 Zhao W. Night life: Adding something to short vacationing (in Chinese). *J Key Tech*, 2015, 3: 54–62
- 8 Yu S Z. *Detailed Analysis on 300 Tang Poetries (in Chinese)*. 2nd ed. Beijing: Zhonghua Book Company, 2005