

Daylight, View and Good Circulation in Hospital Design

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Introduction

From earliest times, civilizations have revered the sun. Daily activities were governed by its presence and movement. Belief sets were developed to worship it. As settlements developed, courtyards and squares, gardens and crop fields were arranged to catch the sun's rays. This paper traces the evolution of daylight, views and circulation as major determinants of built form. The conclusion suggests that a fusion of new construction technologies, particularly the use

of glass and gardens with some of the oldest sensitivities to daylight, can result in energy-efficient and easy-to-use concepts for one of the most complex building types: hospitals.

The point of these early images is to show that an awareness of sun, views, vistas and sequence or circulation were fully absorbed in the general consciousness of the arrangement of rooms, houses, villages and cities. These illustrations are biased toward advanced Western Greek and Roman examples because of the proliferation of materials and documentation available to us in the West. Many early cultures in Africa, Asia, Central and South America, India, and China show an equal awareness of sun, views, vistas and movement as determining factors in the arrangement of their public and private structures.

A few examples in paintings from Holland in the 16th and 17th centuries solidify the notion that direct sunlight entering private dwellings was essential to the execution of routine domestic activities such as sewing, childrearing, cooking and cleaning, if not the mental health of the occupants. The examples are the work of Pieter de Hooch (1629-1684), a contemporary of the more famous Jan Vermeer. The paintings of de Hooch are especially appealing because of their heightened sensitivity to how light reflects from different surfaces. This awareness and concern with reflectivity of light will appear in some of the groundbreaking examples in the work of thoughtful architects several centuries later.

Fast forward to 1934 to the concept drawing for an expanding nursery school by the Hungarian-

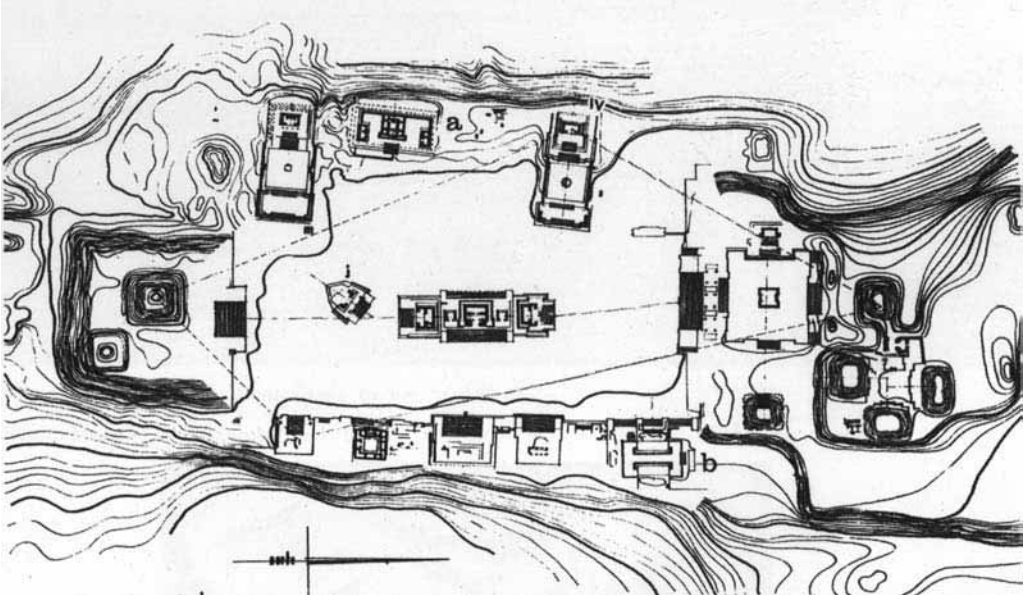


Figure 1 Monte Alban, the first public observatory

English architect, Erno Goldfinger, and one sees an equal sensitivity to how daylight is going to enter the room and determine its feeling and ambience. One could imagine de Hooch and Vermeer doing similar light and shade studies for their paintings.

