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Atrium

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atrium

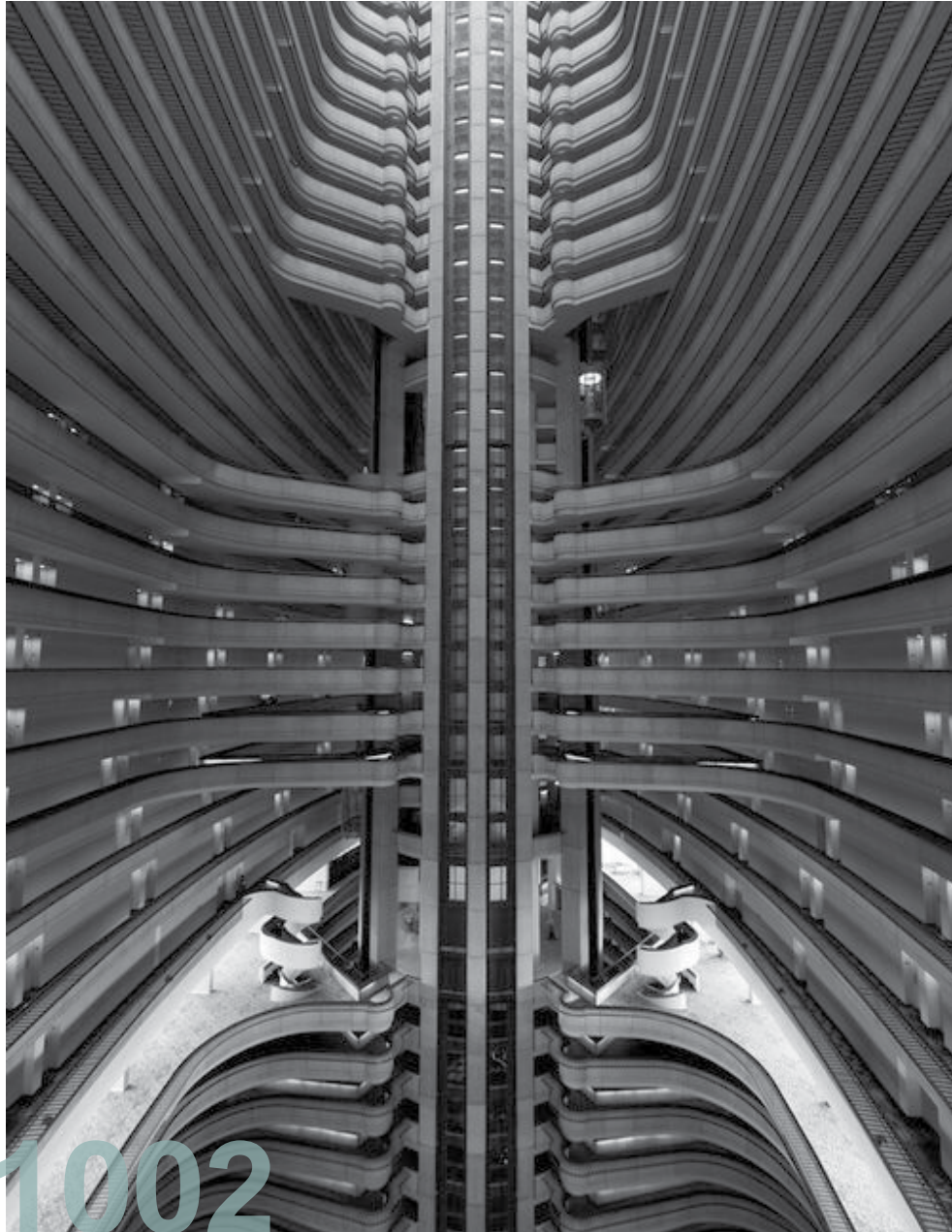
**rem koolhaas
amo**

irma boom

originally a series of 15
books accompanying the
exhibition elements of
architecture at the 2014
venice architecture biennale,
the 2nd edition includes two
new elements

floor
wall
ceiling
roof
door
window
façade
balcony
corridor
atrium
fireplace
toilet
luminaire
stair
escalator
elevator
ramp

atrium



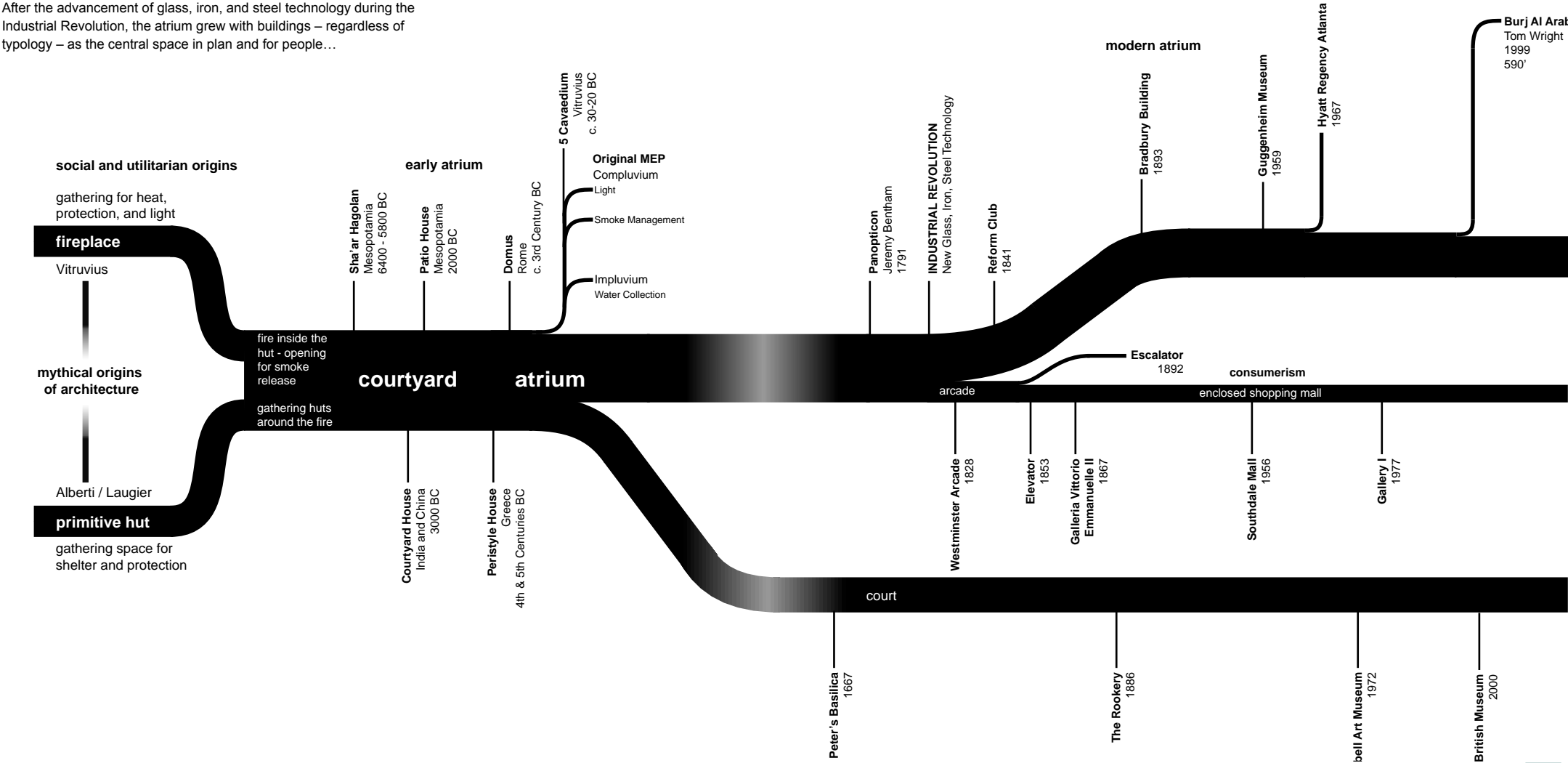
1002

Architectural history has overlooked the significance of one of its oldest and most fundamental elements. Present at the origins of architecture and characteristically essential to almost any contemporary design (over two floors), the atrium consistently finds itself in the lapse of history's judgment - perhaps due to its consistent presence. The atrium has ranged from the hole in primitive shelters for smoke management, to its introduction as a proper space in the Roman domus and finally manifesting itself at its most extravagant in Portman's hotel designs. However, as the atrium acts as the auspice for all vertical openings in a building, it is at once the space - in the form of the courtyard - that protects primitive tribes from surrounding threats - and elsewhere, the mezzanine, allowing the viewer to see the stage in the theatre for the upper class. But it is this same variability that makes the atrium everywhere and nowhere, causing its most important contribution to architecture and society to go unnoticed. As the central space in the building in which people gather, the atrium is an element of collectivity that has played a core historical role, as a catalyst or antagonist, in the urban development of mankind through social interaction.

1003

THE EVOLUTION OF THE COLLECTIVE

From the campfire (or primitive hut) to a seemingly infinite space in the Burj Al Arab, the evolution of the atrium has proved it to be the space for the collective in architecture. Whichever side one chooses between the origins of architecture debate, atria phenomena is imbedded into each argument as the social gathering space with environmental qualities. After the advancement of glass, iron, and steel technology during the Industrial Revolution, the atrium grew with buildings – regardless of typology – as the central space in plan and for people...



ATRIUM
[ey-tree-uh m]
/ ɛˈtrɪəm; ˈɑː-/
(ă-trē-əm)

a skylit central court in a contemporary building or house.

The main or central room of an ancient Roman house, open to the sky at the center and usually having a pool for the collection of rain water.

The evolution of the atrium has proved it to be a principal characteristic throughout the history of architecture, but for an element that dates back to pre-historic Mesopotamia, it has somehow managed to evade a clear definition. Deriving from the Greek courtyard, the atrium proper shares similar characteristics with its early predecessor, while – at times – the terms have been used interchangeably to define each other. Vitruvius, who along with Marcus Terentius Varro claim that the Romans borrowed the term “atrium” from the Greeks, defined five different types of atria - cavaedium (closed courts with an opening in the roof) in his seminal treatise De Architectura. Further early confusion of the term is found in early Byzantine Basilicas where open courts were defined as the atrium despite the distinction between open atria and closed courts at the time. Finally entering the building code in 1981 (only as a response to tragic fires) the atrium was simply defined as an “open well” or “vertical opening.” Although the 2015 International Building Code makes a clear distinction between atrium, court and yard, Section 404 (Atriums) leads to many different sections in attempt to detail and define the atrium, resulting in varying interpretations of the term.

Dictionary.com. Dictionary.com, n.d. Web. <<http://dictionary.reference.com/browse/atrium>>.

“Online Etymology Dictionary.” Online Etymology Dictionary. N.p., n.d. Web. <<http://www.etymonline.com/index.php?term=atrium>>.

cohors
Latin
enclosed yard

cortem
Latin

root *dem- “house, household”

Proto-Indo-European
*dom-o- “house”

Greek - domos - “house”

Russian - dom - “house”

Sanskrit - damah - “house”

domus
“house,”
single-family dwelling divided into two main parts, atrium and peristyle.

1870
anatomical sense
“either of the upper cavities of the heart”

Etruscan
perhaps from PIE *ater- “fire,” on notion of “place where smoke from the hearth escapes” (through a hole in the roof).
Marcus Terentius Varro, *De Lingua Latina*

atrium
Latin, 1570
“central court or main room of an ancient Roman house, room which contains the hearth”

cavaedium
an inner courtyard in a roman house
Vitruvius, De Architecture Libri Decem

Vestibule
a passage, hall, or room between the outer door and the interior of a building

The vestibule led directly into the atrium causing confusion between both terms.

peristyle
a colonnade surrounding a building or a courtyard

arrium - court
Christian Basilicas defining the central court as an atrium

domesticus
Latin
“belonging to the household”

domestique
Middle French, 14c.

domestic
Middle English, 15c.

IBC Section 404
Sub-sections

Chapter 2
Definitions
202 Definitions

Chapter 7
Fire and Smoke Protection
707 Fire Barriers

Fire and Smoke Protection
711 Horizontal Assemblies

Fire and Smoke Protection
712 Vertical Openings

Fire and Smoke Protection
713 Shaft Enclosures

Chapter 9
Fire Protection Systems
903 Automatic Sprinkler Systems

Fire Protection Systems
904 Alternative Automatic Fire-extinguishing Systems

Fire Protection Systems
907 Fire Alarm and Detection Systems

Fire Protection Systems
909 Smoke Control Systems

Chapter 10
Means of Egress
1016 Exit Access Travel Distance

Chapter 21
Masonry Units
2110 Glass Unit Masonry

1967
meaning “skylit central court in a public building”

BOCA / NFPA
1981
Formally enters building code

IBC 2012
Section 404 (Atriums)
“An opening connecting two or more stories other than enclosed stairways, elevators, hoistways,escalators, plumbing, electrical, air-conditioning, or other equipment, which is closed at the top and not defined as a mall.”
(definition derived from IBC Section 202)

tuscanicum
insignificant and astylar with the roof carried on two beams with to short

corinthian
with more than four columns supporting the edge of the compluvium

displuvium
with the roof sloping away from the compluvium, the rain being carried away by means of gutters and pipes

testudinatum
with no compluvium, but crowned with an arched vault testudo

tetrastylum
with four columns, one at each corner supporting the compluvium

impluvium
in ancient Roman dwellings, a cistern set in the atrium or peristyle to receive water from the roof

compluvium
the aperture in the center of the roof of the atrium in a Roman house, sloping inward to discharge rainwater into a cistern or tank

galleria
a central court through several storeys of a shopping centre or department store onto which shops or departments open at each level

arcade
a glass covered passageway which connects two busy streets and lined on both sides with shops.

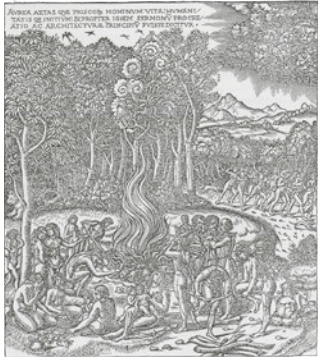
IBC 2012
Court
An open, uncovered space, unobstructed to the sky, bounded on three or more sides by exterior building walls or other enclosing

IBC 2012
Yard
An open space, other than a court, unobstructed from the ground to the sky, except where specifically provided by this code, on the lot on which a building is situated.

ON THE ORIGINS OF ARCHITECTURE

ATRIA PHENOMENA PRESENT THROUGHOUT THE MYTHICAL DEBATE

The origins of architecture have been a greatly debated topic among early and later theorists of the discourse. While Vitruvius claims it was the moment when two rubbing branches combust and sparked a fire, Alberti and Laugier argue it was when man first inhabited primitive structures. Although the claims are simply narratives with no evidence, the atrium finds itself short-circuiting this debate. While both campfire and primitive hut are social and performative developments in the history of dwelling as a gathering space for heat or shelter, each represent atria phenomena as the element that serves as the collective social space with environmental characteristics inside the building...



1521 Cesarano's translation of Vitruvius. The discovery of fire as a social and utilitarian space in Cesarano's Vitruvius



1755 Laugier's Primitive Hut in his fictional depiction on the origins of architecture

"Mankind originally brought forth like the beasts of the field, in woods, dens and groves, passed their lives in a savage manner, eating the simple food which nature afforded. A tempest, on a certain occasion, having exceedingly agitated the trees in a particular spot, the friction between some of the branches caused them to take fire; this so alarmed those in the neighborhood of the accident, that they betook themselves to flight. Returning to the spot after the tempest had subsided, and finding the warmth which had thus been created extremely comfortable, they added fuel to the fire excited, in order to preserve the heat, and then went forth to invite others, by signs and gestures, to come and witness the discovery."

Vitruvius, De Architectura libri decem
Book 2 Chapter 1

1485 In the prologue to De Re Aedificatoria, Alberti indirectly references Vitruvius claiming that his account into the origin of architecture is incorrect and at the moment when man dwelled in a primitive shelter. "Some have said that it was fire and water which were initially responsible for bringing men together into communities, but we, considering how useful, even indispensable, a roof and walls are for men, are convinced that it was they that drew and kept men together." Alberti, De Re Aedificatoria Prologue

DOMESTICATING THE FIRE: THE GATHERING SPACE WHERE SMOKE EXITS THE ROOF

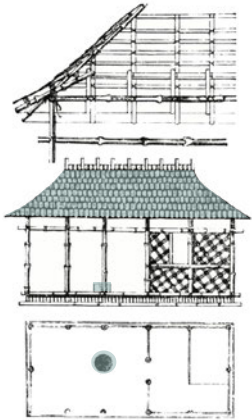
The fire, eventually placed under shelter, became the central domestic space for heating, cooking and socializing. At the intersection of occupancy (fire) and enclosure (shelter), the hut with an opening for smoke subverts the origin of architecture debate by forming a primitive atrium – a social and utilitarian element for the development of mankind...

Parable of the primitive tribe: A savage tribe... arrives at an evening camp-site and finds its well supplied with fallen timber. Two basic methods of exploiting the environmental potential of that timber exist: either it may be used to construct a wind-break or rain-shed – the structural solution – or it may be used to build a fire – the power-operated solution. An ideal tribe of noble rationalists would consider the amount of wood available, make an estimate of the probable weather for the night – wet, windy, or cold – and dispose of its timber resources accordingly. A real tribe, being the inheritors of ancestral cultural predispositions would do nothing of the sort, of course, and would either make fire or build a shelter according to prescribed custom – and that, as will emerge from this study, is what Western, civilized nations still do, in most cases.

(Banham, The Architecture of the Well-Tempered Environment, 1969)



1815-17 M. von Wied-Neuwied. Depiction of a fire under a primitive shelter in eastern Brazil



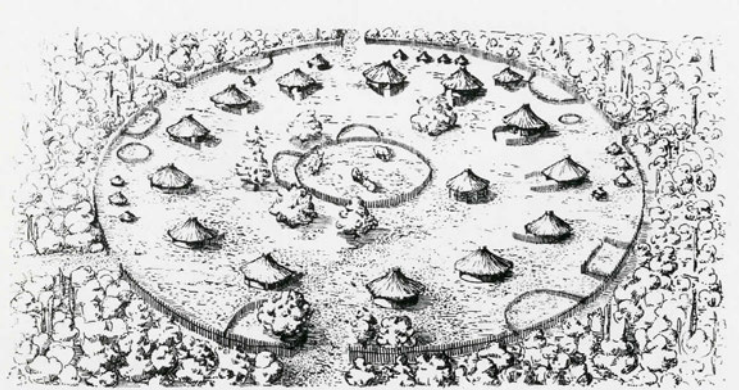
1851 In the Four Elements of Architecture, Gottfried Semper explained his variation of the primitive hut. As a combination of Vitruvius and Alberti, the hut was a shelter with a central hearth for fire.



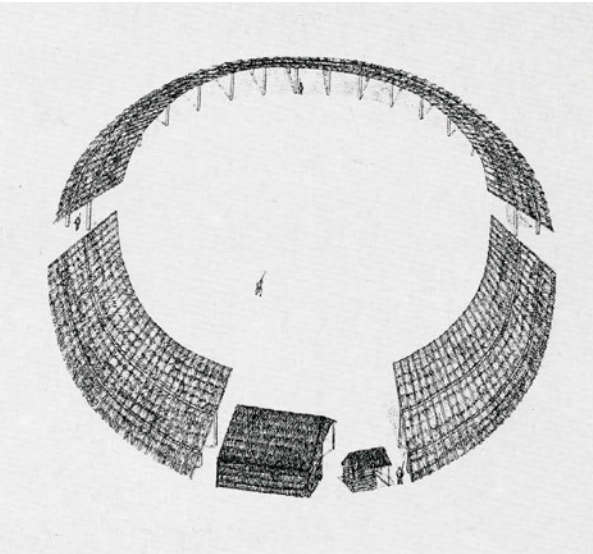
1861 The atrium, at the intersection of occupancy (fire) and enclosure (shelter), short-circuits the origins of architecture debate. (Gustave Clarence Rodolphe Boulanger, Rehearsal of The Flute Player and the Wife of Diomedes in the Atrium of

TO GATHER AND PROTECT

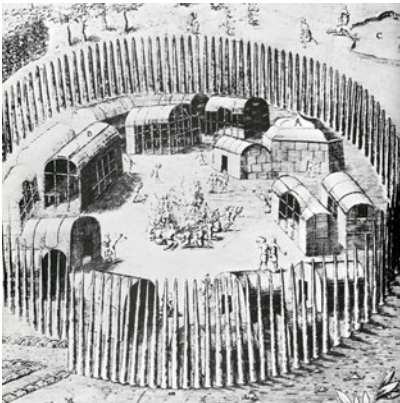
As a means of protection, primitive tribes constructed vertical structures resulting in a central gathering space for people and animals. The structures exhibit the inherent separation and seclusion associated with the courtyard and later atrium...



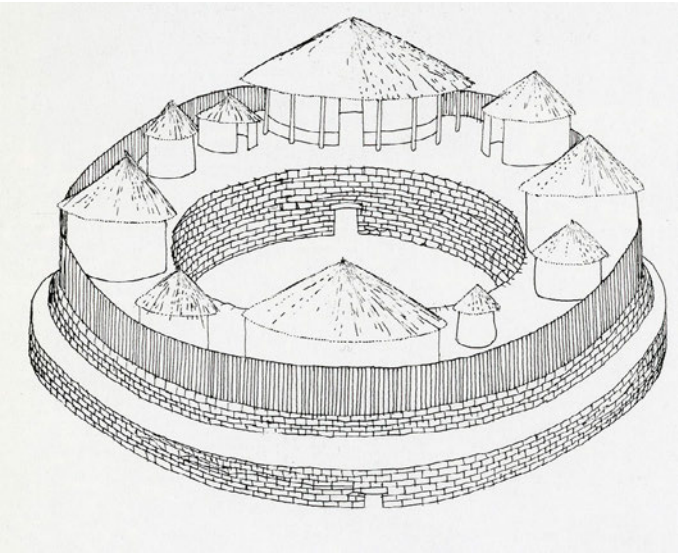
"Circular in form, it is large enough to house an entire extended family (whose oldest and most respected member is recognized as chief). The surrounding stockade has one main opening...and in the center is the circular enclosure for livestock...The dwellings of the individual families are disposed in rings around this enclosure...As is universally the case, the village considers itself the focal point of the link with the territory, which is represented by the sacred tree...as at an altar, sacrifices are offered...during the feast of the dead (chirilu)..."
(Primitive Architecture, Guidoni, 1987)



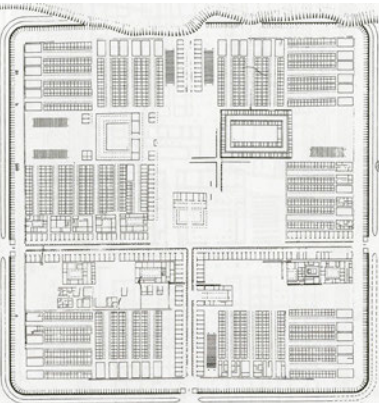
Constructed by the "semi-nomadic" Yanoama from the Amazon in Western Brazil, Lean-tos signified the tribe's territory and acted as protective element from surrounding tribes.



