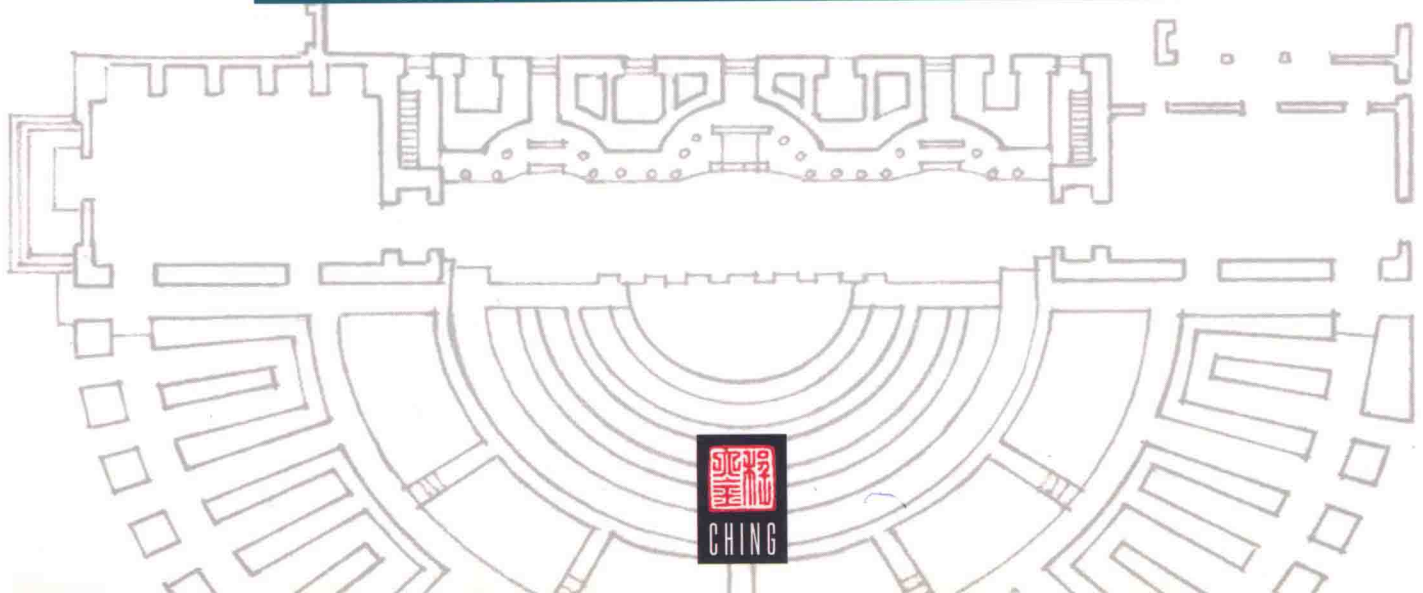




FRANCIS D.K.  
**CHING**

JAMES F. ECKLER

INTRODUCTION TO  
ARCHITECTURE



Cover image: Courtesy of author

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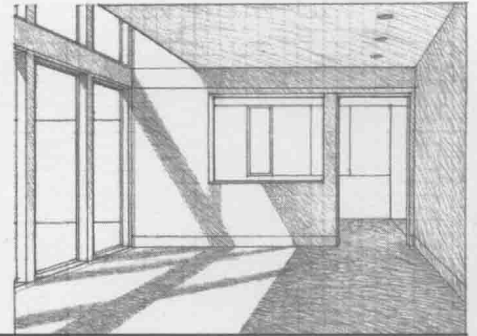
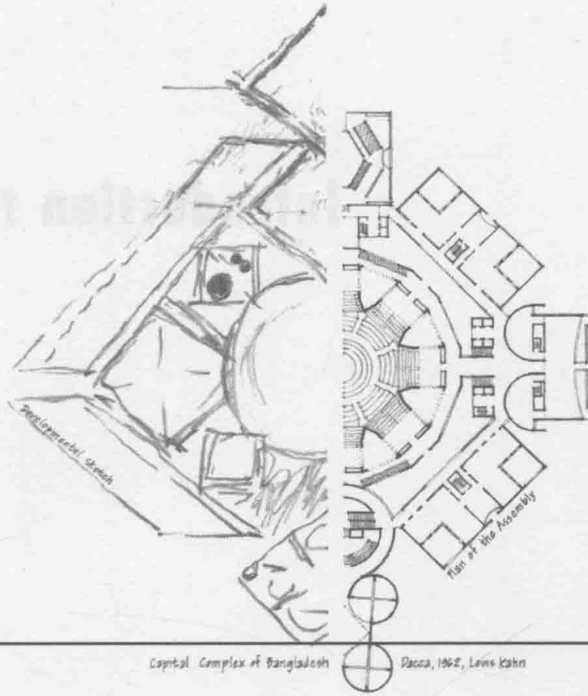
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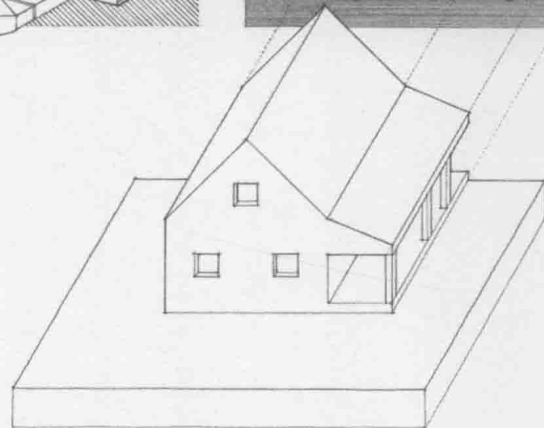
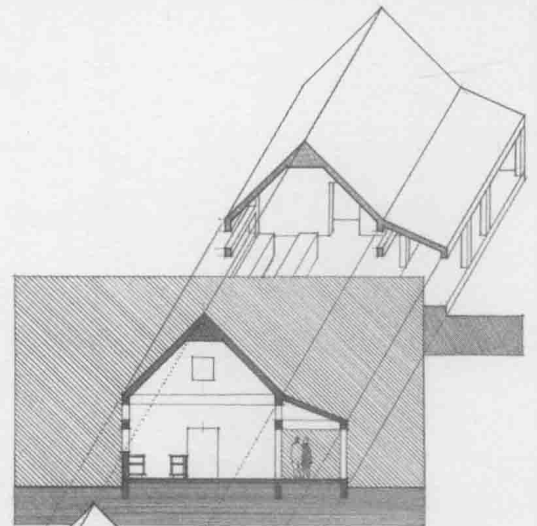
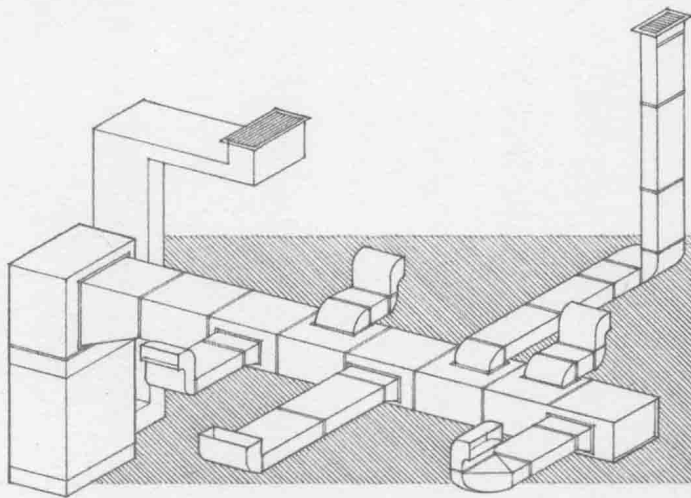
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Lesson to Architecture



Capital Complex of Bangladesh

Dacca, 1962, Louis Kahn



# Preface

Architecture is a multifaceted subject. It was born from the necessity for shelter, forged by the science of materials and energy, and made into an art form by our creative instincts and search for meaning. It reflects culture and society as it responds to real and imagined human needs.