The sensitivity to how light enters rooms and houses, no matter how modest, is evidenced 350 years after de Hooch in the work of the exceptional teacher/architect Samuel Mockbee. With the Rural Studio set in impoverished Hale County, Alabama, Mockbee worked with students from Auburn University School of Architecture, with his, their, and often the future owner/occupants' own hands, usually with very inexpensive, unusual and innovative materials to produce extraordinarily creative structures. Although seemingly "ad hoc" at first visual assessment, the variety and subtlety of light, shade and levels of transparency of these modest buildings are groundbreaking in the quality of light and space. The gradation of light lev-

els, and the variety of ways light enters spaces, shows sensitivity as exceptional as the spaces created by de Hooch's depiction of perceived Dutch domestic reality. Mockbee was awarded the MacArthur 'genius' award, one of the few architects to ever receive this prize. He died prematurely of cancer in the early 1990s.



Figure 2 Rural Studio

The survey would be remiss without a quick mention of monasteries. Often constructed by the monks themselves (often because of their relationship to Christianity which flourished, or was promoted most successfully, in warm, brightly lit southern climates), the monasteries kept alive a sensitivity to light, shade and natural climate control during the dark and middle ages. Thick stone walls provided a measure of security, durability, and quiet for contemplation and study. Many monasteries and their female version, convents, also cared for the ill and those with incurable physical and mental disorders.



Figure 3 *Pennsylvania Hospital 1750*

Initially, artificial light was available only by candles and, somewhat later, gas. If a complex, elective procedure (one requiring optimal lighting for both the nuances of the work and the teaching of it to the students in the galleries) had been scheduled and the day turned out to be dark, cloudy and without good sun/light, the procedure would be cancelled and rescheduled for a sun-filled day.

Growth: the loss of light and views and the proliferation of circulation chaos

The industrial revolution in the 1780s in England, followed shortly in the USA from the early 1800s on, led to unprecedented growth of cities. Huge numbers of poor families moved to cities from rural areas and less prospering countries, seeking a better life. This put enormous pressure on hospitals and other institutions to expand. Initial master plans for new hospital buildings and medical campuses were informed by a very profound awareness of the importance of natural light, good ventilation, views, vistas, and gardens. In the case of two new campuses being planned in the 1870s, The Johns Hopkins Hospital in Baltimore, Maryland, and The Reading Hospital and Medical Center in Reading, Pennsylvania, site visits were made to many of the newest and most innovative hospitals in Europe. Both Hopkins and Reading were modeled after the new Klinikum Manneheim in Germany, recently opened and considered to reflect many of the very best ideas for patient care. Abundant daylight and gardens in the form of many courtyards were an integral part of the designs. The problem was, or became, the huge influx of immigrants and their unabated need for medical care.



Figure 4 *Typical hospital corridor, 1950*

The invention of the light bulb allowed windows to be eliminated and the courtyards filled

in to allow growth where it was needed most: everywhere. Light laws were passed in parts of Europe and England, requiring all rooms to be certain distances from windows. This helped prevent buildings becoming too deep and without natural light, but did not prevent vistas, views, gardens, and clear circulation from getting lost in the shuffle to rapidly expand. These pressures still exist at most of the world's large urban medical centers, putting the challenge to the architect and healthcare planner to not only come up with excellent functional spaces and correct adjacencies, but to restore a modicum of the lost qualities of daylight, views, vistas and clear circulation. A few notable exceptions from Holland and Finland did appear in the 1920s, and although they still remain groundbreaking examples of how hospitals and complex buildings might be arranged, it must be noted that they were both constructed in open, Greenfield sites.

The tuberculosis or TB sanatorium, architectural historian Kenneth Frampton writes, “was dedicated to the treatment of tuberculosis, then prevalent among diamond cutters”, the result of the fine particles of diamond dust resulting from the cutting and polishing of the raw diamonds coming in from the DeBeers mines in South Africa. Frampton continues: “It epitomizes in a subtle way the transcendental wing of the Dutch functionalist movement which was polemically known as the New Objectivity.”

