MONUMENTS TO SCIENCE:

Louis Kahn's Laboratory Architecture

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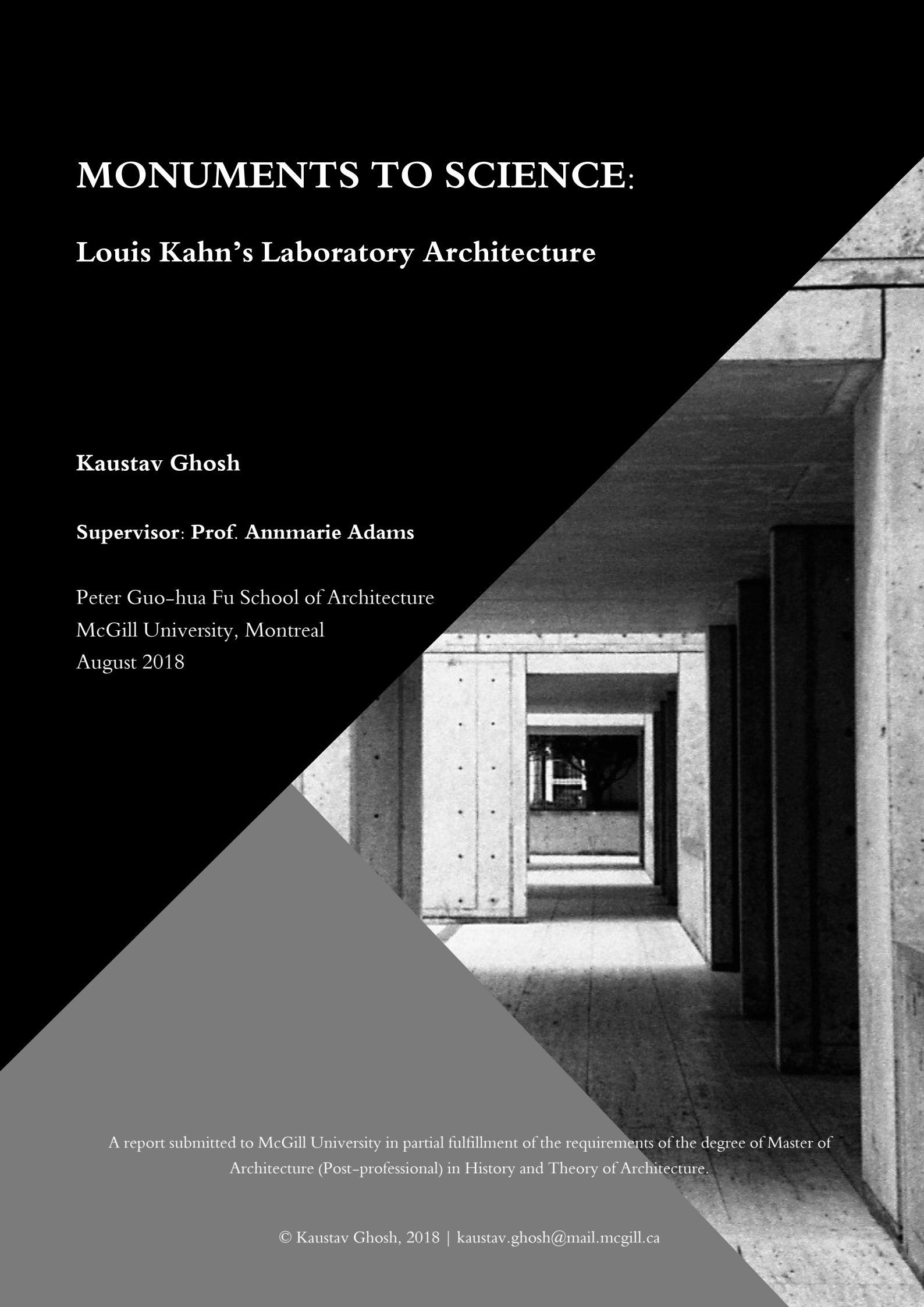
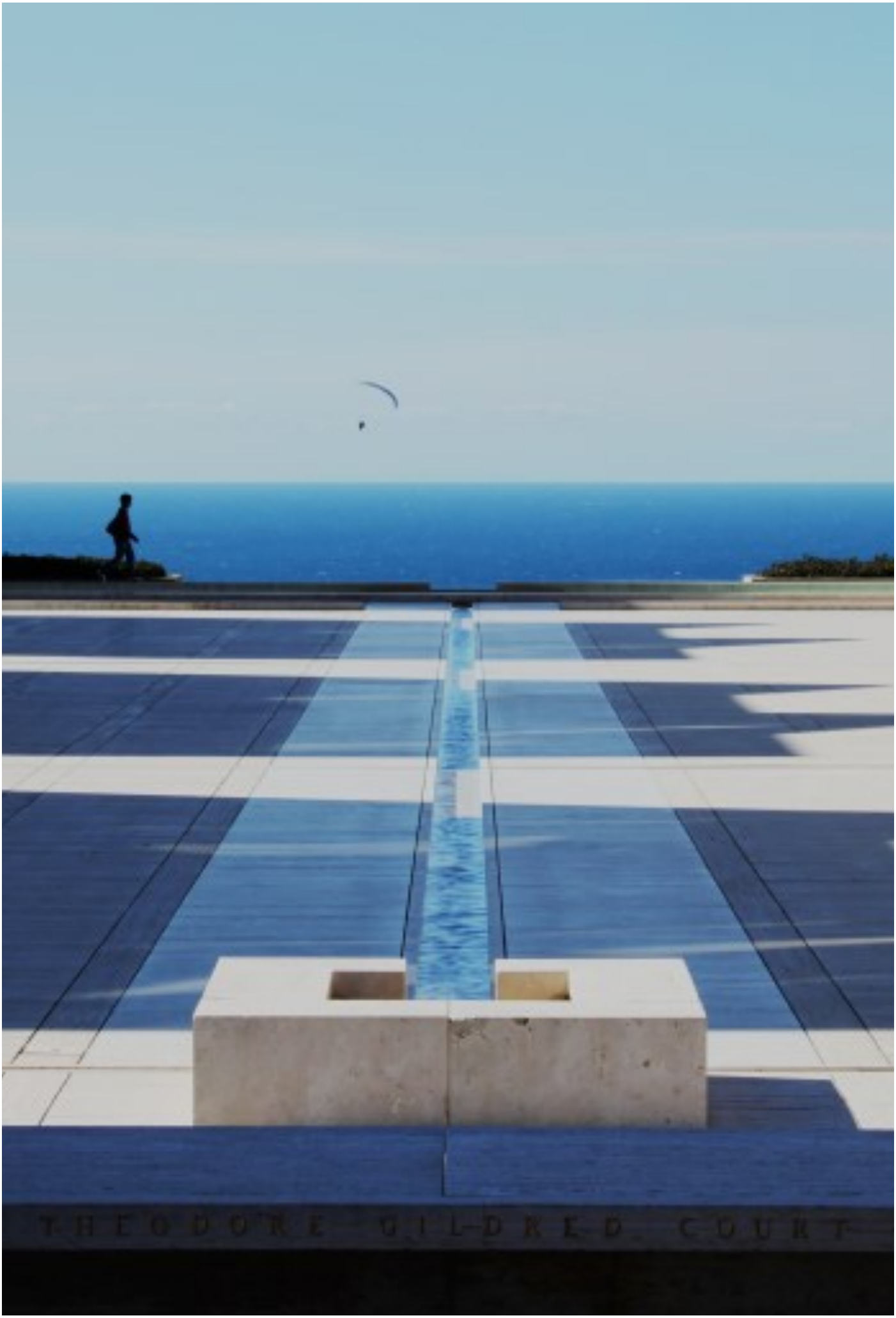


A report submitted to McGill University in partial fulfillment of the requirements of the degree of Master of Architecture (Post-professional) in History and Theory of Architecture.


THEODORE GILDRED COURT

Ahead lie the eternal peaceful shores—

O captain, start pulling your oars.

My friend, I desire your embrace—

Just as the graceful Polaris adorns eternal space, timeless…"

—Rabindranath Tagore

(Translated from Bengali)

To my parents and fiancé

Abstract

The project attempts to understand monumentality in architecture, often attributed to a gigantic scale or something which has stayed extant for a long period of time.[1] However, in the case of Louis Kahn's architecture, buildings did not have to stand the test of time and yet theorists use the term monumentality to describe his works.[2] Kahn, himself, defines monumentality as a "spiritual quality" that conveys a sense of "eternity", something that "cannot be added to or changed."[3] Architecture theorists often define it as a link between past, present and future— unification of consciousness and culture, mediated through change.[4] With ever-changing developments in the world of science, architecture meant for serving science underwent constant alterations and modifications to complement changing needs in work environments. The project examines how Louis Kahn conceives his buildings for science, the Richards Medical Laboratories at Philadelphia, Pennsylvania, and the Salk Institute for Biological Studies at San Diego, California. I study how these two buildings made almost during the same time period and functionally creating unexpected and unconventional laboratory workspaces, adapt to or

[1] Richard L. Burger and Robert M. Rosenswig, *Early new World Monumentality*, (University Press of Florida, 2012).

[2] William J. R. Curtis, "Authenticity, Abstraction and the Ancient Sense: Le Corbusier's and Louis Kahn's Ideas of Parliament," in *Prospecta*, Vol. 20, (MIT Press, 1983), 184.

[3] Louis Kahn, "Monumentality," in *New Architecture and City Planning: A Symposium*, ed. Paul Zucker, (New York, Philosophical Library, 1944), 77-88.

[4] Jose Luis Sert, Fernand Leger, and Sigfried Giedion, "Nine Points on Monumentality," in *Architecture You and Me: The Diary of a Development*, ed. Sigfried Giodion, (Harvard, 1958), 48.

resist the needs of changing scientific environments despite staying timeless or monumental.

Résumé

Le projet tente de comprendre la monumentalité de l'architecture, souvent attribuée à une échelle gigantesque ou quelque chose qui est resté en place pendant une longue période.[1] Cependant, dans le cas de l'architecture de Louis Kahn, les bâtiments n'ont pas eu à résister à l'épreuve du temps et pourtant les théoriciens utilisent le terme monumentalité pour décrire ses œuvres.[2] Kahn, lui -même, définit la monumentalité comme une "qualité spirituelle" qui transmet un sens de "l'éternité", quelque chose qui "ne peut être ajouté ou modifié."[3] Les théoriciens de l'architecture le définissent souvent comme un lien entre passé, présent et futur— unification de la conscience et de la culture, médiatisé par le changement.[4] Avec les développements en constante évolution dans le monde de la science, l'architecture destinée à servir la science a subi des modifications et des modifications

[1] Richard L. Burger et Robert M. Rosenswig, *Early new World Monumentality*, (University Press of Florida, 2012).

[2] William J. R. Curtis, "Authenticity, Abstraction and the Ancient Sense: Le Corbusier's and Louis Kahn's Ideas of Parliament," en *Prospecta*, Le vol. 20, (MIT Press, 1983), 184.

[3] Louis Kahn, "Monumentality," en *New Architecture and City Planning: A Symposium*, ed. Paul Zucker, (New York, Philosophical Library, 1944), 77 -88.

[4] Jose Luis Sert, Fernand Leger, et Sigfried Giedion, "Nine Points on Monumentality," en *Architecture You and Me: The Diary of a Development*, ed. Sigfried Giodion, (Harvard, 1958), 48.

constantes pour compléter l'évolution des besoins dans les environnements de travail. Le projet examine comment Louis Kahn conçoit ses bâtiments pour la science, le Richards Medical Laboratories à Philadelphie, en Pennsylvanie, et le Salk Institute for Biological Studies à San Diego, en Californie. J'étudie comment ces deux bâtiments ont été construits presque au même moment et créé fonctionnellement des espaces de travail de laboratoire inattendus et non conventionnels, s'adaptant ou répondant aux besoins d'un environnement scientifique changeant, tout en restant intemporel ou monumental.

Key Words

Louis Kahn, monumentality, architecture for science, laboratory workspaces, Richards Medical Laboratories, Salk Institute.

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Acknowledgements

My inspiration of this project came in 2014 when I was working as an intern in Bangladesh with architects Tanya Karim and N. R. Khan. Everyday on my way to work I would get to see Louis Kahn's National Assembly and gradually started falling in love with the building. In November 2014, I finally got a chance to get inside the Assembly and was speechless for a couple of hours as I was thoroughly mesmerized by the power of the spaces. My career took a turn from this overwhelming incident and my concern was established around one basic question—how can Louis Kahn create architecture powerful enough to alter the psychological conditions of people?

The desire to explore monumentality in Kahn's architecture first came as an inspiration from Prof. Shubhrajit Das in his course on "Design Methodology," and was triggered once again from the conversations with my supervisor, Prof. Annmarie Adams during her course on "Research Methods for Architects/Critical Writing." I am indebted to Prof. Adams for the freedom of research she has granted me along with her valuable suggestions. I am deeply thankful to Prof. Adrian Sheppard who once

advised me to question Kahn's architecture rather than admire him blindly. I have also learned a great deal from Prof. Alberto Perez-Gomez, Prof. David Theodore and Prof. Ipek Tureli that facilitated my research work in many ways.

I must thank my fiancé who has constantly supported me since 2012 and encouraged me to move ahead with my work despite being thousands of miles apart. I am grateful to my parents without whom none of my achievements would have been possible. I have enjoyed criticisms and suggestions of my fellow architect friends, Kunal Rakshit and Sayantani Kar, and my classmates at McGill. Last but not the least, I thank Marcia King, who is a mother in disguise for all graduate students— her concern and care made me feel at home far away from home.

Introduction

Science buildings today are highly institutionalised and mostly enclosed within the premises of universities or specialized research organizations. Even though science has become incredibly interdisciplinary, access to these buildings is still restricted to the world of academics, research and associated professions. People without valid identity cards are not allowed to visit the premises of these institutions, and when they are provided with an opportunity in case of special events, there is this constant sense of being watched. Analogous to the idea of Bentham's "panopticon," these workspaces of science embody the invisible power of the institutions.[5] Looking at science buildings through panopticism is justified because the panopticon itself was a model of psychological experimentation that established discipline through the network of users and spaces. Amidst this strict surveillance, science buildings are symbols of power of institutions and the discipline of science itself, and the activities taking place in these places are subject to mystery and surprise, much like the structure of museums. People are not generally interested to know how these buildings function, but their product— discovery and innovation,

[5] Michel Foucault, "Panopticism," in *Discipline and Punish: The Birth of the Prison*, translated by A. Sheridian, (Vintage, New York, 1995), 203.

are like exhibits of a museum, mediating awe and intimidation.