Architecture is an integral part of our lives. Good design, often unnoticed, quietly facilitates the activities of everyday life. It is the architect's challenge to create spaces that are perfectly attuned to the activities that take place within them. This text seeks to illuminate some of the tools and techniques at the architect's disposal in facing this challenge. Perhaps, after studying the pages of this book, some of the qualities of buildings that were previously unnoticed will become apparent.

To compile an introductory text that covers the many facets of architecture in a concise and coherent manner, we have compiled material from the following publications, all from Wiley. Additionally, all-new information has been generated for this text that addresses the relationship between architecture and its urban context.

- ***A Global History of Architecture*** by Francis D. K. Ching, Mark Jarzombek, and Vikramaditya Prakash.  
This text illustrates the evolution of architecture in the context of world events that motivated it to change. Brief segments of this text are included to introduce the reader to a small part of architecture's rich past, diversity, and cultural significance.
- ***Architecture: Form, Space and Order*** by Francis D. K. Ching.  
This text presents characteristics fundamental to all architecture. Content from this text is included for the reader to be made aware of some of the design principles and strategies employed by architects.
- ***Building Codes Illustrated*** by Francis D. K. Ching and Steven R. Winkel.  
Building codes are important legal constraints for architectural design. This text details the legal requirements of architecture. This content is included to provide the reader with a better understanding of some of architecture's legal and social responsibilities.
- ***Building Construction Illustrated*** by Francis D. K. Ching.  
This text details the many materials and methods of construction commonly used in buildings today. This content is included for the reader to understand the impact of construction methods on design decisions made by architects.
- ***Design Drawing*** by Francis D. K. Ching and Steven P. Juroszek.  
This text illustrates various drawing techniques used by architects to represent and communicate their ideas. This content is intended to present the architect's required range of skill as well as provide the reader with an understanding of the complexity of the design process from idea through final construction.

- ***Interior Design Illustrated*** by Francis D. K. Ching and Corky Binggeli.  
This text explains the discipline and profession of Interior Design. Content from this text is included to provide the reader with an understanding of the professional, disciplinary, and philosophical relationships between architecture and interior design.
- ***A Visual Dictionary of Architecture*** by Francis D. K. Ching.  
This text assembles a comprehensive list of architectural components, elements, and systems. It provides detailed definitions of their use or importance as well as graphic illustrations. This content is included to provide the reader with a better understanding of the components that make up a building and to expand his or her architectural vocabulary.
- ***Language of Space and Form: Generative Terms for Architecture*** by James Eckler.  
This text assembles a comprehensive list of architectural design principles and concepts. It outlines ways in which these principles can be used to generate ideas in the early stages of the design process. This content is used to introduce and link the diverse topics presented in *Introduction to Architecture*.

We hope that this compilation will both inspire and instruct as it introduces students to the art and discipline of architecture. If at any time more information about a certain topic is needed, we recommend that the reader consult any of the above publications.

### **Metric Equivalents**

The International System of Units is an internationally accepted system of coherent physical units, using the meter, kilogram, second, ampere, kelvin, and candela as the base units of length, mass, time, electric current, temperature, and luminous intensity. To acquaint the reader with the International System of Units, metric equivalents are provided throughout this book according to the following conventions:

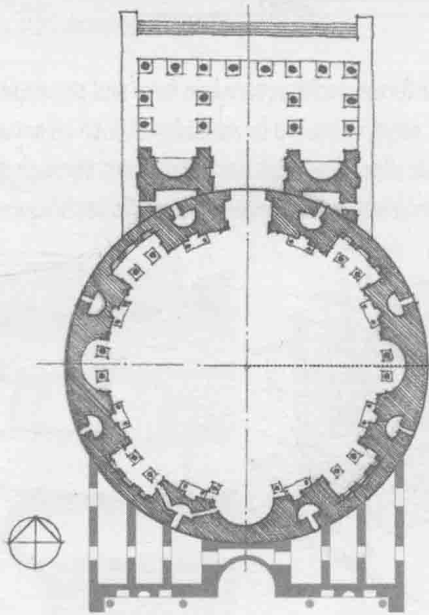
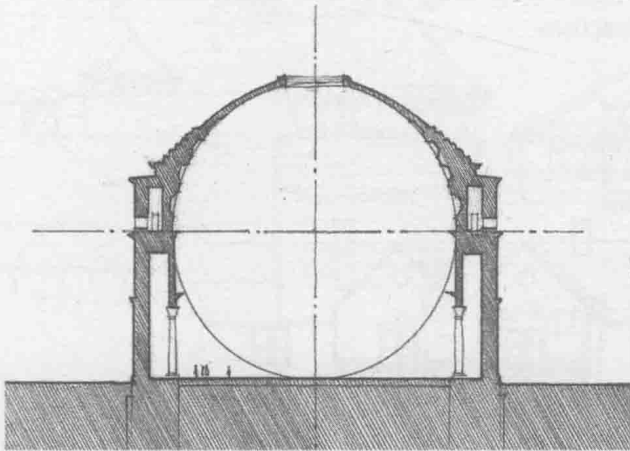
- All whole numbers in parentheses indicate millimeters unless otherwise noted.
- Dimensions 3 inches and greater are rounded to the nearest multiple of 5 millimeters.
- Nominal dimensions are directly converted; for example, a nominal 2 x 4 is converted to 51 x 100 even though its actual 1 1/2" x 3 1/2" dimensions would be converted to 38 x 90.
- Note that 3487 mm = 3.847 m.
- In all other cases, the metric unit of measurement is specified.

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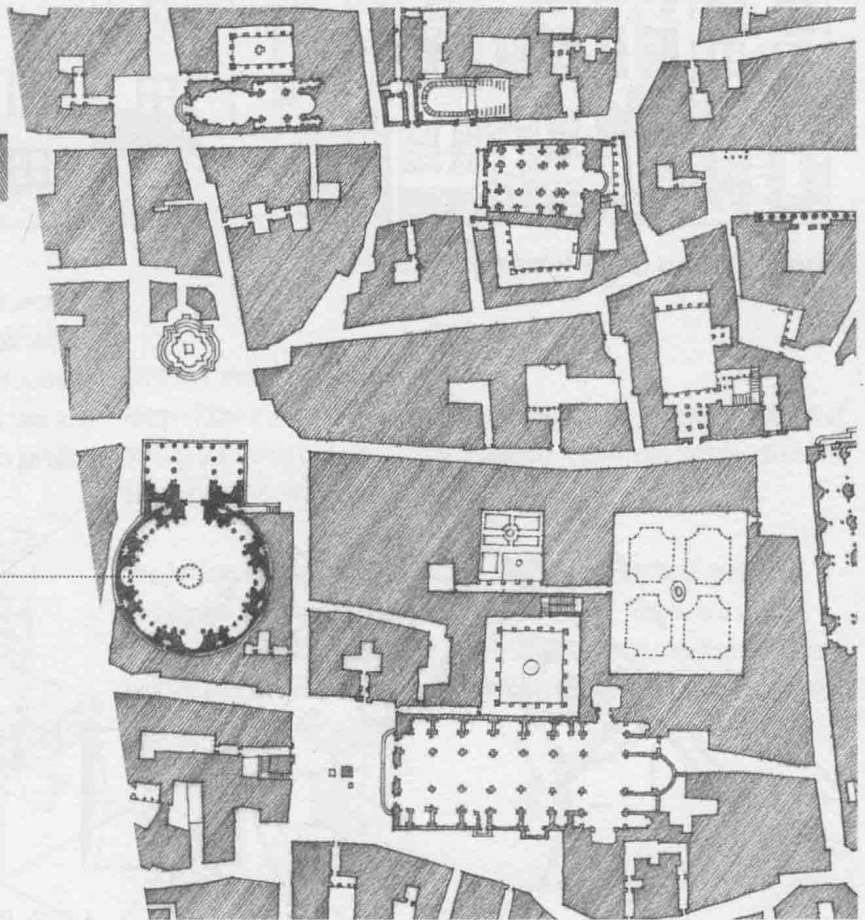
# 1 Introduction:

## Object, Space, Building, City



Pantheon, Rome, 126 CE

Portion of Giambattista Nolli's map of Rome, 1736–1748



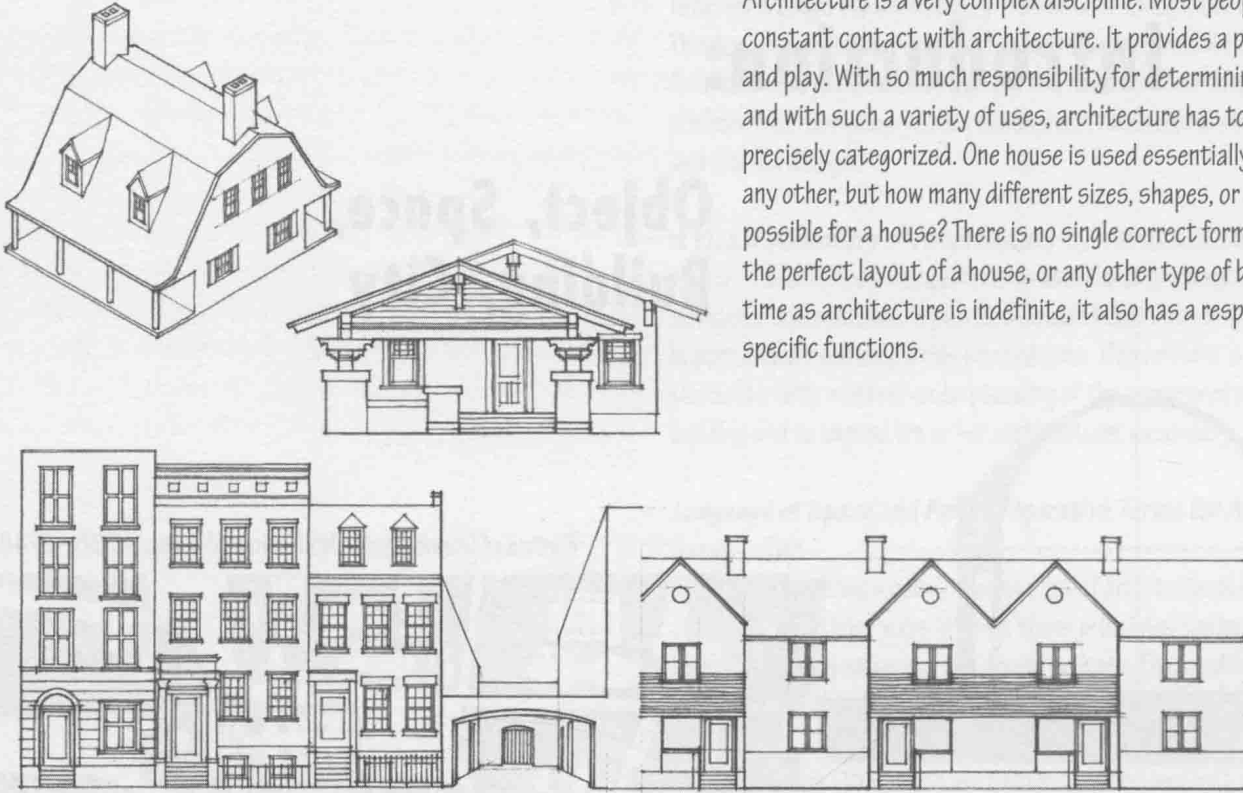
*The mother art is architecture.*

*Without an architecture of our own we have no soul of our own civilization.*

— Frank Lloyd Wright

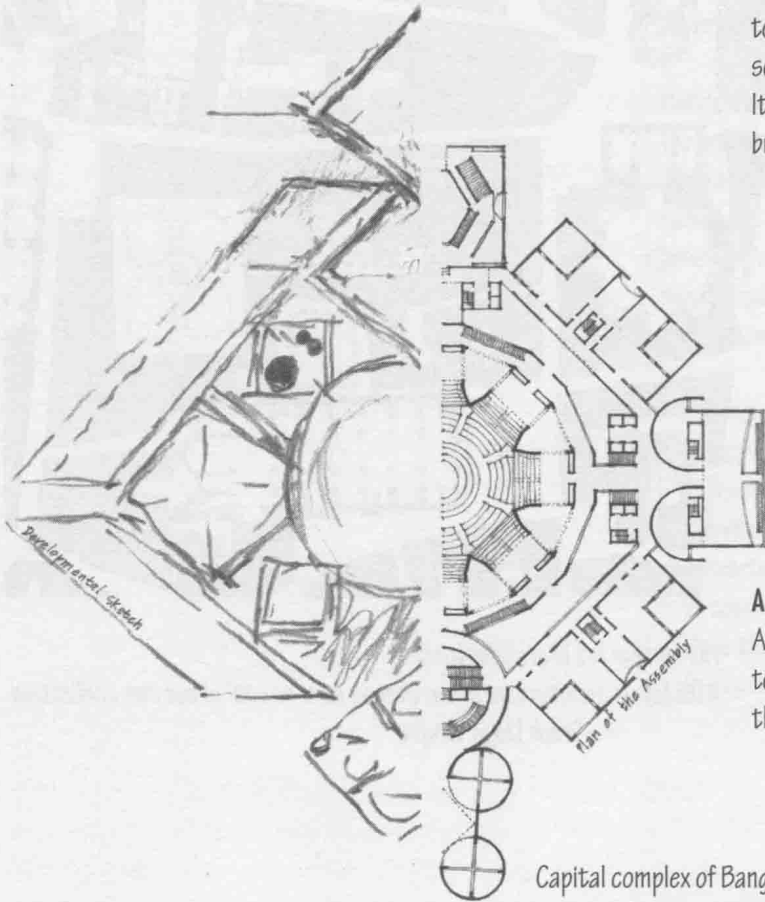
## What Is Architecture?

Architecture is a very complex discipline. Most people live their lives in constant contact with architecture. It provides a place to dwell, work, and play. With so much responsibility for determining our experiences, and with such a variety of uses, architecture has too many forms to be precisely categorized. One house is used essentially the same way as any other, but how many different sizes, shapes, or configurations are possible for a house? There is no single correct formula for determining the perfect layout of a house, or any other type of building. At the same time as architecture is indefinite, it also has a responsibility to facilitate specific functions.



Houses may come in various forms and densities

Because of the diverse forms architecture can take and the need for it to function in specific ways, it should be considered both an art and a science. It is an artistic discipline that seeks to invent through design. It is also a technical profession that relies on specific techniques of building construction.



### Artistic Discipline and Technical Profession

Architects can use almost any techniques for drawing or making models to develop their ideas. However, they must document and communicate those ideas using a universally understood graphic language.

Capital complex of Bangladesh, Dacca, 1962, Louis Kahn

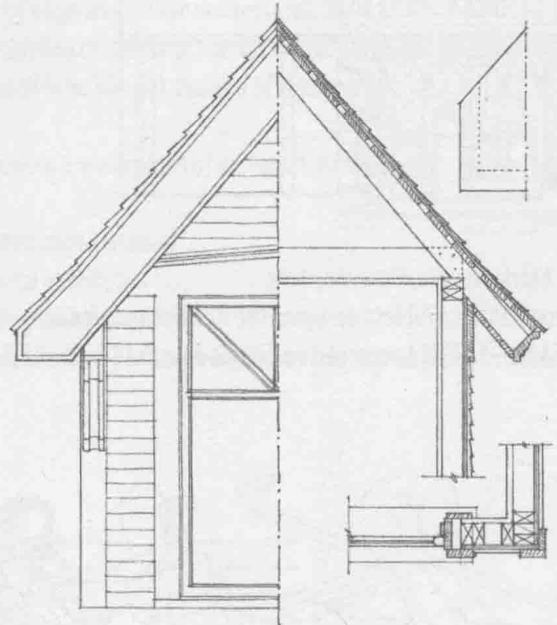


## Creative Process and Construction Method

Architects go through many versions of an idea to perfect it. They experiment with different materials and modes of representing their ideas in order to develop them. However, all of the ideas that are layered into the design of a building must be realized using conventional methods of building construction. As the idea develops, it must remain something that is possible to build.