The plan features a reception or welcomes center off the main access road with four large double wing pavilions or separate buildings set out in such a way as to maximize exposure to the sun and views of the park and gardens.

The noted Finnish Architect, Alvar Aalto (1898-1976), was aware of Johannes Duiker's Zonnestvaal 1928 building, and utilized the planning concepts in his and his partner and wife, Aino Marsio's, competition entry for the large new sanatorium to be built at Paimio in 1927-

1930. The Aaltos won the commission. Aino's rational thinking often counterbalanced Alvar's bubbling exuberance, perhaps making this project one of their more equal collaborations than many history books record.



Figure 5 *Federal Courthouse, Baltimore*

Patient rooms and rest cure lounges all face south, with circulation and support structures expressed in a somewhat random, but expressive, manner on the north. The interconnected buildings have been compared to a fan splaying out into the wooded landscape with wonderful distant views. Windows in the patient rooms, lounges, dining areas, and stairways are all oversized; with the white walls reflecting a high percentage of the light, the rooms are bright and airy. Roof terraces are planted, so nature is close in to where the patients are resting. The plantings also serve to soften the smooth geometry of the exposed and painted concrete surfaces.

1960 to 2005: Hope for the present and future: light, views, vistas, and circulation emerge as determining factors in planning and building design, particularly in dense urban settings

In the 1960s, as a student of architecture, two projects grabbed my attention for the creative and powerful way in which they allowed circulation to determine building form: one was the

plan for a new section of Tel Aviv by the Dutch team of Van den Brook and Bakema; the other was the Piano and Rogers winning entry for the Place Beaubourg/ Pompidou Center in Paris (construction:1971-1977).

In Tel Aviv, the buildings shapes were generated by the arrangement of the roads, some existing and some new. New roads were arranged to shape, enclose and form major urban spaces. The thinking seemed to recognize the influence of the automobile and its movement as a generator of urban form, and in recognizing it somehow tamed and channeled its force for the better.



Figure 6 Pompidou: *Expressed Circulation*

At the Pompidou Center, the main circulation is via a glass-enclosed escalator which makes its way from the ground up the eight-story building, revealing ever more breathtaking views of Paris and its landmarks. This moving stair is executed and detailed in a technologically deterministic way, yet has an expressive feeling that results in a uniquely iconic quality evocative of a friendly serpent.

Inspired by some of the innovations in the Pompidou Center, namely the expressed circulation overlooking a plaza defined by the building, this building is one of the first U.S. courthouses to place the public access on the outside of the building. The goal was to reduce the wayfinding confusion that often results from long, internal, non-day lit corridors, and to bring a measure of animation to the north facade. Baltimore, Maryland, which has an almost tropical climate in the summer, made the less temperate-sensitive corridors ideal for the north side of the building. Extensive sunshading devices, complete with sun shelf reflectors, were planned for the south side overlooking the scenic harbor. The original concept was to clad all the circulation, including the elevators, in glass, but to conform to a previously set low budget; this was changed to the more economical precast concrete.

In these 150-year-old "impacted" campuses, a concept was sought that would bring order to the public circulation and integrate movement and wayfinding with daylight and gardens. As shown earlier, particularly for the Hopkins original buildings and plan of 1876 modeled after the Kninicum Mannheim, these qualities were present, but had been lost through pressures to expand rapidly as one of the nation's top academic medical and research centers. On both campuses, a grid or circulation framework was integrated with south-facing courtyards: glazed over at the Naval Center, and open to the sky and frequent views of the historic dome at Hopkins.