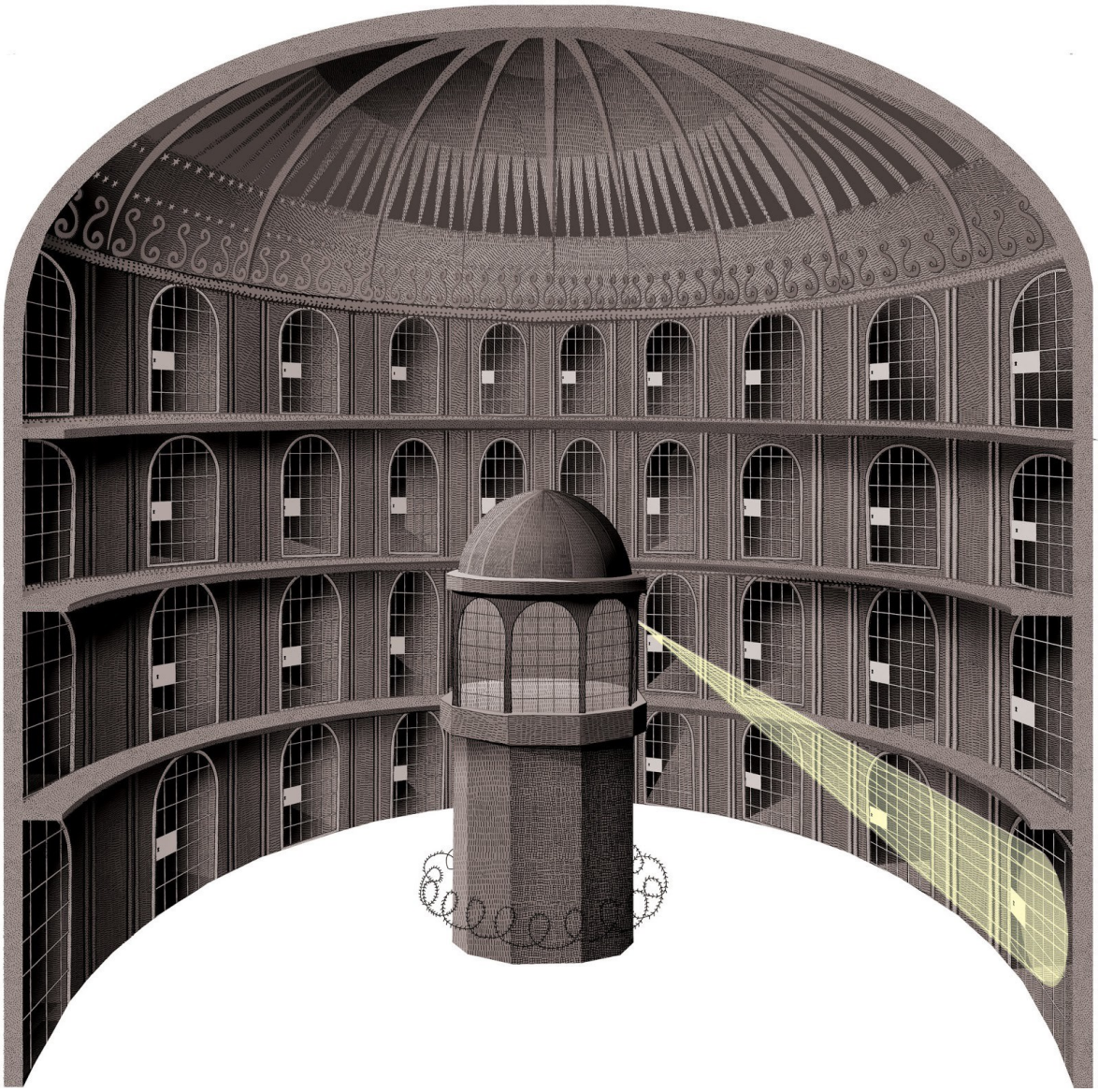


Figure 1: A representational model of Jeremy Bentham's Panopticon, a space where there is a constant feeling of being watched over. It is very similar in laboratories and research institutions even though the structure of these spaces does not exactly look like the prison institution. It is the experiential condition of laboratory workspaces that is analogous with that of the Panopticon.

(Source: https://medium.com/@dylanskrah/the-data-panopticon-and-surveillance-capitalism-dee5cd1789d7)

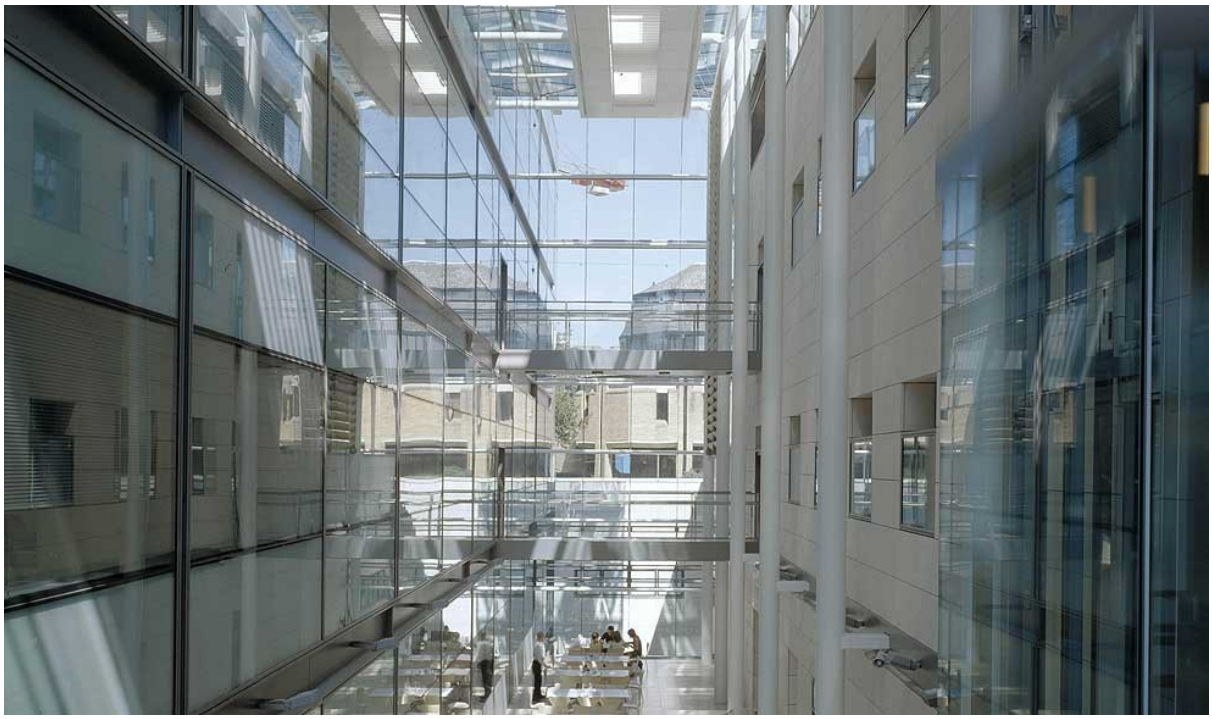


Figure 2: The Chemistry Research Laboratory building at Oxford University is one of the many examples of modern-day research institutions adorned with reflective or tinted glass and having a majestic atrium.

(Source: http://www.architectureexposed.com/project/334/chemistry-research-building-oxford-university-england)

In this era when scientific workspaces are usually not of interest, but emanate an atmosphere of curiousity, it is interesting to explore how these buildings present themselves to people. Science buildings today are identified through their façades adorned in glass, mostly reflective, tinted or coloured; and awestriking atria. Architectural theorists often argue that the shift in today's architecture from absolute intimidation and portrayal of power is by creating new networks through the atrium to generate collaborative synergies and partnerships.[6] It must be considered that the world of science runs on research and experiments which need financial backups from the parent institutions and also from other external

[6] Albena Yaneva, "Is the Atrium More Important than the Lab? Designer Buildings for New Cultures of Creativity," in *Geographies of Science*, ed. David N Livingstone, (Springer, 2009), 142.

Figure 3: The atrium is not necessarily an indoor space as perceived in modern-day buildings but could also refer to a courtyard-like space.

(Source: https://www.pinterest.ca/pin/517843657127364436/?lp=true)

corporations. So, even though there is this inherent condition of a disciplinary structure in science buildings, I argue that these spaces can't project themselves as symbols of power but encourage humility to facilitate partnerships for their own sustenance. Theorists say that the relationship between the internal world of research with the outside world of curiosity takes place through the atrium, which is a space of transition. This atrium is a tall vertical space almost next to the main entrance, normally large in scale and engaging an interplay of light.[7] In ancient Greek and Roman civilizations, the atrium wasn't necessarily an indoor space, but more like a courtyard.

[7] Ibid.

These two typologies of atria are found in Louis Kahn's Richards Medical Research Laboratories at Philadelphia, Pennsylvania, and the Salk Institute for Biological Studies at San Diego, California, both built in the 1960s and serving as institutions of scientific research and experimentation. Even though Kahn's architecture didn't have to stand the test of time, they are often termed "monumental."[8] The understanding of monumentality is often attributed to a gigantic scale or something which, according to Kahn himself, has a sense of eternity.[9] Given the fact that Kahn's architecture is relatively contemporary and certainly doesn't have the attribute of eternal time attached to its existence, the first research question rises—how do we justify monumentality and use this phenomenon as an attribute Louis Kahn's architecture? It is also true that science is ever-changing, and the buildings meant for science should accommodate these constant changes to stay functional and relevant. Why, then, do we need to showcase monumentality in architecture for science, mediated through the works of Kahn, rather than following a generic typology derived from the panopticon as a symbol of institution?

Architectural historian Albena Yaneva writes that

[8] William J. R. Curtis, "Authenticity, Abstraction and the Ancient Sense: Le Corbusier's and Louis Kahn's Ideas of Parliament," in *Prospecta*, Vol. 20, (MIT Press, 1983).

[9] Richard L. Burger and Robert M. Rosenswig, *Early new World Monumentality*, (University Press of Florida, 2012).

the Salk Institute has created expanses of interaction and satisfied its users, while the Richards Medical Laboratories have generated disappointment amongst its users throughout time.[10] It is ironic because the same architect with a strong sense of philosophy made two very similar buildings intended for similar purposes, yet the generated spaces turned out to be very different from each other. This gives rise to my third research question— how did Louis Kahn's architecture at the Salk Institute and the Richards Medical Laboratories address architecture of science, also embodying a sense of monumentality or pseudomonumentality?[11]

Research Methodology

This paper attempts to explore the answers to the three primary research questions through careful investigation of terminologies like "monumentality," "flexible and generic architecture," "function and purpose." I attempt to justify architecture for science buildings through arguments presented by Robert Venturi, Albena Yaneva, Moshe Safdie and Louis Kahn himself. Since the focus of the paper centres round Louis

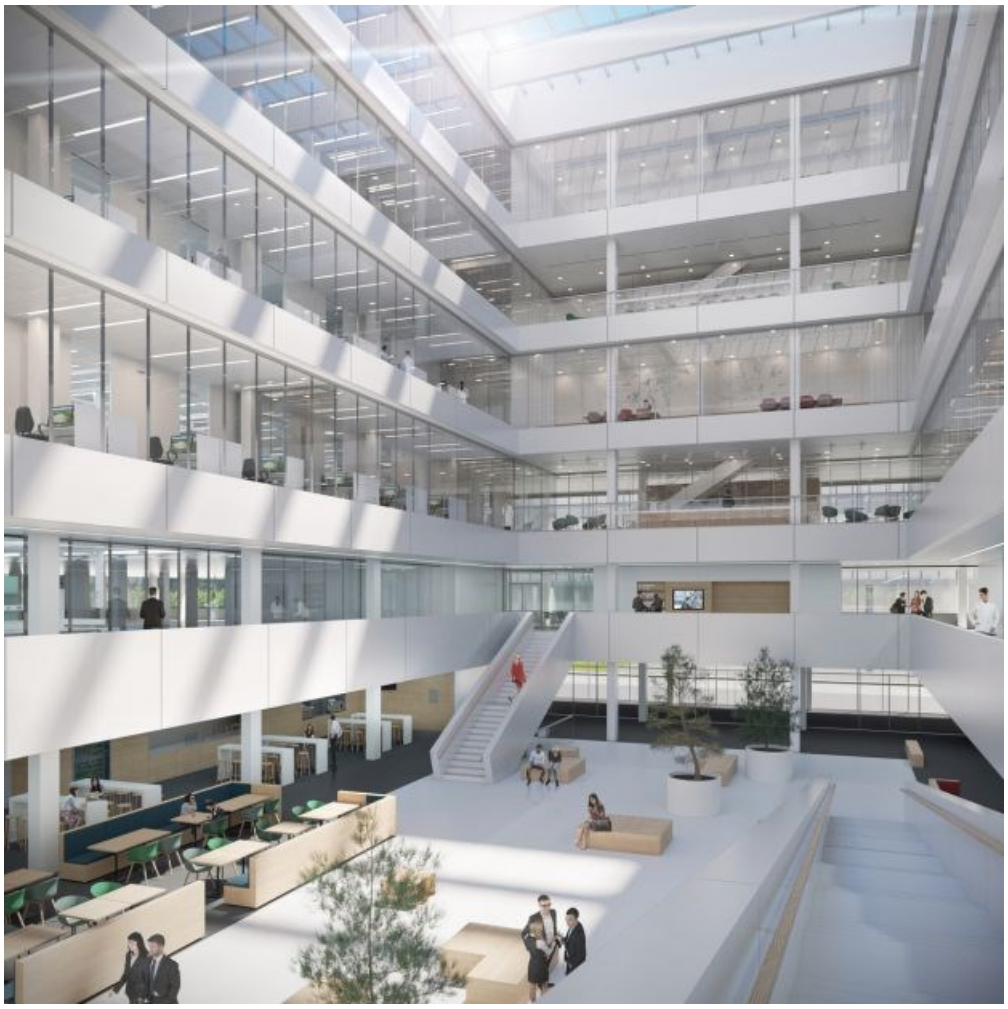
[10] Albena Yaneva, "Is the Atrium More Important than the Lab? Designer Buildings for New Cultures of Creativity," in *Geographies of Science*, ed. David N Livingstone, (Springer, 2009).

[11] Sigfried Giedion, "The Need for a New Monumentality," in *Architecture You and Me: The Diary of a Development*, ed. Sigfried Giedion, (Harvard, 1958), 29.

Kahn's architecture, I analyse his thoughts and philosophies on monumentality and science buildings through his own papers and lectures, as well as, through written accounts of architects and theorists who worked with him and communicated over these matters. My arguments do not showcase only a certain school of thought propagated by the followers of Louis Kahn, but also looks at the opinions of different schools of thought to comprehend an unbiased examination of the topic. Furthermore, I analyse the events associated with the design processes of the Richards Medical Laboratories at the University of Pennsylvania and the Salk Institute for Biological Studies at San Diego, California, to draw connections with Louis Kahn's own treatises written around the same period, that may justify the interconnection of monumentality and architecture for science buildings from his perspective of architectural practice.

PART 1

Architecture for Laboratory Workspaces



Flexible and "Generic" Architecture for Science Buildings

The progress of science is marked throughout the timeline of the 19th and 20th centuries and has maintained its continuity even today. One such contribution of science in the 19th century known as the Industrial Revolution has led to subsequent modernism, functionalism, structuralism and other prominent movements in architecture; thus, establishing a strong interrelation between science and architecture. However, theorists believe that this link between architecture and science has only attained a sense of instrumentality with the advent of the Industrial Revolution; architecture itself is modelled after the scientific philosophy of ancient Greece.[12] Though there have been plenty of discourses on how science has advocated architecture in contemporary times, it is not quite mainstream to talk about how architecture has hosted for the various disciplines of science and projected itself as a strong image of science. I believe that even in this scientific age there is a strong sense of ignorance about scientific professions from an observer point of view, which literally encompasses the

[12] Alberto Perez Gomez, "Architecture as Science: Analogy or Disjunction?" in *Timely Meditations*, Vol. 2, (Rightangle International, 2016), 63.

