THE NOT-SO-SECRET GARDEN
Designing Sustainable Healing Environments

Anna Pelgrim
# Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preface</td>
<td>8</td>
</tr>
<tr>
<td>Introduction</td>
<td>9</td>
</tr>
<tr>
<td>Curing</td>
<td>10</td>
</tr>
<tr>
<td>History of Hospitals</td>
<td></td>
</tr>
<tr>
<td>Issues with the Modern Hospital</td>
<td></td>
</tr>
<tr>
<td>Healing</td>
<td>14</td>
</tr>
<tr>
<td>Nature</td>
<td></td>
</tr>
<tr>
<td>Organic Architecture</td>
<td></td>
</tr>
<tr>
<td>Preventing</td>
<td>19</td>
</tr>
<tr>
<td>Issues with Modern Life</td>
<td></td>
</tr>
<tr>
<td>Proposal</td>
<td>23</td>
</tr>
<tr>
<td>Bibliography</td>
<td>26</td>
</tr>
</tbody>
</table>
With thanks to Anna Arov, Richard Pelgrim, and the department Interactive/Media/Design.
Health depends on a state of equilibrium among the various factors that govern the operation of the body and the mind; this equilibrium in turn is reached only when [humankind] lives in harmony with [their] external environment.

Hippocrates (Purves, 2002, p.xiii)
After moving from Holland to Lebanon at a young age, I witnessed the effect of pollution on health and the environment, but most of all, the mind. My parents worked as humanitarian workers in Lebanon, which consisted of providing medical equipment, staff, and locations for eye surgeries for Palestinian refugees living in overpopulated and deprived camps. During the time of the surgeries, at the age of fifteen, I was helping patients get to the Operation Room, cleaning equipment, and even disinfecting eyes. This led me to experience the hospital environment on a deeply personal level.

It was an unusual time in my life where I witnessed the effects of poorly constructed buildings and the lack of attention to physical wellbeing on people that lived in the city. While becoming aware of the importance of a cohesive hospital environment, I also developed an understanding of the value of a well-developed city on the individual that works, lives, and breathes in it. Moving to Holland after fifteen years of living in Lebanon, I embraced the abundance of greenery and solid infrastructure. There was an expectation with coming back that things would be ‘better’ here. However, being privileged to live in the environment I am in now, I am still confronted with structures within a city like hospitals that do not pay full attention to personal wellbeing and deal with enormously high levels of stress that has so much to with how they are designed.
We are living in a highly stressed and demanding era. With our constant connectivity and our addiction to Netflix, our brains have grown accustomed to a fast paced living standard. This pace causes problems. Stress is now a common concern and causes a lack in attention to our personal wellbeing - we leave almost no time for recovery and relaxation. Our dependence on being fully healthy to be productive and efficient in this chaotic world is therefore enormous. Yet there is a fundamental issue in the way we perceive health nowadays that is reflected in the environments we interact with.

This is especially visible in the environment of the average hospital. We cannot imagine hospitals as anything but sterile or clinical and it is certainly not a place that we look forward to spending time in. However, functioning as a place of treatment and cure, hospitals play a significant role in defining the value placed on our health. Is it not strange then to see that this environment where health is central is actually a space that does not encourage or stimulate natural and holistic healing? It seems as if hospitals still function as a way of fixing an issue rather than taking a holistic approach to healing, creating a problem that has a deep connection to its architectural design.

The psychological effect of a building has a strong impact on the patient and its effectiveness to stimulate recovery. Architects and designers therefore have a responsibility to design structures that encourage healthy living and healing. Here nature becomes a vital element that has been proven to have a positive effect on healing and can aim to create more holistic healing environments.

By redefining the hospital’s function through design, we can change the perception of health within this space. Once a hospital is able to create a holistic healing environment, the building could serve as a mirror for the rest of the city, where structures could even aim to prevent illnesses.
Curing

Aachen Keiserbad 1682

Victorian-era image of the Flower and Fruit Mission ladies doing their deliveries.
Hospitals function as mini cities. It is the heart of the larger city. Without the hospital or healthcare, all other jobs are affected within a city. As Noor Mens describes in her book ‘City Within a City’, “Students, doctors, professors, technicians, patients and their visitors populate the buildings, which are a city in themselves. A large hospital with many patients and visitors and a large staff has something of a public place in a city where a cross-section of the population spends time.” The importance of this structure within a city is often underestimated. Although we might understand the importance of its function, the hospital has a far greater responsibility to its citizens than it might seem; it is a symbol of the value we place on our health. The modern hospital, however, only serves a limited element of healing, namely curing. This becomes especially clear when we look at examples of how hospitals have been designed and have functioned through history.