The examples that follow, from the mid 1980s on, illustrate how an awareness of history and of the principles reviewed have, consciously or not, been utilized to bring order, clarity, rigor, and a sense of delight, joy and caring to a variety of projects. This mixed-use development on a Greenfield site in Clinton, New Jersey allowed for many of the design and planning principles reviewed to be applied. The program includes medical office space with parking for

several hundred cars to be as ‘close-in’ to the office entrances as possible. The fitness / wellness component contains swimming pools and a large fitness area with exercise and rehabilitation medicine equipment. The buildings themselves are used to screen the cars and parking from the restful meadow overlooking the river bank where there are walking and running trails. Large windows at different levels in the buildings open the interior to nature.

Weill Cornell Medical College - This small 1/3-acre site is being developed into a large, 350,000 SF (35,000m²) specialty ambulatory care center at 70th and York Avenue in New York City. Daylight, views and water features are present wherever possible in the public areas: from the ground floor arrival and reception space to the entrance to the ‘sky-lobbies’ directly off the elevators on the upper levels. Taking advantage of the views to the north of upper Manhattan and

the existing collegiate gothic buildings of the Weill Cornell medical campus, the entire east, north and west sides of the building are clad in glass. To avoid too much sun, glare or heat gain, the glass is treated with frits or a reflective pattern of dots of varying density depending on the exposure and activities inside.

At the Robert Wood Johnson University Hospital in Hamilton, New Jersey, the unwritten campus redevelopment and hospital brief were to add healing gardens and views to nature in the presently impacted and crowded buildings. The goal is being achieved by positioning the new construction around a large garden or mini park, reclaiming outdoor space that had been a service yard. The new circulation at all levels overlooks the new garden, as does the new dining area on the ground level which opens out to the garden.