Figure 4: A typical laboratory in the contemporary world for conducting experiments at the Salk Hall, University of Pittsburgh, Pennsylvania. The familiarity associated with the image of modern-day laboratories is complemented by the sense of intimidation, mystery, secrecy and shock, which trigger the disinterest of the common observer towards laboratory workspaces. (Source: https://www.burchick.com/university-of-pittsburgh-salk-hall-addition)

entire world except for academics and professionals associated with them.[13] The world of science has been popularized through media and entertainment— science fiction, television, documentaries and feature films, but it does not eliminate the mysteries that one associates with the realities of the scientific world. It is interesting to point out what I refer to as science here, because it clearly doesn't encompass the disciplines of social science such as history, philosophy, sociology or politics. The observer's disinterest in scientific practices are centred around activities restricted in laboratory experiments which

[13] Bruno Latour and Steve Woolgar, *Laboratory Life: The Construction of Scientific Facts*, (Princeton, 1986), 19.

generate a sense of puzzlement, shock, mystery and secrecy.[14]

Having established the fact that laboratory workspaces are of utmost disinterest to many observers, or to be more precise, the general population, these spaces are restricted to accommodate controlled work environments for a certain group of scientific professionals and represent an esoteric side of architecture. So, these scientific workspaces and laboratories have a point of commonality of being specialized and staying at a distance from people. Architect Robert Venturi calls this type of architecture of laboratory buildings "generic."[15] He describes generic architecture as flexible to the program, symbols and ornaments staying permanent or changing constantly to maintain relevance.[16] If architecture is being flexible to the changes in scientific work environments, it hints at the reality of architecture being shaped by science instead of the reverse. So, the ignorance about the scientific world is not free from architectural practice. In many cases, laboratory spaces prove to be inadequate right after being occupied,[17] which are then subject to changes and alterations. It is this dissociation and ignorance of architectural practice about the world of science that

[15] Robert Venturi, "Thoughts on the Architecture of the Scientific Workplace: Community, Change and Continuity," in *The Architecture of Science*, ed. Peter Galison and Emily Thompson, (MIT Press, 1999), 388.
[16] Ibid.
[17] Martin Kemp, "Laudable Labs?" in *Nature*, Vol. 395, Issue 6705, (Nature, October 1998), 849.

accounts for the inadequacy of function in laboratory workspaces. Following Venturi's argument, architecture can survive in this case only if it can try to cater to the changing needs flexibly. This flexibility in architecture can be noted prior to the world of scientific revolution through changes inside industrial factory buildings like the New England Mill, civic buildings converted from residences like the Palazzo Rucellai, classrooms and dormitories getting converted into administrative buildings like in Massachusetts Hall of Harvard University.[18] Architectural historian and theorist, Albena Yaneva justifies the use of flexible architecture in science buildings—

> The spatial and technical flexibility of labs has become an important feature of science buildings and a way to keep up with the rhythm of scientific research. That flexibility is ensured primarily by creating a layout that allows for the reassessment of space, incorporates a robust infrastructure, and supports a mechanical distribution that can accommodate change. The design of science buildings is conditioned by this paramount need

[18] Robert Venturi, "Thoughts on the Architecture of the Scientific Workplace: Community, Change and Continuity," in *The Architecture of Science*, ed. Peter Galison and Emily Thompson, (MIT Press, 1999), 388-390.

> for flexibility as research and researchers change with the pace of contemporary science.[19]

Yaneva supports her argument by calling for functional spaces that are demountable and easily alterable— a condition that can be achieved through modular designs capable of being taken down and reassembled. These modular design elements take less time to undergo changes and save a lot of labour and money, thereby, confirming the possibility of being subjected to a plethora of changes without disruption. Yaneva argues that this condition is possible through new principles and techniques of construction rather than following traditional methods.[20] The science involved in developing these new methods of construction results in an architecture which in turn accommodates science, in many cases, the same ones responsible for bringing about change. So, the relationship between science and architecture is of a strong interdependence, and even though this procedure often generates a condition of esoterism, the string of arguments prove that this resulting ignorance only can lead to the flexibility achievable through this interplay of architecture and science.

[19] Albena Yaneva, "Is the Atrium More Important than the Lab? Designer Buildings for New Cultures of Creativity," in *Geographies of Science*, ed. David N Livingstone, (Springer, 2009), 141.
[20] Ibid., 141-142.

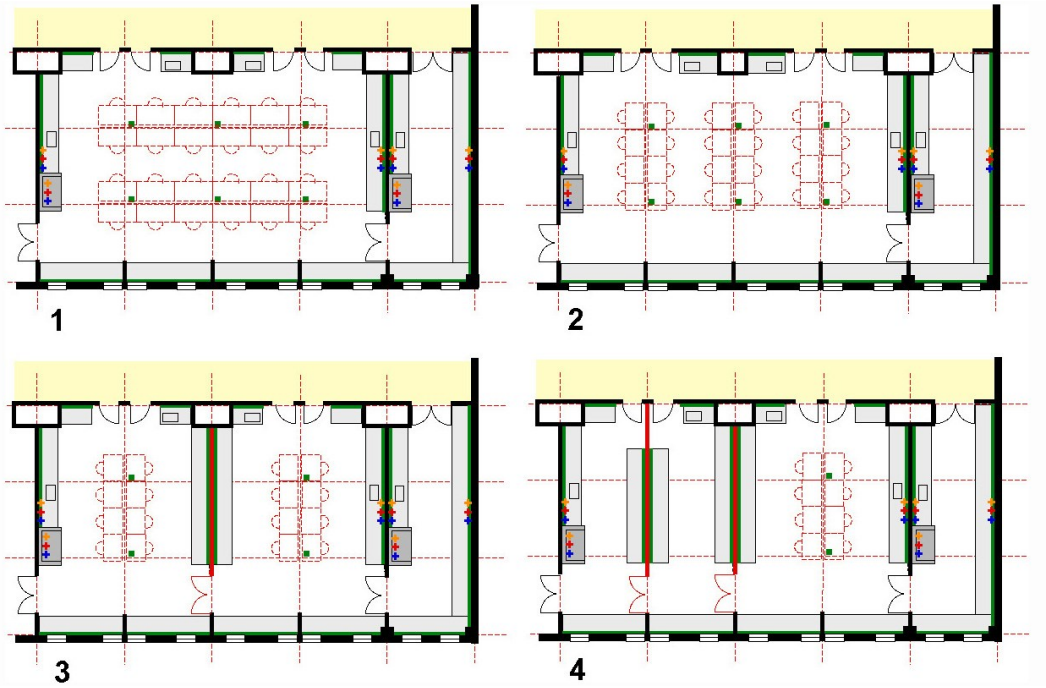


Figure 5: Flexible teaching laboratories at the James Madison University, Harrisonburg, Virginia. The same layout can be subdivided into different smaller workspaces according to changing requirements.

(Source: https://www.sstplanners.com/sstconcepts.html)

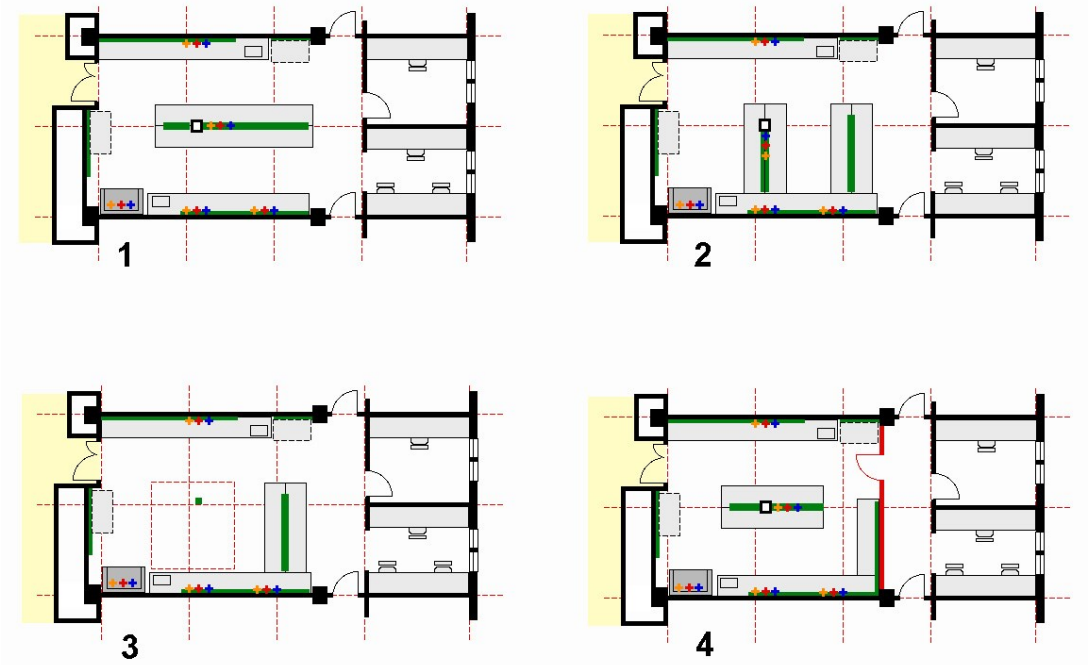


Figure 6: Flexible laboratory workspaces at the Biomedical Engineering and Medical Sciences Building and Cancer Research Laboratory Building at the University of Virginia, achieved through reconfiguration of laboratory furniture.

(Source: https://www.sstplanners.com/sstconcepts.html)

Kahn's Morphological Approach to Architecture for Science

Figure 7: D'Arcy Thompson rationalises existing forms of nature through mathematics in order to explain their morphological interrelation with structures.

(Source: http://www.iaacblog.com/programs/1098/)

Before delving into her arguments, Yaneva mentions that the roots of the discussion regarding good laboratory architecture lies in Louis Kahn's Salk Institute of Biological Studies at La Jolla, San Diego, California, constructed in 1965. Architect Moshe Safdie, who worked on the project with Kahn, reminisces that Kahn's philosophy of architecture for science buildings was influenced by scientist D'Arcy Thompson.[21] Thompson

[21] Moshe Safdie, "The Architecture of Science: From D'Arcy Thompson to the SSC," in *The Architecture of Science*, ed. Peter Galison and Emily Thompson, (MIT Press, 1999), 475.

argues that even though architectural form should accommodate the genius and technicality of structure, it should not override the principles and truths observed in nature; rather maintain its interrelationship with nature.[22] His demonstration of this interplay is morphological and tends to draw analogies from natural beings like the shell to be translated into the technicalities of structural construction and, in turn, into architectural forms.[23] Even though architectural theorists call this understanding of architecture "poetic science" and suggestive of pataphysics,[24] Kahn and Thompson are more interested in the realist translation of this morphology in terms of architecture. For Kahn, this morphological understanding is about grasping the simple scientific principles of nature to create something new and relevant through technological mediation.[25] Safdie argues that evolution of techniques and forms in construction have occurred through vernacular architecture throughout centuries. Beauty is inherent in these buildings not as ornamentation but underlying in its form that generates directly from the purpose.[26] So, considering the fact that Safdie's words are resonant of Kahn's own ideals of scientific architecture, the idea of flexibility generates not only through a

[22] D'Arcy Thompson, *On Growth and Form*, Vol. 2, (Cambridge, 1959), 777.
[23] Ibid.
[24] Alberto Perez Gomez, "Architecture as Science: Analogy or Disjunction?" in *The Architecture of Science*, ed. Peter Galison and Emily Thompson, (MIT Press, 1999), 346.
[25] Louis Kahn, "Monumentality," in *New Architecture and City Planning: A Symposium*, ed. Paul Zucker, (New York, Philosophical Library, 1944), 77-88.
[26] Moshe Safdie, "The Architecture of Science: From D'Arcy Thompson to the SSC," in *The Architecture of Science*, ed. Peter Galison and Emily Thompson, (MIT Press, 1999), 476.

technological genius but also in terms of careful analysis and understanding of the traditions involved in the process of construction which, in turn, evolve from the basic scientific principles of nature.

Actor–Network Theory connecting Form, Purpose, Symbolism

In the case of science buildings, there is a constant change in function due to its ever-changing nature, but its purpose remains the same— experiments, research, discoveries. So, architecture for science should generate a program and form that follow purpose instead of function.[27] This justifies Safdie's argument of generating architecture for science buildings by examining vernacular architecture because the habits and practices related with dwelling has evolved over time, but the purpose has remained the same— dwelling itself. Symbolism associated with architecture has been presented as ornament in Venturi's work, while Kahn's school of thought associates it with collective memory, something that stays eternal and meaningful throughout time.[28] I

[27] Ibid, 480-481.

[28] Carl Gustav Jung, *Man and His Symbols*, (New York, 1964).

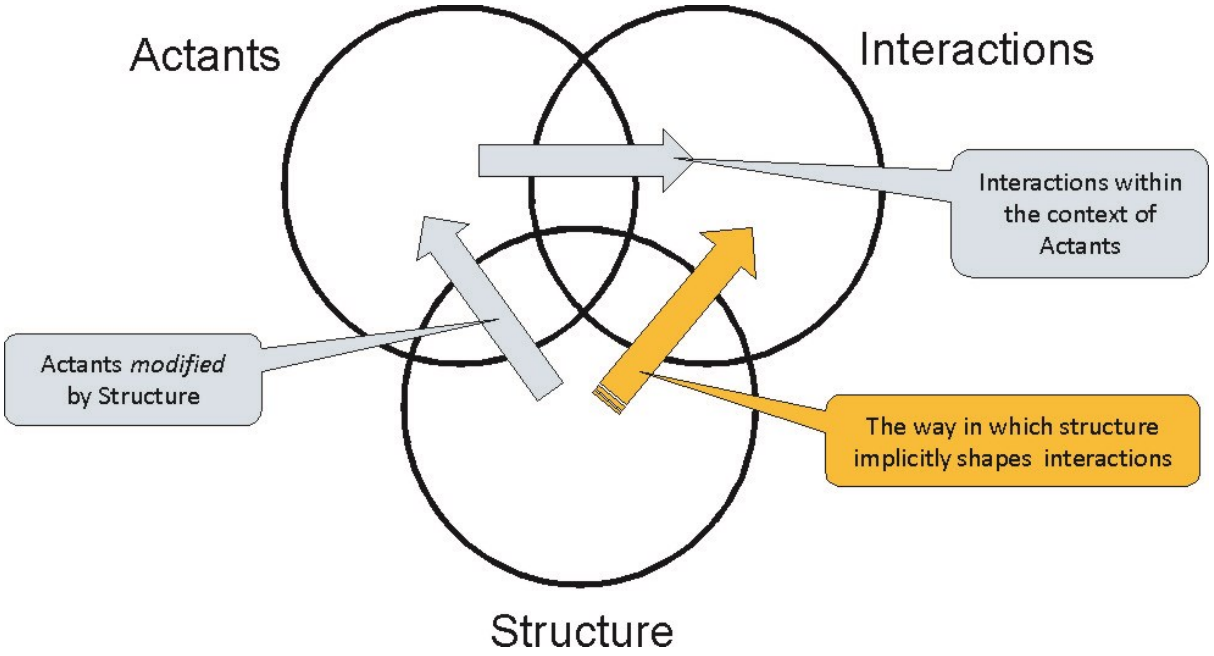


Figure 8:Interconnections between structure, user groups and usable elements through spatial interactions. (Source: http:// www.asymmetricdesign.com/2014/08/ on-stratification/)

argue that this idea aligns with the later-developed actor-network theory, which describes how the purpose or the objective remains the same even with constant changing relationships amongst the people and objects.[29] Even though Venturi's understanding of flexible architecture for science buildings doesn't question the disinterest and ignorance of the world of scientific activities, Kahn and Safdie's ideals indicate careful understanding of the purpose involved in these spaces that translate into form. Yaneva begins her paper explaining flexible generic architecture on Venturi's grounds and then she points out how Kahn's Salk Institute, despite being flexible and accommodating, has created wide-open expanses to make for interactions among scientists and reconnects spaces and

[29] Bruno Latour, *Reassembling the social: An introduction to actor-network-theory*, (Oxford, 2005).

movements of human and non-human actors.[30]

With reference to actor-network theory, sociologist Bruno Latour states that an explanation cannot be retrospective but emerges from the rationality of a program and the actors or users involved with it.[31] I argue that architecture is analogous to Latour's idea of explanation that generates not from stylistic examples of the past but through the rational understanding of a program or purpose which acts as a connection between architectural forms and user groups. Following Yaneva's description of the interactive spaces created at the Salk Institute, I speculate that it is a symbolic representation of the actor-network theory based on Kahn's deep understanding of the sociological parameters even if he was not familiar with the theory.

Architecture for science as monuments?

The fact that Louis Kahn's science buildings follow a deep morphological and sociological understanding which gets mediated through symbolism does not disprove

[30] Albena Yaneva, "Is the Atrium More Important than the Lab? Designer Buildings for New Cultures of Creativity," in *Geographies of Science*, ed. David N Livingstone, (Springer, 2009), 141.

[31] Bruno Latour, "Technology is society made durable," in *The Sociological Review*, Vol. 38, Issue S1, ed. John Law, (Sociological Review Publication Ltd., London, May 1990), 120.