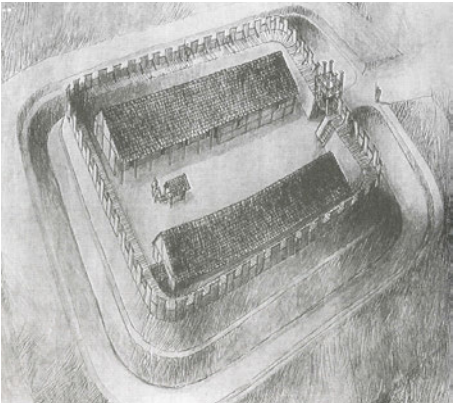
1585 Fortified Village of Pomeiock, North Carolina engraving by Theodore de Bry.



Fortified farmhouse in Rhodesia with sunken inner courtyard for protection of livestock.



83-96/87 AD Inchtuthil: Legionary Fortress



142-148 AD The Barburgh Mill was a fortlet (smaller fort) that accommodated 500 to 1000 men.

THE COURTYARD: CLEARING THE WAY FOR COLLECTIVITY
GATHERING IN THE PRIMITIVE COURTYARD

The courtyard, an early derivative of the atrium was present in prehistoric architecture as the central gathering space for villagers. Found on the Neolithic Yarmukian site (6400 - 5800 BC) located in the Southern Levant are primitive building complexes with rooms oriented toward a central space. According to archaeologists of the site, "Building 1" is a small complex composed of eight rooms that enclose an open area (11.6m x 10.53m), known as "Courtyard A."

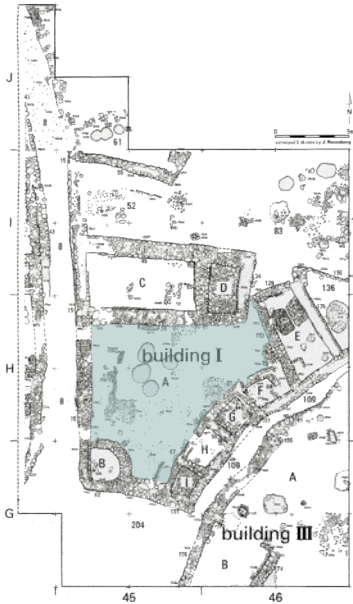
Dug in the middle of the courtyard are shallow pits, presumably used as the central fire in the complex, bringing the villagers together for warmth, cooking, and socializing. Although the earliest known form of the courtyard house, the small-scale central space in Sha'ar Hagolan eventually developed into larger gathering areas that vary in site and use...



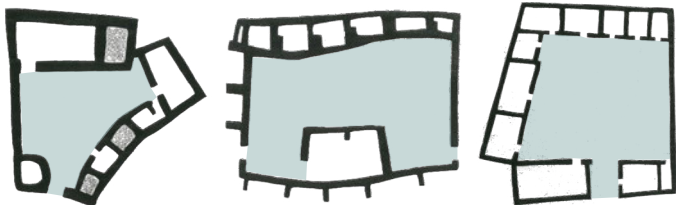
Building complex excavation



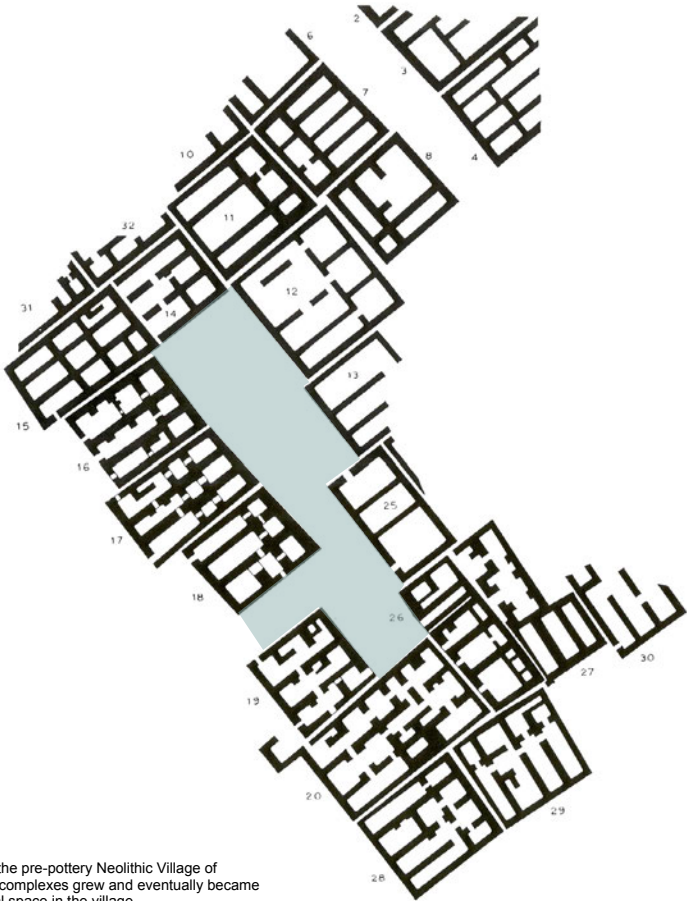
Sunken Pit in Courtyard A



Labeled "Courtyard A" by archaeologists, the triangular structure has an open area enclosed by eight rooms. The courtyard encompasses 60% of the complexes net area. (Sha'ar Hagolan, Garfinkel and Miller, 2002)



Courtyard structures found in Sha'ar Hagolan



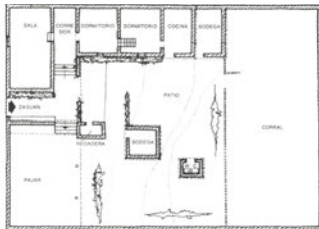
Found in the pre-pottery Neolithic Village of Bouqras, complexes grew and eventually became the central space in the village. (Sha'ar Hagolan, Garfinkel and Miller, 2002)

FORMING CENTRALITY

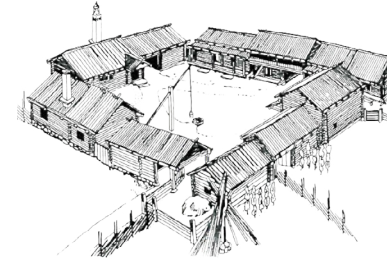
The courtyard, the big brother of the atrium, is an element that navigates across many scales, typologies and regions. Variations of the courtyard are found in monasteries, missions, castles, palazzos, and palaces in areas such as Greece, Rome, India, Latin America, China and many Islamic countries. Although an element that has been adapted throughout many regions due to its versatility, the courtyard is still the central gathering space in the building - regardless of scale, building, or country.

[NOTE TO EDITOR]

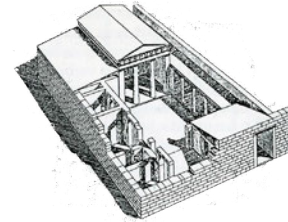
Due to variability of courtyard as an international typology this section must be expanded.



Rural courtyard house in Mexico



Karelian Farmstead, timber-built, in the USSR

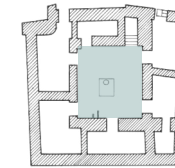


House at Priene



Pompeii Courtyard House

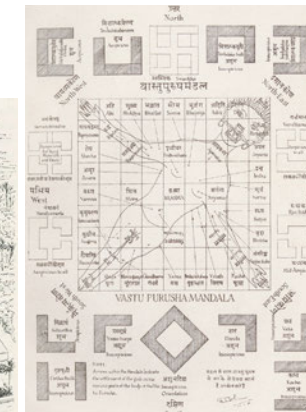
"House development reached its apogee during the heyday of Greek civilization in the 4th and 5th centuries BC. The "peristyle house" was therefore the original form of the oriental courtyard house and had grown more sophisticated with time." (Atrium, Blaser, 1986)



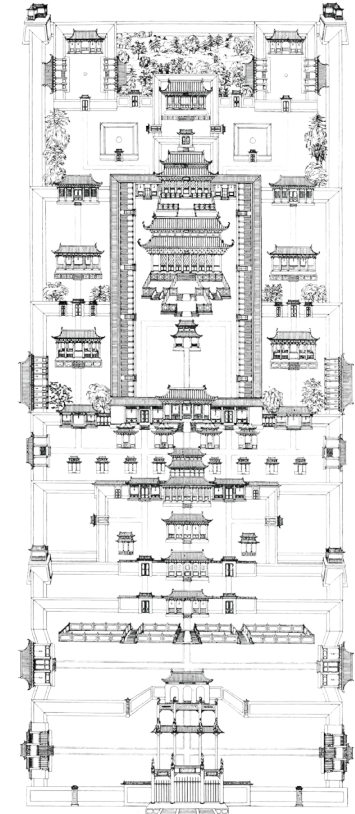
Plan of House at UR, Mesopotamia



Egyptian Courtyard House



Indian Courtyard Variations (Vastu Purusha Mandala)



Chinese Courtyards

"Archaeological evidence shows that courtyards, a negative space, were elements of Chinese structures as early as 3000 years ago, and continued to be a fundamental design principal of temples and palaces, in addition to houses..." (Chinese Houses, Knapp, 2005)

[CONTENT DECIDED BY EDITOR]

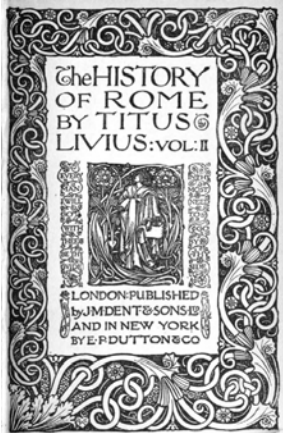
[CONTENT DECIDED BY EDITOR]

THE ATRIUM PROPER
BIRTH OF AN INTERIOR COLLECTIVE SPACE

The atrium proper is the result of tight urban conditions and unorganized sprawl after major fires to ancient Rome. Unable to change the city's formal layout due to social and political reasons the atrium in the Roman Domus was born...

"All this talk was suddenly interrupted by a fire which broke out in the night in several places round the Forum on the eve of the Quinquatrus. Seven shops which were afterwards replaced by five were burning at the same time, as well as the offices where the New Banks now stand. Soon after, private buildings - the Basilicae did not yet exist - the Lautumiae, the Fish Market and the Hall of Vesta were alight. It was with the utmost difficulty that the Temple of Vesta was saved, mainly through the exertions of thirteen slaves, who were afterwards manumitted at the public cost. The fire raged all through the next day and there was not the smallest doubt that it was the work of incendiaries, for fires started simultaneously in several different places..."

Livy, The History of Rome
Book 26 Chapter 27



Livy's account of Rome



The Fire of Rome, 18 July 64 AD, Robert Hubert

"the city was a complex structure in which public, private and sacred demands for space had to be accommodated...there was little or no formal organization of space. Towns grew without order."

"the reasons why the Romans did not take the opportunity to replan their city are more complex than the haste to which Livy refers in his account. Several factors contributed to the decision not to replan...replanning of the city, involving any radical redistribution of land, might have had a serious impact on the social and even the political structure of ancient Rome. Thus, the scope for a radical replanning of Rome was limited, and private housing continued to spread without order."

"The living conditions of ancient Rome reflected on a larger scale conditions in native cities throughout Italy. Domestic quarters grew haphazardly, without order or regulation. Houses and other buildings crowded together, often producing cramped, overcrowded conditions and the typical sinuous, narrow streets. Even within the domestic quarters, the houses themselves show little regularity. Often they were fitted into any available space and were altered opportunistically as more space became available. Initially, houses tended to concentrate along the main roadways and around the designated civic areas of the town..."

(Roman Domestic Buildings, Barton, 1996)

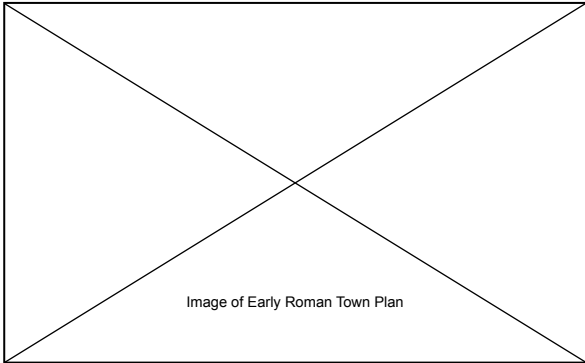


Image of Early Roman Town Plan

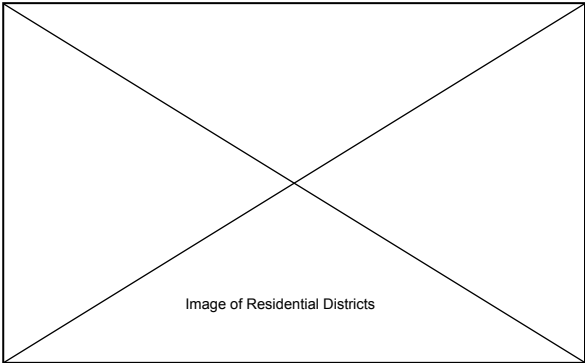
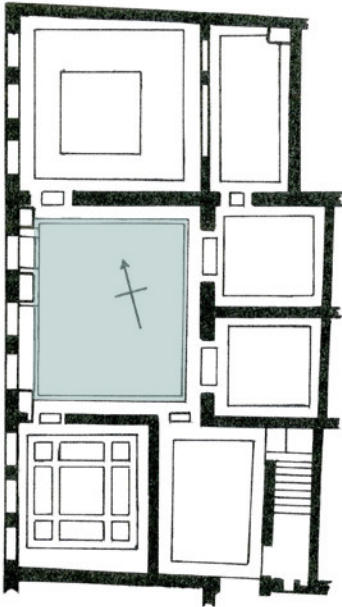


Image of Residential Districts

Similar to early Greek and Roman homes, the Insulae – an apartment building – had a central courtyard.

"Built between AD 123 and 128, the Garden Court is one of the most remarkable examples of Roman urban design. A large rectangular area about 100 x 120 m in size was ringed by apartment housing to make a huge "garden court." In the middle of the court rose two independent apartment blocks containing at least thirteen apartments. In between the free-standing apartments and the outer ranges of the court were eight fountains."

(Roman Housing, Ellis, 1999)

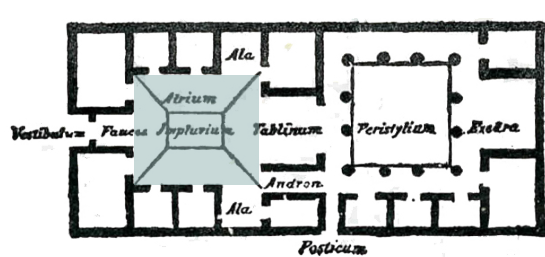


123 - 128 AD Plan of the House of the Yellow Walls (Insula)

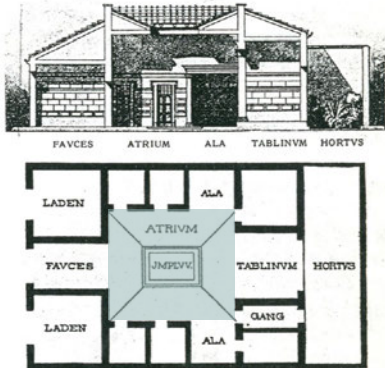
AN INTROVERTED GATHERING SPACE

The result of dense urban conditions and unorganized sprawl after major fires in ancient Rome, the atrium proper was a response to the necessity for a private gathering space in the urban realm. Unable to change the city's formal layout due to social and political reasons, homes were situated in any available space creating cramped conditions.

A derivative of the Greek peristyle, the courtyard in the Roman Domus was the initial gathering space in dense urban conditions - yet due to its versatility the atrium proper quickly took favor as a collective space. While it was only the upper class who were able to afford larger homes with a courtyard and an atrium, the typical Domus employed the atrium for its environmental qualities as well as its ability to be a central gathering space. Although the upper-class homes granted larger spaces to the courtyard, the atrium was the central space in the plan in which the rooms were arranged. The space in which one was greeted upon entering the Domus (through the vestibule) the atrium also offered environmental qualities the courtyard could not – heating as well as a semi-open space when it rained. The central space in the plan of which the rooms are oriented, the history of the atrium proper is rooted in the collective gathering space inside the building and separated from the urban realm...



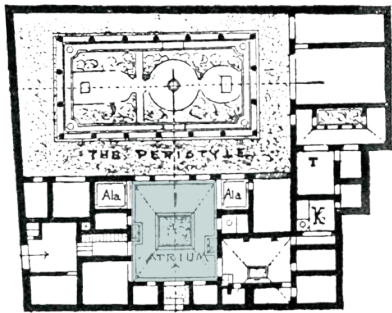
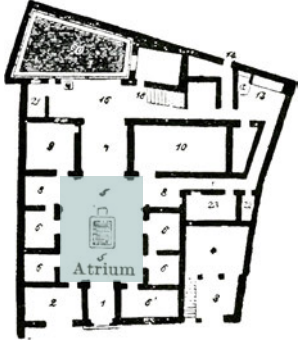
Plan of a typical Roman Domus



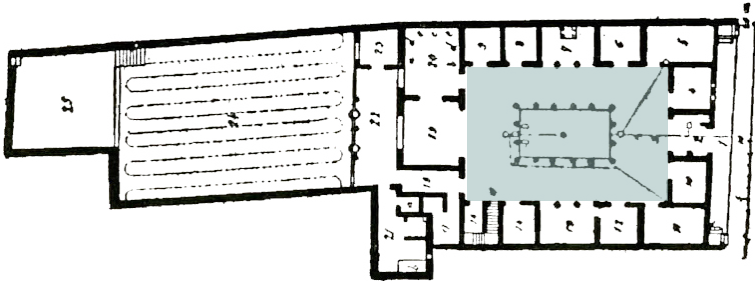
Italian Atrium house at Pompeii



House of the Surgeon The Domus was given its name after numerous medical instruments and frescoes of doctors were found in the home. The Domus was partially destroyed by eruption of Mount Vesuvius in 79 AD.



House of the Vetti The Tuscanic atrium in the house of the Vetti contained two wooden chests which held the family's treasure.



House of the Epidius Rufus

THE 5 CAVAEDIUM

Dating between 30-20 BC, De Architectura Libri Decem, written by Roman architect and engineer Marcus Vitruvius Pollio, is considered to be one of the best accounts into Roman architecture and construction techniques. Formerly the 10 Book on Architecture, the treatise discusses topics from large scale site selection and layout to smaller scale clocks and sundials. It was in De Architectura where Vitruvius asserted his three keys to architecture: firmitas (structurally sound), utilitas (useful), and venustas (beautiful).

In Book 6 Chapter 3, Vitruvius distinguished the five types of Cavaedia (Interiors), four of which are open to the sky. Discussing the uses and construction of each type, Vitruvius also goes into detail of the proportions of each cavaedia. Each type of cavaedia must abide by one of three proportional rules described, while the wings (side entrances) and tablinums (rooms connected to the atria) have their own proportional rules.



c. 30 - 20 BC De Architectura Libri Decem

Types (Genera) of Interiors (Cavaedia)

Tuscan



1...**Tuscan** interiors are those in which the transverse beams of the atrium have hanging joists [between them] and gutters running inward from the corners of the walls to the intersection of the beams, with rafters sloping downward into a central compluvium to collect rainfall.



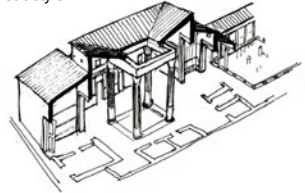
Corinthian



1...In **Corinthian** [interiors] the beams and compluvia are placed in the same way, but the beams that project inward from the walls are arranged around a ring of columns.



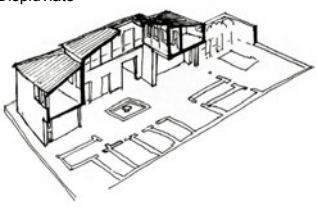
Tetrastyle



1...**Tetrastyle** interiors, with columns under their corner beams, offer both the greatest utility and the greatest soundness, as they are neither forced to sustain great stresses nor are they weighed down with joists.



Displuviate

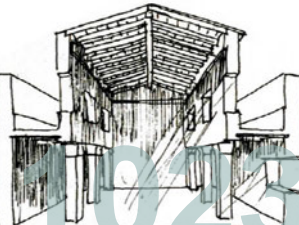


2. **Displuviate** interiors are those in which outward sloping rafters, bearing the frame of the roof, throw off rainwater. These are most serviceable in winter quarters, because their upright compluvia do not interfere with lighting the dining rooms...

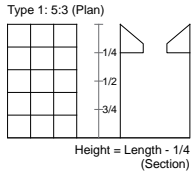
Testudinate



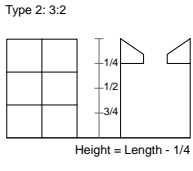
2...**Covered** interiors are made where there are no great stresses on the building; they provide ample living space on the floor above.



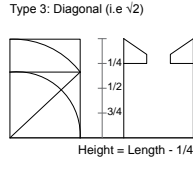
Means of generating sizes of atrium:
The lengths and widths of atria are formed according to three types:



The first type is designed as follows: when the length is divided into five parts, three are assigned to the width.