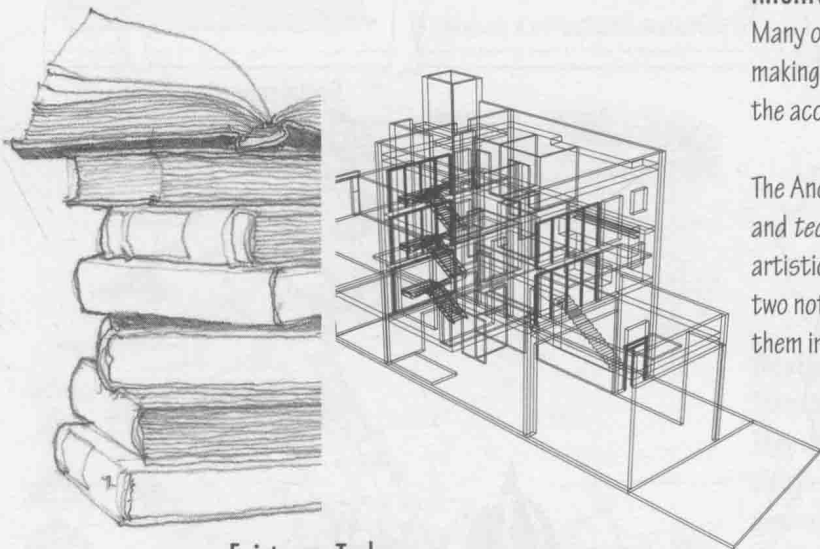
The development of an idea through a series of sketches leading to a construction drawing of the finished idea



## Intuitive and Academic

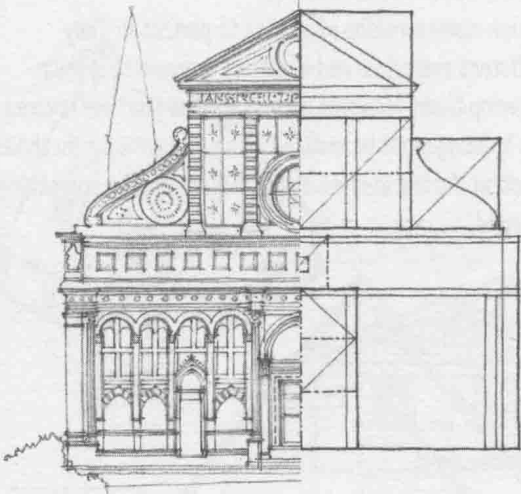
Many of the architect's ideas occur spontaneously, or through the act of making a drawing or model. Many also come from study and research and the accumulation of knowledge over time.

The Ancient Greeks called these two sides of architecture *episteme* and *techne*. *Episteme* is the pursuit of knowledge. *Techne* is a craft or artistic pursuit. To understand architecture one must realize that these two notions are intertwined and are often overlapped in ways that make them interchangeable.



Episteme Techne

The two parts of architecture are realized through what architects refer to as "the design process." The design process is the series of steps that are taken to develop a building from initial idea through the final proposal. While designing, architects must continually move back and forth between the creative act of architecture and the technical understanding of how a building is built.



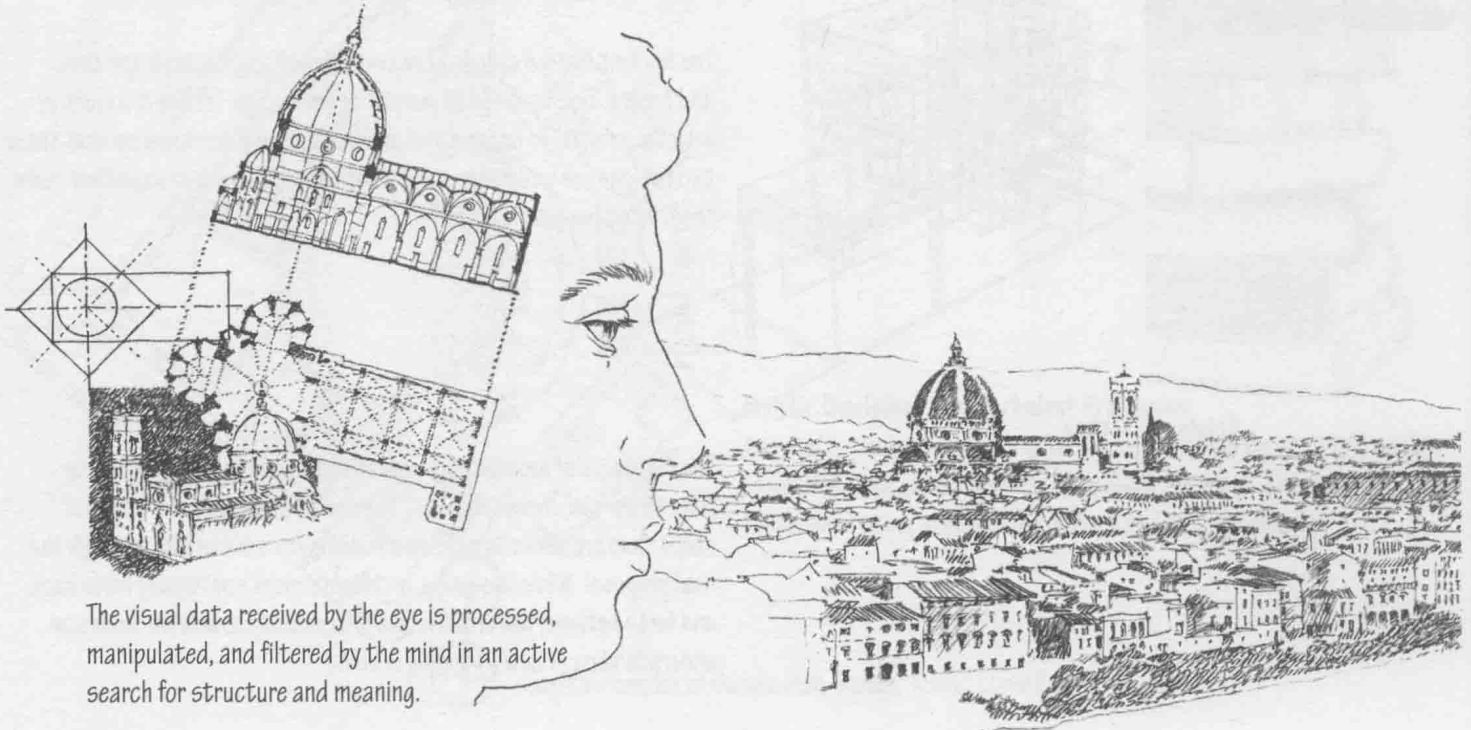
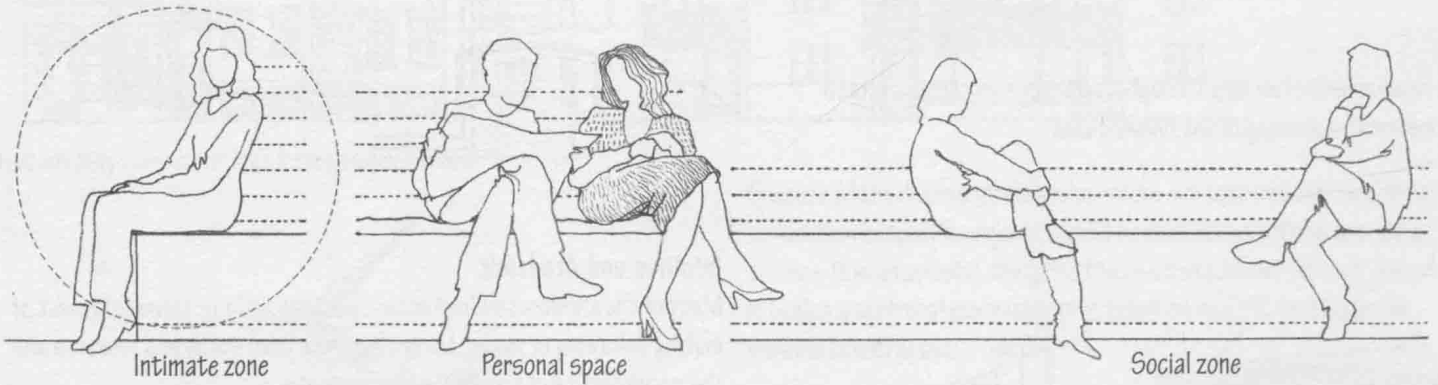
S. Maria Novella, Florence, Italy  
 Leon Battista Alberti designed the Renaissance facade  
 (1456–1470) to complete a Gothic church (1278–1350).