Venturi's argument in favour of generic architecture. Venturi's idea of generic architecture being flexible to the program and complementing ornaments and symbols[32] doesn't contradict the influences of morphology or sociology. At the same time, the question rises if the Salk Institute can be considered an example of generic architecture as it stands out as unique, even as a monument.[33] There have been arguments that science buildings have been made as monuments to express power and greatness of the nation-state, rather than being living examples of values.[34] However, Jonas Salk, the client and founder of the Salk Institute, was deeply interested to create a space that would inherently contain the greatness of science.[35] So, the power and greatness embodied in architecture for science is not necessarily for valorisation of the nation-state, but are expressions in favour of the magnitude of science itself— its greatness marked through timeless discoveries and progress. It certainly doesn't establish whether monumentality in science buildings is right or wrong;[36] it simply is a question whether science and architecture, in dynamic interplay, need to be valorised through expressions of identities, values and traditions.[37]

[32] Robert Venturi, "Thoughts on the Architecture of the Scientific Workplace: Community, Change and Continuity," in *The Architecture of Science*, ed. Peter Galison and Emily Thompson, (MIT Press, 1999), 388.

[33] Josh Mollman, *Louis Kahn's Salk Institute: Pre-Modern Influences in Kahn's Work*, (Dissertation, Indian University, Bloomington, 2014).

[34] Thomas F. Gieryn, "Two Faces on Science: Building Identities for Molecular Biology and Biotechnology," in *The Architecture of Science*, ed. Peter Galison and Emily Thompson, (MIT Press, 1999), 426.

[35] Moshe Safdie, "The Architecture of Science: From D'Arcy Thompson to the SSC," in *The Architecture of Science*, ed. Peter Galison and Emily Thompson, (MIT Press, 1999), 486.

[36] Philip Johnson, in his personal letter sent to Moshe Safdie.

[37] Thomas F. Gieryn, "Two Faces on Science: Building Identities for Molecular Biology and Biotechnology," in *The Architecture of Science*, ed. Peter Galison and Emily Thompson, (MIT Press, 1999), 426.

PART 2

Monumentality in Louis Kahn's Architecture

Figure 9: The Great Pyramids of Giza, Egypt are often termed as examples of monumental architecture. (Source: https://ardaofficialweb.wordpress.com/2017/10/03/i-am-i-dwell-i-build-3000-1500-bce/)

How can we define monumentality?

We often connote "monumentality" or "monumental architecture" as something huge in scale, expressing the greatness of mankind through the evidence of these structures standing the test of time. So, is it about being historic yet popular, or, is it a gigantic expression that makes humans look insignificant in space yet significant in time? We have examples of monumentality in history— the Great Pyramids, Parthenon, Pantheon, Hagia Sofia, St Peter's in Rome, Taj Mahal, or the Palace at Versailles. At the same time, we associate monumentality with contemporary works of Louis Kahn. Though often faced with the difficulty of defining

Figure 10: The National Assembly at the capital of Bangladesh, designed by Louis Kahn and completed long after his death in 1982, is a modern-day building often termed as 'monumental.' (Source: http://www.aestheticamagazine.com/form-follows-function-louis-kahn-aesthetica-magazine/)

monumentality, we casually associate examples with the term. The earliest written treatise, as an attempt to define the word, is *Nine Points on Monumentality*, published in 1943.[38] Even though it is not applicable to Louis Kahn's architecture back in 1943, the terminology is understood widely through other examples in architectural history. I argue that in the process of defining something that is already inherently understood and felt, it would be a biased and one-sided perspective to look at one particular treatise.

Given the possibility of a variety of perceptions of monumentality, it is wise to look at different treatises to

[38] Jose Luis Sert, Fernand Leger, and Sigfried Giedion, "Nine Points on Monumentality," in *Architecture You and Me: The Diary of a Development*, ed. Sigfried Giodion, (Harvard, 1958).

generate a much more comprehensive definition of monumentality that will help us analyse monumental architecture. This entire cycle of generating meaning of the term through examples, and analysing examples through the term, hints at a hermeneutic interplay of "distanciation" and "appropriation."[39] But we must also understand that the fundamental problem doesn't stop with generating meaning or interpretation, rather gets translated through actualization of concepts into real structures for people to experience the phenomenon in the modern-day world of science and technology.

Monumentality vs Pseudomonumentality

We often connote "monumentality" or "monumental architecture" as something huge in scale. Jose Luis Sert, Fernand Leger, and Sigfried Giedion speak about monumentality from a historical and theoretical point of view. In the beginning of their treatises, they begin with an old French song, "Aupres de ma blonde":

[39] Paul Ricouer, *Hermeneutics and the Human Sciences*, (Cambridge, 1981), 143.

Que donneriez vous ma belle
Pour revoir votre man?
Je donnerai Versailles,
Paris et Saint Denis
Les tours de Notre Dame
Et le clocher de mon pays.
Aupres de ma blonde
Qu'il fait bon, fait bon, fait bon.[40]

The distinct references to Versailles, Saint Denis and Notre Dame— an evidence that they are trying to establish a definition of monumentality from their understanding of historic monumental architecture. Since they are writing this in 1943, a time when modernism has already started off and gained its peak through the works of Le Corbusier, Frank Lloyd Wright, Mies van der Rohe, Walter Gropius, Louis Sullivan and others, and also going through the turmoil of the World War II with a gradual change in global politics and society, it is interesting to observe how these contexts play an important role to construct the understanding of monumentality amidst the underlying inherent idea of nostalgia and revisiting history.

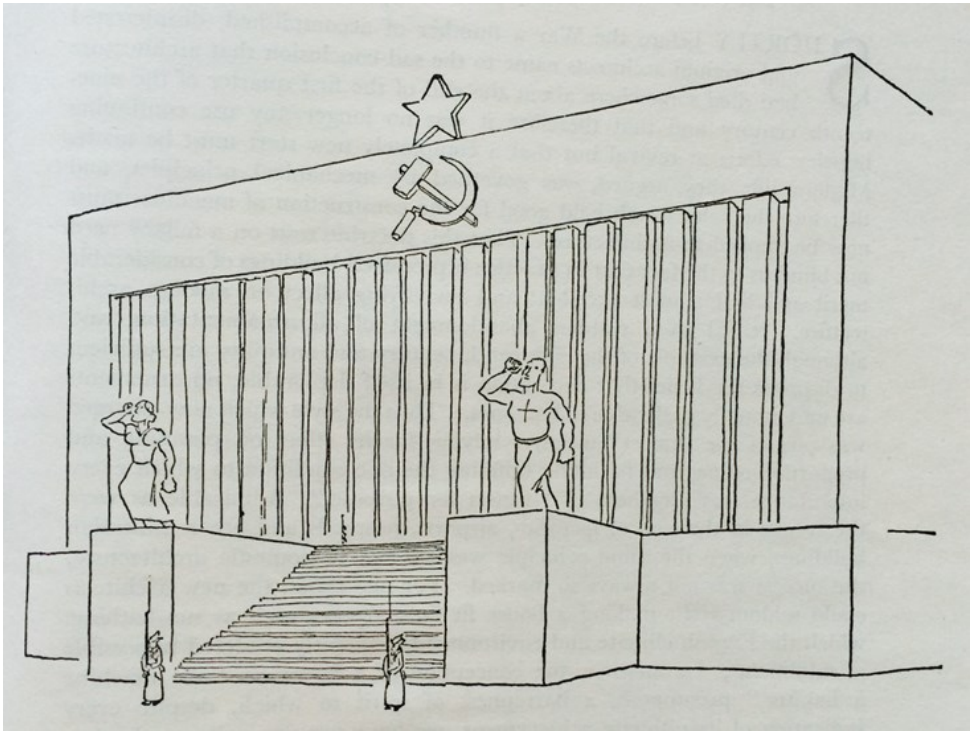
In 1944, Sigfried Giedion traces back the etymology

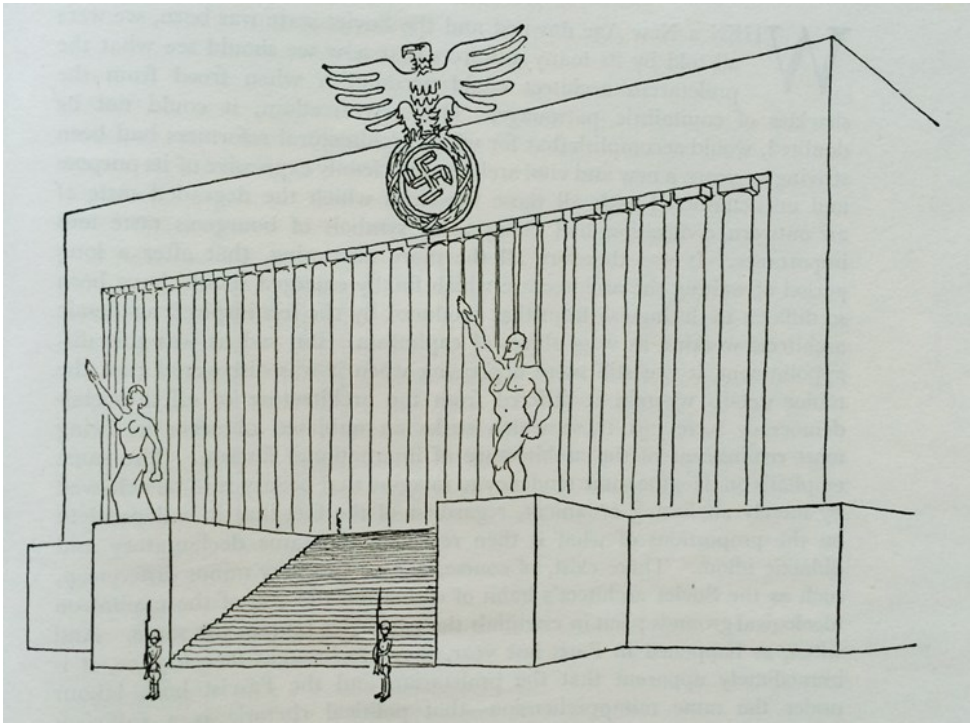
[40] Jose Luis Sert, Fernand Leger, and Sigfried Giedion, "Nine Points on Monumentality," in *Architecture You and Me: The Diary of a Development*, ed. Sigfried Giodion, (Harvard, 1958), 48.

of the word "monuments" and translates it from Latin as "things that remind." He defines monumentality as the act of creating eternal symbols for destiny, through religious or social convictions, to be transmitted to future generations.[41] He argues that a major problem in understanding monumentality is the pre-existing condition of "pseudomonumentality,"[42] that began with the Napoleonic society of the 19th century, when the primary idea of architecture was to imitate the former ruling class. Giedion asserts his argument by tracing the roots of pseudomonumentality in the works of J. N. L. Durand,[43] and extending it to his own time mediated through Nazi Germany and the Soviet Union, taking references from the illustrations of the British cartoonist and architectural historian, Osbert Lancaster.[44]

He presents Durand's work and teaching methods as copying existing government buildings in the Napoleonic society, where creating a monumental façade meant putting a row of columns without any rational justification or purpose.[45] The illustrations of Osbert Lancaster he refers to shows the emergence of two monuments with exactly same identity except for the logos of the respective state power.[46] Giedion draws this

[41] Sigfried Giedion, "The Need for a New Monumentality," in *Architecture You and Me: The Diary of a Development*, ed. Sigfried Giodion, (Harvard, 1958), 28.
[42] Ibid, 29.
[43] Jean Nicolas Louis Durand, *Recueil et parallèle des édifices de tout genre, anciens et modernes*, (Paris, 1799-1800).
[44] Osbert Lancaster, *Pillar to Post: The Pocket-lamp of Architecture*, (John Murray, London, 1938).
[45] Sigfried Giedion, "The Need for a New Monumentality," in *Architecture You and Me: The Diary of a Development*, ed. Sigfried Giodion, (Harvard, 1958), 29.
[46] Ibid, 30-31.





Figures 11 & 12: Pseudomonumentality expressed through Osbert Lancaster's illustrations of the administrative buildings of the Soviet Union and Nazi Germany.
(Source: http://simon-martin.tumblr.com/post/96272785995/pillar-to-post-or-the-pocket-lamp-of-architecture)

reference to affirm the existence of pseudomonumentality in the age of modernity where the monuments are just expressions of state power, with no association of cultural and traditional symbolism with the place. I argue that the examples presented to criticize pseudomonumentality are suggestive of Giedion's condemnation of the ideals of Nazism and Communism, both symbols of one-party political systems rather than democracy, the roots of which lay in the 19th century idea of doing away with the past. He establishes his admiration for a democratic system by questioning the growing distance between architects, painters and sculptors, and talking about the possibility of community work to establish the eternal symbolism of great public projects.[47]

Monumentality— is it historic or modern?

Despite his possible political inclinations mediated in this treatise, it would be unwise to neglect the fact that he is not rigidly speaking against modernism or modern architecture, rather advising to add a context of time and space to contemporary history. However, I argue that

[47] Ibid, 32.

Gideon's thinking is paradoxical. Creating new history that adds meaning in terms of context is what Nietzsche would call "critical history," rather than "monumental history" or "antiquarian history," which are about preserving and imitating the past.[48] If, in Giedion's words, monumentality is about a symbol of remembrance, why not try imitating the works of Durand? Why, then, do we need to associate the element of critically understanding history and rationalizing context to create monumental architecture?

In *Nine Points on Monumentality*, Sert, Leger and Giedion say that monumentality is not just about creating a glorious present or preserving the past but creating a link between past and future.[49] Their understanding of history does not hint at the purpose of being monumental, antiquarian or critical; rather monumentality is expressed simply as a history that connects and stays relevant through time. So, monumentality is about creating a unifying consciousness and culture. In the context of monumentality being a historical link between periods, Sert, Leger and Giedion state— "Periods which exist for the moment have been unable to create lasting monuments."[50] This, backed by

[48] Friedrich Nietzsche, "On the Uses and Disadvantages of History for Life," translated by R.J. Hollingdale, in *Untimely Meditations*, ed. Daniel Breazeale, (Cambridge, 1997), 57–124.

[49] Jose Luis Sert, Fernand Leger, and Sigfried Giedion, "Nine Points on Monumentality," in *Architecture You and Me: The Diary of a Development*, ed. Sigfried Giodion, (Harvard, 1958), 48.

[50] Ibid.

Giedion's examples of Nazi and Soviet architecture, imply why modern architecture rejected the idea of monumentality. On the other hand, they present a post-war situation, where the neglect in the organization of community life needs to be addressed through monumentality, joy, pride and existence.[51] Thus, Sert, Leger and Giedion's treatise expresses the inherent political condition of nation building in the post-war era, laid on the grounds of a joyful, community-centric society. The idea of monumentality, in this era of modernity, is to embody the sense of greatness and timelessness in the image of the nation to generate strength in the process of building new global politics, economics and society.

Kahn on "Monumentality" (1944)

In this new era of generating monumental architecture, Sert, Leger and Giedion present the necessity of effective planning techniques and utilization of modern-day technology with wisely-chosen materials.[52] This idea of monumentality is in harmony with Louis Kahn's treatise on *Monumentality*, published in 1944. It is very

[51] Ibid, 49.
[52] Ibid, 50.

interesting how a historical and theoretical understanding of the subject gets echoed in the words of a practising architect; whose work expresses the translation of theory into tangible buildings. Given the fact that this is one of Louis Kahn's first texts on architectural philosophy, it clearly resonates with the idea embodied in his own practice which he started in 1947.[53] In 1944, Louis Kahn writes:

> Monumentality in architecture may be defined as a quality, a spiritual quality inherent in a structure which conveys the feeling of its eternity, that it cannot be added to or changed. We feel that quality in the Parthenon, the recognized symbol of Greek civilization.[54]

Kahn's reference to the Parthenon reveals the inherent truth about our general association with monumental architecture— the sense of eternity being embodied in structures that have stood the test of time. However, he questions the possibility of this architectural expression of eternal intensity to be extended in structures that are not necessarily historical but social or political like schools, community or cultural centres. His argument is in favour of creating a profound impact in today's structures for

[53] Robert McCarter, "Starting with the Square: Parallels in Practice in the Works of Josef Albers and Louis Kahn," in *Journal of Visual Culture*, Vol. 15, No. 3, (Sage, December 2016), 357-366.

[54] Louis Kahn, "Monumentality," in *New Architecture and City Planning: A Symposium*, ed. Paul Zucker, (New York, Philosophical Library, 1944), 77 -88.