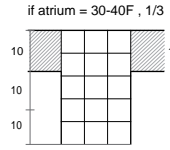


For the second type, when the length is divided into three parts, two are assigned to the width.

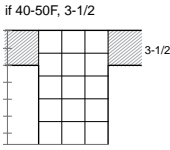


For the third type, make a square whose sides are equal to the width, draw a diagonal line, and whatever the distance of that diagonal, this is the length of the atrium.

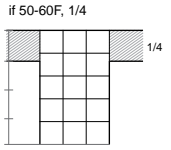
Means of generating sizes of alae (wings):



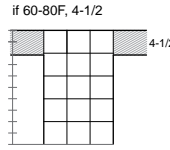
The wide of the alar (wings) on right and left, if the length of the atrium is from thirty to forty feet, should be set at one-third this measure.



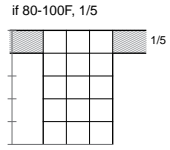
From forty to fifty feet, the length should be divided into three and one-half parts, and of these one part should go to the wings.



If on the other hand, the length will be from fifty feet to sixty, a fourth part of the length should be assigned to the alae.

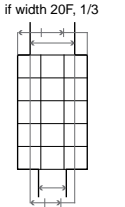


From sixty to eighty feet the length should be divided into four and one-half parts, and of these one part will be the width of the wings.



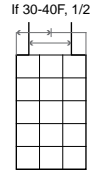
From eighty to one hundred feet the length divided into five parts will establish the proper width for the wings.

Means of generating sizes of tablinum (entrance):

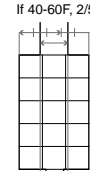


for smaller atria, width of tablinum less than 1/3

As for tablinum, when the breadth of the atrium is twenty feet, take one-third of this sum away and the rest should go to the tablinum.

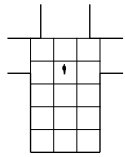


If the atrium is thirty to forty feet, half its width should be assigned to the tablinum.

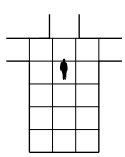


for larger, 1/2 width of tablinum

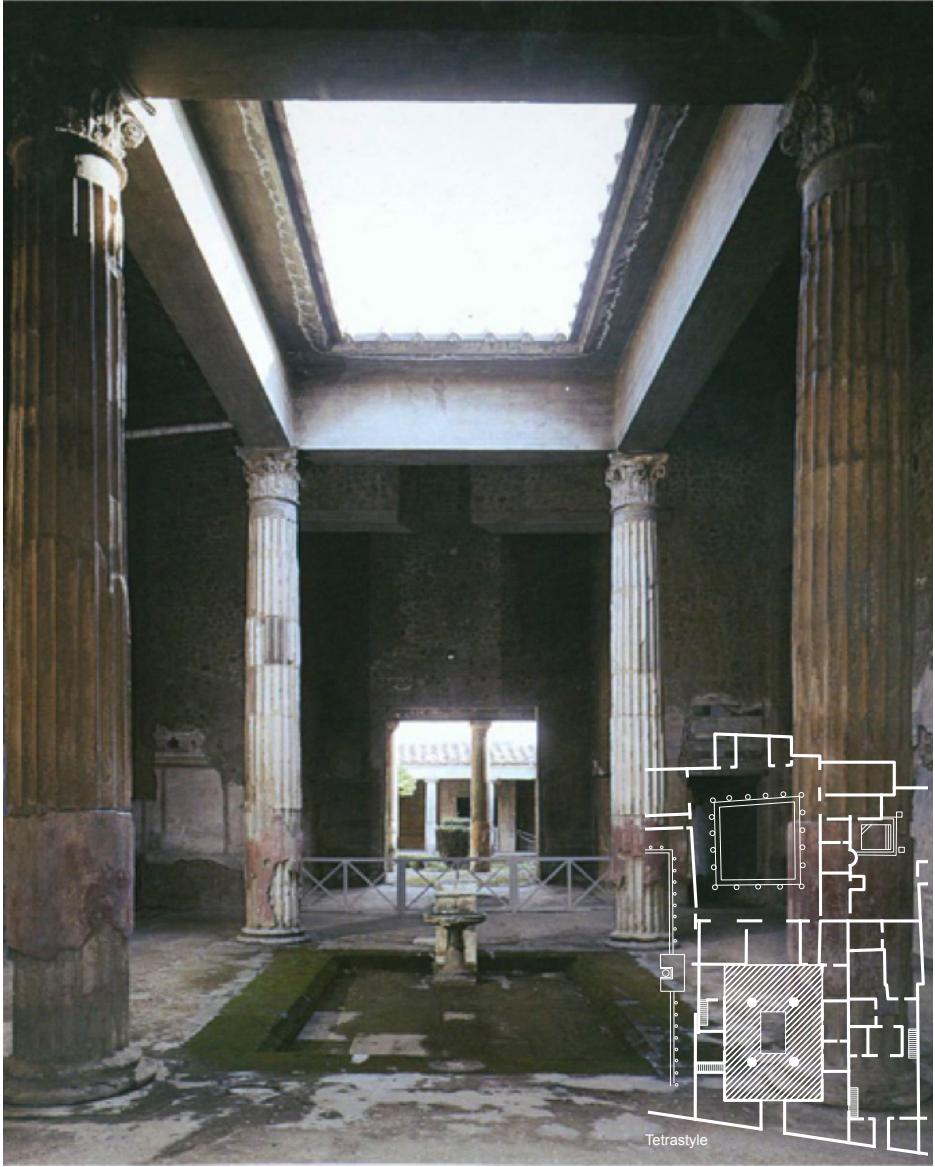
When it is from forty to sixty feet, its width should be divided into five, and of these, two go to the tablinum.



"if we use the proportions of smaller atria to design the larger ones, the dependent rooms will seem vacant and oversized"



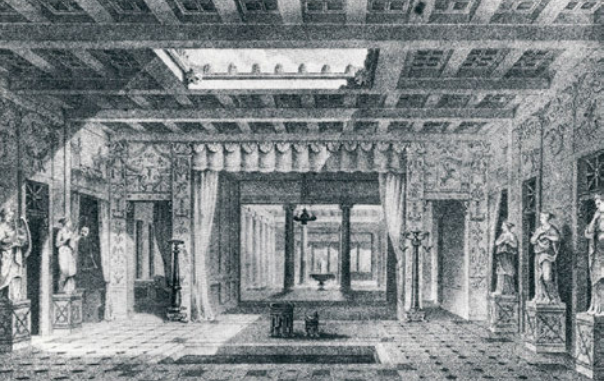
"if we use the proportions of larger atria in the design of smaller ones, the tablinum and alae will seem too small"



c. 300 BC House of the Silver Wedding at Pompeii

PRIMITIVE MEP

As the contemporary building is laden with HVAC, lighting and plumbing systems, the atrium - via the compluvium and impluvium - is the original form of MEP in a building. The atrium was inherently a space for natural light in the dense urban conditions but the compluvium also allowed smoke to exit the central hearth while also funneling rain water into impluvium for storage...



Villa of Mysteries, Pompeii



Domus Aurea, Rome
The Domus Aurea was the result of Nero's ambition to build one of the largest imperial residences after the fire of A.D. 64.

[Com'plu'vi'um] – the rectangular opening in the middle of the inward sloping roof of an atrium
“The compluvium should be left at no less than one-fourth and no more than one-third the width of the atrium; its length should be worked out in proportion with the length of the atrium.”
Vitruvius, De Architectura Book 6. Chapter 3, Line 6

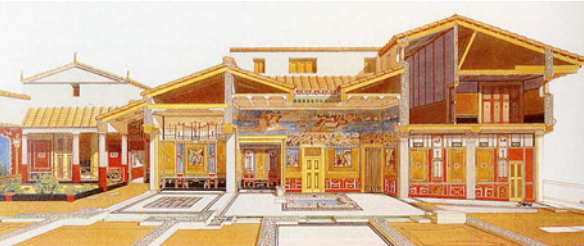


The Samnite House, Herculaneum

[Im'plu'vi'um] - the shallow rectangular basin in the middle of the floor of an atrium
According to Vitruvius's 5 Cavaedium, the Tuscan, Corinthian and Tetrastyle are best for the collection of water as they all have in-ward sloping roofs. Although the displuviat has an opening for water, it has an outward sloping roof which would deflect water rather than funnel it. The testudinate caveadium has no compluvium, meaning no water can enter.

INTROVERTED BY NATURE

Situated within dense urban areas, the Roman Domus used paintings in the atrium to create visions of other spaces. The decorated atria depicted landscapes, mythological scenes and sometimes other cities to situate the user out of their current space and into another...



House of the Tragic Poet (Long Section)

"Seclusion, the courtyard's artificially created seclusion, makes those who dwell there the inhabitants of an imaginary kingdom. To nurture this image of unimpaired existence, man needs walls, fences, enclosures, and therefore the relationship between imagined space and its habitants seems to be of fundamental importance."
(Atrium, Blaser, 1985)



House of the Marine Venus



"The painting... shows the birth of Venus. The goddess reclines like a pearl on a vast cockleshell, and cupids on either side sport in the water. The goddess's coiffure is of a style fashionable during Nero's reign...
"The nude Venus is painted awkwardly, but she still has something of a theatrical effect when seen from afar. She holds a fan in her right hand, and her veil billows like a sail in the wind behind her. She wears gold jewelry - a diadem, a necklace, and bracelets at her wrists and ankles. The overall form of the decoration, divided into panels and painted with fictive curtains..."
(Domus, Donatella Mazzoleni)



Villa of the Mysteries



Livia's Villa at Prima Porta

"The villa belonged to Livia Drusilla, wife of Augustus. The site was chosen, according to Suetonius, because it was here that an eagle dropped into the empress's lap a white hen bearing a laurel branch in its mouth. This legend also explains why some sources refer to the villa as "ad Gallinas Albas" (of the white hens): "Just after she married Augustus, Livia was visiting Veio when an eagle flying over dropped a white hen in her lap." The haruspices whom the empress consulted decided that the laurel branch should be planted; its berries gave rise to the forest of laurel next to the villa. The bay used in the triumphal laurel wreaths of the imperial family came from this forest, which also became a symbol of its prosperity."
(Domus, Donatella Mazzoleni)

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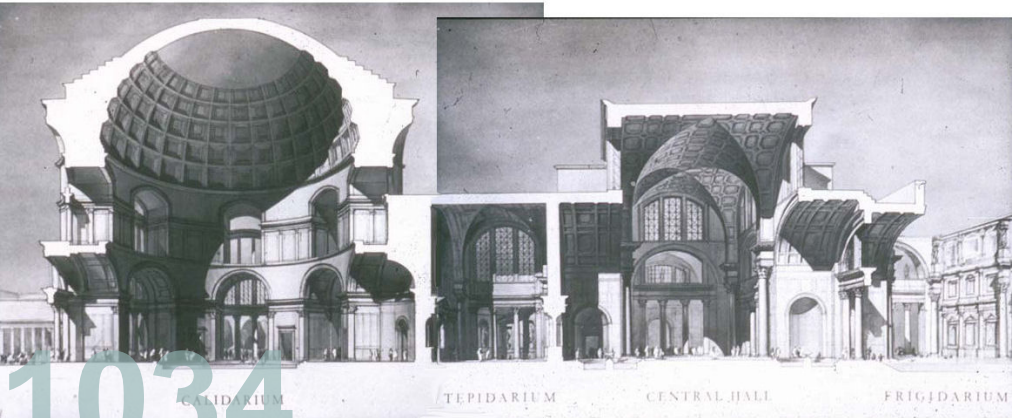
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COMMUNAL CLEANSING

Bathing in ancient Rome played a large cultural role as a hygienic and social affair. As only high class were able to afford private baths - which were still open to the public for a fee - thermae (public baths) became a place for cleansing and socializing. The communal facilities can be compared to a modern day spa where etiquette was expected.

In the communal baths atria and open courts were used as a means of opening the facilities for environmental purposes. Typically in the center of the plan, the vertical openings were necessary to bring fresh air into the typically uncleansed baths. As the central bath was completely open, the caldarium (hot), tepidarium (warm), and frigidarium (cold) were bathing rooms that used smaller openings in the roof to let fresh air inside the space. The facilities were so important even Vitruvius discusses the construction of bath in De Architectura...

"...If these ceilings are made double in calderia, they will be more efficient, for then the moisture from the vapor will not be able to rot the timber of the beams, but instead will wander aimlessly between the two ceiling chambers."
(Vitruvius, De Architectura Libri Decem, Book 5, Chapter 10, Number 3)



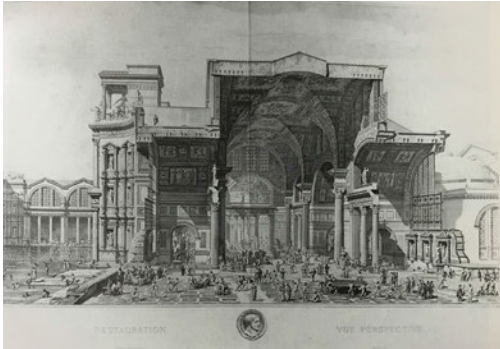
Baths of Caracalla Section



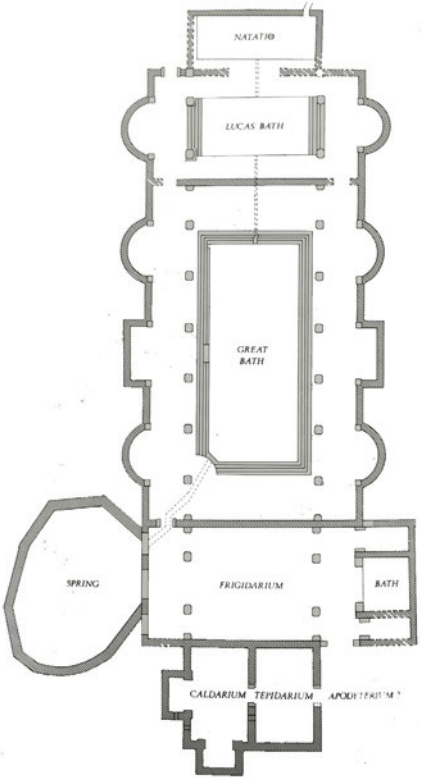
1899 Painting of Baths of Caracalla by Sir Lawrence Alma-Tadema depicting thermae as social space.



Baths at Baths
"...the town of Bath has always been famous as a great religious centre and for its thermal springs with their curative associations. All the time that society has held these properties in high regard, Bath has been a forcing-ground for cultural development, whether in the Roman period or a thousand years later..." (Cunliffe, Roman Baths Discovered, 1971)



Baths of Diocletian
"The Spartan sauna and sweating chambers should be joined onto the tepidarium, and however broad these are, they should have the same height up to the spring of the dome. Leave an oculus in the center of the dome, and from it suspend a bronze shield on chains, so that by adjusting its height the temperature of the sauna may be brought to perfection."
(Vitruvius, De Architectura Libri Decem, Book 5, Chapter 10, Number 5)



Baths at Baths Plan

"The dimensions of baths, it seems, are determined by the number of users. This is how they should be designed. Whatever the length is to be, take away a third part; that should be the breadth, except for the alcoves for the washbasin and the pool..."
(Vitruvius, De Architectura Libri Decem, Book 5, Chapter 10, Number 4)

TEMPLE OF VESTA: CEREMONIES WITH SMOKE EXITING THE HEARTH

In Greek Mythology, Hestia is the goddess of the hearth, home, architecture, domesticity, family, and the state. As Greek mythology was the precedent for Roman mythology, Hestia finds her later Roman counterpart in Vesta. Both goddesses were represented by fire in the hearth which was typically in the center of the home; in ancient Rome, the hearth was in the atrium. Once the vestals, (Vesta's priestesses) would light the fire in a ceremony, Vesta would appear and escape through the atrium in the form of smoke...



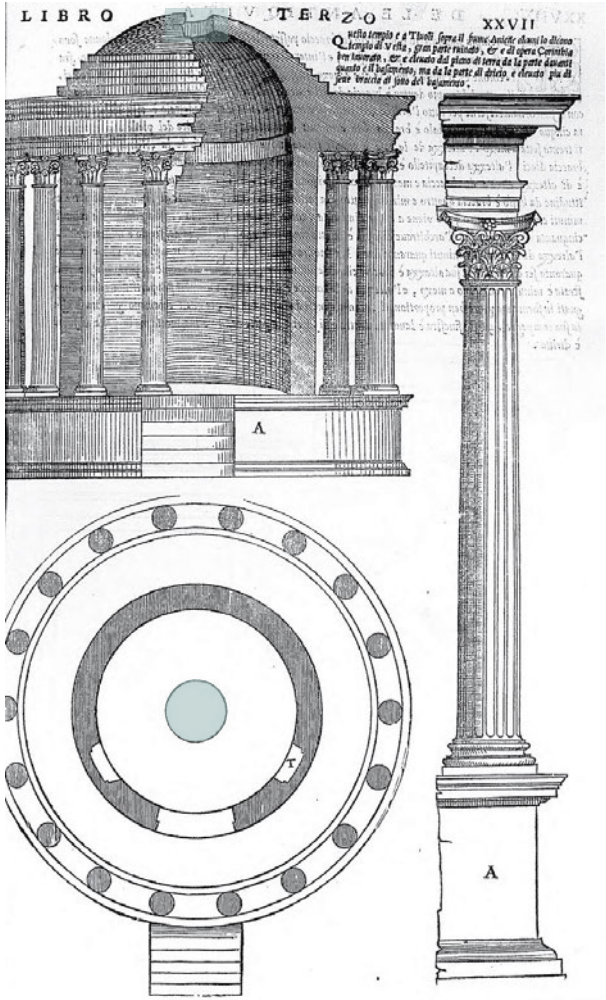
Smoke exiting an opening in the roof of the Temple of Vesta



1727, Vestel Virgins, Jean Raoux
Vestels making an offering inside the Temple



1727, Sacrifice at the Vestal, Alessandro Marchesini



c. 1530 Sebastiano Serlio's depiction of the Temple of Vesta shows a vertical opening to allow smoke to exit during ceremonies.

THE OPENING IN THE PANTHEON

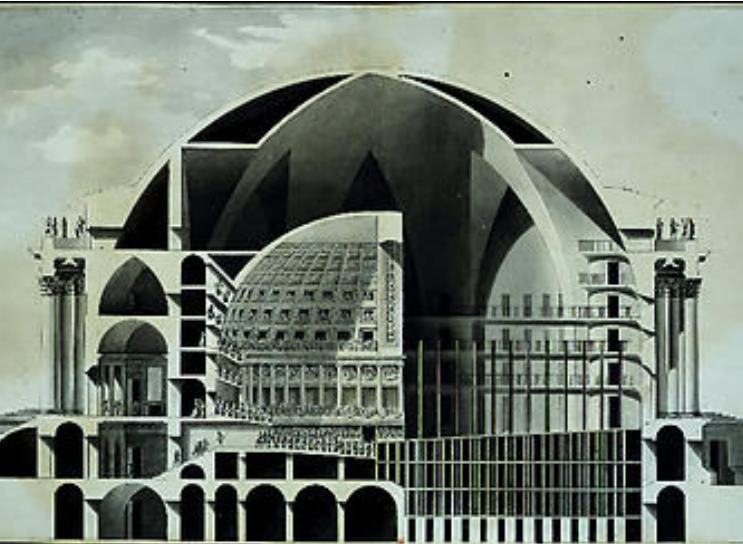
The dome, a main feature and central space in the Pantheon, is highlighted by an oculus that is open to the exterior and allows daylight into the space. Although not an atrium proper, the oculus is a vertical opening that creates dramatic effects throughout the most important social space of the ancient building.



1734 The Interior of the Pantheon, Giovanni Panini

SHELL DOMES: OPENINGS OF ILLUSION

Vertical openings, although at times unseen, have a significant role in architecture as an illusionary space. Beyond hiding unwanted services to act as if they do not exist, the vertical opening has been employed in shell domes to create the illusion of grandeur from the exterior. Enclosed by multiple shells, the openings house the structure for the shell directly above, resulting in an aesthetic effect of a taller and more significant dome..



L'Opera Carousel Etienne-Louis Boullee

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OPENINGS IN THE CITY

The plaza, a gathering space that is open to the sky, exhibits the underlying characteristics of the atrium on the city scale. The city's main social condenser for celebrations, speeches, and events, the plaza is no longer at the scale of the peristyle but enclosed by its surrounding buildings. Although unenclosed, the plaza finds itself in the atrium family tree as a larger representation of the court...



Pope addressing the public
Piazza San Pietro, Vatican City



Flower Carpet
Grand Place, Brussels, Belgium



New Year's Eve
Times Square, New York City



Il Palio
Piazza Del Campo, Siena, Tuscany, Italy



Piazza San Marco, Venezia, Italy



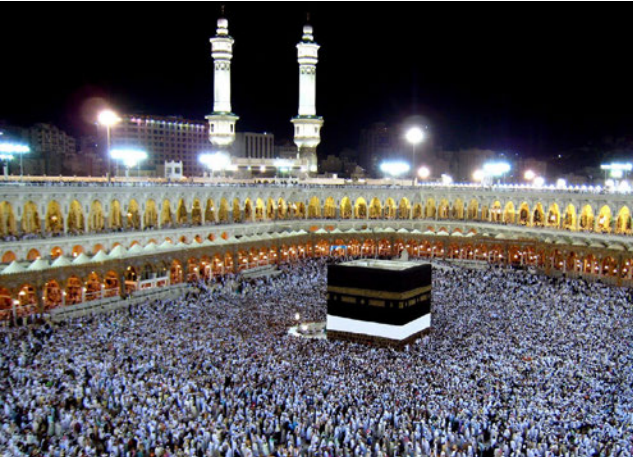
Somerset House, London, England

[NOTE TO EDITOR]

Due to variability of plaza as an international typology this section must be expanded.