The origin of hospitals has a dense history that passes through important moments in time. From the power of religion in the ancient world at ‘the temples of Askelpios in Epidaurus and Kos in Greece (around 500BC), where the sick came to be diagnosed and healed’ to the advances of the military in Rome, where hospitals ‘were developed for military purposes with plans based on barracks’.¹

Taking architectural forms of churches in the Middle Ages, places for the care of the sick and poor were part of religious and charitable call to care for the city. A great example of this structure is seen in the flamboyant Gothic architecture of the Beaune hospice in France founded in 1443. Decorated with chimneys, overhead skylights, and a vineyard, it’s ‘harmonious organization of buildings rule[d] the life of this charitable institution’².

In the eighteenth century, military hospitals, which followed the charitable almshouses, were constructed. Due to the lack of knowledge in sterility and infectious diseases during the early 1900s, hospital areas such as patient rooms were equipped with things like carpets and plants and were almost home-like, therefore allowing for hospital acquired bacterial infections to become “a frequent occurrence”³. At this time, it was far safer to undergo an operation in bed at home (3–5 times safer) than it was to have the same procedure performed in the controlled environment of the hospital³.

The Royal Naval Hospital in Greenwich, England, was therefore influential as its pattern of detached wards were arranged to minimize the spread of infection and housed over 1,200 patients. This is when the importance of the function of the hospital and its architecture started become more apparent.

In a former hospital in Barcelona built in the early 1900’s, named Hospital de Sant Pau, patients visited therapeutic gardens with orange trees that could be picked and were cared for in abundantly decorated rooms and buildings. There was enough space for walking and strolling, taking in sunlight, feeling fresh air, and colors to see. It was a building that “in no way was a sterile building”, “met the highest medical standards”, and was “a unique place in the world, a pioneering model hospital which affirmed the importance of open space and sunlight in the treatment of patients.”

The modern hospital, however, seemed to have lost its edge throughout time with the advances of medical technology and need for efficiency. In the 1970’s, a group called The Humane and Modern Hospital Foundation criticized the effect of modernism on the hospital and felt it led to alienation from the patient’s welfare. Together they emphasized on bringing back the beneficial effects of modern technology and science into line with the ‘natural’ demands of human existence.

However, throughout their efforts and many others, it seems that the need for efficiency still trumps the importance of holistic healing in this structure. Today, the average hospital, specifically the patient room, has not developed much since the 1900s in terms of layout and furniture (with the exceptions of TV’s and phones). The patient bed, table, basin, and cupboard are still placed in a square room with bare colors and one window. The average hospital seems to be stuck in time, unable to move forward with the times. Additionally, through the technological developments in understanding bacteria and research on infections, the hospital has become more sterile than ever before. This sterility, although serving to aid in recovery, does evident harm. Without the benefits of nature and exclusion to the outside world, patients lose a sense of humanity and connection to daily life. Roger S. Ulrich, a professor of the Department of Architecture and Centre for Healthcare Architecture at Chalmers University of Technology, carried out research in 1984 suggesting that patients often experience “considerable anxiety” and their stay in the hospital “limits their access to outdoor environments”.

It is also proven that patients feel stressed due to just the possibility of pain and lack of control. The problem does not end with patients alone; staff members, specifically nurses, are faced with daily doses of high stress levels and risk burnouts. This confirms that the hospital does not work in their favor either. Who does it work for then?
Recovery takes time. Being ill takes energy, time, patience, and is a struggle. It takes medicine, a safe and nurturing recovery space, support from loved ones, positive energy, nature, and constant observation by professionals and caretakers to be able to recover with relative speed. A harmonious balance between these elements is key in a smooth recovery. To be able to achieve this balance is a strenuous task and therefore requires a healing environment.
Healing

Members of the Finnish Sauna Society enjoy the modern electric sauna in Helsinki, capital of Finland, Dec. 10, 2016.