## Episteme

Architectural episteme lies in the inquiry that is intrinsic to the design process. In the design process many questions are asked. Those questions define the problem that a design is meant to solve. To answer these questions, the architect must rely on a body of knowledge to inform design decisions. In designing a building, the architect tries many different versions of an idea in order to test and refine it. Through this process, new ideas can be generated as discoveries are made—many of which are unexpected but can still be traced to a fundamental knowledge of architecture and its contributing disciplines.

The following are aspects of architecture that refer to a pursuit of knowledge.

- History
- Theory
- Human behavior
- Human perception



The visual data received by the eye is processed, manipulated, and filtered by the mind in an active search for structure and meaning.

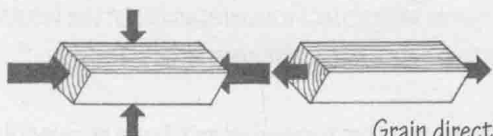
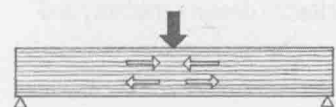
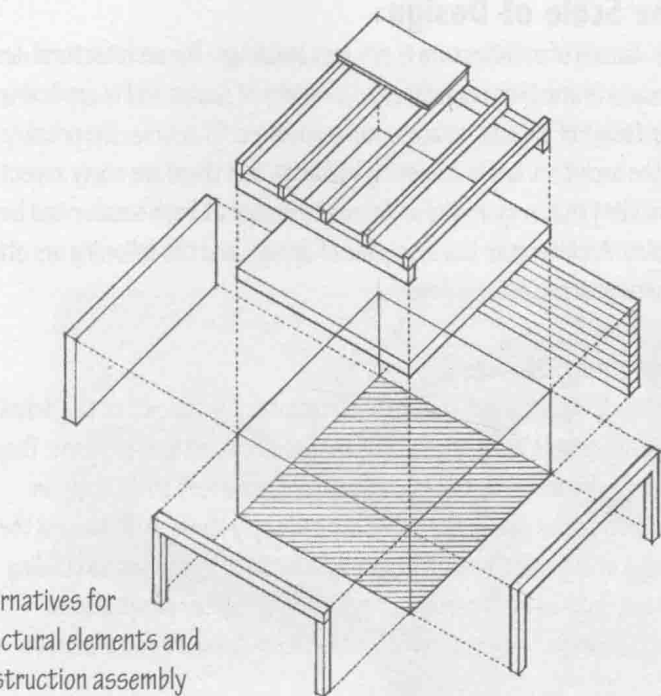
## Techné

Architectural techné lies in the craft of building and the application of technique in design. It is the art and craft of building. In the design process, discoveries are made through the act of making. The architect must know how to draw and represent an idea before he or she can see if it adequately solves the design problem. Different techniques for representing an idea can allow the architect to investigate it in a variety of ways and better understand how it works. Additionally, an understanding of construction techniques and technologies can yield a more feasible building at the end of this process.

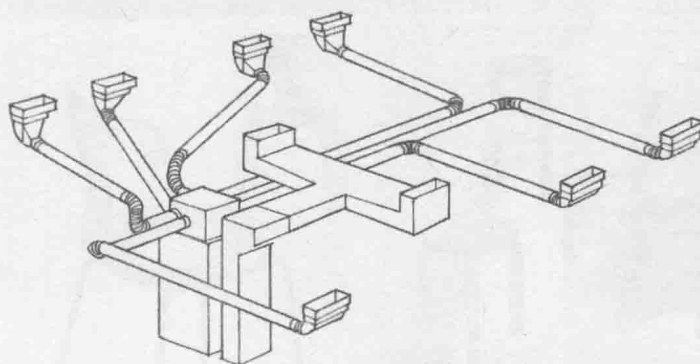
The following are elements of architecture that refer craft or technique:

- Construction methods
- Material attributes
- Building technology
- Representation and communication (through drawing or model)

Alternatives for structural elements and construction assembly



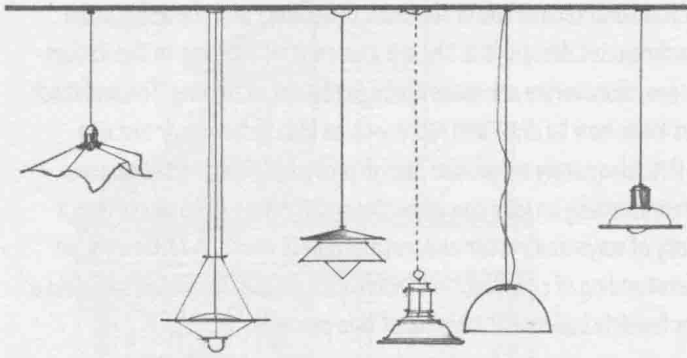
Grain direction is the major determining factor in the way it is used as a structural material.



Mechanical and electrical systems maintain necessary conditions of comfort, health, and safety for the occupants of a building.

## Design Thinking

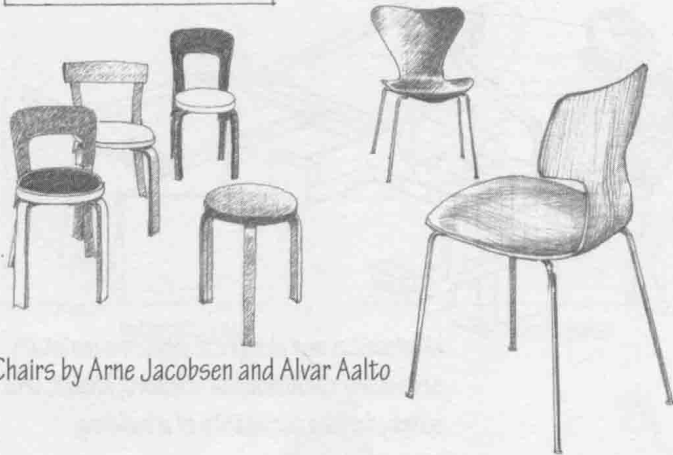
Taken together, these qualities of architecture inform design thinking. They define the way an architect generates ideas for a building. They also provide the architect with the tools necessary for design in a more general sense of the word. The priority of architecture is habitation—a design of the way people will occupy and use an environment. This has a broad range of applications that demand that the architect design at a variety of scales—from the size of a doorknob to that of a city block.



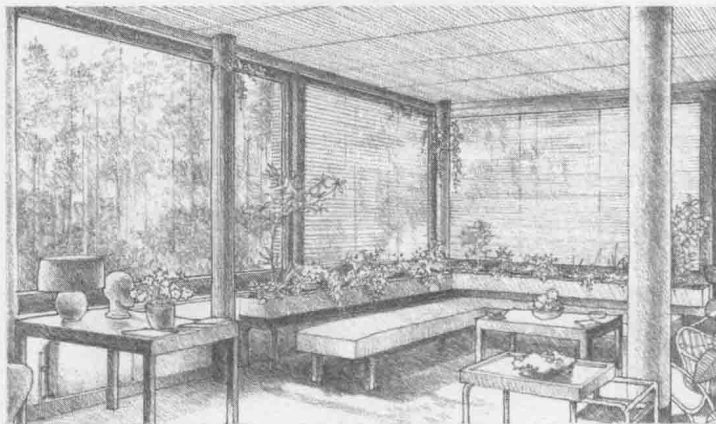
Examples of suspended light fixtures



Print by Joan Miró



Chairs by Arne Jacobsen and Alvar Aalto



Living room, Villa Mairea, Noormarkku, Finland, 1938–1939, Alvar Aalto

## The Scale of Design

The domain of architecture is not just buildings. The architectural design process is one that translates to a variety of scales and is applicable to the design of objects, spaces, and even cities. Of course, the primary role of the architect lies in designing buildings, but there are many aspects of a building that require the architect to design at both smaller and larger scales. Architecture is a discipline of design, and the following are other facets of architectural design.