CLOISTERS: WORLDS WITHIN WORLDS

An enclosing for religious gathering spaces, the court has a significant role within cloisters as the central space for prayer. An inclusive space for worshipers, the court creates an alternate world open to the sky bringing worshippers closer to the heavens...



c. 2000 BCE Mecca



"Pilgrims use the courtyard to perform the ritual circumambulation of the Ka'bah, known as the ṭawāf. Two more sacred sites are located in the courtyard: the station of Abraham (Arabic: maqām Ibrāhīm), a stone which Islamic tradition associates with the Qur'ānic account of the rebuilding of the Ka'bah by Abraham and Ismā'īl (Ishmael), and the Zamzam well, a sacred spring. Immediately to the east and north of the courtyard are al-Ṣafā and al-Marwah, two small hills which pilgrims must run or walk between in a ritual known as the sa'y." (Encyclopedia Britannica)



19 BC Western Walls



The drastic change in color in the stone of the Western Walls is the result of visitors placing their foreheads, hands, and lips on the wall overtime.



1496 Procession in St. Mark's Square, Gentile Bellini

[NOTE TO EDITOR]
Section to be expanded

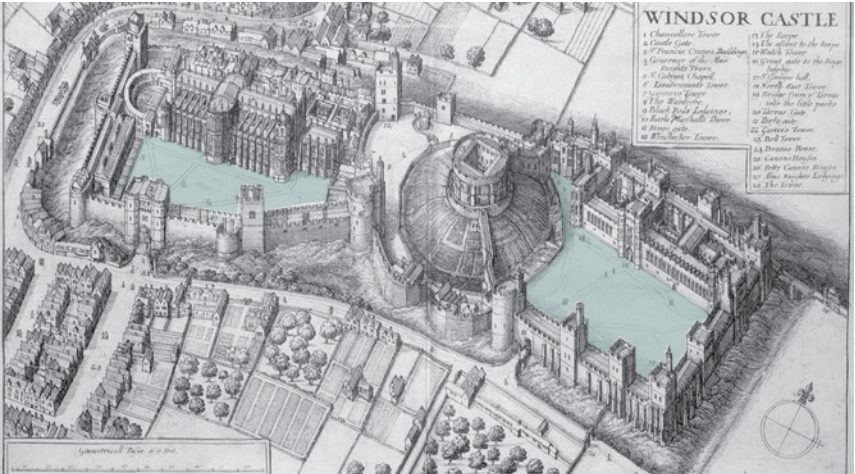
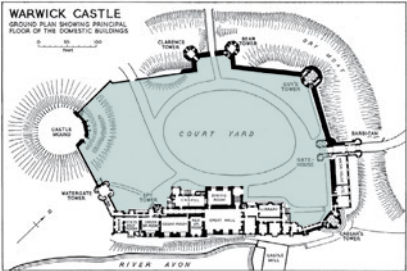
FORTIFIED YARDS: PROTECTED GREEN SPACE

An inherent quality of the wall is division, separation, and segregation. A necessary element in order to form an enclosure for an atrium, courtyard, or any other vertical opening, the wall becomes a protective measure in the fortification of castles. Known as baileys, the walls serve a specific purpose for defense, but an inherent result of the fortification are central courtyards allowing the user to be outdoors while still protected from any threat.

Bailey - a courtyard within the external wall or between two outer walls of a castle (Dictionary.com)



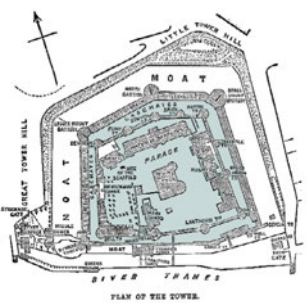
1068 Warwick Castle, Warwickshire, England



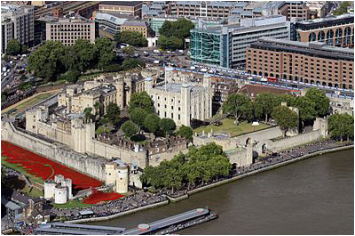
c. 1070 Windsor Castle, Windsor and Maidenhead, United Kingdom



1070 Tamworth, Saffordshire



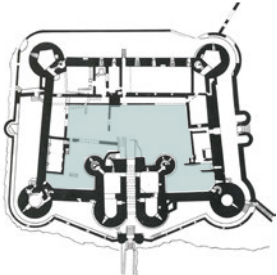
1078 Tower of London (Innermost Ward built 1170s)



[NOTE TO EDITOR]
Section to be expanded



1283 Harlech Castle
Harlech Castle, built toward the end of the thirteenth century, is sited on a hill with an outer bailed covering the difficult approaches, a middle bailey, and an inner bailey...the middle and inner bailey are protected by a moat on the south and east



1323 Naworth, Cumberland

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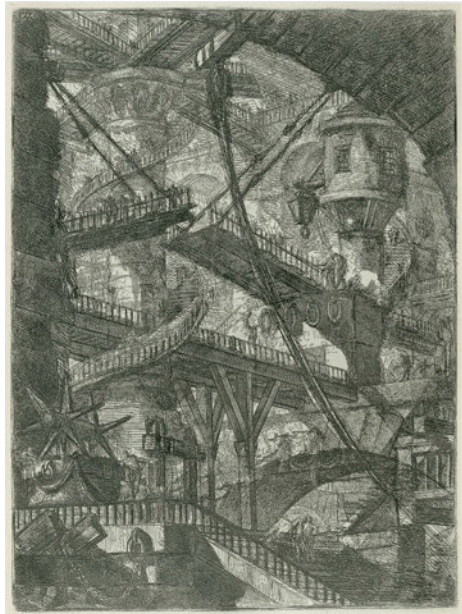
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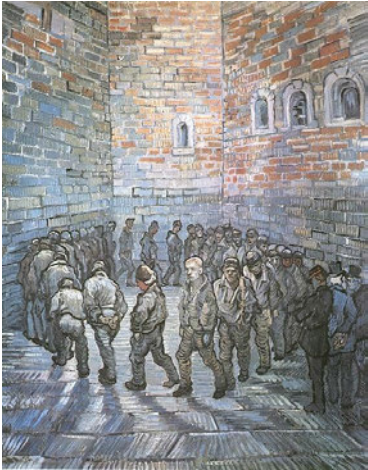
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GATHERING IN THE PRISON

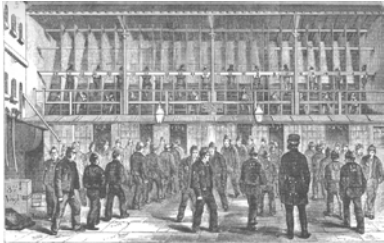
Atria and vertical openings alike are penetrations through floors that create visual connections throughout a building. Spaces of surveillance and control, the atrium and courtyard, have played a pivotal role in prison architecture...



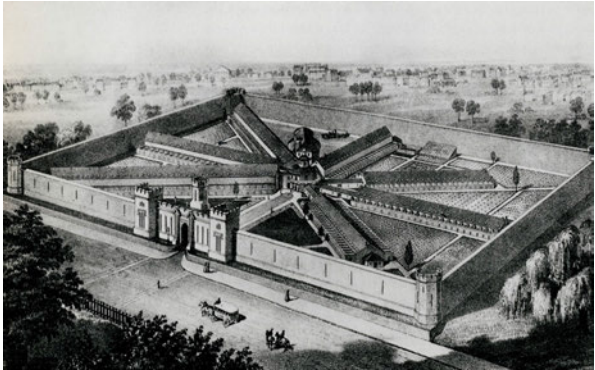
1761 The Drawbridge (2nd State)
Known for his elaborate engravings, Piranesi used the atrium as a tool to create sublime depictions for radical depictions of imaginary prisons. Creating eccentric labyrinth structures, Piranesi placed multiple platforms in vertical spaces to enhance the sublimity of the prison. The series of etchings were strictly perspectival with no basis of floor plans allowing Piranesi the ability to be more radical in his atria-prisons...



1890 Prisoner's Exercising, Vincent van Gogh



Prisoner's Treadmill in Colldbath Fields Prison



1836 Haviland's Eastern Penitentiary Courtyards



1868 Strangeways Prison



1796 Kilmainham Gaol (Victorian Wing built 1971)

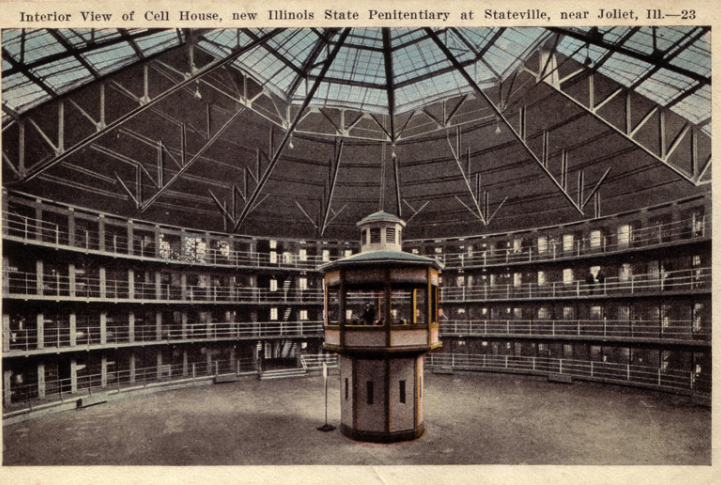
THE ATRIUM IN THE PANOPTICON

The atrium as a surveillance mechanism is best exhibited by Jeremy Bentham's Panopticon, a prison designed around self-observance. An attempt in prison reform, Jeremy Bentham's Panopticon used the atrium typology as a means of surveillance and power. The prison cells are arranged in a circular form that surround a freestanding watchtower. As light illuminates the cells from the windows, the all-seeing jailer at the center of the atrium is offered a complete 360-degree view of the entire jail. In Discipline and Punish, Foucault addressed the Panopticon's spatial configuration as an element that forced the prisoners to become self-regulated due to their inability to know if they are being watched.

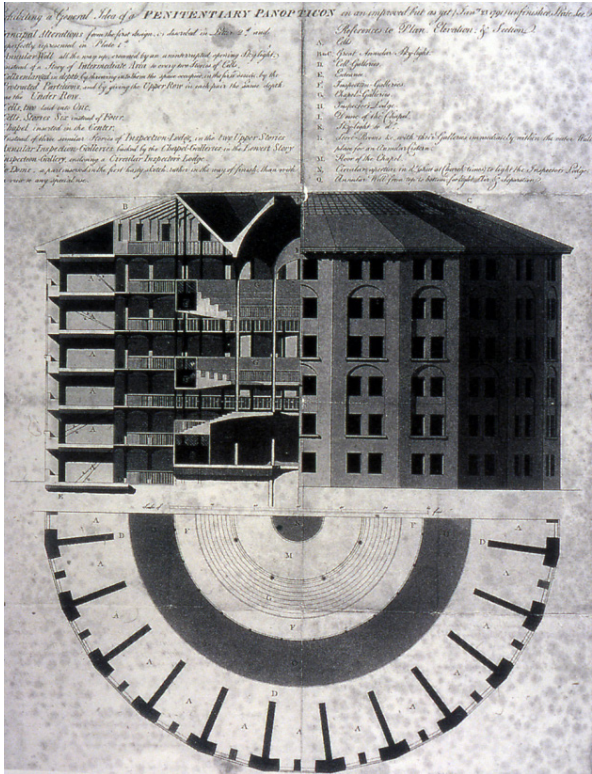
The atrium was the key to the Panopticon's success in creating visual connections and self-surveillance. The modern atrium is an opening through multiple floors that fosters visual interaction between the observer and the observed - known or unknown...



Jeremy Bentham
"The Panopticon must not be understood as a dream building: it is the diagram of a mechanism of power reduced to its ideal form"
Discipline and Punish, Michel Foucault



1858 Joliet Stateville Prison



1791 Panopticon Plan and Section

Built Panopticons



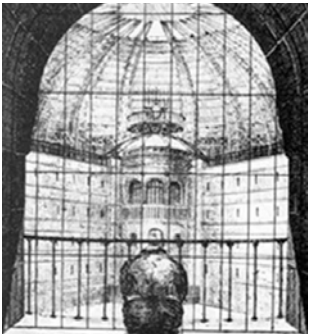
Presidio Modelo
Isla de la Juventud, Cuba



Haarlem Prison
Haarlem, Netherlands



Stateville Correctional Center
Crest Hill, Illinois, United States



"he is seen, but does not see; he is the object of information, never a subject in communication"

"arrangement of his room, opposite the central tower, imposes on him axial visibility, but the divisions of the ring those separated cells, imply a lateral invisibility"

"Hence the major effect of the Panopticon: to induce in the inmate a state of conscious and permanent visibility that assures the automatic functioning of power"

Michel Foucault, Discipline and Punish

[INTERVIEW WITH LESLIE FAIRWEATHER AND SEAN McCONVILLE
(AUTHORS OF *PRISON ARCHITECTURE*)]

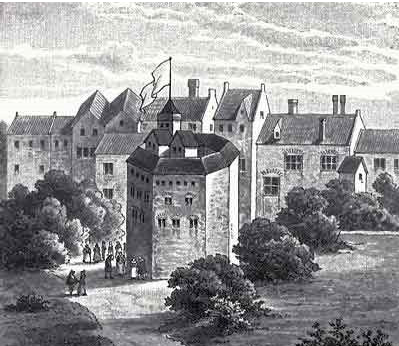
[INTERVIEW WITH LESLIE FAIRWEATHER AND SEAN McCONVILLE
(AUTHORS OF *PRISON ARCHITECTURE*)]

(NATURALLY) PANOPTIC THEATRES

The theatre, similar to the Panopticon, has an all-seeing jailer. Using the stage as the jailer's tower, the performer has a complete view of the crowd. The self-regulating audience member does not leave their seat - unless indicated during an intermission - in order to avoid the glares of their peers or even worse, the jailer.

Originating in Athens, the theatre was a social gathering for entertainment in large open amphitheaters. The open air theatres were usually built into mounds to create inclined seating, resulting in better sight lines for audience members. As theatres became domesticated in buildings, sightlines for audience became ever more important but were resolved by the use of mezzanines. Although at times considered a balcony, the mezzanine is a necessary element in theatre to open the space, creating visual connections between audience and performer...

The ceiling above the stage of the Globe Theater is painted to represent the sky.



During a performance of Henry VIII in 1613, a stage cannon ignited the thatched roof of the Globe Theater setting the building ablaze and eventually burning it to the ground.



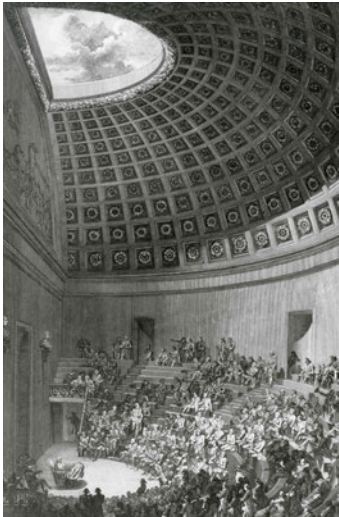
People standing in the court of a recent performance in the Globe Theater



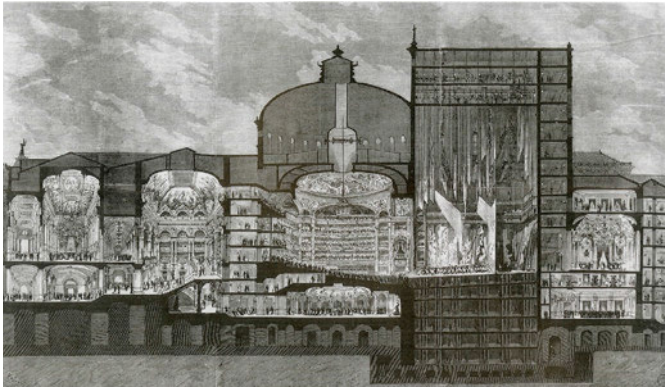
1585 Teatro Olimpico is one of the oldest remaining indoor theaters.



1747 Musical Fete, Giovanni Panini
The mezzanines in the theater create a central space similar to that of an atrium



1774 The School of Surgery in Paris by Jacques Gondoin has an anatomy theatre that employs inclined seating as well as an opening in the roof.



1875 Paris Opera, Charles Garnier

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INDUSTRIAL REVOLUTION: BIRTH OF THE MODERN ATRIUM
CHANCE BROTHERS GLAZING THE SKY

The Industrial Revolution prompted the birth of the modern atrium with technological developments in glass, iron and steel. Typically open to the sky, atria with large spans could now be covered as a result of new fabrication techniques of plate-glass from the Chance Brothers, iron production, and a revolutionary steel manufacturing process by Sir Henry Bessemer. A direct result of the glass and iron industry, the atrium was present at a pivotal moment in the history of architecture as the central space in the Crystal Palace. After the introduction of iron and steel - coupled with glass - the first epoch of the modern atrium had arrived.

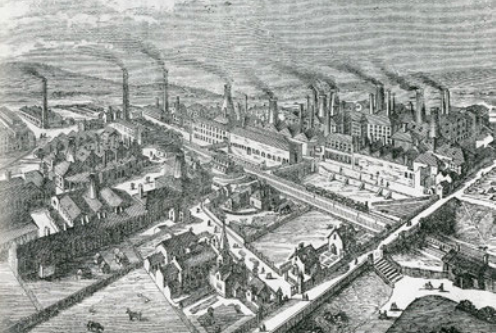
As a man-made material, glass is old enough to be traced back to 3500 BCE in Mesopotamia. Deviating according to cultural and regional influences, the diverse material evolved from small-scale objects to glass curtain-wall systems that wrap entire buildings.

The material had two major revolutions during the early to mid-nineteenth century - both at the hands of the Chance Brothers. In 1832, while collaborating with Georges Bontemps, the brothers developed the Cylinder Method. A new means of manufacturing the material, the molten glass is poured into a cast-iron formwork, and pressed using a single roller. The Cylinder method was an efficient means of mass production and improved the surface quality over larger panes of glass. Working with James Hartley in 1847, the Chance Brothers improved the Cylinder Method by introducing the Rolled Plate Method - an even more efficient means of forming glass. Similar to the Cylinder Method, the Rolled Plate Method cast the material in the same formwork but was pressed using two rollers, resulting in even larger and stronger panes.

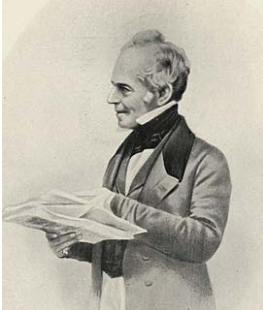
During the Industrial Revolution, many people influenced the process of iron manufacturing. The introduction of new chemicals in the production of cast and wrought iron made the material cheaper and more available. Coupled with new iron production techniques, glass played an important role in the design and construction of the Crystal Palace.



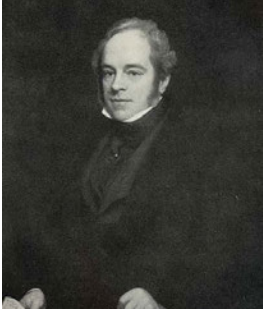
Ca. 1832 Manufacturing glass in the Chance Brothers Factory



Ca. 1860 Glassworks factory in Smethwick established by Robert Lucas Chance

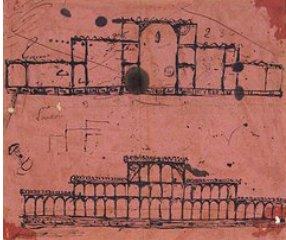


Robert Lucas Chance



William Chance

Constructed out of iron and glass, the Crystal Palace was a representation of the Industrial Revolution. At 1,851 feet long and 128 feet tall, the Crystal Palace was constructed out of 6,024 cast-iron columns and 1,245 wrought iron girders. Assembled in a mere 9 months, the prefabricated building was completely enclosed by glass supplied by the Chance Brothers. A revolution in Architecture's history, the Crystal Palace was fundamentally an atrium building that eventually inspired many exhibition spaces similar in form and material...



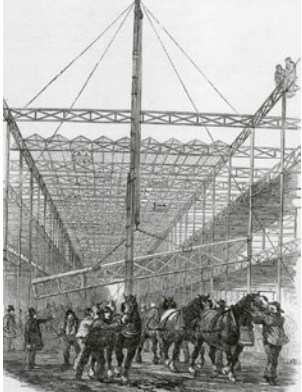
1850 Sir Joseph Paxton's sections of the Crystal Palace were designed and sketched during a railway tribunal.

"Over a decade or two leading up to the mid-century...there is an unbounded delight in technological experiment..."

With such a marvelous mix, such a fitting aim for the mid-19th century, the society quickly revitalizes itself. By the mid-1840's, we see here all those who come to own the 1851 Great Exhibition; not just as client body but as enablers, designers, and builders."
(Crystal Palace, John McKean, 1994)



1850 Raising the Transept ribs



Great Nave trusses being hoisted by horses during construction



The Crystal Palace at bare structure before any contents were placed inside. Engraving by W.G. Brounger

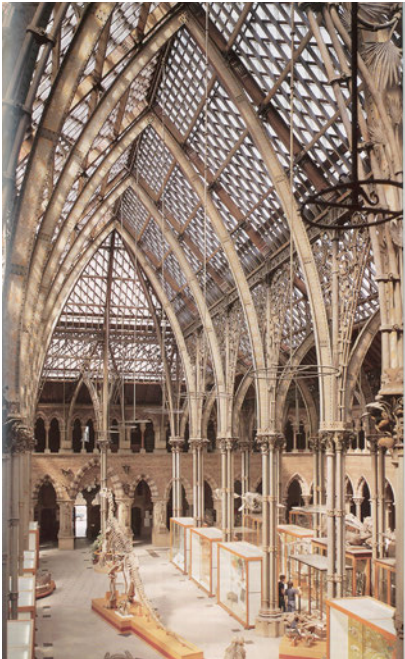


The Crystal Palace during the Exhibition

ADAPTING THE PAXTON MODEL
The Cystal Palace prompted a revolution of buidlings in similar material and form.