Figures 13 & 14: The vaults of the Kimbell Art Museum may resonate with Kahn's idea of monumentality—understanding the principles of the vaults of classical Roman architecture and reinventing them in a contemporary way.
(Sources: https://www.skyscrapercity.com/showthread.php?t=827174&page=15; https://en.wikipedia.org/wiki/Kimbell_Art_Museum)

which we don't have to always look back at history, rather create new histories that would stand through eternity. Kahn talks about creating "social monuments" that simulates our experience in terms of a social or political movement— something that helps us leave a distinct imprint on our civilization. His inspiration and understanding of monumentality from history is not about admiration or synthesis of facts.

The intentionality of Kahn's architecture, expressed through his own arguments, expresses the desire to translate architectural meaning from antiquity to modernity through a contemporary social and political context.[55] For instance, he talks about the significant understanding of Roman vaults, domes and arches, and architectural elements of Romanesque, Gothic and Renaissance, blended with the advent of modern day technology.

[55] Ibid.

Monumentality in Kahn's Architecture: technology, tradition and history

Louis Kahn's thoughts expressed in his treatise on *Monumentality* are often interpreted by critics as anti-historic. For instance, architectural historian Dana Margalith states that Louis Kahn shifts from an anti-historic approach in *Monumentality* to a sympathizer of architectural history much later in *On the Responsibility of the Architect*.[56] Arguments like Margalith's can't be justified on the lines of history even though Kahn declares that the intention is not about replicating structures like the Crystal Palace or the Taj Mahal. He clearly mentions that monumentality should commemorate the achievements and aspirations relevant to a time.[57] I argue that it is a thorough misunderstanding to judge Louis Kahn's initial thoughts on monumentality as anti-historic, rather it is his intention to create timelessness and temporality by analysing history and contextualizing it. Speaking of context, he elaborates on the expertise of construction— methods, both traditional, to highlight the scientific principles on which they work, and innovative,

[56] Dana Margalith, *Louis I. Kahn— Architectural History as Mediation*, (PhD Dissertation, McGill University, 2013), 29.

[57] Louis Kahn, "Monumentality," in *New Architecture and City Planning: A Symposium*, ed. Paul Zucker, (New York, Philosophical Library, 1944), 77-88.

to integrate the scientific principles with modern-day applications of engineering and technology, based on the regulated codes of practice. Even though Kahn's text on "Monumentality" showcases a technological conscience, it is a misconception to comprehend his idea on monumental architecture as something simply parametric or just derived from sciences—

> I do not wish to imply that monumentality can be attained scientifically or that the work of the architect reaches its greatest service to humanity by his peculiar genius to guide a concept towards monumentality. I merely defend, because I admire, the architect who possesses the will to grow with the many angles of our development.[58]

He calls this blend of technological consciousness, contemporary context and understanding of history as "efforts towards a comprehensive architecture" that makes it enigmatic or monumental.[59] The idea that unlike his contemporaries, Kahn is not blindly following rational use of technology to create something massive or huge or even new is suggestive of his discontent with the pure form of modernism which, according to him, failed to address contemporary social issues;[60] and he addresses the

[58] Ibid.
[59] Ibid.
[60] Robert McCarter, "Starting with the Square: Parallels in Practice in the Works of Josef Albers and Louis Kahn," in *Journal of Visual Culture*, Vol. 15, No. 3, (Sage, December 2016), 357-366.

re-examination of the norms of modern-day construction.[61] This, again, resonates with the treatise published by Giedion in the same year. It is hard to know whether Giedion and Kahn were familiar with each other's works when they published the treatise because they don't cite these works in their references. On the other hand, the similarity in their works hints at the universality of the socio-political conditions embodied in the idea of producing monumental architecture in the post-war 20th century, respecting technology as well as history, adding a context that makes sense.

Even though Kahn's text on monumentality was conceived very early in his career, unlike many other contemporaries, he stayed consistent with his words of generating new ways of learning the ordered principles underlying in history and traditions. Echoing the words of Frank Lloyd Wright, "… it is a declaration of love for the spirit of that law and order, and a reverential recognition of the elements that made its ancient letter in its time vital and beautiful."[62] Having spoken against formal historicism, Kahn favours embodiment of tradition—something which is simply not a habit, but a sense of validity and inheritance which expresses truth.[63] For him,

[61] Robert McCarter, *Louis I. Kahn*, (Phaidon Press, London, New York), 42-43.

[62] Frank Lloyd Wright, "In the cause of architecture," (May 1914), in *In the cause of architecture, Frank Lloyd Wright: essays*, ed. Frederick Albert Gutheim, (Architectural Record, 1975), 19.

[63] Robert McCarter, *Louis I. Kahn*, (Phaidon Press, London, New York), 443.

tradition is not ever-changing, but eternal and indestructible which complements context through time and retains meaning in creation.[64] I argue that Kahn's way of conceiving monumental architecture is an attempt to create timelessness through careful translation of indestructible tradition into his buildings. This idea of timelessness is never devoid of the fundamental principles of geometry,[65] however being paradoxical of being incredibly modern yet returning to the sources.[66] It would be interesting to observe how he translates this sense of timelessness through embodiment of tradition into his buildings for sciences— meant for disciplines that are constantly changing. Can we see Louis Kahn's Salk Institute and Richards Medical Laboratories as monumental and a manifestation of his stringent philosophy, or, are they distant from his philosophy?

[64] Louis Kahn, "Space and Inspiration," in *Louis I. Kahn: Writings, Lectures, Interviews*, ed. Alessandra Latour, (New York, Rizzoli, 1991), 224-230.

[65] Robert Hughes, "Brick is Stingy, Concrete is Generous," in *Horizon*, Vol. 16, No. 4, (American Heritage Publishing Company, Fall 1974), 33.

[66] Paul Ricouer, "Universal Civilization and Natural Cultures," in *History and Truth*, (Northwestern University Press, 1965), 277.

PART 3

Kahn's Monuments for Science

Richards Medical Laboratories, **University of Pennsylvania**, **Philadelphia**

Architectural historian Vincent Scully calls the Richards Medical Laboratories "one of the greatest buildings of modern times."[67] Louis Kahn was commissioned to design the Richards Medical Laboratories for the University of Pennsylvania in February 1957. It was around the same point of time when two of his treatises got published— *Order in Architecture* and *Spaces, Order and Architecture*. The use of contemporary technology and science in construction is justified in these treatises through the mentions of his desire to experiment with towers, which reflects in the Richards Medical Laboratories. Kahn says that towers are concepts of a higher order of construction merging multiple basic principles like triangulation of structural members to address wind loads and the use of enclosure to facilitate both illumination and structural stability.[68] Architectural historian Vincent Scully speculates that Kahn was deeply influenced by two engineers during the construction of the Richards Medical Laboratories—

[67] Vincent Scully, *Louis I. Kahn*, (George Braziller, New York, 1962), 27.

[68] Louis Kahn, "Order in Architecture," in *Perspecta 4: The Yale University Journal*, (Yale, 1957), 58-65.

Robert Le Ricolais in terms of theory, and August Komendant in terms of practice.[69] Komendant worked as the official structural engineer in the construction of the Richards Medical Laboratories. So, Louis Kahn's personal associations and inclinations towards modern technology, during the commissioning of the Richards Medical Laboratories at the University of Pennsylvania, played a strong role to set the premise for the architecture and design of the building.

Historic Context of the Richards Medical Laboratories

There are, however, profound debates amongst architectural historians whether Kahn was influenced by any architectural marvel from the pages of history. Some sources proclaim that Kahn blatantly denied the influence of any historical example in the Richards Medical Laboratories.[70] Others directly state or speculate on the use of historic examples in this work. For instance, I. M. Pei states that during a personal conversation, Kahn himself confessed that the towers of the Richards Medical

[69] Vincent Scully, *Louis I. Kahn*, (George Braziller, New York, 1962), 27.

[70] Richard Saul Wurman, *What will be has always been the words of Louis Kahn*, (New York, 1986), 127.

Laboratories represent the castles of Scotland—[71] an expression of timelessness. The other speculation, derived from reading drawings and archival material related to the construction of the Richards Medical Laboratories, point to a possible influence of Piranesi's Rome mediated through Robert Venturi. Even though there is a distinct difference of philosophy in the works of Venturi and Kahn established in chapter 1, architectural theorists speculate that there has been a noted influence of Venturi in Kahn's works.[72] This influence, however, is not on the grounds of architecture meant for science buildings, but through a Roman influence— architectural historian David Long also speculates that Kahn's perspectives of Philadelphia are reminiscent of Piranesi's Rome.[73] The influence might have found its roots when Venturi joined Kahn's office in 1957,[74] that strengthened Kahn's inclinations towards geometric order.[75]

[71] Interview of I. M. Pei by Nathaniel Kahn, in *My Architect: A Son's Journey*, (Documentary film, Mongrel Media, 2003).

[72] David G. De Long, "The Mind Opens to Realizations," in *Louis I. Kahn: In the Realm of Architecture*, ed. David Bruce Brownlee and David G. De Long, (Rizzoli, New York, 1991), 61.

[73] Ibid.

[74] Denise Scott Brown, "A Worm's Eye View of Recent Architectural History," in *Architectural Record*, Vol. 172, No. 10-12, (New York, February 1972), 73.

[75] Letters of Louis Kahn to Anne Tyng, in *Louis Kahn to Anne Tyng: the Rome letters, 1953-1954*, (Rizzoli, New York, 1997), 41-49.

Planning and Design of the Richards Medical Laboratories

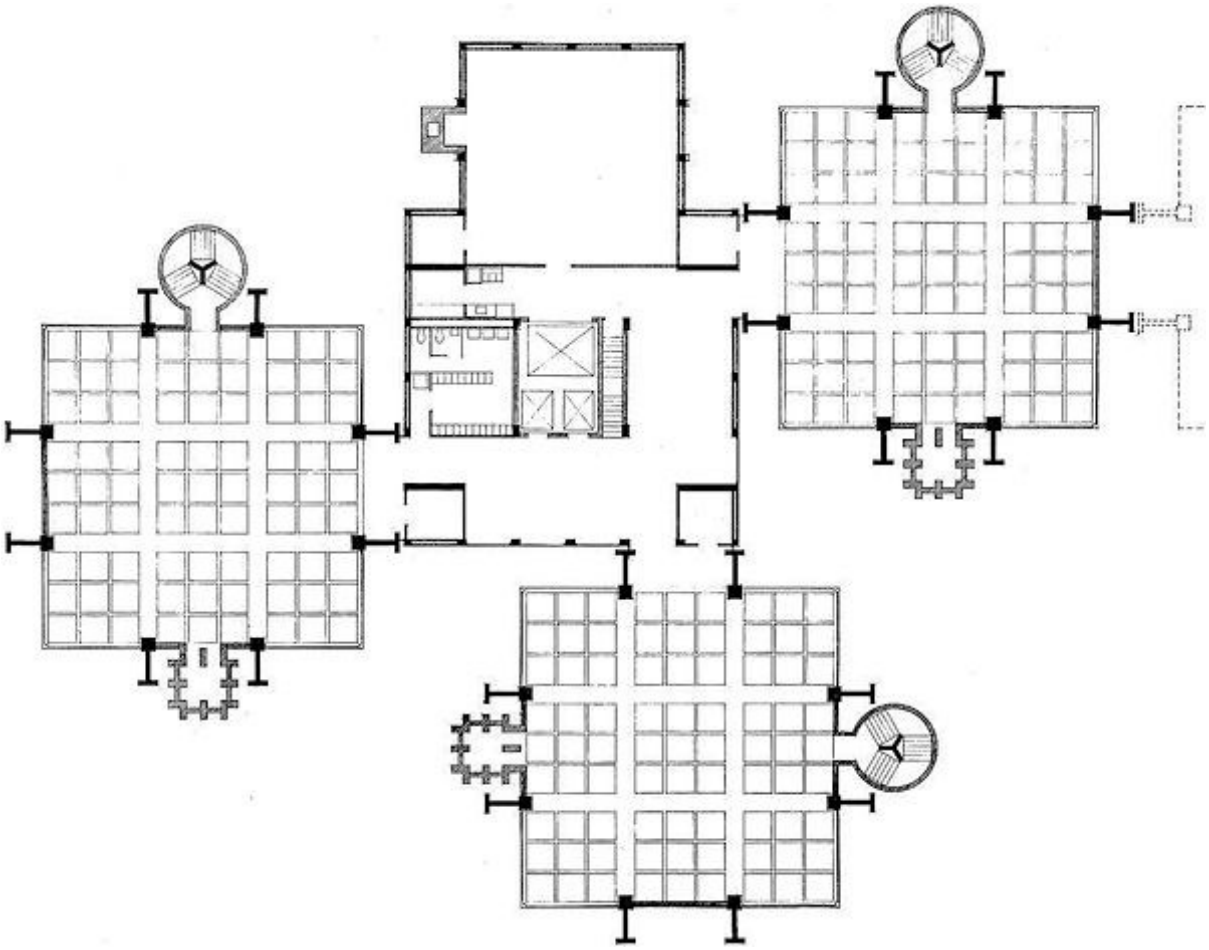


Figure 15: Early Plan of the Richards Medical Laboratories at the University of Pennsylvania, Philadelphia (Source: https://www.quondam.com/40/4003l.htm)

The initial planning of the Richards Medical Laboratories at the University of Pennsylvania in 1958 showcases a geometric order of three laboratory towers set in a pinwheel pattern, conjoined through a service tower.[76] In the later stages of planning, two more towers were added when the programmers decided to include laboratory facilities for biology.[77] Each of the laboratory towers is

[76] Robert McCarter, *Louis I. Kahn*, (Phaidon, London, New York, 2005), 112.
[77] Ibid.

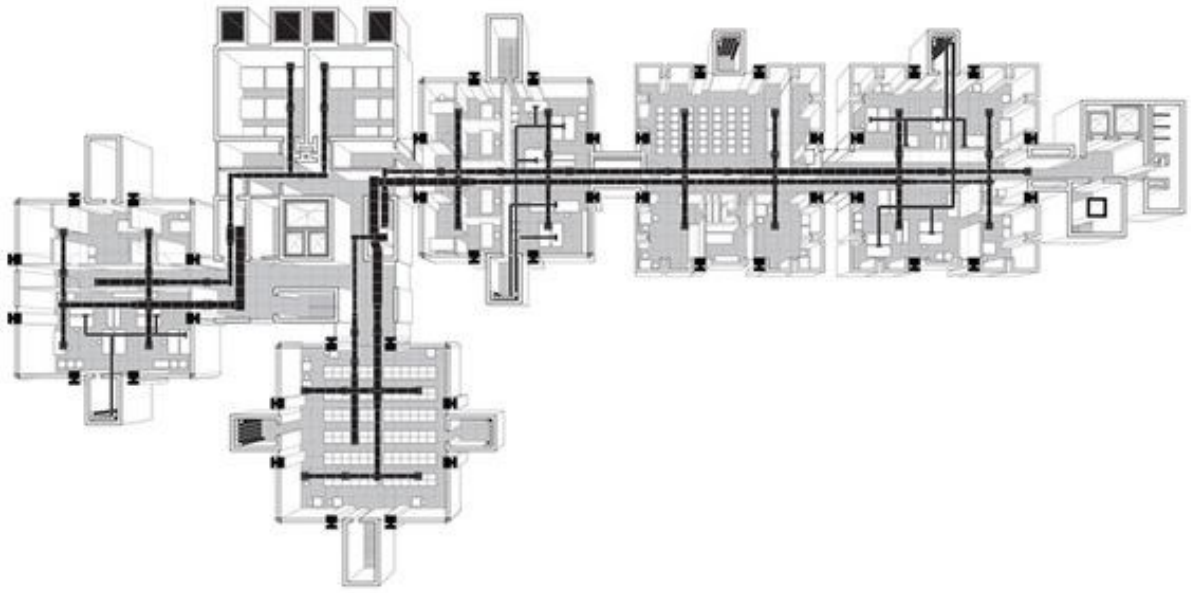


Figure 16: Later plan of the Richards Medical Laboratories at the University of Pennsylvania with two additional towers.
(Source: https://www.pinterest.ca/pin/411235009707372514/?lp=true)

square in the initial plan with a dimension of 45 feet (13.5 metre) on each side. Columns were proposed to be placed at the third-point at a distance of 15 feet (4.6 metre) from each other, and stairs and exhaust shafts were positioned at the mid points, thereby freeing the laboratory workspaces of hindrances caused by structure and services.[78] Since the structural support elements are not present at the periphery, each floor has cantilevered ends in all directions with the placement of gigantic glass windows without mullions.[79] Modifications made during the successive stages of design witness the addition of two more towers, with the stairwells altered from the previous cylindrical to a cuboidal form.[80] The floor plans are standardized and repetitive with a sense of spatial flexibility and extrovert

[78] Ibid, 113.
[79] Ibid, 117, 120.
[80] Ibid, 112-113.