### Designing Objects

Building design ranges from considerations of site down to the detail. Building details are designed toward specific functions of space. They also require the skills necessary to design as a very small scale. In addition to the detail, the architect can apply these skills toward the design of objects. Those objects might be directly related to building design, such as an ornament or a door handle. They might also be isolated projects that tap the skill sets possessed by an architect.

- Furniture design requires the architect's design sensibility and knowledge of ergonomics.
- Lighting design requires an architect's understanding of the behavior of light and desire to create a particular experience with light.
- Sculpture and painting are often pursued by architects because of the similarity of compositional principles and crafting technique.

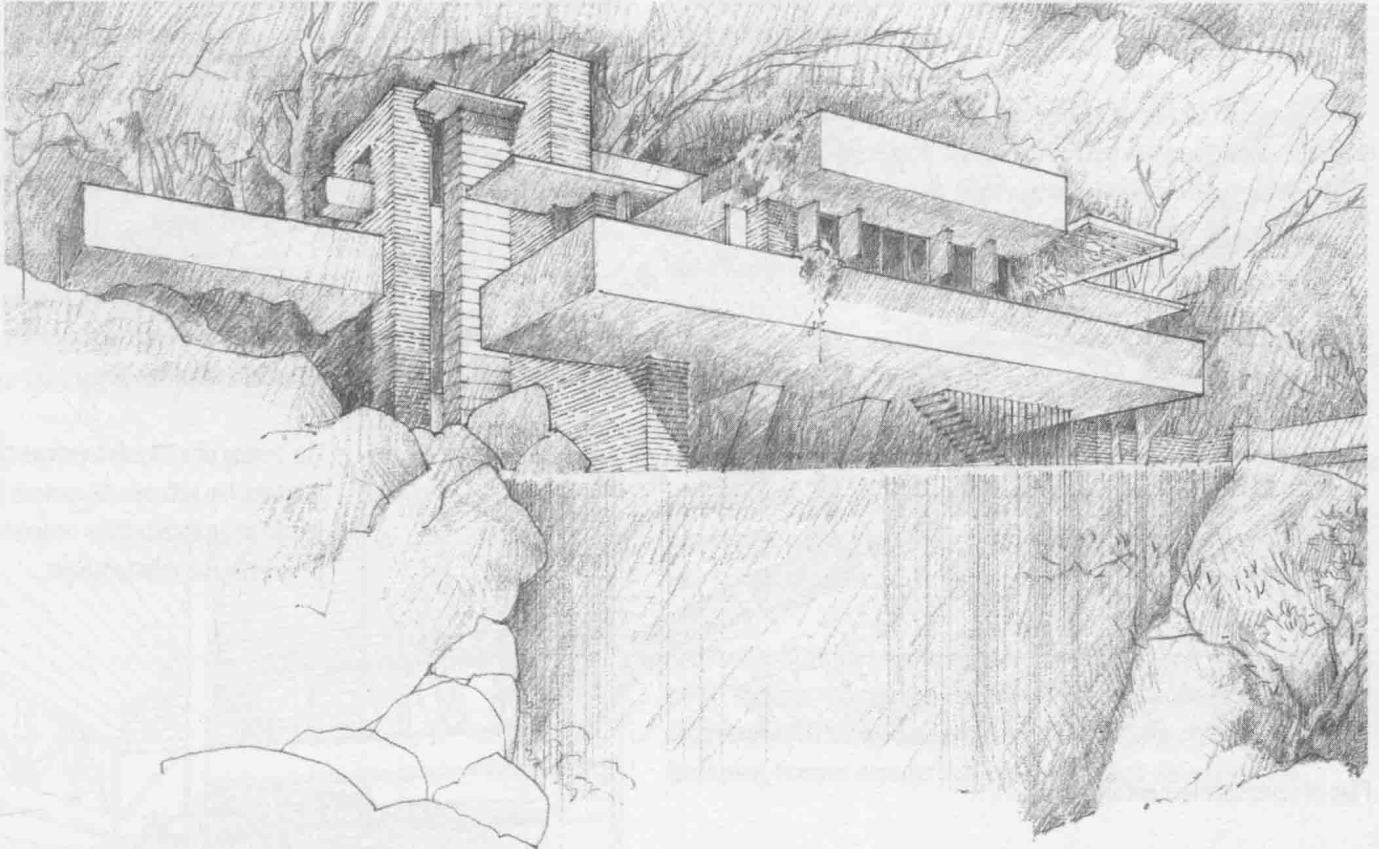
### Designing Spaces

One of the fundamental qualities of architecture is space. The architect is not just required to design a building but to configure the spaces within that building so that they can be used for a specific function. Designing spaces requires the architect's understanding of proportion, organization, light, and material.

- A room requires an architect's understanding of design to be configured for a specific function.
- An outdoor space requires an architect's understanding of composition to define its edges without fully enclosing it.
- Buildings are experiential constructs. Experience is dependent on the configuration of spaces to inform the way it is perceived. This requires the architect's understanding of material, proportion, color, texture, and the way environments are sensed.

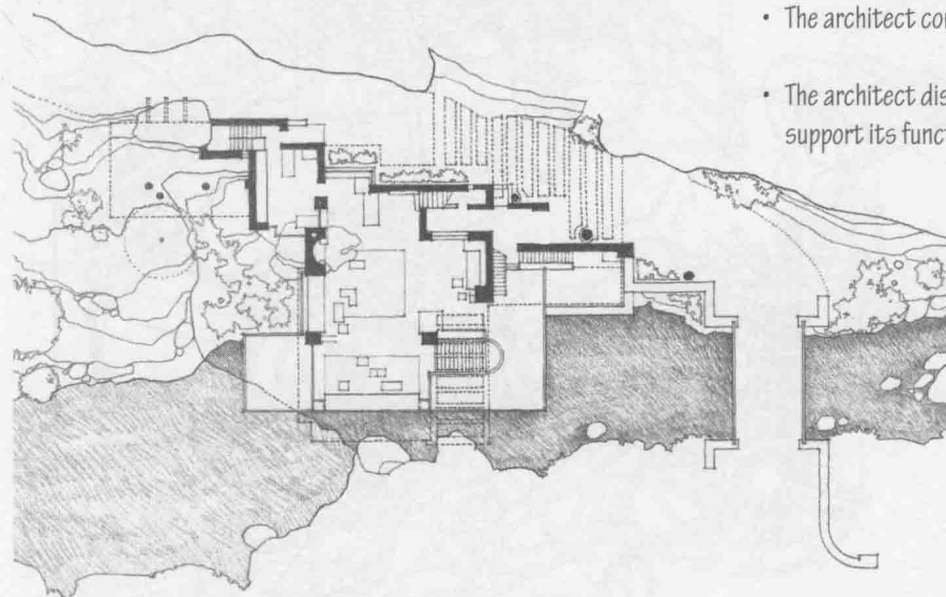
## Designing Buildings

The first understanding of the role of the architect is at the scale of building. Buildings have specific purposes and must be organized to fulfill those purposes. The architect also has the obligation to configure spaces within the building and to position the building within its surroundings. Both of these influence the success of the building in fulfilling its designed purpose.