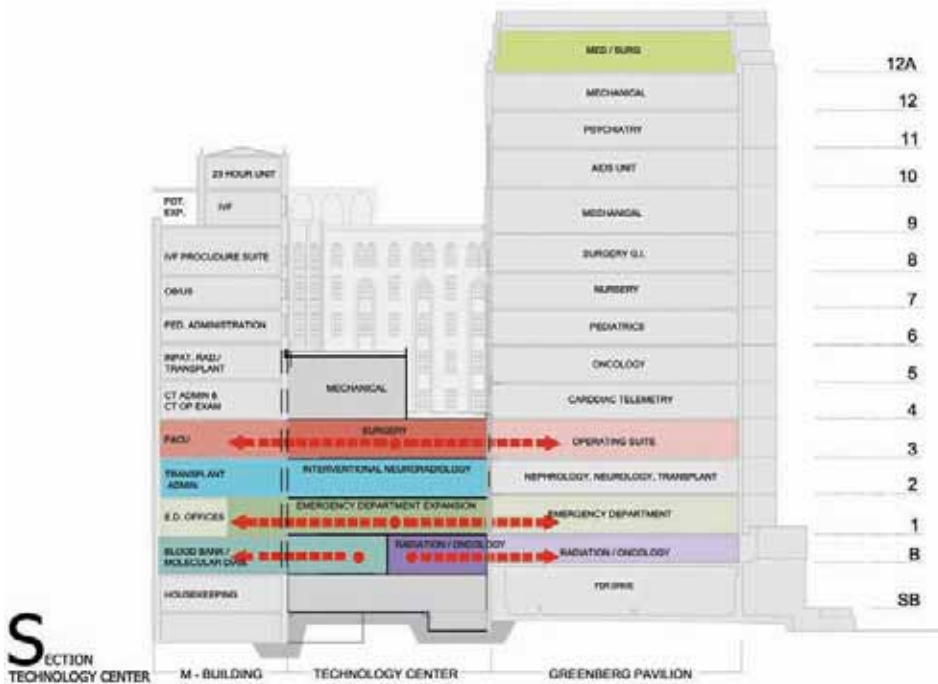


Figure 7 Weill Cornell: Section



Figure 8 *Clinton Wellness at Dusk*

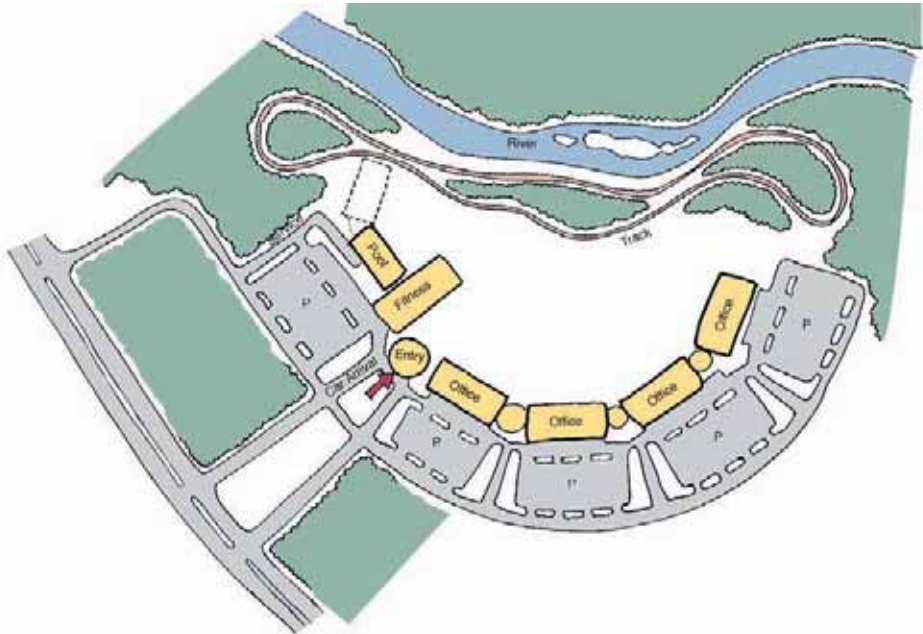


Figure 9 *Clinton Wellness Master Plan*

In the private patient rooms, the windows are oversized, and include a light shelf very similar to the one used by Erno Goldfinger in his Willow Road houses of 1927. To be sure the patient has control over the light level; windows are fitted with motorized shades and are controllable from the bed. Even the bathrooms have windows with translucent glass, so they are not the usual dark caves.

At the Jersey City Medical Center Wilzig Hospital, all the campus and hospital planning is informed by an awareness of views and daylight, in particular the views of the local icon, the Statue of Liberty (“Ms. Liberty”).

Songdo, South Korea - This completely new, 1,300,000 SF (130,000m²) academic medical center for a consortium of Philadelphia teaching and research hospitals is a wonderful opportunity and challenge to test what has been learned from

this survey of the evolution of daylight, views, vistas, and gardens as determining factors in site planning and hospital/mixed use development. A mini-park has been placed the lowest level of the 1600-car underground parking garage. The garden will contain a water feature, oriented to the south, and forms the below grade level focus of the entire campus. The mini-park concept is continued into the three concourse levels along the south side of the buildings at the lower levels. This linear winter garden allows southern light directly to the oncology entrance and public areas located by necessity due to the weight of the vaults below grade. All public areas have gardens as an integral part of the circulation routes, together with views out to gardens or parks. This approach allows the Diagnostic and Treatment building to be a large ‘loft’ or flexible support building with large floor plates, without loss of clarity of circulation.