Figure 17: Visual interactions with other laboratories and the surroundings. (Source: https://www.design.upenn.edu/historic-preservation/events/master-class-modern-problems--myths-and-reality-preservation-modern)

characteristic of the laboratory workspaces.[81] Each floor could be flexibly modelled in the interior with partitions according to its relevant changes in requirement with constant progress in the world of science. The laboratories complement the changes through time, despite retaining the sense of timelessness in their structural order, form and

[81] Ibid, 117.

distinct texture of concrete, brick and glass.[82] The workspaces are more like studios, something which Louis Kahn tried to replicate in the Salk Institute in a different way, where the characteristics of laboratories as chaotic and introverted spaces have been challenged and subjected to a new harmony through a soothing visual connectivity with other laboratories and buildings on campus.[83]

Reading from the Richards Medical Laboratories

Historians have read Louis Kahn's drawings of the North Elevation, made in September 1957, as a way of incorporating different patterns of fenestration designs, some recalling Roman motifs.[84] Following Kahn's texts on monumentality, I argue that this is a thorough misreading of his drawings, because never does he mention replicating architectural elements from the past but talks about revisiting the principles through a contemporary approach. No detailed articulations or motifs are presented in the eight-storey towers of his design; the Richards Medical Laboratories rather look like representations of the existing neo-classical buildings on

[82] Ibid.
[83] Ibid.
[84] David G. De Long, "The Mind Opens to Realizations," in *Louis I. Kahn: In the Realm of Architecture*, ed. David Bruce Brownlee and David G. De Long, (Rizzoli, New York, 1991), 61, 326.

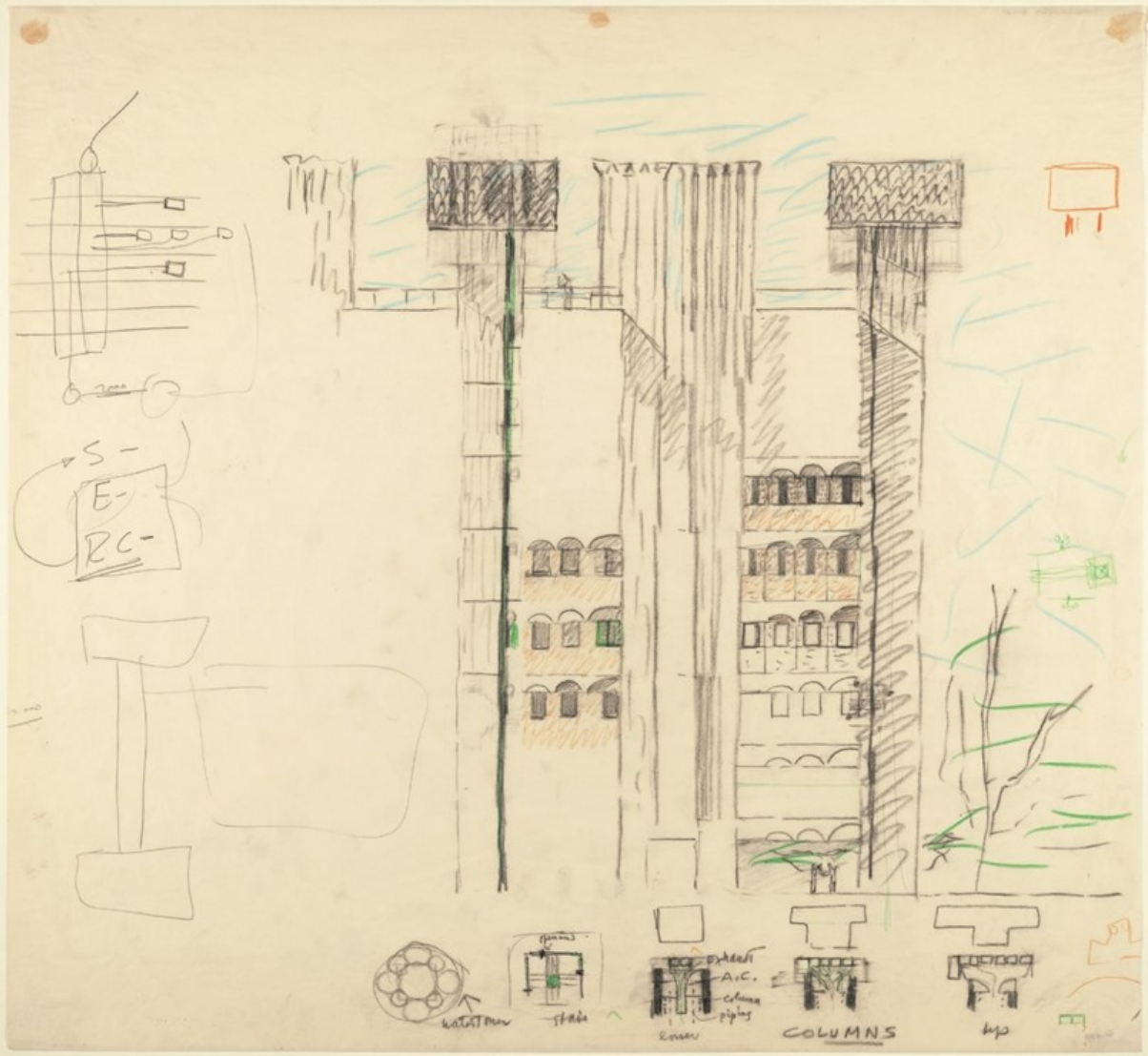


Figure 18: Early Conceptual Elevation of the Richards Medical Laboratories at the University of Pennsylvania, Philadelphia, resembling Roman motifs and fenestrations. (Source: The Collection, MoMA, New York, https://www.moma.org/collection/works/397?classifications=1%2C+2&locale=it&page=46)

the campus of the university. Each tower, having eight structural columns in the exterior and prominent service shafts, is conceived through structural logic, highlighting the rationalization of this logic through visibility.[85] The rationality of compositional logic is explained through the translation of separate demands of the program— general experiments and studies conducted on animals, a

[85] Ibid, 63.

Figure 19: The Richards Medical Laboratories in the background complementing the classical-looking Neo-Jacobean style of the Quadrangle Dormitory at the University of Pennsylvania. (Source: https://commons.wikimedia.org/wiki/File:UPennQuad006.jpg)

complicated segregation of air supply and exhaust—mediated through the separate towers and careful understanding while designing the service tower. The building showcases an empathetic distinction between servant and served spaces.[86] We often neglect storage spaces, service rooms, work cubicles as partitioned spaces, at unwanted corners of the structure. Kahn argues that these spaces should have their own structure rather than being isolated elements of the building that remain hidden.[87] I believe that this idea of rationally justifying a tradition of spatial planning by prioritizing both primary and service spaces resonates with that of meaningful

[86] Ibid.

[87] Louis Kahn, "Architecture is the thoughtful making of spaces," in *Prospecta 4: The Yale University Journal*, (Yale, 1957), 2-3.

Figure 20: The service shafts and columns in the exterior act as distinct decorative elements of the building complementing the neo-classical buildings on the campus of the University of Pennsylvania. (Source: https://en.wikipedia.org/wiki/File:Richards_Labs_Penn.JPG)

traditional mediations that are expressed in his treatise on *Monumentality:*

> The Medical Research Building… is conceived in recognition of the realizations that science laboratories are studios and that the air to breathe should be away from the air to throw away. The normal plan of laboratories… places the work areas off one side of a public corridor [with] the other side provided with the stairs, elevators, animal quarters, ducts and other services… The only distinction

> between one man's spaces of work from the other is the difference of the numbers on the doors.[88]

So, Kahn develops the program at the Richards Medical Laboratories not based on the particularities of the detailed functions involved in experiment and research, rather conceives his architecture from the purposes of highlighting primary workspaces and service spaces and generating interaction in the laboratories as studios as well as establishing visual interconnections across studios from separate towers. The way he grouped the towers embodies the inception of community work amongst scientists through interactions. Even though Kahn's idea of generating form through purpose gets translated through the buildings, his structural re-investigations during construction was later (in 1991) criticized by the structural engineer of the project, August Komendant—

> He lacked the basic knowledge of structures and structural materials… He hid his lack of structural knowledge behind arrogance and his position.[89]

This, however, doesn't justify Kahn's ignorance about technology, because he personally admires Komendant and acknowledges his contribution to develop meaningful

[88] Louis Kahn, "Form and Design," in *Architectural Design*, Vol. 31, No. 4, (London, April 1961), 151.

[89] August Komendant, "Architect-Engineer Relationship," in *Louis I. Kahn: Writings, Lectures, Interviews*, ed. Alessandra Latour, (New York, Rizzoli, 1991), 317.

form from structure,[90] again repeating with what he says in *Monumentality*.

Problems and Aftermath of the Richards Medical Laboratories

Even though the Richards Medical Laboratories garnered positive reviews from architectural critics like Scully, it also got criticized by many. A careful investigation of the construction period generates a few answers. The university authorities changed their initial plans to incorporate more towers for the biology labs. The budget of the building rose from $2.4 million to $3.0 million, whereas the available funds reduced from $3.1 million to $2.8 million.[91] The university authorities discovered late during the stages of design that they had not considered funds for laboratory equipment and furniture.[92] One of the most criticized elements of the Richards Medical Laboratories is the presence of excessive heat and light in the laboratories. Reduction in construction expenses jeopardized insulation and window blinds and saw the replacement of insulated glass with ordinary glass.[93] While design modifications were in place

[91] Personal letter from Vice Dean Thomas Whayne, January 1958.

[92] Robert Gutman, "Human Nature in Architectural Theory: The Example of Louis Kahn," in *Architects' People*, ed. Russell Ellis and Dana Cuff, (Oxford, 1989), 105-126.

[93] Alex Soojung-Kim Pang and Preston Thayer, "Alfred Newton Richards Medical Research Building, University of Pennsylvania," in *Louis I. Kahn: In the Realm of Architecture*, ed. David Bruce Brownlee and David G. De Long, (Rizzoli, New York, 1991), 325.

to accommodate the changes in budget, Kahn's reputation had also been tarnished by problems in air-conditioning and construction details, which saw the inclusion of a construction management firm, United Engineers. Though Kahn initially says during the design stage, "The limited budget of the Richards Medical Laboratories did not interfere with the idealistic demands of architecture,"[94] his intentions actually gets overpowered by the budgetary problems. Kahn's idea was to make the additional two towers five-storeyed and conjoined at the top with the scheme of reading rooms having light from the top.[95] I argue that the intentionality expressed in this scheme is to generate a sense of eternity through manifestation of natural light, something that stays eternal. However, the budgetary problems compelled this scheme to be dropped and the construction management firm had to negotiate with the proposed design to generate something more economically viable. The narrative of construction, explored through written accounts, clearly expresses Louis Kahn's objective of creating an architecture for science that would resonate as a monument, but the setbacks resulted in turning parts of it into ruins.[96]

[94] Letters, Kahn to Henry Pemberton, October 20, 1961, and Kahn to David Goddard, October 21, 1961, in *Master File, October 2— December 31, 1961, Box LIK 9, Kahn Collection*, (University of Pennsylvania Archives).
[95] Jeffry Kieffer, *Readings from the architecture of Louis I. Kahn*, (Xlibris, 2001), 32.
[96] Ibid, 36.

Figure 21: The Richards Medical Research Laboratories after renovation.
(Source: https://archinect.com/aosarchitects/project/richards-medical-research-laboratory-renovations)

Despite criticisms, in 2009, the Richards Medical Laboratories building was designated a National Historic Landmark. Subsequent renovation started in 4 phases with estimated costs of $13.4 million, $ 16.5 million, $10 million and $18.5 million, respectively. The objectives of the renovation include replacement of the glazing of windows, rearrangement of interior spaces and upgradation of the plumbing, illumination, heating and ventilation services to match the original design envisioning of Louis Kahn.[97] Although the last two phases of the work are still in progress and awaits popular

[97] Penn Connects: A Vision for the Future, https://www.pennconnects.upenn.edu/index.php, (Accessed August 1, 2018).

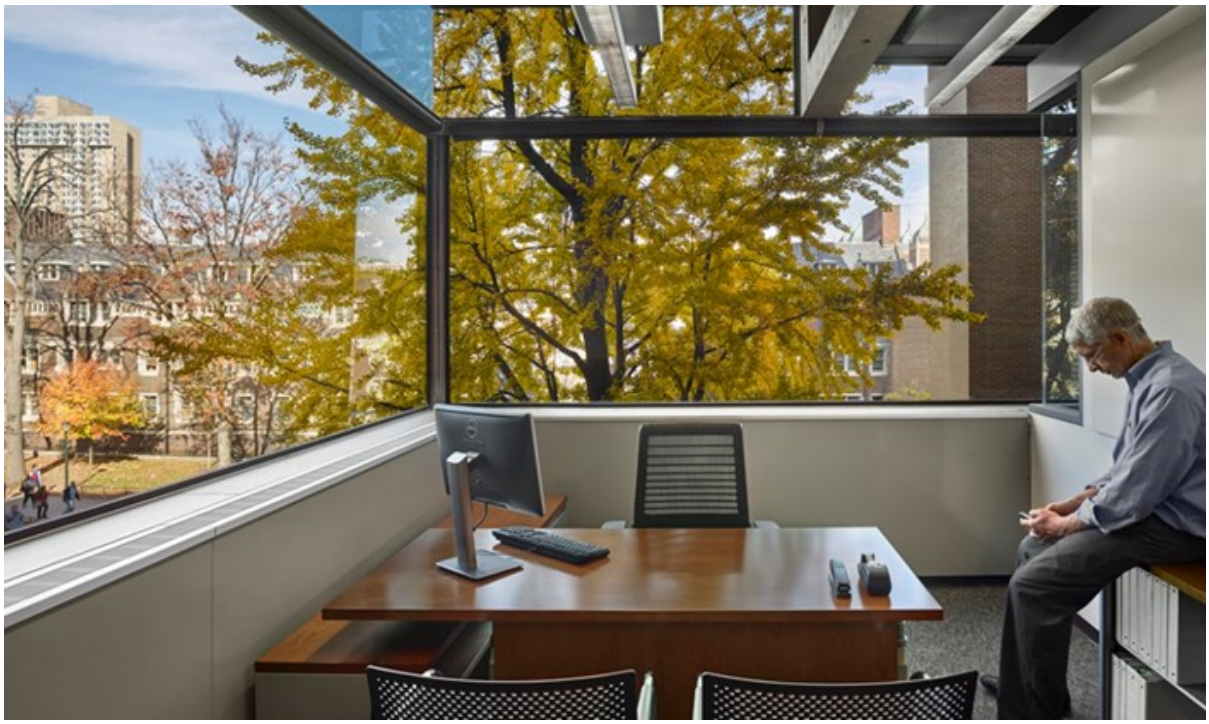


Figure 22: The Richards Medical Research Laboratories after renovation.
(Source: https://archinect.com/aosarchitects/project/richards-medical-research-laboratory-renovations)

feedback from the user groups, it has to be taken into account that Kahn's architecture for the Richards Medical Laboratories has the potential of incorporating changes with time, thus being flexible as well as staying timeless through its own distinct image— making it justifiably monumental.