1855 Palais de l'Industrie



1861 Central Court of Oxford Museum
"In an 1854 lecture, 'On the Use of Metals in Church Buildings and Decoration', Skidmore critiqued Paxton's mute utilitarianism, arguing that iron could be hammered and worked into a formal language at once its own, finer and more delicate than stone, and capable of imitating the natural forms...
(European Architecture, Bergdoll, 2000)



1862 Hector Horeau's glass and iron proposal for covering the projected Avenue de l'Opera
"A fervent advocate of vast and covered spaces of iron and glass as remedies for the ills of the modern city, Horeau took up the prophetic role of glass and iron architecture first advanced by Saint-Simonians. The technology of the Crystal Palace, for which he had bid unsuccessfully, could foster a whole new vision of urban space..."
(European Architecture, Bergdoll, 2000)



1889 Galerie des Machines

THE BESSEMER PROCESS

Experimenting with metals in the early 1850's, Sir Henry Bessemer created a process that allowed for the mass-production of steel from wrought iron. At a time when steel was only used for specialized products, one was now able to mass-produce the metal for cheap using the "Bessemer Process." Explaining the process in 1856, Bessemer read an essay to the British Association entitled "On the Manufacture of Malleable Iron and steel without Fuel" which detailed how to create the stronger and more expensive steel from its cheaper derivative.

Bessemer was doing research on gun manufacturing when he blew air through molten pig iron and found that the introduction of oxygen created an exothermic reaction. The mixture of oxygen with any excess carbon - or other impurity - combined and eventually burned off, producing the unrefined "mild steel." Mild steel was found to be strong, corrosion-resistant and easily welded, making it a feasible material to work. Taking place in Bessemer's convertors, the steel could now be produced in large quantities.

After initial problems, Bessemer eventually received a patent, which he later sold in 1866 to the Pennsylvania Railroad Company. One year later the company manufactured the first commercial railroad track, using the Bessemer Process, validating it as the novel way to mass-produce steel.

"The revolution in steel production triggered a corresponding revolution in the size and character of industry participants. In essence, it accelerated the trend toward incorporation and large-scale production that had first emerged in the 1850's. "The minimum economic size of a Bessemer plant was far larger than anything known before, a development which led to a different industrial structure in the production of steel than prevailed in the making of iron..." (Industrial Revolution: Iron and Steel in America, Hillstrom and Hillstrom, 2005)

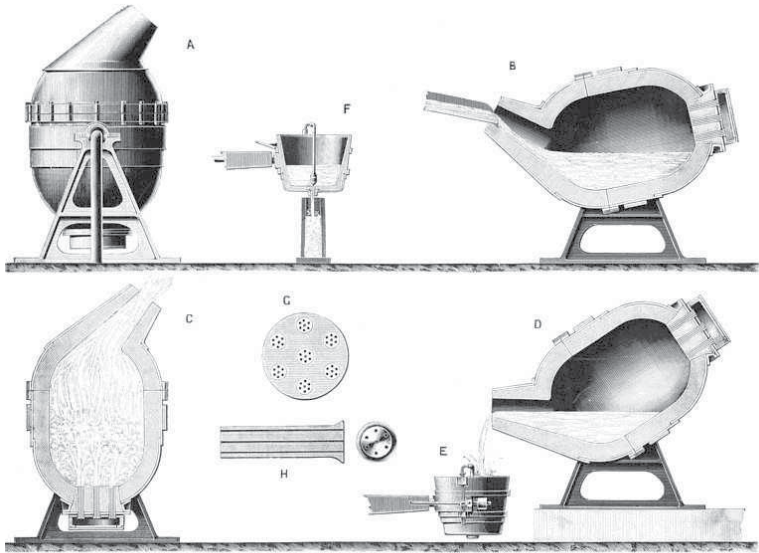
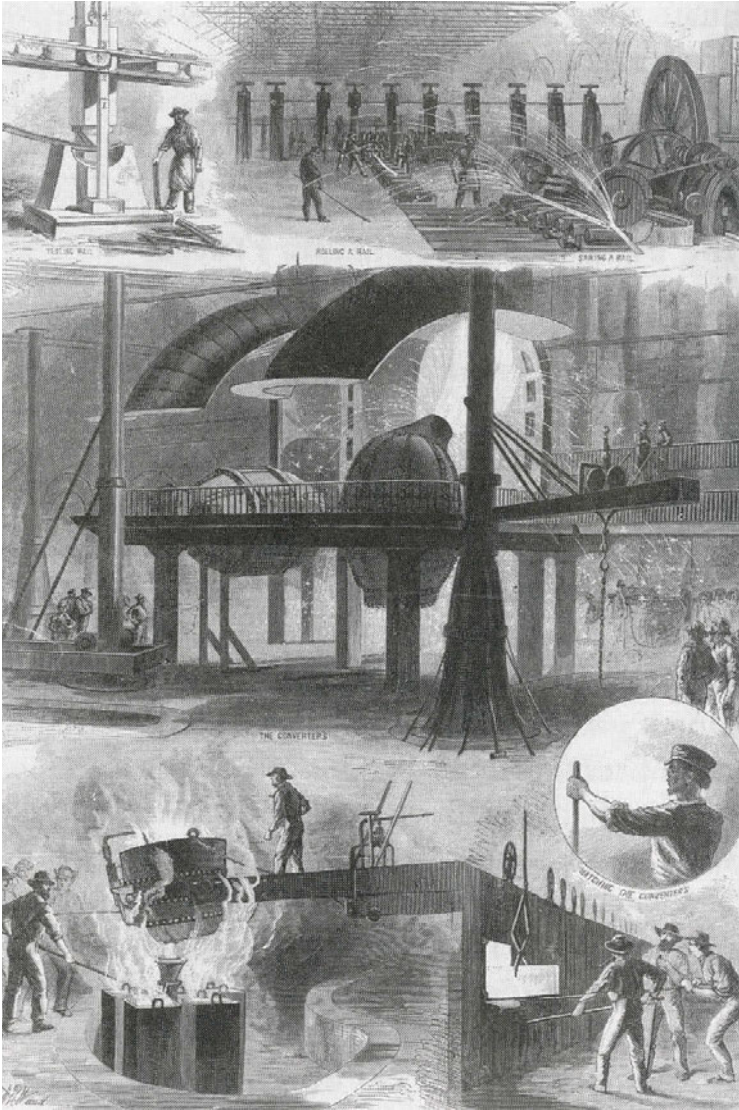


FIG. 43. THE FIRST FORM OF BESSEMER MOVABLE CONVERTER AND LADLE

Patent for the Bessemer Convertor



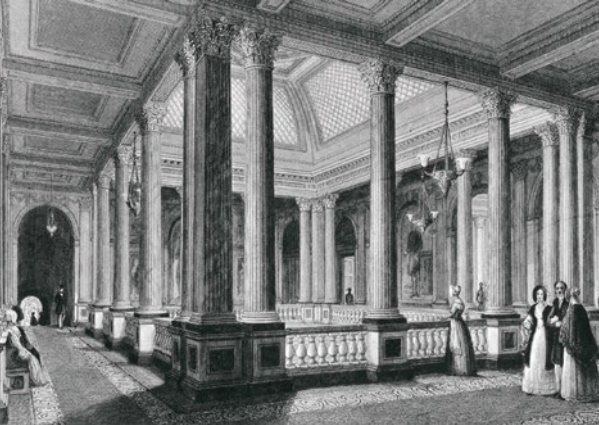
Sir Henry Bessemer



1856 Illustration of the Bessemer Process

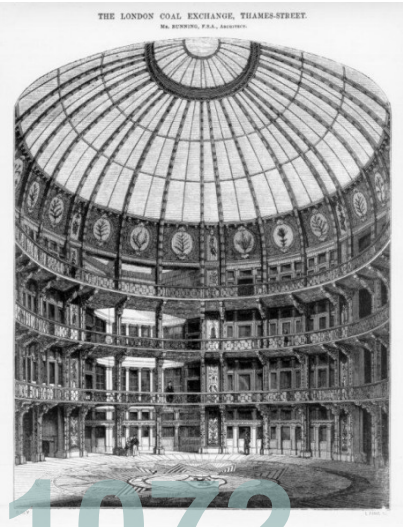
THE MODERN ATRIUM

Glass, iron and steel technologies during the Industrial Revolution spurred the birth of the modern atrium. After the first epoch of the atrium ended in Europe due to failures during fires, the vertical opening re-gained popularity during the end of the 19th century in Europe and the United States merging in the second major epoch.



1841 Reform Club, Sir Charles Barry

1846 London Coal Exchange, J.B. Bunning



1893 Bradbury Building, Wyman and Hunt



1887 National Building Museum (Formerly United States Pension Office)



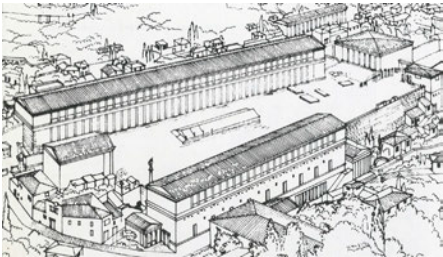
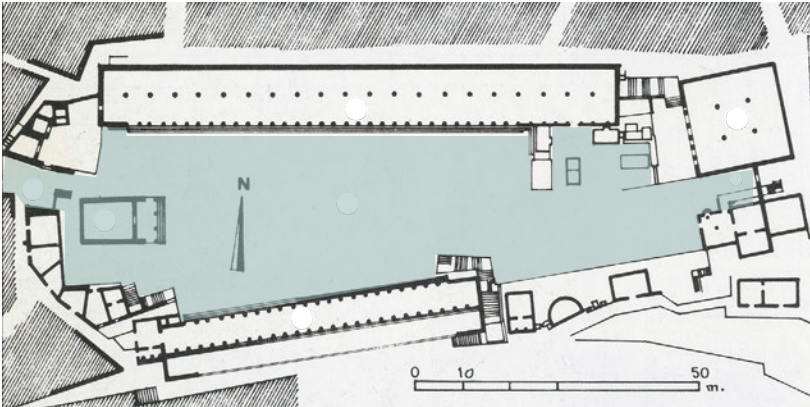
1903 Amsterdam Stock Exchange Hendrik Petrus



1920 Atelier Esders - Auguste Perret, Paris, France

THE ATRIUM AND CONSUMERISM

Trade and commerce, one of the earliest forms of communication between prehistoric humans has always been an important economic, cultural, and social activity during the evolution of mankind. In ancient Greece, the agora – which literally translates to “a gathering place” - was the central marketplace in the city-states for socializing and trade. The agora was a large court that set the precedent for vertical openings in the marketplace in many regions. After the development of glass and steel, the modern atrium developed the arcade typology and later became a central space within the indoor mall. Deeply rooted in the trading of commerce and customs, the atrium has played a pivotal role in the development of the marketplace from ancient Greece up to contemporary consumer culture.



Assos. Reconstruction and plan of stoa



1828 The Arcade, Providence, Rhode Island



1838 Le Bon Marche

"the arcade...developed and prospered during the course on nineteenth century in England, France, Italy, Germany, and America. Its invention was based on the specific needs of society during that century for a public space, protected from traffic and the weather, which would aid in the marketing of luxury goods being rapidly produced in industry."
(The New Atrium, Bednar, 1996)



1867 Galleria Vittorio Emanuele II



c. 1920 Le Bon Marche Extension

"Victor Gruen... introduced the benefits of the enclosed mall to the city centre..." (Atrium, Saxon, 1983)



1952 Southdale Mall



1979 Atlanta Apparel Mart

"This central space serves the dual role of providing orientation within the mammoth 1.2 million square foot apparel mart and of accommodating a 2000-seat fashion theatre. The tiered balconies which surround the atrium expand the viewing capacity to 5000 persons." (The New Atrium, Bednar, 1996)



Terminal 21 Bangkok

[NOTE TO EDITOR]
Section to be expanded

[CONTENT DECIDED BY EDITOR]

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WORKING IN THE ATRIUM

Larkin Administration Building
Designed by Frank Lloyd Wright, the Larkin Building used the atrium as the central work space. Motivational text was written on plate placed at the top of the atrium, with words such as: generosity, loyalty, integrity, and sacrifice...



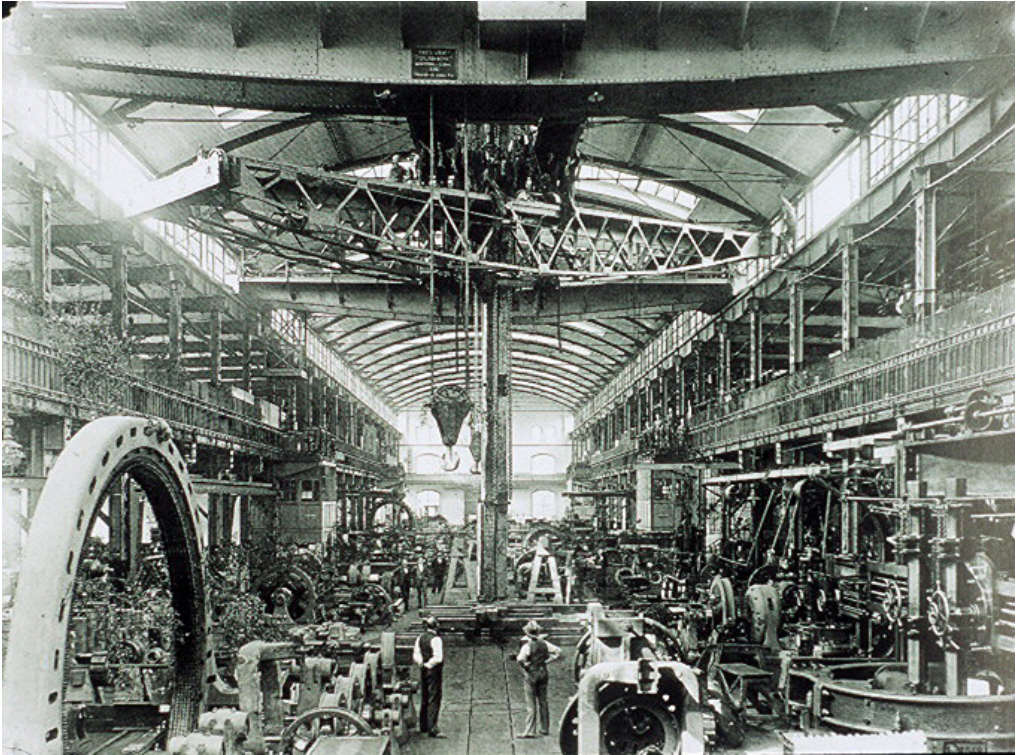
1906 Central work space in the Larkin Administration Building

AEG Turbine Factory
Built in 1909, Peter Behren's AEG Turbine Factory was an atrium building with a glass and steel roof to allow light into the main floor. The structure was placed on the edges of the building creating an open plan which allowed for the transportation of large machinery throughout the atrium space and construction floor.



1909 Peter Behrens Turbine Factory placed all structure of the building to the exterior to allow for an open atrium plan.

Interior of AEG Factory



Interior of AEG Factory

GATHERING IN THE GARAGE

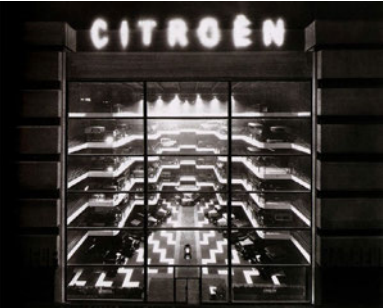
In the history of parking garages, the atrium has transitioned from an aesthetic characteristic to an element of utilitarian purpose. Treating the space like a display area by showing the cars off, the vertical openings brought light into the closed garages. Eventually the atrium evolved into an opening for the main shaft in automated parking structures...



1907 Garage Rue du Ponthieu, AG Perret



Atrium space of Garage Rue du Ponthieu



1928 Garage Marbeuf, Albert Laprade



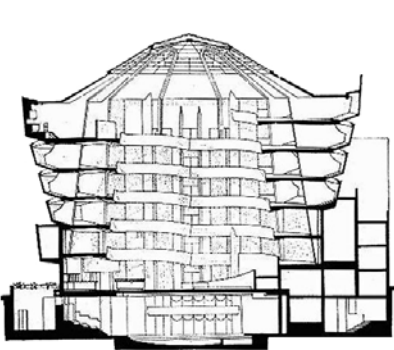
Atrium space of Garage Marbeuf



Automated Parking at the Baxter Street Garage in New York City, NY.

GUGGENHEIM MUSEUM
Frank Lloyd Wright, New York City, NY, 1959

One of the most recognizable atriums in the United States, and even the world, the famed Guggenheim Museum has a vertical opening that is a result of Frank Lloyd Wright's ambitions for the museum. Creating a continuous experience the ramp is a continuation of 5th avenue into building spiraling to the top level. The atrium a result of the

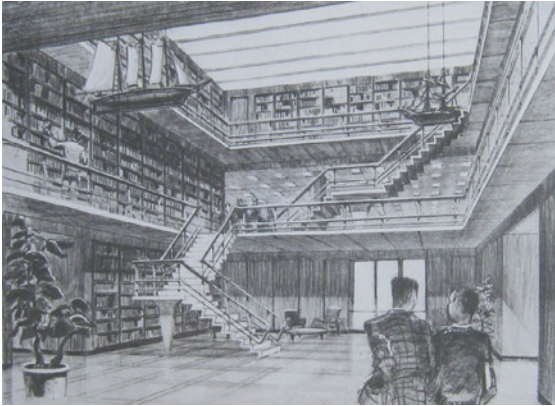


[NOTE TO EDITOR]
Page 88 of Ramp book should be repurposed to
atrium book as it speaks more to atrium than ramp.

PHILIPS EXETER ACADEMY LIBRARY

Louis Kahn, 1965-72
One of the most recognizable atriums in the United States, Louis Kahn's Exeter Library, almost never was. The original scheme for Exeter Library was designed by O'Connor and Kilham architects and featured a central atrium (known as the book court), before the project was turned over to Louis Kahn.

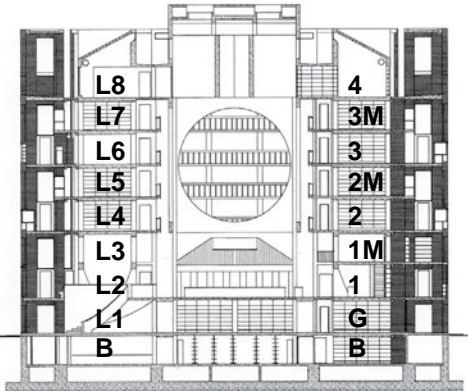
Although keeping it an atrium building, Kahn's design inserted itself into the zoning regulations and buildings codes and exploited the gaps in the codes. Under the constraint of a four-storey building, Exeter Library is an eight level building only possible by employing mezzanines within the mandated four complete stories. If designed under the current IBC the mezzanines would be considered complete floors as they are more than one third than the floor below. The result would be an eight level atrium forced to have smoke management controls.



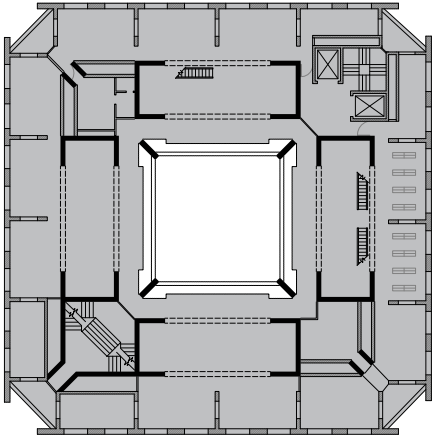
Original scheme O'Connor and Kilham Architects
"Seen from the outside through the glass façade, the Book Court draws students inside and efficiently uses the central space as an access to all main rooms and areas of the building."



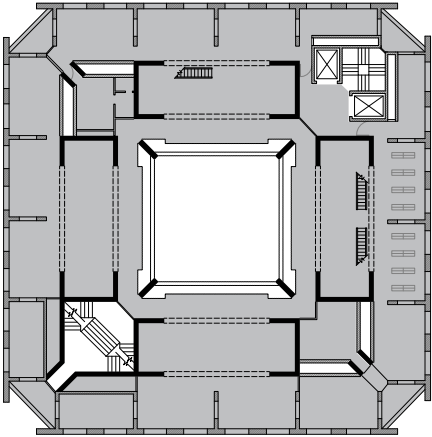
Exeter Library



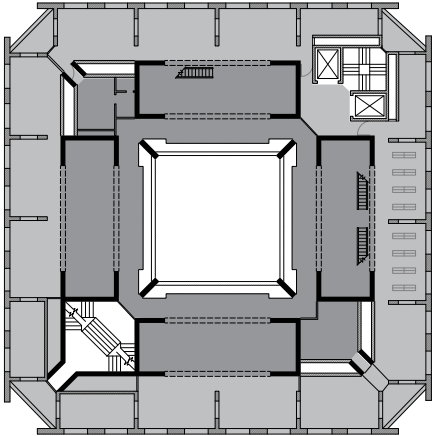
Exeter Library Section



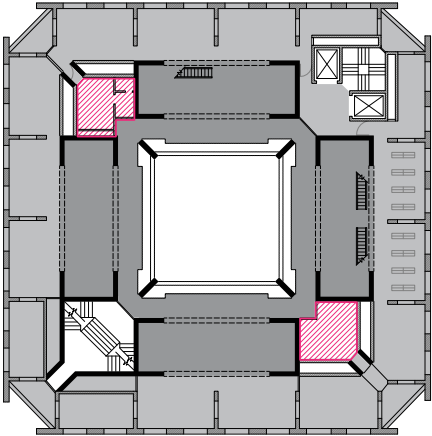
Floor Plate = 11930 SF
Atrium = 1515 SF
A1 = Floor Plate - Atrium
A1 = 10415 SF



Vertical Openings = 985 SF
A2 = A1 - Vertical Opening
A2 = 9430 SF



Mezzanine = 5472 SF
B1 = Mezzanine - Atrium
B1 = 3957 SF



Enclosures constitute as part of mezzanine as they are less than 10% of mezzanine area
Enclosed Mezzanine area = 195 SF x 2 = 390
390/3957 = .098 (9%)

Mezzanine / Floor Plate = M (must be <1/3)
3957SF / 9430 SF = 43%* > 1/3

* If enclosed Mezzanine areas were not considered portion of the mezzanine it would still be over 1/3 of floor plate

3957 - 390 = 3567 / 9430 = 38% > 1/3

PUBLIC ATRIUM AS INCENTIVE


In 1961, New York City amended a new Zoning Resolution that offered incentives for buildings to incorporate ground floor public spaces such as covered pedestrian spaces, retail malls, and through-block arcades. Within the indicated districts, the addition of the public amenities allowed for an increase in the maximum floor area of the adjoining building. The atrium, granted the same incentive as the plaza, became a public space that offered incentives to the building.