Fallingwater (Kaufmann House), Bear Run, Pennsylvania, 1936–1937, Frank Lloyd Wright

- The architect positions a building on its site to define relationships with the buildings around it.
- The architect configures a building for a specific function.
- The architect distributes spaces within the building to adequately support its function.



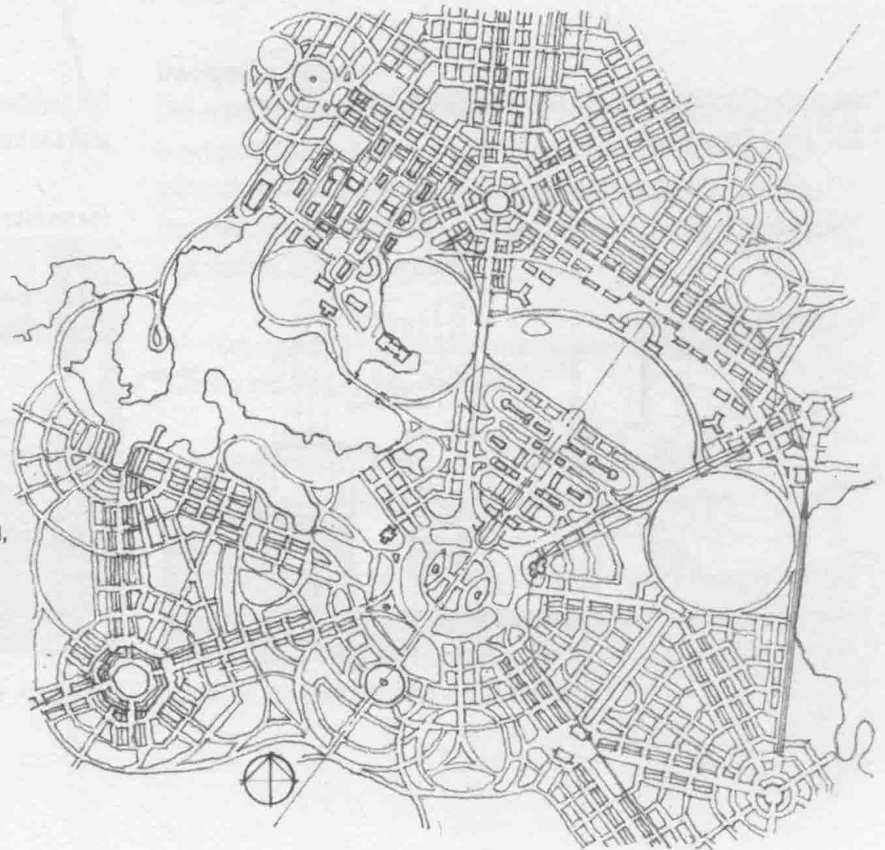
## Designing Cities

Cities share many of a building's characteristics. They are spatial constructs, experiential environments, and designed with specific functions in mind. These similarities place the architect in an ideal position to influence the design, growth, and development of urban environments. Architects are also responsible for the buildings that compose a city, and through their design they can affect the urban environment directly.

- The design of space is the specialty of architects and is applied at the scale of cities for the development of public space and streetscapes.
- Buildings compose a city, placing architects in a position to define the development of the city.
- The zoning of a city determines the relationship between its various functions, requiring an architect to understand programmatic relationships.



Plan of seventeenth-century Paris



Walter Burley Griffin's plan for Canberra, Australia, 1912



## Allied Disciplines

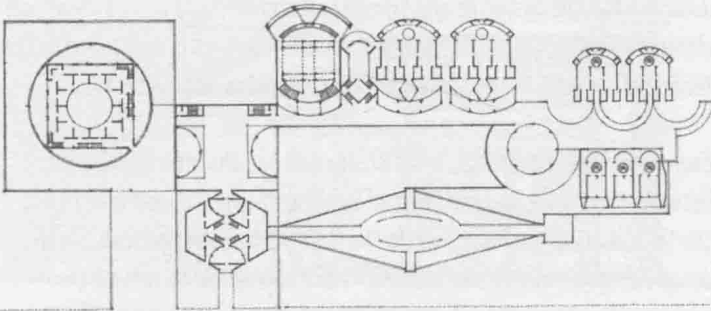
Architecture is a very old and multifaceted discipline. It touches on many subjects that influence the way we live.

Architecture is a fine art. It shares many of the same compositional principles that are applied to painting, sculpture, music, and literature. Through those principles of design and composition, it is allied with the other artistic disciplines.

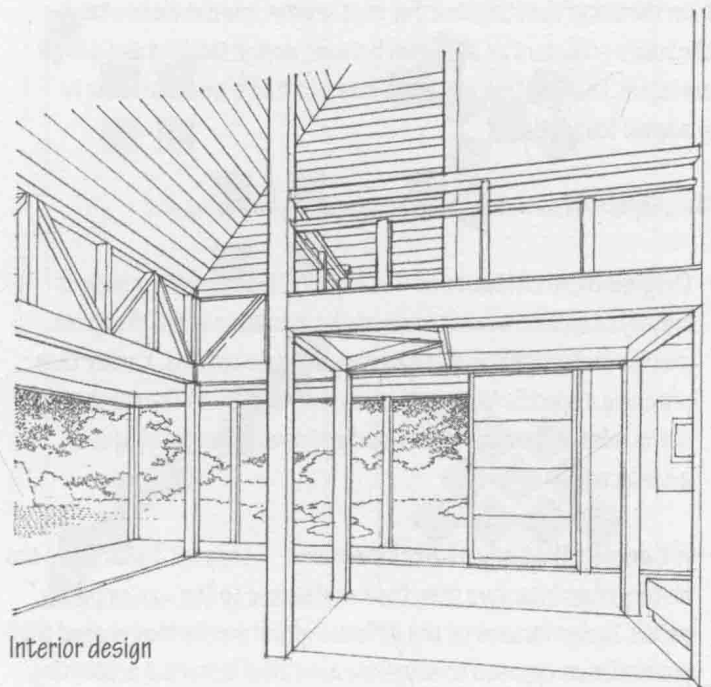
It is also responsible for creating products that work to facilitate the way we live. This aligns architecture with other design disciplines such as interior design, urban design, and industrial design. With their emphasis on inhabitable environments, interior design and urban design are historically rooted in architecture.

Architecture is also a construction-based science that employs a knowledge of form and material to realize buildings and predict how they will act under stress. This allies architecture with the various construction industries and physical sciences. It also employs knowledge of human behavior, perception, and culture to create spaces that support the way of life of those who inhabit it. This allies architecture with the social sciences.

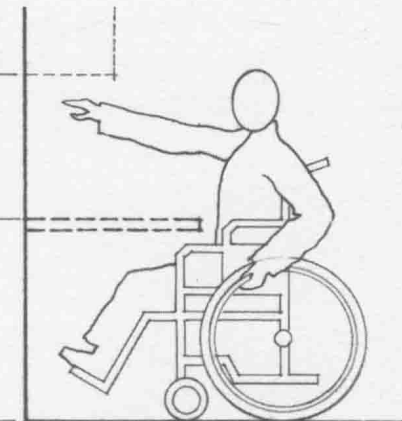
Architects must have a general understanding of these allied disciplines even if they are not experts. This knowledge plays a crucial role in determining the success of a building. It enables the architect to make functional, humane designs that positively affect our ways of life.