Salk Institute for Biological Studies, La Jolla, San Diego, California

During the construction of the Richards Medical Laboratories, Louis Kahn's work gained critical acclaim and he was approached by Jonas Salk, the inventor of the polio vaccine, to design a facility that would accommodate scientific research as well as foster exchange of ideas between scientists and cultural leaders.[98] Salk's idea was to generate architecture that would be a place of interest not only for working scientists, but also be a source of entertainment for artists like Picasso.[99] Louis Kahn considered Salk as his most trusted critic[100] and intended to translate this space of integration of science and arts into measurable and unmeasurable— Salk's idea of the subjective and objective worlds of science parallel to Kahn's own belief of the ability of architecture to merge the ineffable with the mundane.[101] The final design of the Salk Institute, which transpired from this mutual ideology of Kahn and Salk, had functioning laboratory workspaces along with the presence of a plaza as a space of repose that tends to merge into the unmeasurable infinity of the horizon and depth of the ocean. Even though

[98] Charles P Snow, *The Two Cultures and the Scientific Revolution*, (Cambridge, 1959).
[99] Interview of Jonas Salk by David Bruce Brownlee, April 18, 1983, *Kahn Collection*, (University of Pennsylvania Archives).
[100] Louis Kahn, "Remarks," in *Perspecta 9/10: The Yale University Journal*, (Yale, 1965), 332.
[101] Thomas Leslie, *Louis I. Kahn: Building Art, Building Science*, (George Braziller Inc., New York, 2005), 131.

architectural historians and critics point out the constant mutual admiration between Kahn and Salk, it has to be also kept in mind that they were not always in unison, with Salk rejecting Kahn's design ideas at times and Kahn trying to convince Salk with his concepts. But their mutual criticism had a common purpose— restoring the separation between human intellect and spirit in the world of modern science.[102] They did not just want to create a research facility but focused on valorising the timeless, monastic and holistic nature of science to address the social and humanitarian context of the advancements in biological science.[103]

Initial Phase Planning and Design of the Salk Institute

This interplay between science and sociology, as envisioned in the eventual Salk Institute, can be seen to have been based on four basic principles laid by Basil O'Connor, an American lawyer who started organizations for the research on polio prevention and treatment, and Jonas Salk himself as early as 1956—

[102] David Bruce Brownlee, "The Houses of the Inspirations: Designs for Study," in *Louis I. Kahn: In the Realm of Architecture*, ed. David Bruce Brownlee and David G. de Long, (Rizzoli, New York, 1991), 95.
[103] Thomas Leslie, *Louis I. Kahn: Building Art, Building Science*, (George Braziller Inc., New York, 2005), 131.

1. the pursuit of knowledge through scientific research is a constructive human activity in itself.

2. the most effective means for the maintenance and enhancement of health as well as for the prevention and cure of disease will derive from the fundamental advancements in life sciences.

3. the growing knowledge and behaviour of cells and of the molecules of which they are composed promises to effect a fundamental change in man's view of himself as he interacts with his external environment and in the possibilities of control over himself and over the environment.

4. in order to assure the maximum contribution to human welfare, the scientist must be concerned with men not only as biophysical organisms but as unique individuals and as social beings.[104]

The initial planning of the Salk Institute was derived less from these principles, rather witnessed the replication of the research towers at the Richards Medical Laboratories, University of Pennsylvania. The designated site of the Salk Institute at La Jolla, San Diego, California was of 27 acres, much more than what was available for

[104] Ibid., 131-132.

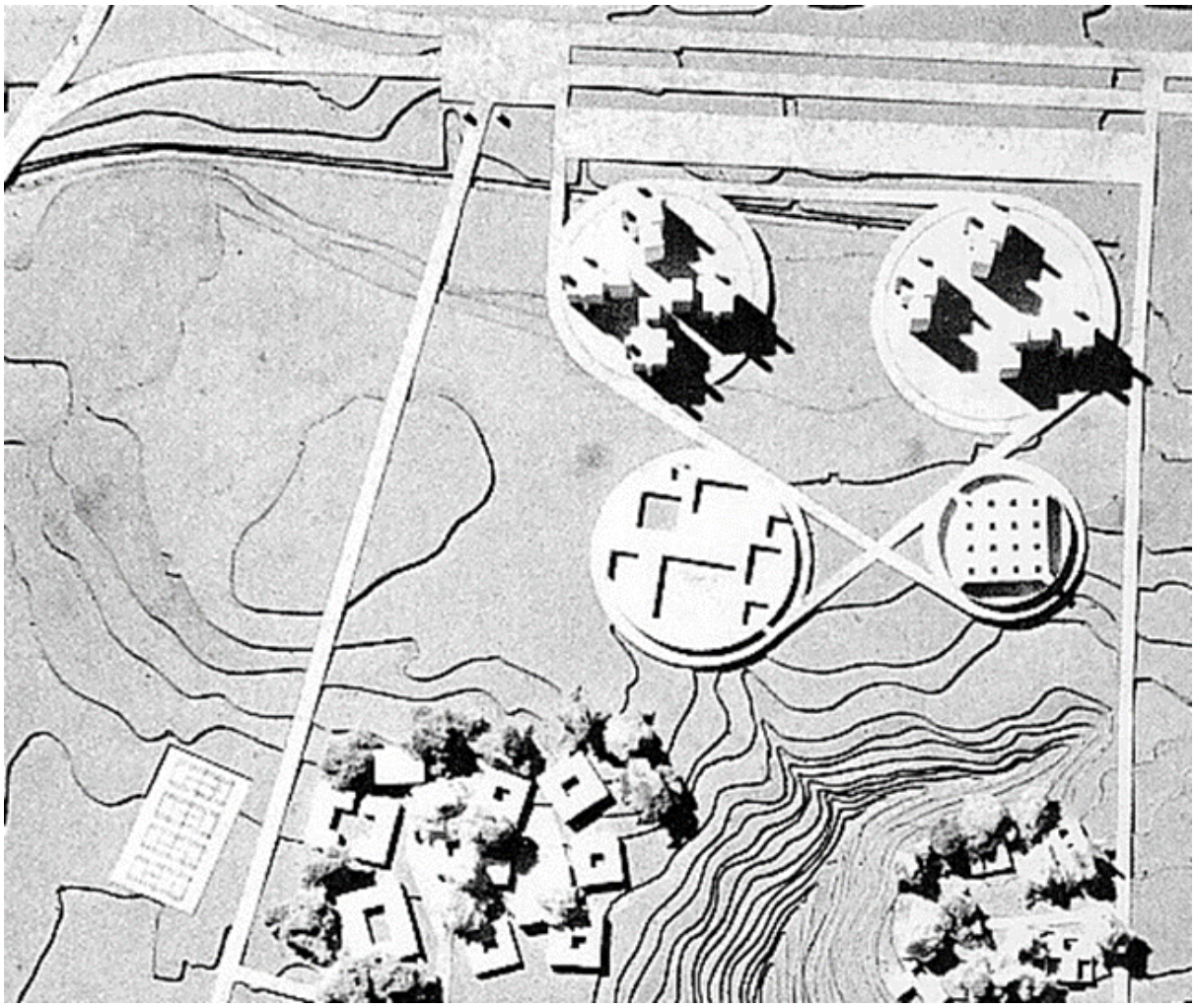


Figure 23: Initial design scheme of the Salk Institute having laboratory towers as derived from the Richards Medical Laboratories.
(Source: https://archinect.com/forum/thread/52945355/the-philadelphia-school-deterritorialized)

the Richards Medical Laboratories. The gigantic scale of the site at La Jolla made the design scheme of the research towers look out of place even though this scale compensated by eliminating the problems in building services witnessed at Philadelphia.[105] I argue that when Kahn started designing the Salk Institute, he was concerned more about solving the design problems related to the services of the Richards Medical Laboratories, to

[105] Ibid., 132–135.

valorise the timelessness of this new research facility by reducing the potential of future alterations.

This design scheme, later dubbed unrealistic and inefficient by Louis Kahn himself, had problematic and unequal visual connectivity with the surroundings—laboratory towers in the west would have a constant view of the serene Pacific Ocean, while those on the east would face the new campus of the University of California, adjacent to the site. Jonas Salk immediately rejected this design scheme that resulted in an apology from Kahn for his lack of sensitivity towards the site.[106] However, I speculate that this initial design scheme was not a fruit of unwise planning by neglecting site conditions but an outcome of Jonas Salk's admiration for the Richards Medical Laboratories that led him to hire Kahn for the Salk Institute in the first place.[107] I argue that Kahn, aware of Salk's admiration, could have been under the impression that the architecture of the Richards Medical Laboratories was expected to be replicated and improved. It also hints at Kahn's scientific interest, expressed in *Monumentality*, of looking at architecture as an experiment and adding context to the results in further projects. Even though Salk's vision of his institute at La

[106] Ibid., 134-135.

[107] Vincent Scully, *Louis I. Kahn*, (George Braziller, New York, 1962), 30.

Jolla, San Diego suggests an architecture true to the essence of its place, it is possible that the Salk Institute is conceived from the Richards Medical Laboratories through different threads of imagination of Salk and Kahn.

Final Design Program of the Salk Institute

Unlike the Richards Medical Laboratories, the Salk Institute did not have a design program during its design phase but evolved during the process of design and even after the completion of the buildings in 1967. Following my previous note of Salk's admiration for the Richards Medical Laboratories, I further speculate that he had faith in Kahn's knowledge of architectural program for laboratories though he wanted laboratory workspaces that, despite functioning properly, would emerge as a symbolic space of science itself and staying true to the harmony of the site. It resonates with D'Arcy Thompson's idea of architectural evolution from simple elements of nature.[108] I speculate that Salk was also familiar with Kahn's treatises on *Monumentality*, *Spaces, Order and Architecture*,

[108] D'Arcy Thompson, *On Growth and Form*, Vol. 2, (Cambridge, 1959), 777.

written around the same point of time, that express his inclination towards rational science. After the rejection of the initial design concept, Louis Kahn came up with a design abstract rather than a program—

> The choice of the site of Torrey Pines, La Jolla, San Diego, overlooking the sea and protected by surrounding park and University (of California) property is the first inspiring act towards creation of the environment for the (Salk) Institute of Biology. From the presence of the uninterrupted sky, the sea and the horizon, the clear and dramatic configuration of weather-beaten land spare of foliage, the buildings and their gardens must find their position in deference to Nature.[109]

So, Kahn's final design for the research facility for the Salk Institute, derived from this abstract, is not just an attempt to enclose functional yet flexible laboratory workspaces, it is, first of all, a sanctuary or retreat for the scientist himself, who looks at science as a timeless objective of humanity mediated through nature. Architectural historian Thomas Leslie argues that even though this abstract is suggestive of a spiritual space for the working scientists of the Salk Institute, the program of

[109] Louis Kahn, "Salk— Program Notes, June 19," 1962, in *Box LIK 27, Kahn Collection*, (University of Pennsylvania Archives).

design is incredibly efficient. The design included column -free spaces that were meant to serve laboratory works not only for biological sciences but could address the requirements of natural and physical sciences as well,[110] suggestive of its flexible nature like the Richards Medical Laboratories.

Open Plan at the Salk Institute

Although the design of the Richards Medical Laboratories was already famous, Salk insisted on the kind of practical, open-plan building that was unusual for laboratories. Kahn was not unfamiliar with this kind of planning which he had done in his Yale Art Gallery, but he looked at it as a cliched way of creating modern architecture.[111] Salk's intentions, however, were not restricted to creating a repetitive modernism through open-plan spaces, rather focused on creating laboratory spaces modelled on the holistic ideals of monasteries. Amidst this argument, it is interesting to observe that the Richards Medical Laboratories at the University of Pennsylvania are not completely devoid of this idea of openness. The laboratory workspaces at the Richards

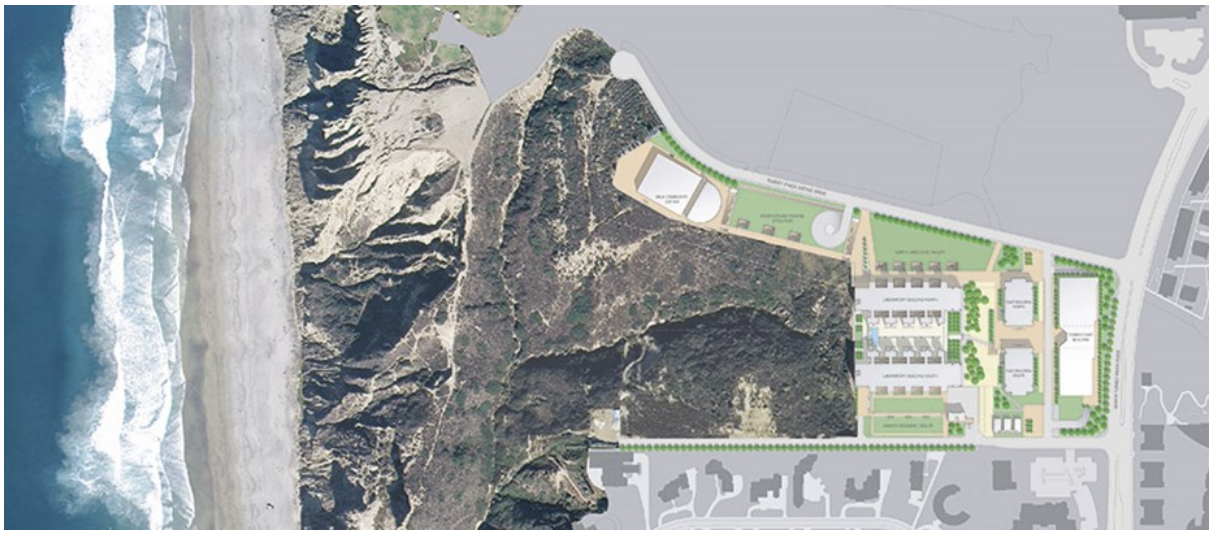
[110] Thomas Leslie, *Louis I. Kahn: Building Art, Building Science*, (George Braziller Inc., New York, 2005), 136.

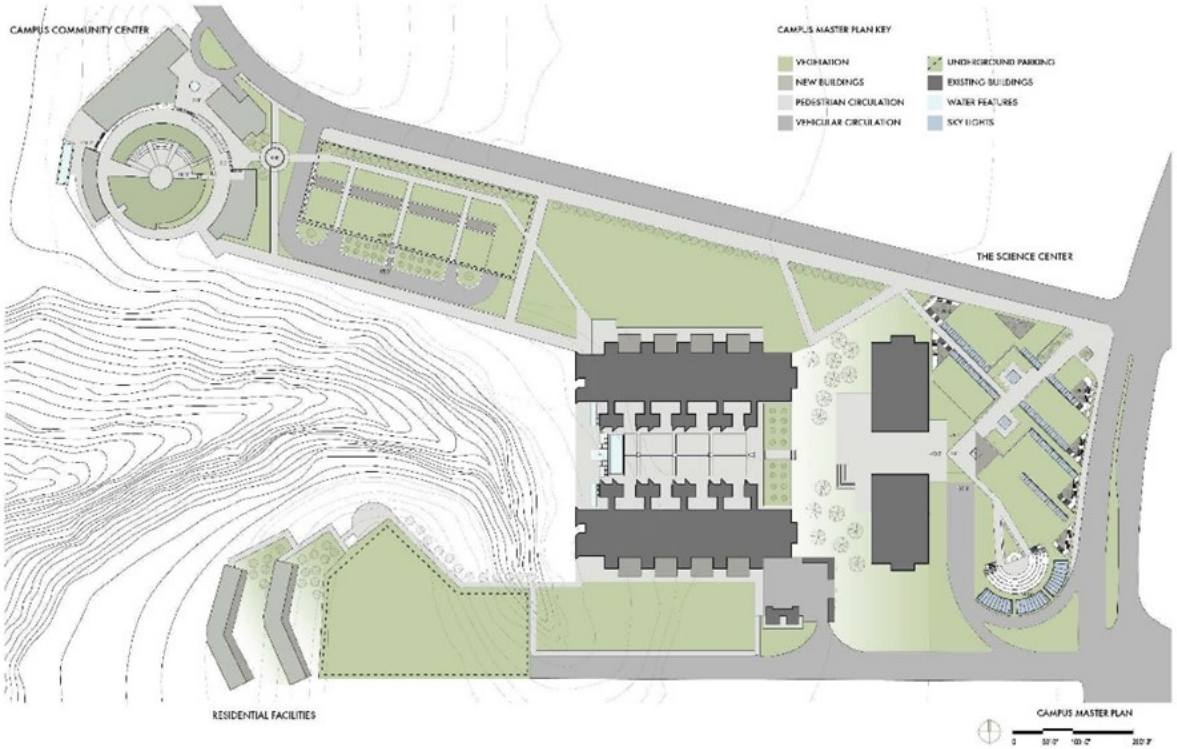
[111] David Bruce Brownlee, "The Houses of the Inspirations: Designs for Study," in *Louis I. Kahn: In the Realm of Architecture*, ed. David Bruce Brownlee and David G. de Long, (Rizzoli, New York, 1991), 96.

