Einstein Tower

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Diagramming: Form
Body
Technique
Space

EVDA 621
Erich Mendelsohn, architect of the Einstein Tower, took inspiration from Einstein’s theory of relativity where light bends around objects due to imposed gravitational forces. Mendelsohn envisioned a new monolithic concrete tower which aimed to streamline exteriors with organically flowing interiors that defied traditional structural law (Pearson, 2001). The challenge was to still have the building function as a working observatory while not sacrificing the desired form. “Mendelsohn did not deny his ignorance regarding the practical aspects of a working observatory and was open to constructive criticism” (Hentschel, 1997, p. 55). Mendelsohn spoke often with his close friend Erwin Freundlich, an astronomer/Einstein’s assistant, about how the building had to functionally be able to perform.

After learning that the form, mostly layout, of the interior tower and subterranean floors was fixed in size and dimension due to the requirements of a working observatory, Mendelsohn shifted his focus to the rest of the building which was fair game for him to design. The exterior Expressionist architecture that emerged was seen to be unusual and “a little capricious... the stylistic language [did] not in any way suit the other buildings of the Astrophysical Institute” (Hentschel, 1997, p. 62) but due to the political situation of Germany post WWI, the Nation was in a hurry to build a monument in Einstein’s honour. “Thanks to the runaway inflation rate, such reservations about the design were briskly swept aside by decree at the highest cabinet levels, so as not to delay start of construction” (Hentschel, 1997, p. 63). Mendelsohn’s final drawings were therefore built with striking similarity to his original forms that were sketched during WWI.
“Every artistic impression is based upon its own energetic escalation. Segments line up, blow up, or jut out. Only the interplay of their energies can transmit the overall tone” (Hentschel, 1997, p. 57). The rounded off corners of the tower emphasize the continuity of the form (Abrams, 2008) and it is necessary for every shape of the building to be as it is so that the entire building is understood as a whole.

“The conceptual program was perhaps more complex than the functional one: Mendelsohn consciously strove to make a design devoid of right angles, that was molded rather than built, and that architecturally expressed the dynamic interchange of mass and energy inherent in Einstein’s theory of relativity” (Taylor, 2009). Based on the bending of light due to gravity, Mendelsohn had a curvilinear exterior so when light struck the building it would bend as he interpreted it would within the boundaries of the theory.

The Einstein Tower has “relaxed horizontal forms” where many contemporaries justifiably see the tower as an architectonic rendition of Einstein’s theory” (Hentschel, 1997, p. 71). Seeking to represent mass and form, Mendelsohn chose reinforced concrete to create a “dynamic and rhythmic condition” (Galison, 2008, p. 109) that described relatively as he understood it.

The tower gets ever so slightly thicker at the base because of structural requirements and yet the proportions of the building naturally change with the increase in size. Mendelsohn noted the natural shape change when brick had to be included in the foundation for extra support. Each element shifted where it needed to in the overall form for aesthetic balance.
Rooted in Jugendstil (Art Nouveau) and Expressionist architectural styles the Einstein Tower was described by Einstein himself as “organic” (Bolles, 2004, p. 128). New typology was created based on past precedents informing new forms for the tower (Argan, 1996). The Einstein Tower was only similar to other observatories when looking at the cupola at the top of the tower. The lenticular dome atop the tower was required to be mechanically opened to allow the telescope to measure readings from space.

A whole new series of effects were produced to form the Einstein Tower (Allen, n.d.). Besides being outfitted with the largest aperture telescope in the world, the tower could boast having an Expressionist form which was a vast departure from any other observatory built before it. “In terms of architecture, the 19th century and modern period had produced observatories that were neoclassical monuments, frequently repeating the same shape and decorative patterns as civil palaces” (Wolfschmidt, n.d., p. 211).

The interpretation of science and technology in terms of organic form is completely observable when studying the Einstein Tower. One can see that the exterior skin of building appears as though it is being stretched like light affected by gravity; the building was not built to be a modern monument rather it played with curvilinear forms pushing the conceptual boundaries of architecture. The architect applied his own understanding of the union of space and time dictated by special relativity and of the general theory’s non-Euclidean space-time structure to create an unique structure (Hentschel, 1997, p. 71).
Understanding then that architecture often translates parts of the human body into the built environment we look to Filareti, who describes human figures represented in architecture as always being male (Agrest, p. 180). When one looks at the Einstein Tower, one is aware of connection between the height of the tower and the phallic symbolism that is male. The “well-shaped man” shows particular symmetry, Vitruvius would say (Agrest, p. 177).

“Take the case of the chair: as a body part, the chair is mimetic of the spine; as a projection of physical attributes, it is mimetic of body weight; as a repository of the desire to will an end to discomfort, it is mimetic of sentient awareness as a whole” (Beatritz, p. 7).
Where “symmetry is related to proportion—symmetry being an essential feature in the design of temples and proportion being the correspondence among measures of an entire work” (Argrest, p. 177) one can argue that the symmetry and proportion used in the design of the Einstein Tower was a response to getting closer to an understanding of the universe, by trusting science. After WWI, the world had come to know a place that “no god would fashion for his most deadly enemies” (Harrison, p. 69) and there was a common conception that god had abandoned mankind. This notion gave rise to the ideology that science was the new way to understand the changed world.