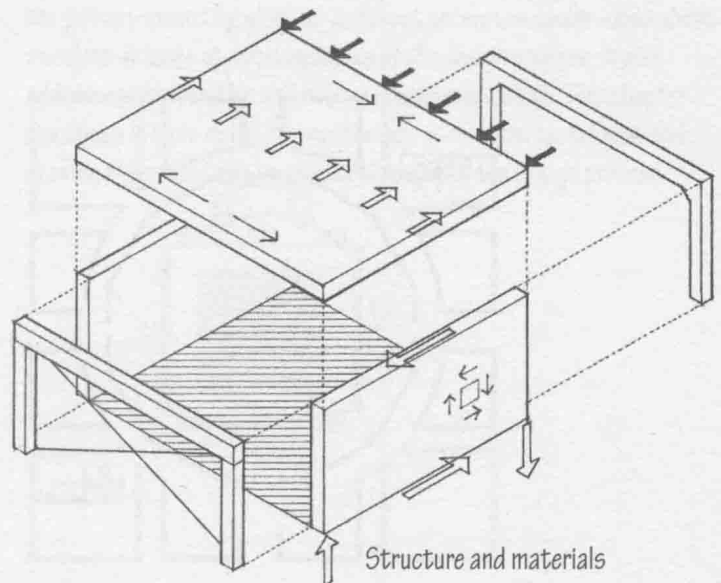
Project for the capital complex of Islamabad, Pakistan, 1965, Louis Kahn



Interior design



Human factors



Structure and materials

## The Anatomy of This Text

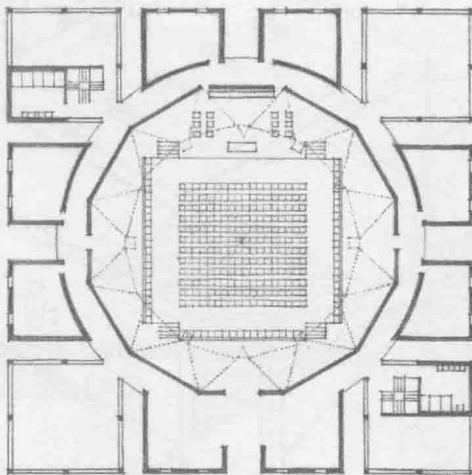
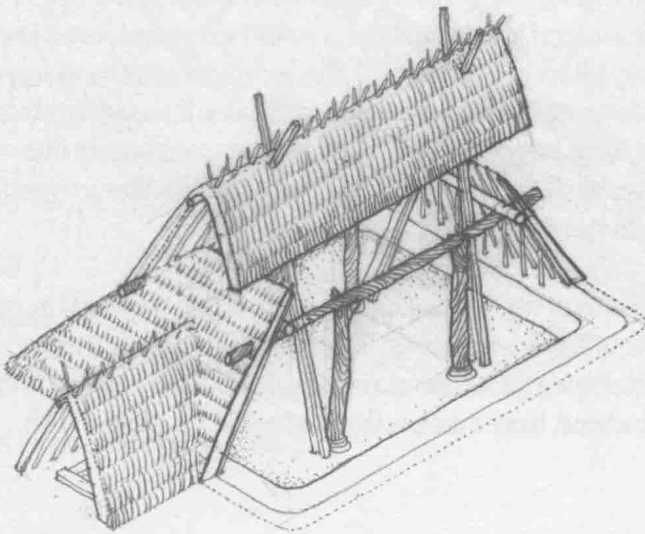
This text is intended to provide a brief overview of the issues and practices of architecture. It is a very old, complex, and diverse discipline, and the subject matter of this book presents only its most basic aspects.

The format of this book follows the distinction between *episteme* and *techne* as described previously. The first chapters of the book are dedicated to the histories and theories of architecture as well as design elements and process. The second portion of the text is dedicated to the technical aspects of the contemporary profession of architecture.

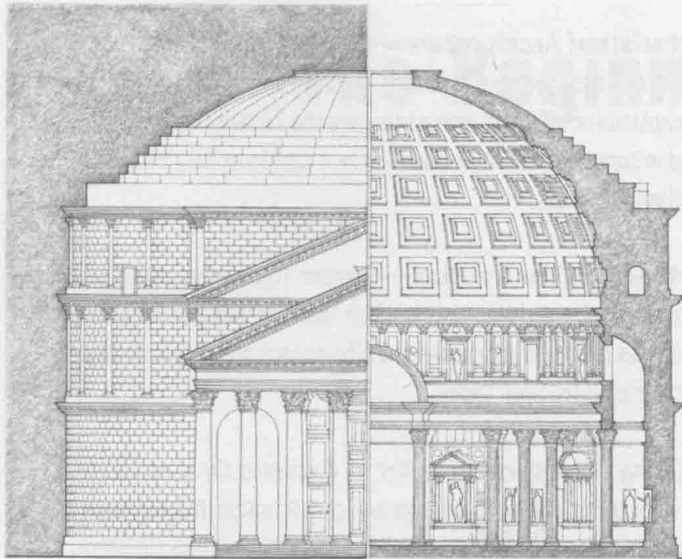
Even within these subsets, however, one can see the interrelationship between the knowledge and craft of building. It is not possible to divide the two facets of architecture. In the first portions of the text, which detail design concepts and process, it is not possible to remove the aspects of craft and knowledge upon which those concepts are built. Similarly, in the later chapters, which detail technical aspects of the profession, it is not possible to completely remove the artistic desire from the act of construction. For that reason, one can understand the book's structure as a division between design thinking and design execution, knowing that neither is ever isolated from its artistic or academic foundations.

The chapters that detail architectural design thinking are:

- **Origins of Architecture**—Chapter 2 addresses the ancient history of architecture. It looks at the formation of the discipline and the factors that motivated its early development. Rather than providing a specific history, this chapter focuses on the events that surrounded and motivated the earliest developmental stages of architecture.
- **A Concise History of Architecture**—Chapter 3 addresses the history of architecture from the Renaissance to the contemporary period. It also focuses on the different global events that shaped the profession as opposed to supplying a detailed historical accounting.







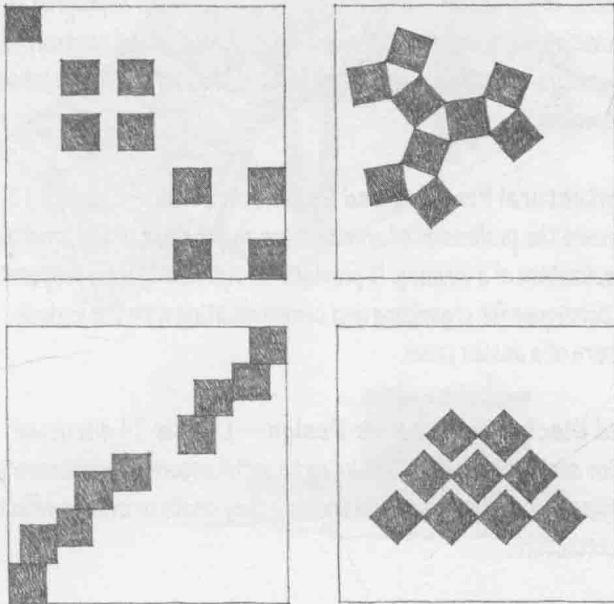
- **Fundamentals of Architecture: Form**—Chapter 4 discusses form as one of the fundamental design considerations of architecture. It is the physical nature of architecture. This chapter details the ways in which it is understood and used in the design process. It also looks forward to the way formal thinking prefigures an understanding of material, construction, and other acts of making.

- **Fundamentals of Architecture: Space**—Chapter 5 discusses space as one of the fundamental design considerations of architecture. It is the experiential and habitable nature of architecture. This chapter details the ways in which space can be understood and used in the design process. It also looks forward to the way spatial composition prefigures issues of programming and experience.

- **Fundamentals of Architecture: Order**—Chapter 6 discusses order as one of the fundamental design considerations of architecture. It is the organizational nature of architecture. This chapter details ways in which organization and ordering can be used in the design process. It also looks forward to the way arrangement and composition of architectural elements prefigures programmatic relationships and spatial sequencing.

- **Elements of Architecture**—Chapter 7 discusses the elements that comprise architecture. It looks at the anatomy of a building and different ways in which different elements can be combined to spur innovation as a part of the design process.

- **The Design Process**—Chapter 8 discusses the design process as the primary means by which an architect generates design ideas about a project. It looks at considerations of the design process; it also addresses the iterative and heuristic nature of design. This chapter discusses in more detail the various representation techniques and drawing types that can be applied throughout the design process.



The chapter will discuss the various ways in which the design process can be used to generate ideas about a project. It will also discuss the various representation techniques and drawing types that can be applied throughout the design process.