Ashiyana Yoga and Spa Village - Goa
Our need to connect and surround ourselves with nature lies deep in our DNA. We are living creatures that depend on nature even though we can often pretend we do not. As technology advances and the more fast-paced our lives get, we are slowly distanced more and more from the natural world. Yet our brains still search for ways to wind down. People frequently find that nature effectively aids in relaxation and has an enormous positive impact on the body’s ability to heal and recover. This is evident in the design of the average home. When looking closely, there is a pattern to be spotted in the way they are decorated: a houseplant.

What a simple thing, yet we have grown a desire for inviting these organisms into our homes. Often seen only as decoration, there is a deep connection to our biological need, or in other words our biophilic need for greeneries in this simple ‘thing’. A houseplant is actually quite useless: you cannot eat it or do much with it, yet there is a million dollar industry that lies behind it. Likewise, this plant trend is also visible on social media, specifically on Instagram where the hashtag ‘nature’ has over three hundred million posts while the hashtag ‘city’ has only fifty million posts. Not for nothing, however.

Plants and greenery have a significant effect on our mind and body. Plants purify the air, by reducing the concentrations of CO2 and volatile organic compounds. Green views reduce stress levels and indoor plants humidify the air, reducing headaches and improving concentration. A study in Toronto revealed that people in neighborhoods with higher tree density not only felt significantly healthier, but also showed significantly lower rates of cardiovascular diseases. Surprisingly, ten extra trees per city block delays the onset of age-related health conditions by an average of seven years. Even in real estate, the presence of greeneries in the immediate vicinity of houses increases their value by 4-15% depending on local conditions. In hospitals, it has been proven that plants have reduced overall negativity scores in patients by 64%. This has also lead to a decrease in the intake of medication. Overall nature has an enormous impact on our lives; the more it is implemented in the design of spaces, the more positive change it can bring.

Outdoor environments that have already been proven to reduce stress and positive effect ways of living are parks. Parks allow for fresh air and interaction with nature, which has proven to enhance productivity and aids in weight loss as it encourages activities such as walking and running. A park ‘increases the mortality rate in highly polluted cities’ and creates a central space for communities to interact. Similarly, natural ecosystems that could not develop in concrete city blocks flourish and help clean polluted air. Besides being a relaxing and engaging environment, the integration of numerous parks within the city structure can enhance its appearance and aid in striving for a healthy city.

Like parks, there are indoor environments that also allow for this positive interaction. A structure that promotes healing through its marketing strategy but also its architectural design is a spa. A spa has aspects that reduce negative issues such as stress and encourages relaxation. Although it is marketed as a luxury in some cultures and a common habit in others, a spa has a function that no other building in the city does. It is constructed with the intention for relaxation for longer periods (on average more than 2 hours), makes use of all natural elements such as water, fire, earth, and air, often permits nudity, and is even built for social interactions. The combination of these elements makes the structure of a spa unique in a city. It is clear that its architectural design plays a large role in the effectiveness of the customer’s ability to relax. Usually designed with larger open spaces, natural or dimmed light, curved walls, semi-private corners, subtle or luxurious colors, a good balance between indoor and outdoor areas, fitness rooms, and lookouts onto nature, a spa provides a nourishing distraction and evidently reduces stress levels. Elements of a spa can also be seen as a social affair. In Finland, for example, with a population of 5.5 million, visiting saunas is a group activity that induces relaxation and promotes sweating; it is estimated that there are as many as 3.2 million saunas registered. The average Finnish or Scandinavian home can even be designed to accommodate a sauna.

9 A summary of the positive effects of greenery on well-being in residential environments Greenery and Residential, Wageningen UR E-depot – WUR.
10 Scientists have discovered that living near trees is good for your health, The Washington Post.
11 8 Reasons Why Parks Are Important by Casandra. Green Ribbon.
12 Mikko Norros, This is Finland. ‘Bare Facts of The Sauna’, December 2001; updated May 2009.
13 Toyoda, Masahiro. (June 2012). Associate Professor, Graduate School of Landscape and Management, University of Hyogo. JAPAN. ‘Horticultural therapy in Japan’.
Throughout history, alternative therapies such as public baths were considered a social norm, specifically to the ancient Romans. These baths were places to enjoy art, therapeutic retreat and even undergo medical procedures. A therapeutic technique called Horticultural Therapy by which “plants, gardening activities, and the innate closeness we all feel toward nature are used as vehicles in professionally conducted programs of therapy and rehabilitation” was first recorded in Ancient Egypt. It was utilized “when court physicians prescribed walks in palace gardens for royalty who were mentally disturbed”14. Horticultural Therapy has also proven to reduce heart rates, stress, increase recovery rate, emotional and memory functions, and even helps regain confidence.