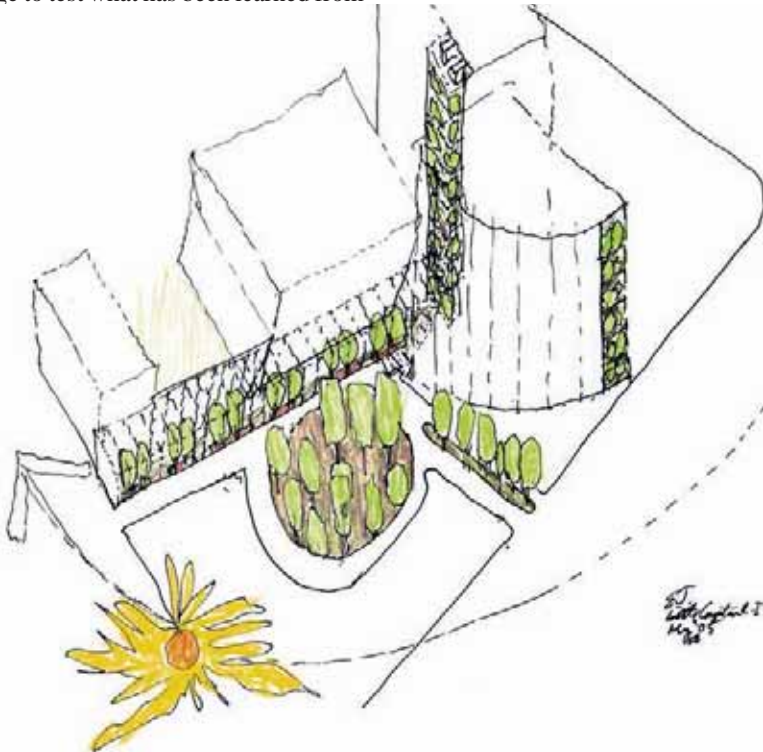


Figure 10 Songdo, South Korea - New Academic Medical Center



Figure 11 Songdo, South Korea - New Academic Medical Center

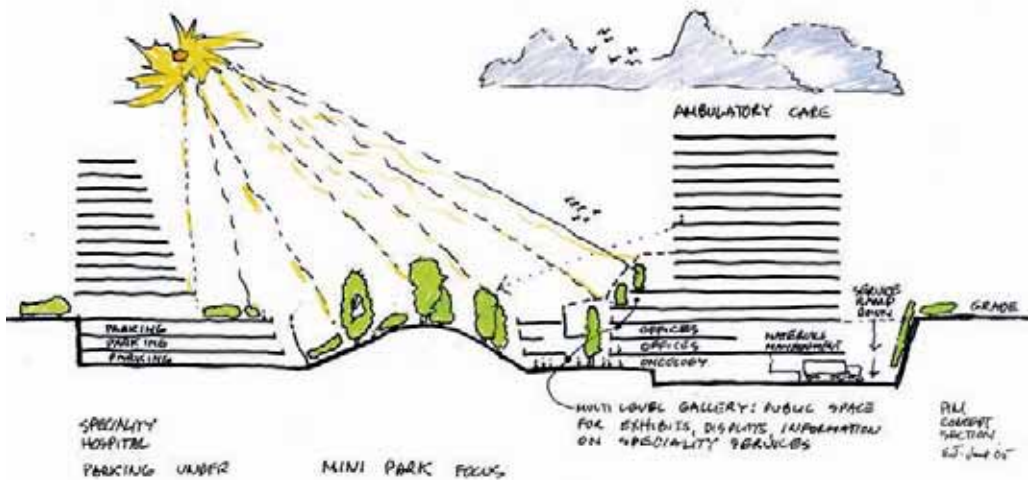


Figure 12 Songdo, South Korea - Nature, Daylight and Views: Informing the Concept

PART IV How can the effects of these planning and design principles be measured or verified?

Clients contemplating a major building project often make field trips to recently constructed facilities to see the results first-hand of comparable projects. Discussions can take place with peers as to what worked out as planned and what might have been done differently. This practice continues today. Architectural practices which specialize in certain building types also keep records of Post Occupancy Evaluations or POEs, for both their own designs and those of others. The three or four schools of architecture in the U.S. that offer Master and Ph.D degrees in health facility design and planning encourage and require work that follows more rigorous scientific protocols. Control groups are tested and evaluated against other groups in altered envi-

ronments. Although a relatively new source of data in the sense that papers have been written and made accessible over the web for only the last few decades, many have addressed the topics reviewed here. A key measurement is comparing the recovery rates of patients who have views with those who do not: those with views have faster recoveries.