The Einstein Tower was a symbol of the revival of Germany and its superiority in astronomy with a new tower and telescope that could look further into the sky than ever before. Man could look for the answers that they believed were out there. The tower would be used, and it later did prove Einstein’s theory of relativity” (Fraser, p. 133). Mendelsohn, the architect, applied a lot of his own understanding to the union of space and time as defined by the theory of relativity (Hentschel, p.71) and many contemporaries justifiably see the tower as an architectonic rendition of Einstein’s theories” (Hentschel, p. 70).
The conceptual program “was perhaps more complex than the functional one: Mendelsohn consciously strove to make a design devoid of right angles, that was molded rather than built, and that architecturally expressed the dynamic interchange of mass and energy inherent in Einstein’s theory of relativity” (Taylor and Francis, p.28), which subsequently took the form of an overweight male. The concrete covering, filled with protuberances and recesses, appears swollen with pressing internal cavities, and it gesticulates to the surrounding atmosphere (Zevi, p. 41). These protuberances and recesses are what specifically look like fat rolls on a human body.
“We want architecture that bleeds, that exhausts, that whirls and even breaks” a round delicate, voluptuous, dreaming, seductive, palpitating architecture (Beatriz, p. 8). The Einstein Tower does have many of the qualities just described. There are many human characteristics portrayed in the built form beyond that of human fat. The enlargement of the body as a form of shelter keeps warm and safe the individuals that it houses the same way the body encloses and protects the individual within: “like the body, its walls put boundaries around the self, preventing undifferentiated contact with the world, yet in its windows and doors it enables the self to move into the world and allows that world to enter (Beatriz, p. 10). The client primarily detailed the interior program of the building but Mendelsohn did bring the swelling form of the exterior into the interior of the building wherever possible. “The interiority of architecture more than any other discourse defines a hierarchy of vision articulated by inside and outside” (Eisenman, p. 558) and Mendelsohn designed the tower comprehensively. Finally, the human eye is also represented in the Einstein Tower. With the tower being an observatory, many connections between the tower’s programmatic layout and the networking of the human eye can be seen.
Mendelsohn had to deal with thickening of the building at the base due to structural requirements.

For the rest of the building, Mendelsohn had full authority to design whatever he pleased as seen here on the ground floor. The triangular shaped staircase leads into the entrance then to the half-moon shaped stairs that go down to the technical space below. The traditional shaped stairs further to the left wrap around the telescope beam-transmitting square.

Above the ground floor the Einstein Tower already starts to slender.

The building continues to take on new form as it extends vertically here on the third floor.

The top of the Einstein Tower resembles the form of other observatories already built at the time. The specific part of the Einstein Tower that fully articulates itself based on present is the half shaped cupola that mechanically opens to allow light to reflect down to the subterranean astrophysical laboratory.
Here is the only part of the exterior building that has any right angles. The subterranean laboratory was the portion of the building in which Mendelsohn had no control over the design outcome. Mendelsohn was required to design around predetermined spaces due to the desired functionality of the area, it being a working observatory. This portion of the building has grass growing on the exterior walls to help mask the abrupt right angles.

Mendelsohn aimed at dynamic construction. The curvilinear shape of the exterior upper levels is what is seen as depicting the building being bent/pulled as if it were light bending around an object. Although this effect may be hard to see, Mendelsohn saw that light interacted with surfaces based on the way that they were constructed; therefore, he designed the exterior so that it would bend light a certain way over the curvilinear surfaces.
Wood was used instead of steel to help dampen vibration in the heavy instruments in the tower and thus prevent blurring of the images; and the separate foundation allowed the optics to remain unaffected by any movement of the building caused, for example, by gusts of wind against the external walls. (Hentschel, p. 68). The rest of the Einstein Tower sits centered above the base of the working observatory.

Mendelsohn had to accommodate a more stable foundation for the coelostat and lens in the dome, resulting in a stouter tower. But the design was not altered significantly (p. 65).

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a. The horizontal length and vertical height of the Einstein Tower was fixed by the focal length of the spectrograph and lenses.

b. Specific rooms designed by astronomers were required close to the technical equipment.
The building has a clear sense of what is interior versus exterior space. It is easily defined and controlled based on the openings in the building envelope.

There are many protuberances and recesses that give the Einstein Tower an organic/human quality.
Light deforming surface:
Modern to Expressionist Style

Dynamic Construction
Grass over basement decreases visual impact of right angles from every direction.
FORMAL LOGIC OF THE SPACE

Located at the southernmost edge of the Albert Einstein Science Park in Potsdam, Germany, the Einstein Tower stands as the best known piece of architecture in the park. The master plan for the park was designed and finalized well before the Einstein Tower was completed allowing for a variety of buildings focused on scientific research to be built in the same location of the city as the observatory. The Astrophysical Institute Potsdam now owns both the Einstein Tower and the Great Reactor of Potsdam, both within the park where tours are held each day for visitors to look at the architecture.
MATERIAL FORMATIONS

The main body of the Einstein Tower was built as a brick substructure covered with reinforced cast-in-place concrete. Mendelsohn argued that the functional construction of the building transferred the essence of the machine to the building itself whereas the dynamic construction worshiped the mechanical motor of the telescope housed within the observatory (Zevi, 1982). The striated space of the building is a constant push and pull of the functional versus the dynamic, sterility versus plastic exuberance. The smooth space surrounding the observatory is reminiscent of an English garden. The landscape literally envelops the lowest floor of the tower in an attempt to rid the exterior of right angles. From 1997-1999 an extensive renovation was done to the interior and exterior of the tower.

1 & 2. form versus function within the tower
3. pathway/ vegetation of the ‘English garden’ landscape
4. pre-1997 renovation
Mendelsohn described the Einstein Tower as a building that looked at physics in a new way; intricate winding shapes and elegantly bending curves represented it. Albert Einstein himself called the building ‘organic.’ The expressive lines are unlike any other buildings of its kind. The plastic treatment of form (where not dictated by function) allowed for the building to float up to the domed cupola. The abstract form that emerged successfully drew the logic of the exterior into the interior (of the upper floors) with furniture representing the overall design. Many monuments to Einstein are placed around in the landscape of the site allowing for visitors to engage with the site.
Bibliography