“The color, shape, smell, touch and taste of plants, sounds of wind, water, insects, birds, and conversation with others stimulate the sensory organs, attract people and make them comfortable”13

Cultures that seem to take on healing with a more patient attitude can be found in Japan and China, specifically throughout aspects in religious views, healing techniques, and spiritual guidance. Tibetan healing, for example, “focuses on the direct healing of the patient’s body and mind with the help of the appropriate medicines, diet, behavior and therapies to pacify the result of mental negative passion”15. Tibetan medicine is different from conventional Western medicine because it emphasizes finding and treating imbalance as the first step toward healing and health15. A Japanese healing technique, called shinrin-yoku or forest bathing, is a way of relaxing and improving mental and physical health by walking through a forest while smelling essential oils and is used to as a stress management technique.

Architects such as Frank Lloyd Wright have strived to design structures that are in harmony with humanity and its environment. The philosophy called Organic Architecture, coined by Wright, exemplifies the motivation for this harmony. The best example produced with Frank Lloyd Wright’s philosophy is “Fallingwater” designed in 1935 (photo). Wright’s passion for Japanese architecture is appreciated in the importance of ‘interpenetrating exterior and interior spaces and the strong emphasis placed on harmony between [humans] and nature’16.

14 University of Minnesota. “What is the History of Tibetan Medicine?”.
With Fallingwater, Frank Lloyd Wright accomplished the traditional Taoist objectives of meeting wind with water, or what the Chinese describe as Feng Shui\(^{17}\). Feng Shui is an “ancient Eastern art of placement that believes that buildings should allow for a positive flow of energy called Chi” and accentuates on Taoism, which emphasizes on a harmonious living with nature\(^{18}\). Simply said, Feng Shui means living in balance with nature.

Architect and planner David Pearson proposed a list of rules towards the design of organic architecture. These rules are known as the Gaia Charter for organic architecture and design. It reads:

“Let the design:
• be inspired by nature and be sustainable, healthy, conserving, and diverse.
• unfold, like an organism, from the seed within.
• exist in the “continuous present” and “begin again and
• follow the flows and be flexible and adaptable.
• satisfy social, physical, and spiritual needs.
• “grow out of the site” and be unique.
• celebrate the spirit of youth, play and surprise.
• express the rhythm of music and the power of dance.” \(^{19}\)

With the knowledge of the benefits of nature and methods of designing, there is an increase of architects, designers and engineers using them to create better hospital environments. Hospitals such as the New Lady Cilento Children’s Hospital in Queensland Australia, designed by Lyons and Conrad Gargett, prove to be an outstanding example of blending architecture with nature in the healing structure. By landscaping the building with large trees, playgrounds, and specifically designed healing gardens, a sense of engagement and interaction with the real world is achieved (photo). The Frankel Cardiovascular Center’s atrium in Michigan U.S., is a welcoming view for many visitors, nurses, and patients who can spend time around nature indoors (photo).

Although not all of aspects of healing can be implemented in hospitals, there is much to learn from nature that can slowly be brought back in this structure. In creating more natural spaces and designing the right environment for the medical processes that take place, the hospital can function as stimulating space for people who interact with it. Once this ideal is accomplished, zooming out from hospital and back to a step before acquired illnesses, it is important to look at how the city and its urban spaces can prevent the modern issues of stress through its architecture.

\(^{17}\) MDA Development. Frank Lloyd Wright Influences
Lady Cilento Children's Hospital, Queensland, Australia.

Lady Cilento Children's Hospital, Queensland, Australia.

The Frankel Cardiovascular Center's atrium in Michigan U.S.
With more than half of the world’s population living in urban areas - a statistic which is projected to grow to 70% by 2050 - the report hinges around the theory that “massive urbanization can negatively affect human and environmental health in unique ways” and that, in many cases, these affects can be addressed by architects and designers by the way we create within and build upon our cities.

ArchDaily
In the chaos of communication, transportation, business, education, and competition, our brains have gotten addicted to the overload of the modern world. With the advance in technology and our fast paced living standards in Western society, it seems as if the attention to the holistic understanding of our wellbeing has become lost. Stress has become a reoccurring issue that stems from this fast paced living standard. In highly stressed environments the risks of burnouts, a recent and modern issue, are extremely high and can take a toll on productivity, physical and emotional health, and affect relationships. In the average citizen of today, issues like insomnia, social withdrawal due to stress, fatigue, and even depression are all seen regularly. Although these issues are common, it seems as if not much is being done to assist this new way of living in the 21st century.