Figure 24: Open plan of the Yale Art Gallery designed by Louis Kahn in 1953.
(Source: https://www.pinterest.co.uk/pin/316026098821914213/?lp=true)

Medical Laboratories, as demonstrated in the earlier part of this chapter, shows how Kahn achieved a sense of openness through the huge glass windows though the plan remained enclosed but flexible.

Despite the desire of scientists to stay close to their work environments all the time (user groups were even disappointed with the laboratory studios at the Richards Medical Laboratories), Kahn designed small studies for the scientists, close to their labs yet segregated, overlooking





Figures 25 and 26: Plans showing the two rectangular laboratory blocks of the Salk Institute separated by a concrete plaza overlooking the ocean. There have been subsequent proposals for redesigning parts of the site and adding new infrastructure, but Louis Kahn's design of the laboratory blocks and the plaza has been kept unaltered.
(Sources: www.nbbj.com/work/salk-institute-for-biological-studies-master-plan/; https://archinect.com/people/project/17351223/the-urban-carpet-an-addition-to-the-salk-institute/17358443)

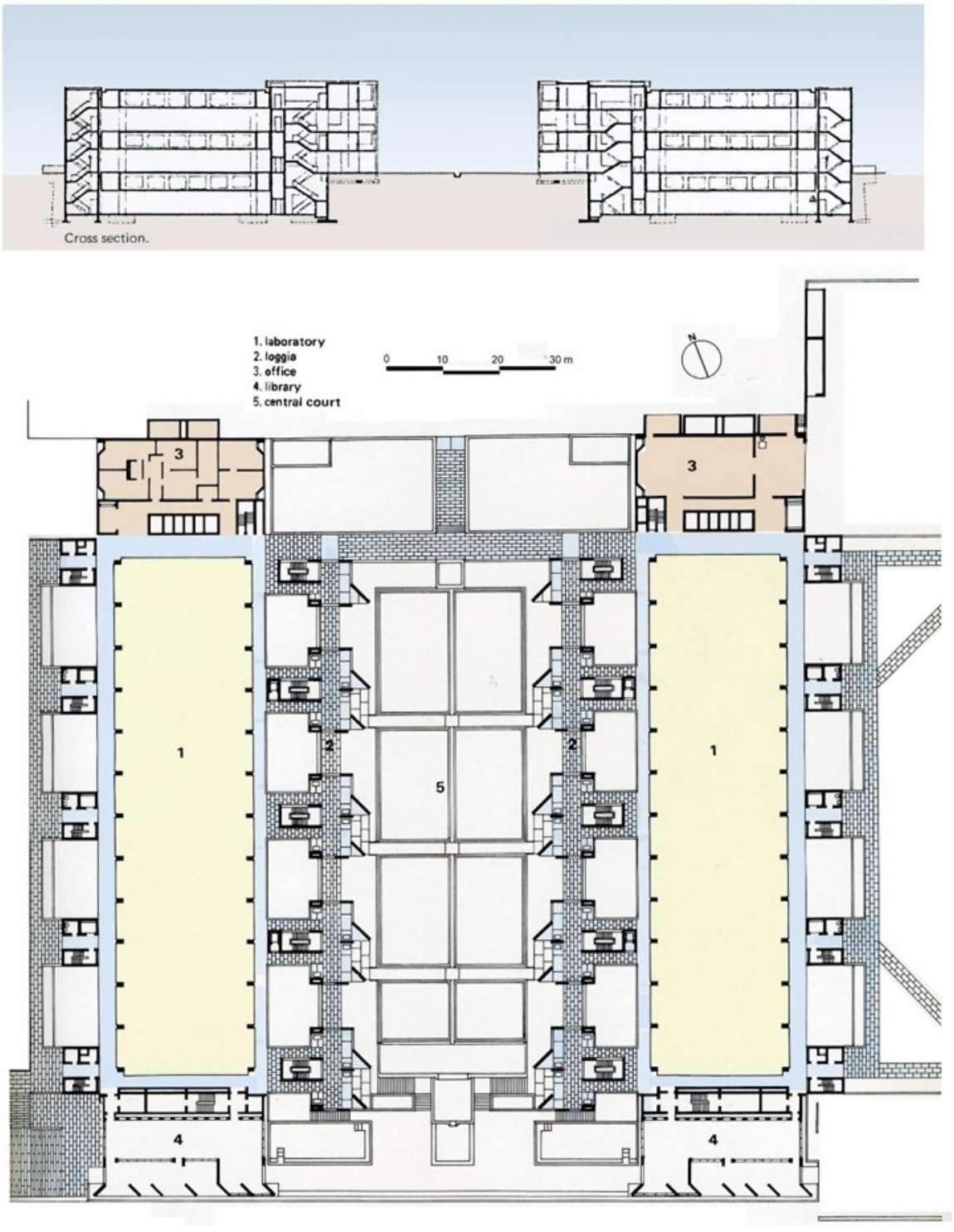


Figure 27: The two rectangular laboratory blocks of the Salk Institute submerged into the site by a storey and separated by a concrete plaza overlooking the ocean.
(Sources: https://www.pinterest.com/pin/397583473332976374/)

Figure 28: The concrete plaza between the laboratory buildings of the Salk Institute visually merging with the horizon. The walls of the research studios are inclined to facilitate a view of the ocean. (Source: https://www.kpbs.org/news/2018/apr/23/famous-salk-institute-cancer-researcher-suspended/)

the ocean, analogous to monastic planning, and creating clean architecture for laboratories.[112] After repeated iterations in the design process, the final scheme was two rectangular laboratory blocks of size 245 feet (75 metres) x 65 feet (20 metres), each submerged into the site by one full storey so that it would facilitate the view of the Pacific Ocean for neighbouring developments. These two blocks are separated by a concrete plaza in between that visually merges with the horizon over the ocean, this visuality accentuated by a narrow channel of water emerging from a concrete bench and running through the absolute centre of the plaza.

[112] Louis Kahn, "Law and Rule in Architecture," lecture, Princeton, November 29, 1961, in *LIK Lectures 1969, Box LIK 53, Kahn Collection*, (University of Pennsylvania Archives).

Figure 29: Inside the studio-like study spaces of the Salk Institute. (Source: http://proyectoskiara.blogspot.com/2012/10/louis-i-kahn_24.html)

Each side of the laboratory blocks are provided with five towers to facilitate research and study of the principal scientists and laboratory investigators, away from the confines of conventional and enclosed laboratory workspaces.[113] These personal studio-like research spaces are resonant of the idea of visually open laboratories, expressed in the Richards Medical Laboratories, though, here, there is a deliberate attempt to connect the workspaces with the infinite depth of the horizon rather than the laboratories themselves. Each of these study

[113] Thomas Leslie, *Louis I. Kahn: Building Art, Building Science*, (George Braziller Inc., New York, 2005), 147.

spaces are provided with sliding and fixed glass panels on teak frames.

Monumentality of the Salk Institute

The condition expressed through the inclined walls of the studies in the laboratory blocks facing the ocean instigates a contemplative movement towards the horizon— a purpose envisioned by Kahn that stays constant, no matter how the function changes in the labs. The landscape architect of the project, Louis Barragan, recalls that Kahn deliberately wanted not the slightest intervention of plants in the plaza that overlooks the Pacific Ocean.[114] Architectural theorists speculate that Kahn's design of the Salk Institute portrays a strong interplay between the will to knowledge and nihilism, inspired by Nietzsche's writings.[115] I argue that even though there is no strong evidence of this influence, it certainly evokes the space as a poetic image and valorises the idea of inquisitive knowledge as the new religion. I support my argument with Kahn's own statement, "Poetry is the aura of religion."[116] Unlike the architecture of the Richards Medical Laboratories which tries to

[114] Richard Saul Wurman, *What will be has always been the words of Louis Kahn*, (New York, 1986).
[115] Jeffry Kieffer, *Readings from the architecture of Louis I. Kahn*, (Xlibris, 2001), 41.
[116] Richard Saul Wurman, *What will be has always been the words of Louis Kahn*, (New York, 1986), 118.

rationalize eternal existence through a mediation of purpose, the Salk Institute tries to attain eternity through a much more divine understanding of the purity of knowledge.

Although there is an expression of the technological genius through the folded-plate structures creating workspaces, what highlights the design is a constant spatial -temporal condition generated at the edge of the institute with the ocean. Addressing the design has been achieved functionally through iterations of design options, but the constant focus of the Salk Institute remains the same—creating a space for monastic learning. It also resonates with Vedic philosophy, which states that knowledge is a form of meditation. Kahn had been travelling to India and Bangladesh for the respective designs of the Indian Institute of Management and the Assembly at Dhaka; and this brings about the possibility of him coming across this philosophy and incorporating it in his designs. So, unlike the Richards Medical Laboratories, the Salk Institute was not faced with budgetary problems or conflicts with clients, but got the architect much more enriched in philosophy and experience, along with a constant support from an intellectual client. The idea of eternity mediated

Figure 30: Monumentality expressed through the spirituality of light and shadows at the Salk Institute. (Source: http://www.latimes.com/entertainment/arts/miranda/la-et-cam-salk-institute-louis-kahn-20161107-htmlstory.html)

in *Monumentality* is rightfully expressed here, much more through a spiritual outlook.

Conclusion

Out of the mind of a tiny whimsical man
who happened by chance,
great forms have come,
great structures, great spaces that function.
Some houses the essence of the past,
others the creators, the discoverers and leaders
of an emerging future.
The wonder surrounding it all
is in the mystery
of his existence
and in his creations,
a mystery that will endure…[117]

Jonas Salk's poetry on Kahn's memory is not only suggestive of his ability to create architecture of mystic depth but also praises his buildings as spaces of function. Following the facts and arguments recorded in the previous chapter regarding the Richards Medical Laboratories at the University of Pennsylvania, this statement by Salk is biased and a clear contradiction to the experiences of the user groups. However, it would be unwise to state that the Richards Medical Laboratories were a complete failure as it was the basis of how Kahn

[117] Jonas Salk, Poem in Louis Kahn's memory, in *Louis I. Kahn: Works and Projects*, ed. Romaldo Giurgola and Jaimini Mehta, (Westview Press, Colorado), 7.

started designing the Salk Institute, the first building of his own that he liked after completion.[118] I argue that Kahn's inclination towards science is expressed in the idea of conceiving his designs as experimental processes. Not all experimental results end in success but trigger the possibility of further experimentation. Just as failed experiments are landmark events in the world of science, so can the Richards Medical Laboratories be dubbed as successful as a precursor to the Salk Institute.

These two buildings are not only an outcome of a design experimentation but also flagbearers of new scientific methods involved in construction. Louis Kahn had decided in 1950, during the construction of the Philadelphia Psychiatric Hospital that he would not use light-weight, thin steel, a symbol of modern architecture, in the design and construction of his future projects.[119] He favoured the use of reinforced concrete that would shape spaces, provide structural support, as well as furnish an integral sculptural embellishment—[120] an inspiration from ancient structures that he had seen during his visit to Italy, Greece and Egypt in 1950.[121] During the construction of the Richards Medical Laboratories, he employed August Komendant as the structural engineer of the project and

[118] Narration by Nathaniel Kahn, in *My Architect: A Son's Journey*, (Documentary film, Mongrel Media, 2003).

[119] Robert McCarter, "Louis Kahn and the Nature of Concrete: Two masterworks and their shared natural conception," in *Concrete International*, Vol. 31, Issue 12, (American Concrete Institute, December 2009), 28.

[120] William Jordy, "The Impact of European Modernism in the Mid-twentieth Century," in *American Buildings and their Architects*, Vol. 5, (Oxford, 1986), 397.

[121] Robert McCarter, "Louis Kahn and the Nature of Concrete: Two masterworks and their shared natural conception," in *Concrete International*, Vol. 31, Issue 12, (American Concrete Institute, December 2009), 28.

requested the use of pre-cast concrete. The design requirements of large cantilevered floor areas needed the concrete to be not only pre-cast but pre-stressed as well, something that was relatively new in the construction industry. Despite problems in the budget when an easier solution could have been embraced, the use of new scientific methods in construction, I argue, is an evidence of the fact that this research building is an experiment in itself. After completion, architect Eero Saarinen asked Kahn if he considered the project an icon of structural marvel or architectural milestone.[122] For Kahn, architecture and structure are not separate entities which is also suggestive of his design of buildings as scientific or structural metaphors, the use of which has also been termed as scientization of architecture.[123]

Following the claim in chapter 1, where I speculate that Kahn approached architecture through a morphological understanding, resonating with the ideals of D'Arcy Thompson, I argue that he also incorporated various branches of science related with his observations from nature into his designs. The concrete plaza of the Salk Institute focuses on the fundamentals of optics—how the human eye responds to the interplay of light and

[122] August Komendant, *18 Years with Architect Louis I. Kahn*, (Aloray, 1975), 18-19.

[123] K. Michael Hays, "Diagramming the New World, or Hannes Meyer's "Scientization" of Architecture," in *The Architecture of Science*, ed. Peter Galison and Emily Thompson, (MIT Press, 1999), 249.

shadow. The water channel running through the centre of the plaza draws the attention towards the depth of the horizon as an illusional kinematic movement. So, the Salk Institute can be dubbed as a metamorphosis of the interconnection between the science of optics and dynamics. Keeping scientization apart, the Salk Institute also employed the use of Vierendeel trusses and interstitial floors to house services without disrupting the activities of the continuous and open laboratories.[124] Not just are the use of these technological tools uncommon but it also respects the integrity of scientific work by reducing obstruction at workspaces. Safdie justifies that modern-day scientific activities require solitude as well as collaboration—[125] a condition that Kahn tried to establish through the separation of laboratories from individual studies facing the ocean. The design program of the Salk Institute is not just functional placement of spaces but a reflection of the life of science. Louis Kahn explores the possibility of appropriating science with humanity through science itself and, in the process, creates two iconic buildings. Both the Richards Medical Laboratories and the Salk Institute have favourable arguments that

[124] Thomas Leslie, *Louis I. Kahn: Building Art, Building Science*, (George Braziller Inc., New York, 2005), 146.

[125] Moshe Safdie, "The Architecture of Science: From D'Arcy Thompson to the SSC," in *The Architecture of Science*, ed. Peter Galison and Emily Thompson, (MIT Press, 1999), 486.

make them monumental and scientific metaphors of laboratory workspaces.

"What, or where, was the source

of his inspiration,

of his judgement—

There will be found

the creative process

of Nature itself…"

—Jonas Salk on Kahn

Illustrations

Front Cover— Salk Institute
http://www.everystockphoto.com/photo.php?imageId=2843083

Page 2— Salk Institute
https://occupyactionscape.wordpress.com/tag/salk-institute/

Page 4— Richards Medical Laboratories
http://www.grantmudford.com/

Page 24— Laboratory Building at Roche
http://www.henn.com/de/projects/science-industry/roche-labor-und-buerogebaeude

Page 38— IIM Ahmedabad, one of the examples of Kahn's monumental architecture
https://deponti.livejournal.com/1038773.html

Page 56— Richards Medical Laboratories
https://www.flickr.com/photos/32224170@N03/5914468014

Page 90— End of the water channel at Salk Institute
http://www.investingbb.com/louis-kahn-salk-institute.html

All other illustrations have the sources imprinted in their supporting captions.

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