A very promising mission in the U.S. is the Center for Health Design's Pebble Project. Membership and participation requires a fee to defray administration costs, and is open only to hospitals and medical centers. There are approximately 27 hospitals in the U.S. that are participating, with specific topics or issues to be measured against agreed-upon criteria for improvement. Procedures and protocols for measuring outcomes are shared with other members.



Figure 13 *The Johns Hopkins Hospital Master Plan*



Figure 14 Jersey City Medical Center Exterior View

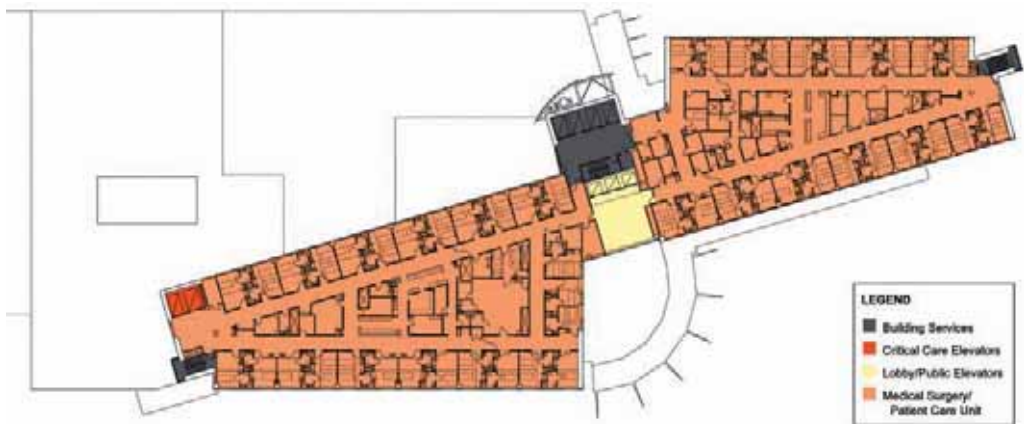


Figure 15 Jersey City Medical Center Plan

Topics presently under study include reduction of wait times for emergency care (speed with which one can make an appointment to be seen and receive follow up care). Administrators of hospitals often have training in healthcare or business as opposed to architecture or design, so it is not surprising that at the moment there is a bias in the study of improvement to activities that relate to operations and profitability. But competition for staff and patients can cause an expansion of interests to areas such as the amount of daylight, the presence of gardens and proximity to nature, and ease of circulation and wayfinding.

The Robert Wood Johnson University Hospital, shown here, is perusing a green building not only for the sake of the environment and posi-

tive recognition, but as a recruitment feature for new physicians and staff. In office building design, many case studies have documented that the presence of daylight, garden views, and vistas to nature have substantial positive benefit on productivity and a reduction in absenteeism. I am optimistic that these amenities formerly somewhat rare in the commercial work place are much more the norm, and are now finding their way into hospital and medical center planning in a more objective way.

There are many connections one can make to the examples surveyed. Frederick Law Olmsted (1822-1903) worked for several decades to promote, design and see the park built. His firm carried on by his sons designed the grounds of the Reading Hospital we have seen.



Figure 16 Robert Wood Johnson University Hospital Garden



Figure 17 Weill Cornell view - rendering



Figure 18 *The Gates - Central Park, New York City 2004*

The Gates project is obviously about daylight, views, vistas, and circulation. It attempts to make the subjective objective. What I liked best, when my wife and I experienced it, was how relaxing it made one feel and how much more one could appreciate the natural features of the park. Large outcroppings of rock are transformed from obstacles into pleasant events to be explored and successfully navigated, guided by the colorful orange gates or flags. Human perception is both accentuated and relaxed at the same time. I heard many visitors in many

languages, especially children, say, "I never realized how nice the park is." This is the effect a successful application of the planning and design principles reviewed here will have on complex building types.

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