These issues are seen even in the way cities are built. Mainly revolved around efficiency and economy, maximizing space for an ever-growing population, most city’s structures prove to be a substantial issue to the health of its population. Rather than creating spaces to allow for rest and recovery, most visuals aspects of the city remind their citizens of their fast paced life through billboards, high-rise structures, and even concrete surroundings.

Weather has a profound effect on human health and wellbeing and plays a large role in countries with lower temperatures, fewer sunlight hours, and more downpours. The escalated pace in mass production effects issues like global warming that have an immense impact on weather through rising water levels and extreme temperatures. The worse the weather, the more time is spent indoors. The more time spent indoors, the less encounters there are with important elements such as fresh air, sunlight, and greenery, which are important for wellbeing.

With an innate desire to return to nature and a desperate plea from Mother Nature to do the same, we need to rethink how nature’s ability to create a healthier living standard can be implemented more within a city. With the aged population currently at its highest level in human history meaning more and more people will need care in future, there is urgency in developing cities revolved around health that can sustain the future population.


Once hospitals take on a more holistic approach to healing, the building could act as a mirror for the rest of the city to change the perception of health within it. This change in design within structures such as offices, universities, or homes can offer a function of preventing issues such as stress within their design. Disciplinary architecture is an example of architecture that aims to manipulate and ‘regulates behavior’ of its targeted audience. Unlike organic architecture, however, it does not aim to create a harmonious and interconnected environment, rather it enforces a certain control to prevent or ‘direct a certain type of behavior through the psychological effects of the surrounding built environment’\(^\text{22}\). Spikes that prevent skateboarders to skate over railings in cities or benches designed to prohibit people from sleeping on them are examples of how the city’s architecture prohibits certain actions that could be disturbing or destructive. Although disciplinary architecture might come across negatively, it could be seen as an inspiration to design structures that could prevent more pressing health-related issues.

To direct a behavior or enable it to prevent a certain action is key in designing structures that encourage healthy living. Instead of discouraging a behavior, however, the goal of preventative architecture as a way of promoting a healthy citizen works to encourage behaviors such as walking amongst nature or relaxing in the sun (the term preventative architecture does not exist, but it is used here to make a point). Urban spaces such as the proposal for a garden in China named ‘The River Runs’, exemplifies this blend between directing and encouraging a target audience. It does so by working with curves in its rising and receding ground levels all seamlessly combined with nature and the functions of a garden. Skogskyrkogarden, a cemetery garden in Sweden, uses its architecture to breathe life into a common solemn location. It respects the function of the environment and enhances the surroundings by creating dedicated structures that allow for moments of reflection and serenity. With its pleasant atmosphere, the garden also aims to help with the grieving process and even prevent issues such as stress when visiting a deceased loved one.

The act of prevention comes through the attention to detail in the design of spaces. When an environment encourages healthy living standards through the implementation of plants, for example, which has been proven to reduce stress, it can act as a gateway for prevention. Rather than waiting for a problem to arise and using the functions of another building to solve the problem, such as a hospital, architecture is able to stop issues in its tracks.
To achieve this method of preventative architecture, we must return to the hospital. Being the center of health, it must set an example to the rest of the city as to how to deal more holistically with our health. As with disciplinary architecture, the design of a hospital should direct its target audience on a more nourishing and holistic path. The role of the designer here is crucial. In the future of healthcare, their expertise in understanding the needs of the various occupants of this space and the capacity to incorporate the advances of medical technology will need to combined. It is important here to discuss the role of patients within the future designs of healthcare centers. It is impossible to create impactful and useful healthcare buildings without keeping in mind the needs of the people who will use the space the most. Rather, it works by accepting that a solution works not in terms of efficiency and technology, but is a collaborative effort by the direct users who often have simpler and more impactful solution. It is then the makers who reflect, iterate, and execute the results. In this way, the hospital could learn a lot from design methods and creative solutions.