The Citicorp Center atrium is a public space that offered building height incentives.

CITY PLANNING COMMISSION • DEPARTMENT OF CITY PLANNING

THE CITY OF NEW YORK



**ZONING MAPS
and
RESOLUTION**

1961 NYC Zoning Resolution

COMMERCIAL DISTRICTS

Bulk Regulations

DISTRICTS							
C1	C2	C3	C4	C5	C6	C7	C8

Supplementary Regulations

33-13
Floor Area Bonus for a Plaza

33-131
Commercial buildings in certain specified Commercial Districts

In the districts indicated, for each square foot of plaza or portion of a plaza provided on a zoning lot, the total floor area permitted on that zoning lot under the provisions of Section 33-12 (Maximum Floor Area Ratio) for a commercial building may be increased as set forth in the following table:

FLOOR AREA BONUS	
Permitted additional floor area per square foot of plaza (in square feet)	
10	C5-2 C5-3 C6-4 C6-7
6	C4-7 C5-2 C5-4 C6-4
4	C6-1 C6-2 C6-3

33-132
Community facility buildings in C1 or C2 Districts with bulk governed by surrounding R9 or R10 District

In the districts indicated, when mapped within an R9 or R10 District, for each square foot of plaza or portion of a plaza provided on a zoning lot, the total floor area permitted on that zoning lot under the provisions of Section 33-12 (Maximum Floor Area Ratio) for a community facility building or a building used for both commercial and community facility uses, may be increased by six square feet.

C1-1 C1-2 C1-3 C1-4 C1-5 C1-6 C1-7 C1-8	C2-1 C2-2 C2-3 C2-4 C2-5 C2-6 C2-7 C2-8
--	--

33-133
Community facility buildings in certain other specified Commercial Districts

In the districts indicated, for each square foot of plaza or portion of a plaza provided on a zoning lot, the total floor area permitted on that zoning lot under the provisions of Section 33-12 (Maximum Floor Area Ratio) for a community facility building or a building used for both commercial and community facility uses may be increased as set forth in the following table:

FLOOR AREA BONUS	
Permitted additional floor area per square foot of plaza (in square feet)	
10	C5-3 C6-4 C6-7
6	C1-8 C1-9 C2-7 C2-8 C4-6 C4-7 C5-1 C5-2 C5-4 C5-5 C6-5
4	C6-1 C6-2

Italicized words are defined in Section 12-10.

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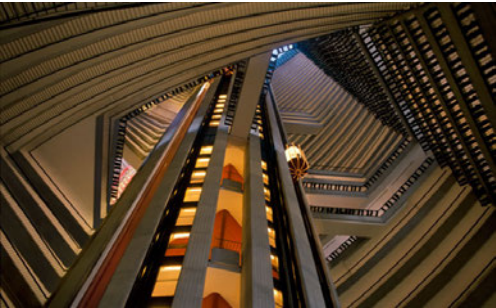
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**INCLUSION BY EXCLUSION
FOSTERING THE CULTURE OF CONGESTION**

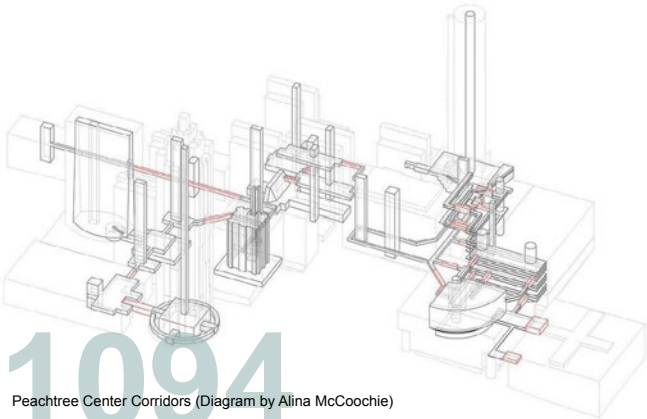
After constructing the revolutionary Hyatt Regency Atlanta in 1967, the later development of John Portman’s Peachtree Center came to represent the Modernist ideal as the object that “defines, excludes, and separates from the rest.” Amplifying the atrium proper’s origins as an element that separates one from the city, Portman’s atria situate the user inside the complex divorced from downtown Atlanta. Connecting multiple buildings throughout the seventeen-block Peachtree Center, above-ground pedestrian bridges allow the user to circulate through the atrium buildings without leaving the complex. Offering living spaces, stores, athletics clubs, and even consulates for multiple countries, Portman (also a developer), creates a corporations dream where the consumer never has the leave the complex. Using the complex’s buildings as context, pedestrian bridges as circulation, and elaborate atria for natural sunlight and social spaces, the Peachtree Center is truly a city within a city.



1967 Hyatt Regency Atlanta



1985 Marriot Marquis Atlanta



Peachtree Center Corridors (Diagram by Alina McCoochie)

“The glory and the undoing of the rebirth of the American city and the rebirth of the American downtown was Portman’s invention of the atrium.” (Atlanta, Koolhaas, 1996)

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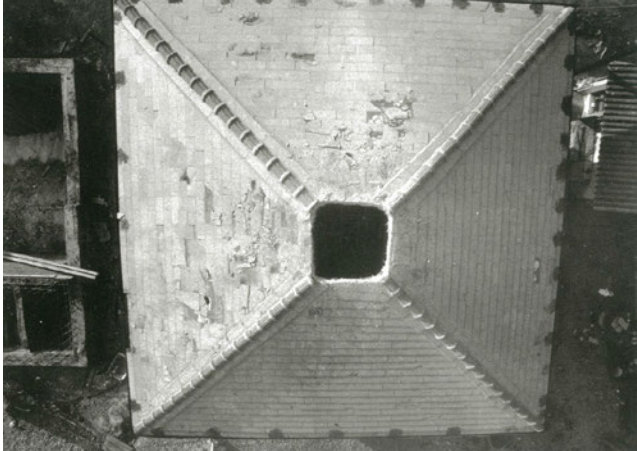
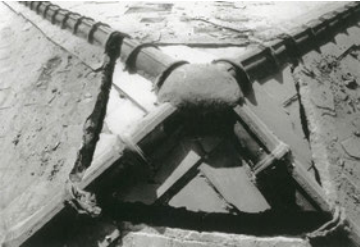
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[ESSAY ON ATRIUM - AUTHOR SELECTED BY EDITOR]

INFORMAL ATRIA
ANARCHITECTURE

After studying architecture at Cornell University, artist Gordon Matta-Clark became co-founder of the Anarchitecture Group in 1973. A play between anarchy and architecture, the group rebelled against the culture architecture glorified. Matta-Clark's more famous works dealing with architecture involved cutting a series of buildings in different ways – these cuts made a series of informal atria...



1973 A W-hole House, Roof Top Atrium
"What fascinated me was the interior central plan. The act of cutting through from one space to another produces a certain complexity involving depth perception. Aspects of stratification probably interest me more than the unexpected views which are generated by the removals – not the surface, but the thin edge, the severed surface that reveals the autobiographical process of its making." - Gordon Matta Clark



1977 Office Baroque



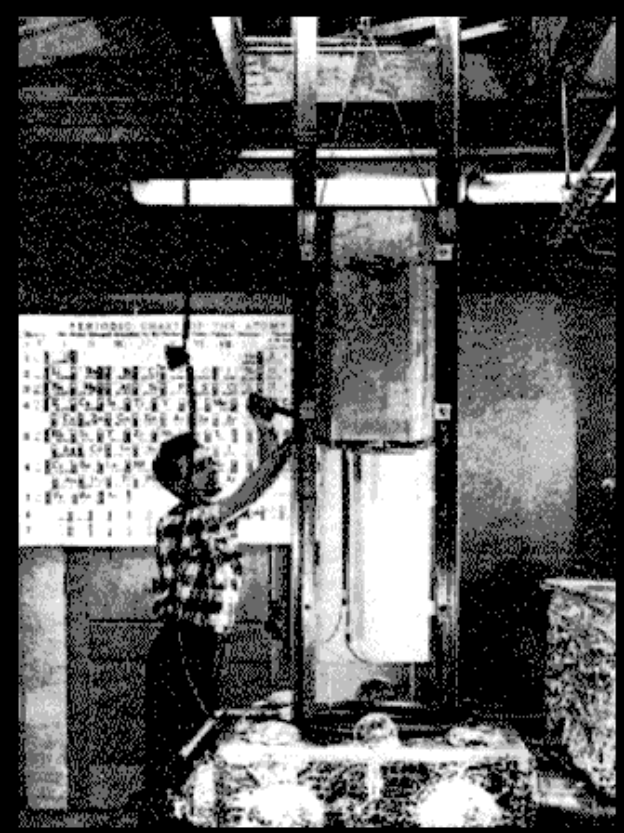
1974 Splitting



1975 Conical Intersect

PLYWOOD PALACE

Initially intended as a temporary structure, Building 20 on MIT's campus housed 20% of the world's physicists – including nine Nobel Peace Prize recipients. The building was a wooden structure allowing the scientists to transform and change the building at will. When constructing his atomic clock, Jerrold Zacharias cut a section of the floor above creating a vertical opening for more space above.



Jerrold Zacharias was able to construct his atomic by removing a section from the floor above.



MIT's Building 20
"It was a place that would be shaped by its occupants... It was not something to be imposed on them; it was what you'd call a malleable space" - Jerome V. Lettvin, professor of electrical engineering and bioengineering (MIT News, "Building 20 denizens say farewell to former home," April 1998)

TRAGEDY IN THE ATRIUM

On July 17, 1981, tragedy struck the Hyatt Regency in Kansas City, Missouri, during a party in the atrium. Connections supporting the ceiling rods on the suspended walkways in the atrium failed, collapsing fourth floor walkway on top of the second floor walkway and eventually the crowded ground level. The third floor walkway, offset onto the other side of the atrium remained intact. The structural failure is considered to be one of the worst in the United States resulting in 114 deaths and 200 injuries.



Before Collapse



After Collapse

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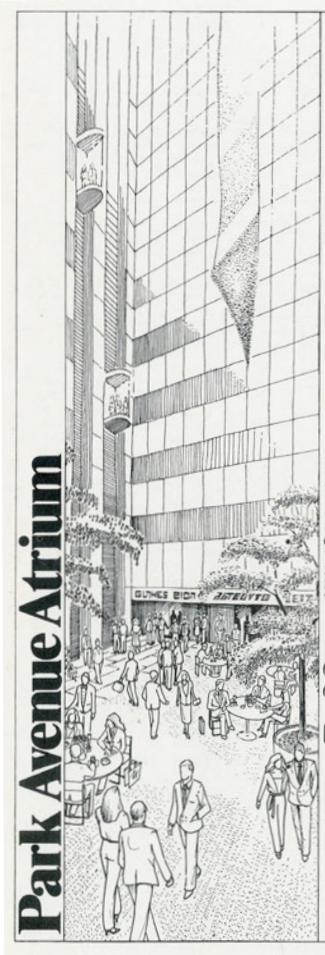
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THE ATRIUM AS COMMODITY

The modern atrium became a product for profit, a commodity sold to the user. On one hand, the atrium was used to sell the building to the user as a space of leisure and delight, while simultaneously being a space of advertisement. On the other, vertical openings began to appear in catalogues as a product one can buy.

Park Avenue Atrium



Located in the heart of the busy Grand Central Midtown Manhattan area on Prestigious Park Avenue and 46th Street, The Park Avenue Atrium offers retailers a splendid opportunity to take advantage of the most advanced concept in urban marketing... an indoor selling environment.

This magnificent retail selling space provides a readily accessible luxury shopping area for the thousands of business people in the immediate vicinity, and the entrances on Park and Lexington Avenues, East 45th and 46th Streets assure a continuous flow of buyer traffic.

Stores of 1000 to 4000 sq. ft. are available for June 1981 occupancy. For leasing information call or write Jack Feder, Sr. Vice President, Olympia and York Properties, 245 Park Avenue, New York, N.Y. 10017. Telephone 850-9600.

Park Avenue Atrium
OLYMPIA & YORK

Bednar, Michael J. The New Atrium. New York: McGraw-Hill, 1986. Print.



Tra Tieng Mall, Vietnam



INTRODUCING THE FIRST AMERICAN BUILDING TECHNIQUE TO AMERICAN BUILDINGS.

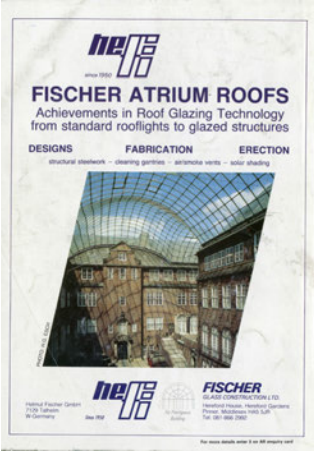


At the Pilkington Corporation, we know that a glass system is not just a window, but a statement.



Try it. One company knows how to earn yours for handling big, big queries the jobs fearlessly.

Similar to the importance of architecture in advertising to relate a product to luxury, the atrium was used in advertisements to sell products of delight.



FISCHER ATRIUM ROOFS
Achievements in Roof Glazing Technology from standard rooflights to glazed structures

DESIGNS FABRICATION ERECTION

Structural steelwork cladding systems aluminium windows solar shading

hete
Fischer Partner
Fischer Partner
Fischer Partner

FISCHER
Fischer Partner
Fischer Partner
Fischer Partner



Webster Avenue

Then . . . and Now

UNISTRUT Space Frame Systems GTE

The vertical opening became a product found in catalogues, selling buyers their own space back. Atrium roofs and mezzanines, allowed owners to transform spaces for year-round use or double their floor area.

On a smaller scale, the skylight - simulating an atrium - is sold to bring direct sunlight into the home from above.



DON'T MOVE OUT, MOVE UP!

DMD for your Complete Mezzanine Solution

MOVING CAN BE AN EXPENSIVE EXERCISE, NOT INCLUDING THE BUSINESS DOWN-TIME AND INCONVENIENCE!

MEZZANINE

From only **\$199*** Per m²

FREE STANDING STRUCTURE
MODULAR DESIGN
DOUBLE YOUR STORAGE SPACE!
SUPER FAST INSTALLATION
FREE SITE ANALYSIS

PERFECT FOR:
Extra Offices
Storage Rooms
Computer Rooms
Lunch Rooms
Staff Rooms
Secure Rooms
Change Rooms
Bathrooms

Get Organised & Create Space!

Australian Made
100% Australian



Glass Distinction

Available in a variety of sizes and shapes. Customise your design with the latest in glass technology. We can supply you with the latest in glass technology. We can supply you with the latest in glass technology. We can supply you with the latest in glass technology.

TURN A SHOPPING MALL INTO A CATHEDRAL.

UNISTRUT Space Frame Systems GTE



MODUSPAN



Like this? - No! Like that!



Like this? - No! Like that!

HISTORIC PRESERVATION

Historic preservation, as a movement, is fueled by an attempt to preserve buildings and the context in which they are situated. Rather than tearing down old buildings and putting up new ones, the goal is to be resourceful and respectful to sites of major importance. The atrium, as a tool for preservation, allows for adaptation of older buildings for new uses. Whether original or inserted later on, the atrium building typology allows for easy adaptation for a building's rejuvenation.

The atrium is a versatile tool that can be employed in multiple ways for the preservation of a building. Although the typology allows for smooth adaptive re-use through program changes, other strategies can be employed to give new life.



Louis Sullivan's Wainwright Building in Chicago was originally a courtyard building but later converted to an atrium after the addition of a glass roof. The move was part of a new scheme to change the circulation system and make the building more energy efficient.



The enclosed court with new walkways.



Metropolitan Museum of Art

Not strictly held to a single building, atrium roofs can be applied to connect a new building to an older one, sometimes creating larger complexes. On a small scale this strategy is used in the Metropolitan Museum in New York forming the Charles Englehard court. This sensitive strategy allows for the preservation of facades while connecting new ones, typically creating interesting juxtapositions.

The most radical approach is carving out large sections of the interior, which is usually an attempt to preserve the building's façade. Butler Square in Minneapolis had over a half million square feet removed throughout nine floors in order to bring light into the deep planned floor plates.



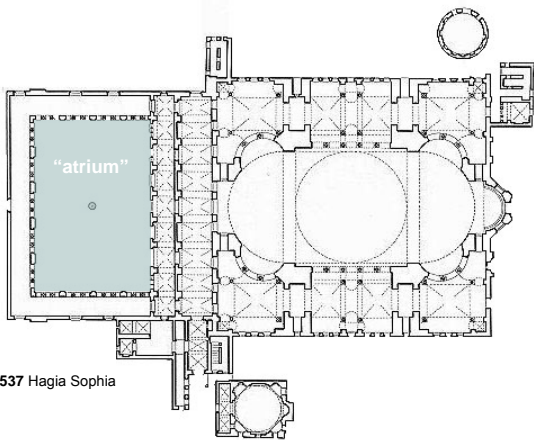
Butler Square Mall

Bednar, Michael J. The New Atrium. New York: McGraw-Hill, 1986. Print.

Saxon, Richard. Atrium Buildings: Development and Design. New York: Van Nostrand Reinhold, 1983. Print.

COURT OR ATRIUM?

As the atrium is the derivative of the court, naturally, the two have inherent similarities that make it difficult to distinguish the two. In fact, the term atrium was used to refer to open court in the front entrance of Christian Basilicas around the eleventh century. As both elements are central vertical openings in the building, the major differences lie in the circulation of the surrounding spaces and the roof. Both typically central spaces in the building, atria afford the ability to circulate the upper floors of the enclosed space while courts – typically lower spaces - tend to reserve the user to ground floor circulation.



537 Hagia Sophia

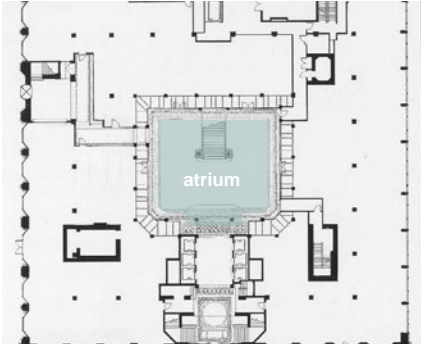
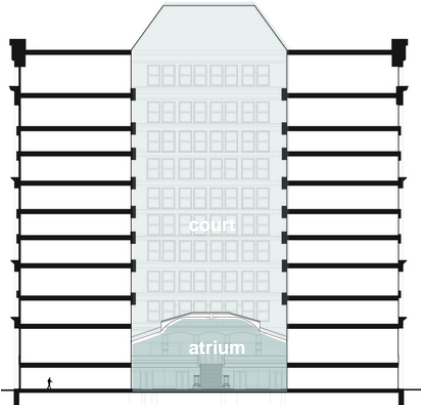


379 Basilica of Sant'Ambrogio

"The differences between a Roman atrium and a court (courtyard or cortile) are more difficult to determine. Court is a very general term which has been applied to many kinds of open-air spaces surrounded or defined by building elements. There exist courts in medieval castles, Italian palazzos, beaux arts government buildings, college dormitories, and houses from many parts of the world, including English manors...the distinction between a Roman atrium and a court is in the degree of relationship between this space and the surrounding rooms. Physical and visual access to a court from the surrounding rooms is restricted." (The New Atrium, Bednar)

COURT TO ATRIUM

The application of a glass roof onto a court creates a clear distinction of the space type. Earlier a court, the use of a roof forms an atrium with an interesting juxtaposition of old and new materials while covering the building's gathering space for year-round use.



1886 The Rookery Section (above) and floor plan



2000 British Museum Court (Norman Foster)

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ELEMENT OF FANTASY
Architecture and film have a symbiotic relationship as two disciplines with similar strategies and characteristics while simultaneously enabling each other. As directors such as Hitchcock and Kubrick have mastered spatial configurations to convey messages in their films — architects have used montaging techniques from film to set up a sequence of spaces within their buildings. Yet, no other genre in film benefits more from this relationship with architecture than science-fiction. Employed in the early sci-fi thriller *Things to Come*: Everytown USA — a movie that inspired John Portman — the atrium has played a pivotal role in film as a sublime space that represents infinity and power.

Things to Come
1936
Director H.G. Wells
Sci-Fi Thriller

Actors:
Raymond Massey
Edward Chapman
Ralph Richardson
Margaretta Scott



save our cities

Buckminster Fuller

1960 Buckminster Fuller's proposal to place a dome over Manhattan is the ultimate vertical opening as a gathering space.



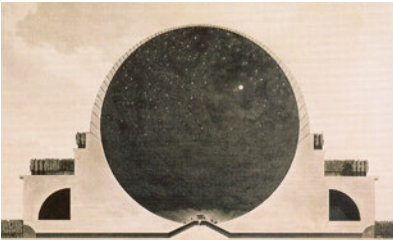
INFINITE SPACE

As buildings get taller, the atrium has become a space of sublimity. The main spaces in buildings, the seemingly infinite atria can be linked to the origins of the sublime.

In the 18th century, the introduction of the sublime as an aesthetic category in architecture challenged beauty - the only source for judgment – as a means of critiquing buildings. Represented through power, fear, vastness, repetition and infinity, the concept of the sublime was made popular by Edmund Burke's A Philosophical Enquiry into the Origins of our Ideas of the Sublime and the Beautiful. Burkes description of the sensation was based on nature and feelings in relation to the physical emotion imposed by buildings. Relating architecture to the aesthetic category of the sublime, Burke Claimed "...architecture affects us by the laws of nature..."

No other architect exemplified sublimity better than Étienne-Louis Boullée. The French architect created massive spaces (although lived only on paper) that were daunting on the human scale. The vast spaces used repetition as a means of exhibiting the buildings infiniteness. Although bounded due to necessity, Boullée's Cenotaph for Newton was a massive space enclosed by a single surface. The building is one large vertical opening that attempts to encompass the infinity of outer space. The Metropole is depicted in an atrium space for gathering with light gleaming in from above. Finally, the Royal Library, although has a vertical opening above to allow in light, more surreally depicts a contemporary atrium if one changes perspective of the back space as now top of the atrium.