In thinking in a more creative and ambitious design method, the large structure of the hospital could be looked at from a new perspective in which the building could serve as a holistic healing environment that is engaged with society. Rather than functioning as a one-dimensional building, the hospital should reflect its importance within the city. With so many medical functions, it deserves to be multi-layered in its design. This could be accomplished by dividing the large structure of the hospital into smaller structures scattered around the city. This way it can become more involved in it. Inspired by its design in the early stages in history of the structure’s development as a hospital, it must give room to its function rather than restrict it. Allowing visual access to certain activities of a hospital, citizens can be more involved rather than barricaded in the process of recovery, which will in turn help eliminate the taboo of the hospital and illness. Designing interiors using more curved and organic shapes to direct attention from rigid, direct lines allow for more coherent surfaces that guides rather than directs attention. By dispersing the hospital, urban spaces such as gardens and even functional buildings such as spas or gyms can be attached to create more unified structures that deal with healing, curing and preventing simultaneously. Instead of living, as Kevin McCloud remarks in his series Grand Designs, in the ‘rectangular age’ as we do now, ‘we should push the envelope’ to a more organic design method.
The logistical implementation of this concept is complicated. It is expensive to build with curves, arches, large amounts of glazing, and nature. It is also illogical to suggest deconstructing and then rebuilding hospital and other functional structures. Additionally, the investment needed for these adjustments and redesigns is definitely not available in every city even though it might have a drastically positive effect on its people. However, with the help of patients, staff members, designers, engineers, and architects, it is possible to continue pushing the boundaries of the traditional healthcare system. By constantly proving the positive effects of natural elements and designed healing environments on the occupants of hospitals, we can work towards an engaging and stimulating design for the future.

As a designer with experience in hospitals and highly stressed environments, I believe there are affordable and sustainable ways to use nature as a tool to make a difference. Through my work, I hope to engage people with experiences using nature to reduce stress and campaign to make a change primarily in the hospital. Just like Mary was able to guide bedridden Colin to the Secret Garden, there is a key to unlock the doors to sustainable and holistic healing environments...
Bibliography

4 Former Royal Naval Hospital, the Quadrangle Centre, the Quadrangle Centre Creykes, Gordon, Fellowes, Lyster and Sandon Court, the Quadrangle Centre Evans, Hornby, Dudding, Pryn and Norbury Court. Historic England. Web.
9 A summary of the positive effects of greenery on well-being in residential environments Greenery and Residential, Wageningen UR E-depot – WUR.
10 Scientists have discovered that living near trees is good for your health, The Washington Post
11 8 Reasons Why Parks Are Important by Casandra. Green Ribbon.
12 Mikko Norros, This is Finland. ‘Bare Facts Of The Sauna’, December 2001; updated May 2009
13 Toyoda, Masahiro. (June 2012). Associate Professor, Graduate School of Landscape and Management, University of Hyogo. JAPAN. ‘Horticultural therapy in Japan’.
14 University of Minnesota. ‘What is the History of Tibetan Medicine?’.
17 MDA Development. ‘Frank Lloyd Wright Influences’. February 2002
23 TV series Grand Designs, Boundless Productions.
28 Marieke Karssen, Into Green. ‘Innoveren is net kietelen, je kan het niet alleen’.
29 Joren van Dijk, Into Green. ‘Evidence based design en healing environments’.
33 Noor Mens, Stad in Stad. ‘de architectuur en bouwgeschiedenis van het universitair medisch centrum Groningen (UMCG)’
35 Fallingwater, ArchTravel. 08/05/2016, http://www.architravel.com/ architral/building/fallingwater/

Images
2 Jan Luyken or Cuyken (ungeklärt) - Scan einer Reproduktion eines Kupferstiches
7 Arxiu Foogràfic de Barcelona. Frederic Ballell. bcn001637
10 A glimpse into daily life of members from Finnish Sauna Society http://news.xinhuanet.com/english/photo/2016-12/14/c_135905224_5. htm
11. Falling for Frank Lloyd Wright in Pennsylvania’s Laurel Highlands


14 The Frankel Cardiovascular Center’s atrium in Michigan U.S. https://thetravellinght.wordpress.com/2013/09/15/university-of-michigan-hospitals/

15 Disciplinary Architecture or Deterrence by Design.http://hyperallergic.com/131525/disciplinary-architecture-or-deterrence-by-design/

16 On Defensive Architecture https://thepetitetoolbox.wordpress.com/2015/08/17/on-defensive-architecture/


20 A new vision for Boston Children’s Hospital https://www.bostonglobe.com/opinion/2016/02/18/new-vision-for-boston-childrens-hospital/qLti9cjJ8NitSaNd6k91CsK/story.html