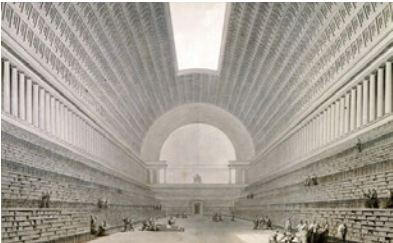
The contemporary atrium, displaying characteristics of sublimity similar to Boullée, have become large openings reaching to seemingly infinite universe. The atria, only allow one understand its depth through the diminishing perspective of the repetition of the buildings floors. First exemplified in Portman's Hyatt Regency Atlanta, sublime atria are typically highlighted with a glass roof allow the light into the space but in more dramatic results hiding the end of the building, tricking the user into its infinite depth.



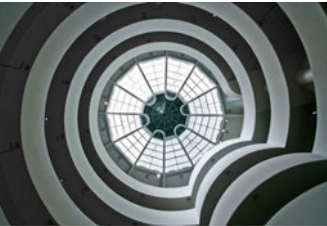
Cenotaph for Newton



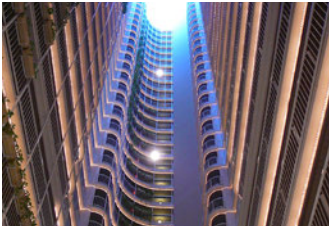
Metropole



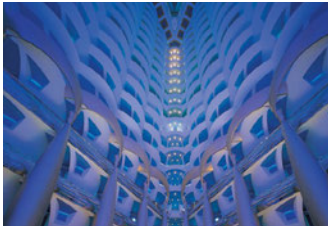
Royal Library



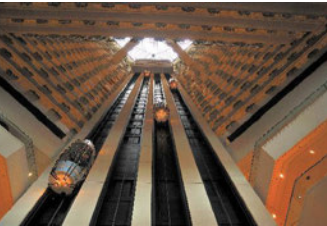
Guggenheim Museum



Doubletree Miami Hotel



Burj Al Arab



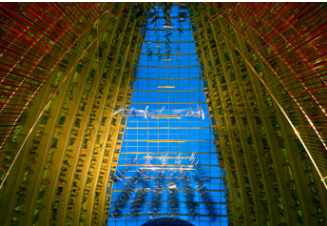
Suntrust Garden Offices



Hyatt Regency Atlanta



Shandong Hotel and People's Hall



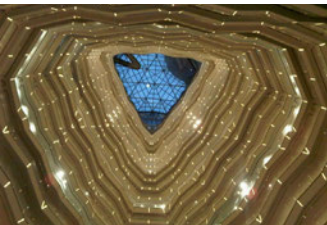
Marina Mandarin Hotel



Marshall Field Store



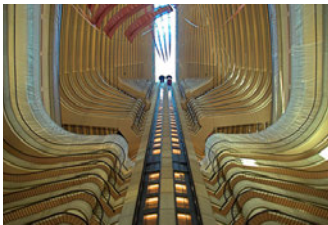
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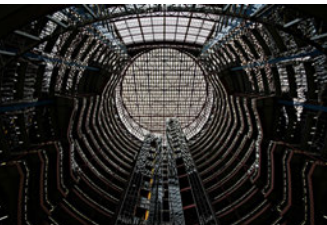
Four Seasons Guangzhou



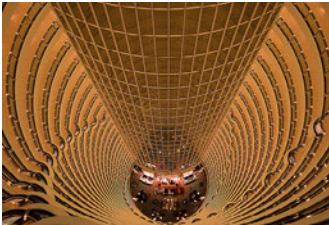
Lloyds of London



Marriot Marquis Atlanta



State of Illinois Center



Jin Mao Tower



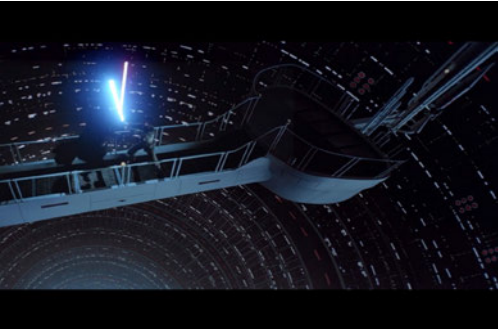
Marriot Marquis NYC

TWIST IN THE CORE

Architecture and film have a symbiotic relationship as two disciplines with similar strategies and characteristics while simultaneously enabling each other. As directors such as Hitchcock and Kubrick have mastered spatial configurations to convey messages in their films – architects have used montaging techniques from film to set up a sequence of spaces within their buildings. Yet, no other genre in film benefits more from this relationship with architecture than science-fiction. Employed in the early sci-fi thriller Things to Come: Everytown USA – a movie that inspired John Portman – the atrium has played a pivotal role in film as a sublime space that represents infinity and power.

The vertical opening was present at one of the most memorable moments in movie history. Echoed through multiple generations, Darth Vader's famous words "I am your father" to the vulnerable Luke Skywalker were uttered within the sublime core of Cloud City. Taking everyone by surprise, the moment transformed the movies series and solidified the atrium as an important element of fantasy within sci-fi movies...

Star Wars: Episode V - The Empire Strikes Back



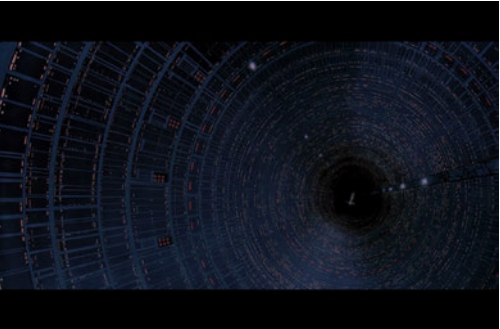
1:50:04 Darth Vader and Luke Skywalker engage in a light saber fight within the core of Cloud City.



1:51:18 After Darth Vader cuts off Skywalkers hand, he attempts to convert him to the Dark Side. Telling Skywalker that they can control the galaxy, he reveals to Skywalker the fate of his father. Skywalker, thinking his father was killed by Darth Vader, was surprised when Vader uttered the famous words..."I am your father."



1:51:32 Skywalker, skeptical of Vader, looks down into the seemingly infinite vertical opening in the Cloud City core.



1:52:18 After Vader's persistence to join the Dark Side, Luke jumps.

RE-INTRODUCTION OF NATURE

Caves, water and fire were the original gathering areas for the pre-historic man. As the use of natural landscapes in courtyards and atria date as early as the vertical openings themselves, man attempts to recreate the earliest cave dwellings, by placing natural landscapes inside the building's social space...



Man-made river flows through the atrium of the Hyatt Regency San Antonio. (Architects: Thompson, Ventulett,



Peachtree Plaza Hotel Atrium (Architect: John



1976 Westin Bonaventure Hotel (John Portman and Associates)



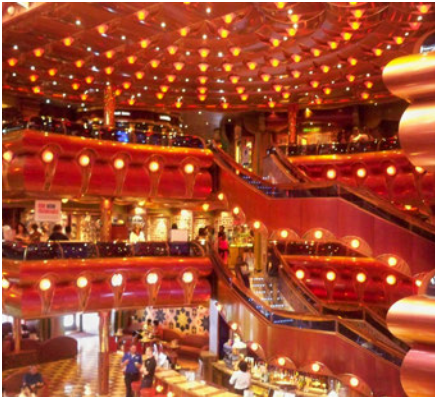
1978 John Deere Headquarters - Roche and Dinkeloo
"Deere West has a more airy, spacious, garden...
It is by far the most ambitious atrium garden yet
attempted and uses a wide range of plant material to
give contrast of texture, color, and scale..."

[NOTE TO EDITOR]
Section to be expanded

ATRIA ON THE WATER
Not held to static buildings, the atrium is employed in the cruise ship as a central gathering space. Driven by consumer culture, Cruise ships adorn the atria – typically programmed as casinos or bars – to stimulate money spending.



Carnival Conquest



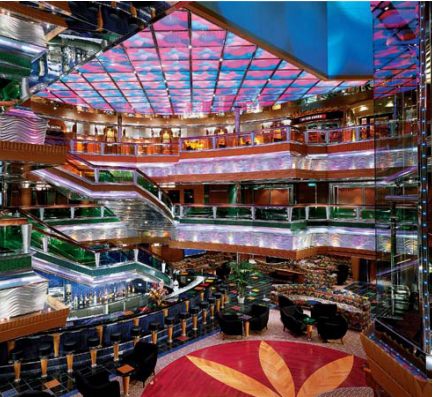
Carnival Freedom



Carnival Magic



Carnival Miracle



Carnival Glory



Carnival Liberty



Carnival Triumph



Carnival Victory

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ASSEMBLY IN THE ATRIUM

Originally known as the Vertical Assembly Building, the VAB is located in the Kennedy Space Center in Brevard County, Florida. Built in 1966 to accommodate the Saturn V rocket for the Apollo program, the entire building is a vertical opening 526 feet tall to accommodate the construction of spacecrafts.



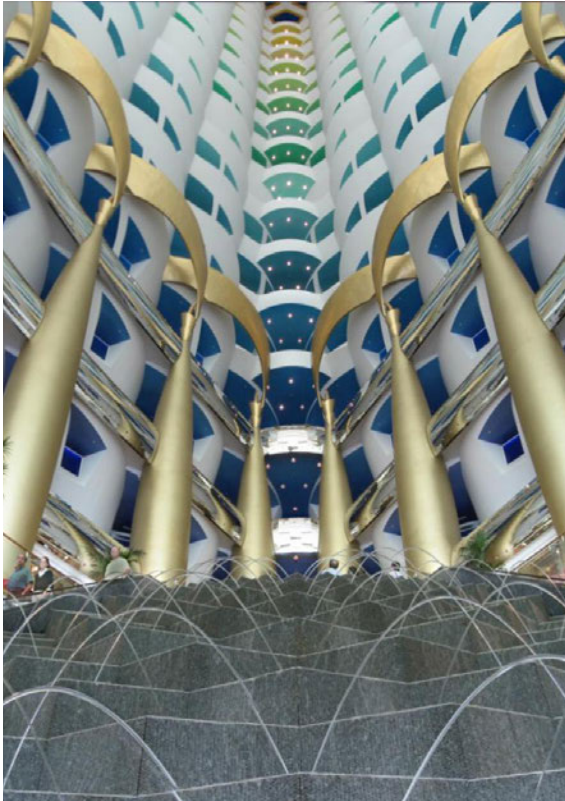
NASA Vehicle Assembly Building



The assembly building is a vertical opening that houses the construction of space crafts.

(UN)OCCUPIABLE VOID

The only “7-Star” hotel in the world, the Burj Al Arab is a result of the economic surge in Dubai. The third tallest hotel in the world, 39% of the Burj is unoccupiable, due to the “worlds tallest atrium” at 590 feet.



1997 Burj Al Arab is considered to have the “world’s tallest atrium”

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POLITICIANS AND THE PEOPLE

Designed by Norman Foster, the Reichstag dome is a public space above the chamber of the Bundestag (German Parliament). Intended to symbolize people over the government, the vertical opening creates a visual connection between the parliament and the people, reminding the parliament who they work for...



1999 Reichstag Dome



Parliament Chamber

POLITICIANS AND PRISONERS

Within each of their respective buildings both politicians and prisoners use vertical openings as a means of gathering - whether in an assembly room or in a yard...



UN Assembly Building



2007 Prisoners in the Phillipines CPDRC correctional facility re-enacting Michael Jackson's Thriller in the prison courtyard.

OPERATION RED DAWN

When Saddam Hussein was captured in December 2003, he was found in a one-man “spide hole.” A vertical opening below ground leading to a space only large enough for him to lay in. More importantly, a smaller opening - similar to primitive atria - was constructed to allow light and air from above ground.

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2003 Entrance of Spider Hole Saddam was found in

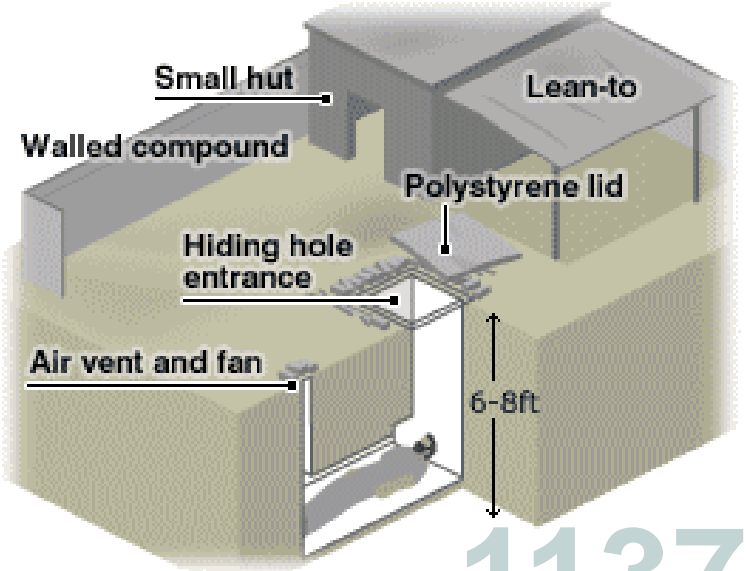


Diagram of Saddam Hussein's spider hole

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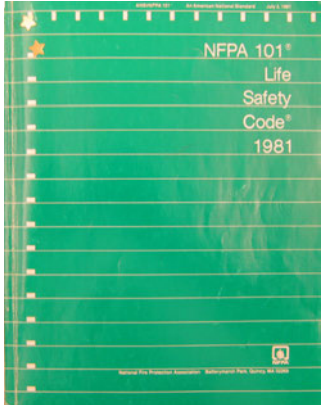
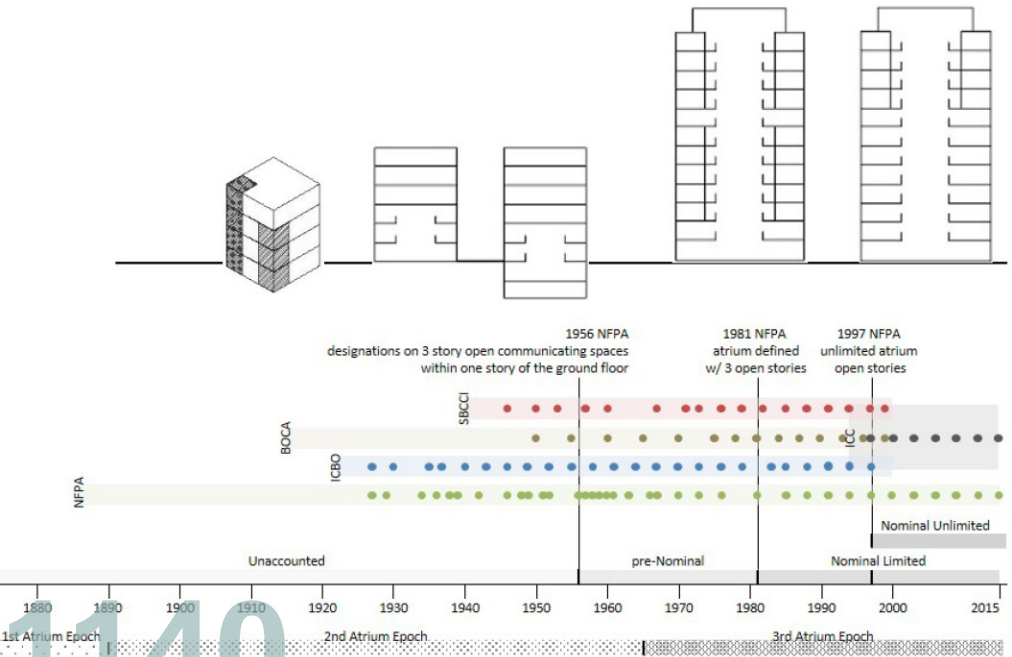
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ENTERING THE CODE

The atrium finally entered the NFPA Life Safety Code and BOCA in 1981, only as a response to the tragic fire in vertical openings. Early on, the atrium proved difficult to define because there was little precedent in modern construction at the time. Simply considered a “vertical opening” or “open well” in early codes, the 2015 International Building Code defines the atrium as “an opening connecting two or more stories other than enclosed stairways, elevators, hoistways, escalators, plumbing, electrical, air-conditioning or other equipment, which is closed at the top and not defined as a mall.” Yet, Section 404 of the IBC, directs the reader to eight other sections (2110, 707, 711, 712, 903, 907, 909, and 1016) in attempt to define what an atrium is or is not. As one enters these secondary sections, they are lead to more sections in attempt to detail the atrium. Sending the user through a network of definitions to 2015 code still has difficulty in defining the atrium. Although typically thought to be clear laws, building codes are written in general terms and read through subjective interpretations allowing one to insert themselves into the code...



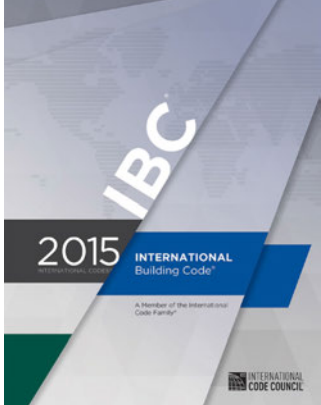
In 1980, a fire broke out in the MGM Grand in Las Vegas and killed 85 people due to smoke inhalation



"Present codes relating to the treatment of atrium space lack an extensive history and/or background and should be looked to as the best interim solution presently available to the designer."

(The New Atrium, Bednar, 1986)

Atrium. A floor opening or series of floor openings connecting two or more stories that is covered at the top of the series of openings and is used for purposes other than an enclosed stairway; elevator hoistway; or utility shaft used for plumbing, electrical, air conditioning, or communication facilities.



"Whether by definition, exception or clever evasion, the atrium presents an interesting series of holes in the fabric of the modern construction era's US building code history. This is little surprise, perhaps, in that atria are as old and culturally significant the world over as building construction itself."

(Atrium (W)holes in the Code, Svetz, 2015)

ATRIUM. An opening connecting two or more *stories* other than enclosed *stairways*, elevators, hoistways, escalators, plumbing, electrical, air-conditioning or other equipment, which is closed at the top and not defined as a mall. *Stories*, as used in this definition, do not include balconies within assembly groups or *mezzanines* that comply with Section 505.

ENTERING THE NETWORK

SPECIAL DETAILED REQUIREMENTS BASED ON USE AND OCCUPANCY

locked from the *stairway* side shall be capable of being unlocked simultaneously without unlatching upon a signal from the *fire command center*.

403.5.3.1 Stairway communication system. A telephone or other two-way communications system connected to an *approved constantly attended station* shall be provided at not less than every fifth floor in each *stairway* where the doors to the *stairway* are locked.

403.5.4 Smokeproof enclosures. Every required *interior exit stairway* serving floors more than 75 feet (22 860 mm) above the lowest level of fire department vehicle access shall be a *smokeproof enclosure* in accordance with Sections 909.20 and 1023.10.

403.5.5 Luminous egress path markings. Luminous egress path markings shall be provided in accordance with Section 1025.

403.5.6 Emergency escape and rescue. Emergency escape and rescue openings specified in Section 1030 are not required.

403.6 Elevators. Elevator installation and operation in *high-rise buildings* shall comply with Chapter 30 and Sections 403.6.1 and 403.6.2.

403.6.1 Fire service access elevator. In buildings with an occupied floor more than 120 feet (36 576 mm) above the lowest level of fire department vehicle access, no fewer than two fire service access elevators, or all elevators, whichever is less, shall be provided in accordance with Section 3007. Each fire service access elevator shall have a capacity of not less than 3,500 pounds (1588 kg) and shall comply with Section 3002.4.

403.6.2 Occupant evacuation elevators. Where installed in accordance with Section 3008, passenger elevators for general public use shall be permitted to be used for occupant self-evacuation.

SECTION 404
ATRIUMS

404.1 General. In other than Group H occupancies, and where permitted by Section 712.1.7, the provisions of Sections 404.1 through 404.10 shall apply to buildings or structures containing vertical openings defined as "Atriums."

404.1.1 Definition. The following term is defined in Chapter 2:

ATRIUM.

404.2 Use. The floor of the *atrium* shall not be used for other than low fire hazard uses and only *approved* materials and decorations in accordance with the *International Fire Code* shall be used in the *atrium* space.

Exception: The *atrium* floor area is permitted to be used for any *approved* use where the individual space is provided with an *automatic sprinkler system* in accordance with Section 903.3.1.1.

[F] 404.3 Automatic sprinkler protection. An *approved automatic sprinkler system* shall be installed throughout the entire building.

Exceptions:

1. That area of a building adjacent to or above the *atrium* need not be sprinklered provided that portion of the building is separated from the *atrium* portion by not less than 2-hour *fire barriers* constructed in accordance with Section 707 or *horizontal assemblies* constructed in accordance with Section 711, or both.
2. Where the ceiling of the *atrium* is more than 55 feet (16 764 mm) above the floor, sprinkler protection at the ceiling of the *atrium* is not required.

[F] 404.4 Fire alarm system. A *fire alarm system* shall be provided in accordance with Section 907.2.14.

404.5 Smoke control. A smoke control system shall be installed in accordance with Section 909.

Exception: In other than Group I-2, and Group I-1, Condition 2, smoke control is not required for *atriums* that connect only two *stories*.

404.6 Enclosure of atriums. *Atrium* spaces shall be separated from adjacent spaces by a 1-hour *fire barrier* constructed in accordance with Section 707 or a *horizontal assembly* constructed in accordance with Section 711, or both.

Exceptions:

1. A *fire barrier* is not required where a glass wall forming a smoke partition is provided. The glass wall shall comply with all of the following:
 - 1.1. Automatic sprinklers are provided along both sides of the separation wall and doors, or on the room side only if there is not a walkway on the *atrium* side. The sprinklers shall be located between 4 inches and 12 inches (102 mm and 305 mm) away from the glass and at intervals along the glass not greater than 6 feet (1829 mm). The sprinkler system shall be designed so that the entire surface of the glass is wet upon activation of the sprinkler system without obstruction;
 - 1.2. The glass wall shall be installed in a gasketed frame in a manner that the framing system deflects without breaking (loading) the glass before the sprinkler system operates; and
 - 1.3. Where glass doors are provided in the glass wall, they shall be either *self-closing* or *automatic-closing*.
2. A *fire barrier* is not required where a glass-block wall assembly complying with Section 2110 and having a $\frac{1}{2}$ -hour *fire protection rating* is provided.
3. A *fire barrier* is not required between the *atrium* and the adjoining spaces of any three floors of the *atrium*

provided such spaces are accounted for in the design of the smoke control system.

[F] 404.7 Standby power. Equipment required to provide smoke control shall be provided with standby power in accordance with Section 909.11.

404.8 Interior finish. The *interior finish* of walls and ceilings of the *atrium* shall be not less than Class B with no reduction in class for sprinkler protection.

404.9 Exit access travel distance. *Exit access* travel distance for areas open to an *atrium* shall comply with the requirements of this section.

404.9.1 Egress not through the atrium. Where required access to the *exits* is not through the *atrium*, *exit access* travel distance shall comply with Section 1017.

404.9.2 Exit access travel distance at the level of exit discharge. Where the path of egress travel is through an *atrium* space, *exit access* travel distance at the level of *exit discharge* shall be determined in accordance with Section 1017.

404.9.3 Exit access travel distance at other than the level of exit discharge. Where the path of egress travel is not at the level of *exit discharge* from the *atrium*, that portion of the total permitted *exit access* travel distance that occurs within the *atrium* shall be not greater than 200 feet (60 960 mm).

404.10 Interior exit stairways. A maximum of 50 percent of *interior exit stairways* are permitted to egress through an *atrium* on the level of *exit discharge* in accordance with Section 1028.

SECTION 405
UNDERGROUND BUILDINGS

405.1 General. The provisions of Sections 405.2 through 405.9 apply to building spaces having a floor level used for human occupancy more than 30 feet (9144 mm) below the finished floor of the lowest level of *exit discharge*.

Exceptions: The provisions of Section 405 are not applicable to the following buildings or portions of buildings:

1. One- and two-family *dwellings*, sprinklered in accordance with Section 903.3.1.3.
2. Parking garages provided with *automatic sprinkler systems* in compliance with Section 405.3.
3. Fixed guideway transit systems.
4. *Grandstands*, *bleachers*, stadiums, arenas and similar facilities.
5. Where the lowest *story* is the only *story* that would qualify the building as an underground building and has an area not greater than 1,500 square feet (139 m²) and has an *occupant load* less than 10.
6. Pumping stations and other similar mechanical spaces intended only for limited periodic use by service or maintenance personnel.

405.2 Construction requirements. The underground portion of the building shall be of Type I construction.

SPECIAL DETAILED REQUIREMENTS BASED ON USE AND OCCUPANCY

[F] 405.3 Automatic sprinkler system. The highest level of *exit discharge* serving the underground portions of the building and all levels below shall be equipped with an *automatic sprinkler system* installed in accordance with Section 903.3.1.1. Water-flow switches and control valves shall be supervised in accordance with Section 903.4.

405.4 Compartmentation. Compartmentation shall be in accordance with Sections 405.4.1 through 405.4.3.

405.4.1 Number of compartments. A building having a floor level more than 60 feet (18 288 mm) below the finished floor of the lowest level of *exit discharge* shall be divided into no fewer than two compartments of approximately equal size. Such compartmentation shall extend through the highest level of *exit discharge* serving the underground portions of the building and all levels below.

Exception: The lowest *story* need not be compartmented where the area is not greater than 1,500 square feet (139 m²) and has an *occupant load* of less than 10.

405.4.2 Smoke barrier penetration. The compartments shall be separated from each other by a *smoke barrier* in accordance with Section 709. Penetrations between the two compartments shall be limited to plumbing and electrical piping and conduit that are firestopped in accordance with Section 714. Doorways shall be protected by *fire door assemblies* that are automatic-closing by smoke detection in accordance with Section 716.5.9.3 and are installed in accordance with NFPA 105 and Section 716.5.3. Where provided, each compartment shall have an air supply and an exhaust system independent of the other compartments.

405.4.3 Elevators. Where elevators are provided, each compartment shall have direct access to an elevator. Where an elevator serves more than one compartment, an elevator lobby shall be provided and shall be separated from each compartment by a *smoke barrier* in accordance with Section 709. Doors shall be gasketed, have a drop sill and be automatic-closing by smoke detection in accordance with Section 716.5.9.3.

405.5 Smoke control system. A smoke control system shall be provided in accordance with Sections 405.5.1 and 405.5.2.

405.5.1 Control system. A smoke control system is required to control the migration of products of combustion in accordance with Section 909 and the provisions of this section. Smoke control shall restrict movement of smoke to the general area of fire origin and maintain *means of egress* in a usable condition.

405.5.2 Compartment smoke control system. Where compartmentation is required, each compartment shall have an independent smoke control system. The system shall be automatically activated and capable of manual operation in accordance with Sections 907.2.18 and 907.2.19.

[F] 405.6 Fire alarm systems. A *fire alarm system* shall be provided where required by Sections 907.2.18 and 907.2.19.

405.7 Means of egress. *Means of egress* shall be in accordance with Sections 405.7.1 and 405.7.2.

Paranoid Critical Atria

Although typically thought to be clear laws, building codes are written in general terms and read through interpretations allowing one to insert their subjective thought. Koolhaas, using Dali’s Paranoid Critical Method, leverages these gaps in the code to interpret the atrium to his agenda. Taking advantage of the inability to clearly define the atrium, Koolhaas employs Dali’s Paranoid Critical Method to transform the introverted element to a vertical opening that creates a dialog between the building and urban environment. The reinvention of the atrium derives from Koolhaas’s critical view of the element for its anti-urban characteristics that foster a culture of congestion, best exemplified in the Portman typology.

Through the use of elaborate atria, John Portman’s Peachtree Center represents the Modernist ideal as objects in space that “defines, excludes, and separates from the rest (Fig.1).”¹ Amplifying the atrium proper’s origins as an element that separates one from the city, Portman’s atria situate the user inside the complex divorced from downtown Atlanta. Connecting multiple buildings throughout the seventeen-block Peachtree Center, above-ground pedestrian bridges allow the user to circulate through the atrium buildings without leaving the complex. Offering living spaces, stores, athletics clubs, and even consulates for multiple countries, Portman (also a developer), creates a corporative dream where the consumer never has the leave the complex. Using the complex’s buildings as context, pedestrian bridges as circulation, and elaborate atria for natural sunlight and social spaces, the Peachtree Center is truly a city within a city.

While under the restriction of Building Code - a limitation Portman was not under - Koolhaas, uses the Paranoid Critical Method to engage the constraint, allowing him to loosely interpret the code for his atrium designs (Fig.2).

Seattle Central Library has a formal atrium that spans eleven floors, but the whole building can be considered one large vertical opening in a diagrid shell. The formal atrium is documented as a vertical penetration through the book spiral and offices, yet as the mixing chamber and reading area are unenclosed, they are open and part of the atrium (Fig.3). As the book-stacks are technically the only complete multi-story program in the building, the application of roll gates in the auditorium, 2nd, and 9th floors invalidate the levels transforming into mezzanines. As the “living room” is an extension of 5th avenue into the building, Seattle Central Library’s Paranoid Critical Atrium is a vertical opening that suspends the program in the urban context.

Fig. 1 - Portman’s Marquis Marriot in the Peachtree Center in Downtown Atlanta.

1 Koolhaas did not direct quote toward Peachtree Center



In Milstein Hall, a mezzanine supplemented by a vertical opening above, creates a condition that simulates an atrium - although not acknowledged by code as such. Acting as an extension of the sidewalk into the building, the mezzanine penetrates the dome - that encloses the basement - and connects to the studio level above through a vertical opening in the floor (Fig.4). According to section 404.5 of the International Building Code, any vertical opening that penetrates more than two floors must comply with smoke control systems in section 909. Yet, as the mezzanine is less than one-third of the building floor plate, it is considered a partial floor that belongs to the basement level below.¹ Creating a seamless connection from the exterior of the building to the studio level and basement below, the mezzanine and vertical opening in Milstein Hall create a formally interesting pseudo-atrium while simultaneously allowing the space to evade smoke management.

Seen at its most surreal in larger projects, Koolhaas's formal massing of the building results in an atrium on the exterior of the building. As Section 202 in the International Building Code defines the atrium as "an opening connecting two or more stories...which is closed at the top and not defined as a mall," Koolhaas's use of the Paranoid Critical Method reveals that the definition does not distinguish the atrium as a strictly interior element. Reversing the Portman typology, the Paranoid Critical Atrium is a vertical opening that situates the building's program in the urban realm (Fig.5).

Challenging the vertical perception of the skyscraper, CCTV is modeled to have a massive cantilever that forms an urban atrium (Fig.6). The cantilever, using the green space below as a living room, acts as the enclosure at the top of the atrium, forming a vertical opening that orients the program on the exterior. Standing below, one can perceive the sublimity of CCTV's Paranoid Critical Atrium similar to that of Portman's - except in the urban realm. Highlighting the voyeuristic characteristics of the atrium, circular glass plates are placed on the lowest level of the cantilever, allowing one to look below as they would in a conventional vertical opening. Although the interior atrium in CCTV is significant as a large lobby space, the Paranoid Critical Atrium is a direct result of the buildings ambitions of challenging the verticality of skyscrapers while fulfilling Koolhaas's goal of erasing the distinction between interior and exterior.

Designed in 2002, Koningin Julianaplein, and the World Trade Center are two

2 If more than one-third of the floor plate the mezzanine would be considered a complete story and would require smoke management in the space

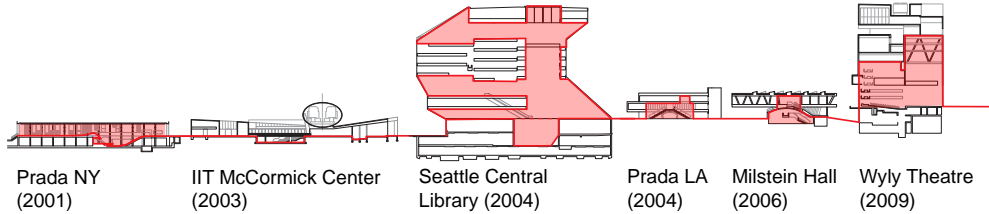


Fig. 2 - Koolhaas' distorted atria range in typology and scale

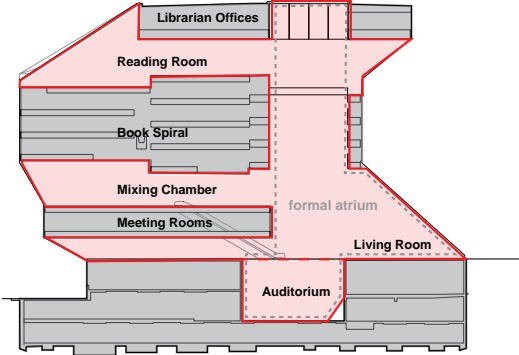


Fig. 3- Seattle Central Library has a formal atrium (gray dash) that spans eleven floors but the whole building can be viewed as an atrium (red).



Fig. 4 - Milstein hall has a pseudo-atrium created by a mezzanine and vertical penetration.

unbuilt projects that have similar formal massings that result in vertical openings that allow the public to circulate freely through the buildings. Resting on three legs, both buildings form high vertical spaces with public plazas on the ground floor. The exterior atria, serve as main corridors in the city, transforming the private buildings into public infrastructures.

One of Koolhaas's most recent projects, the Axel Springer Headquarter building, is bisected by a diagonal atrium that is projected toward the Springer campus. Generating a series of terraced floors that serve as an informal stage for collaboration, the Paranoid Critical Atrium houses the program that shift from open to enclosed leaving the “interior” of the building exposed to the urban realm. Open toward the campus, the open atrium is the main circulation route into the building - as an extension of the buildings context.

Koolhaas's clever revision of the atrium is seen as an extreme use of the Paranoid Critical Method on building code in order to free himself from conventional thought of an introverted element. A reversal of the origins of the atrium and Portman, the Paranoid Critical Atrium seeks to create a connection between the building and the city.

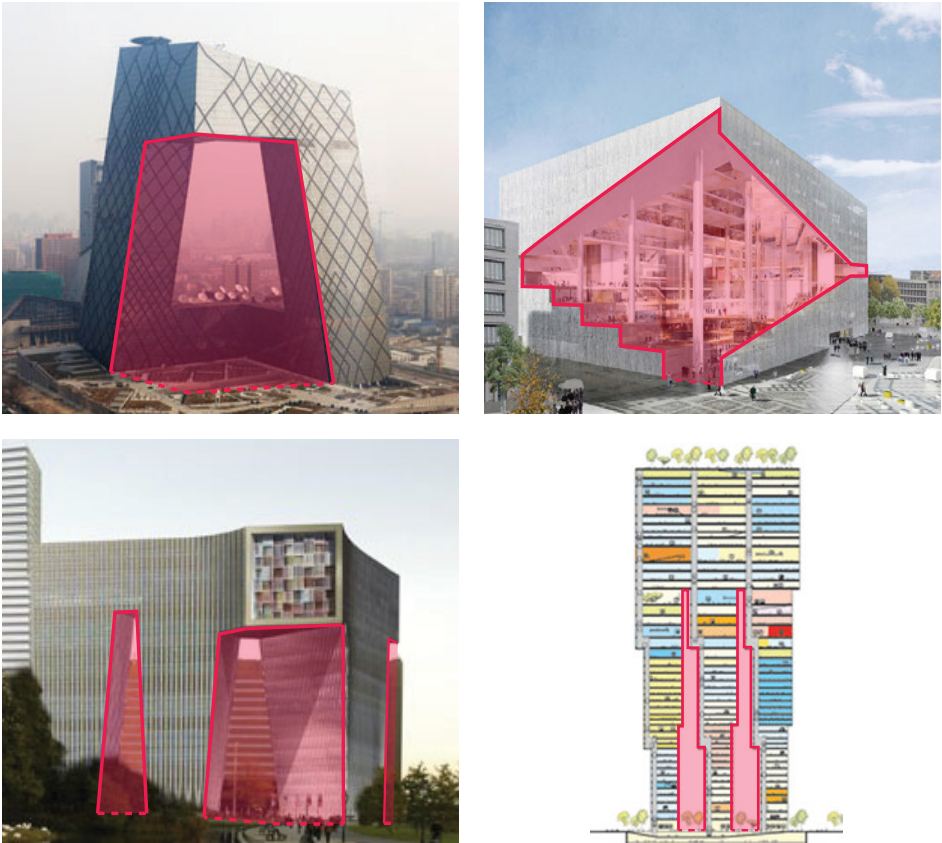


Fig. 5 - Clockwise from top left - CCTV, Axel Springer HQ, World Trade Center, Koningin Julianaplein

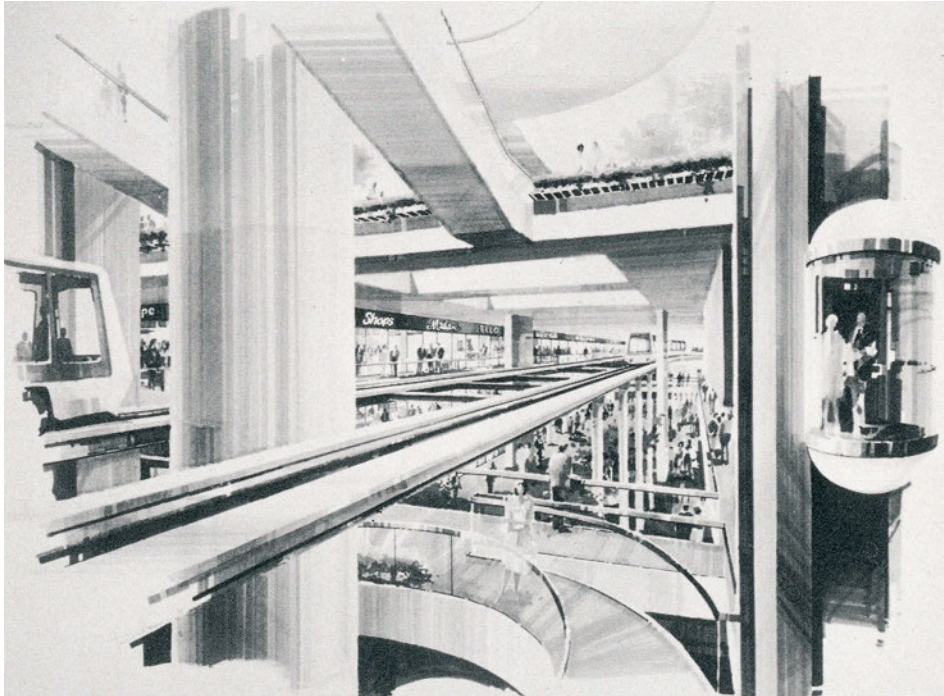
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FORTHCOMING...



John Portman's vision of future atria

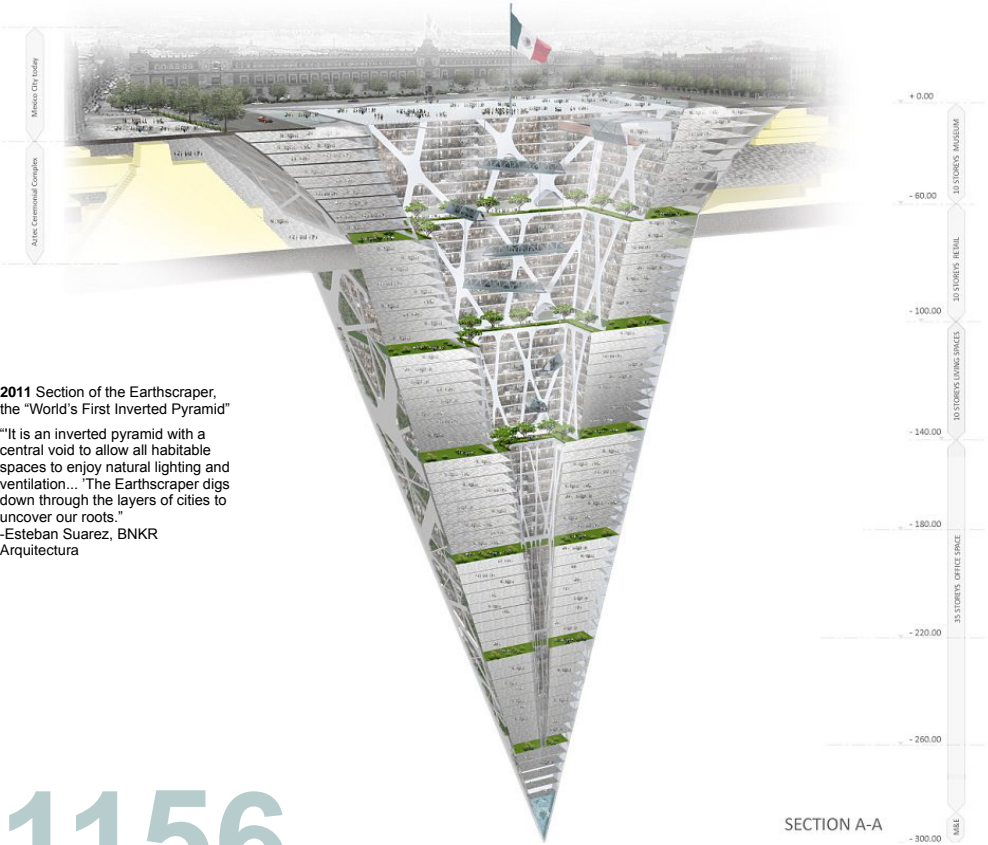
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EARTHSCRAPER

The Earthscraper is a Mixed-Use building that runs 65 stories below ground in the heart of Mexico City. The top of the atrium (at grade) is the main plaza of Mexico City called "Zocalo." The 57,600 m2 plaza is covered with glass preserving the urban fabric. The inverted skyscraper uses an atrium for its traditional intent - a means for light and ventilation, but now for levels below grade.



2011 Earthscraper atrium



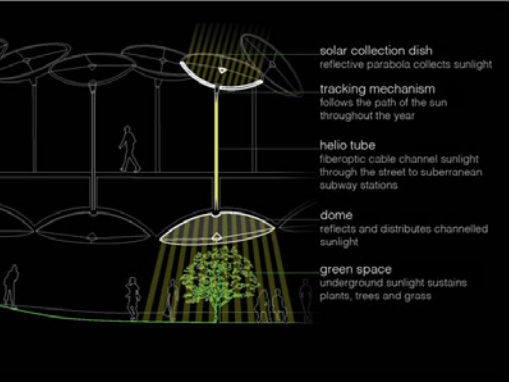
2011 Section of the Earthscraper, the "World's First Inverted Pyramid"

"It is an inverted pyramid with a central void to allow all habitable spaces to enjoy natural lighting and ventilation... 'The Earthscraper digs down through the layers of cities to uncover our roots.' -Esteban Suarez, BNKR Arquitectura

FAKING IT: THE LOW LINE

The Low Line, considered to be "the first underground park" is located below Delancy Street in the Lower East Side of Manhattan. Unable to place large openings into the street for light, the Low Line uses a solar collection dish above ground - that simulates an atrium and - distributes light below ground.

"The Lowline | The World's First Underground Park." Lowline. N.p., n.d. Web. 03 Apr. 2015.



2012 Section Drawing of the Low-Line's solar technology



2012 Mock-Up of Solar device



The Low-line is considered to be the "World's First Underground Park"

"Designed by James Ramsey of Raad Studio, the proposed solar technology involves the creation of a "remote skylight." In this approach, sunlight passes through a glass shield above the parabolic collector, and is reflected and gathered at one focal point, and directed underground. Sunlight is transmitted onto a reflective surface on the distributor dish underground, transmitting that sunlight into the space. This technology would transmit the necessary wavelengths of light to support photosynthesis, enabling plants and trees to grow. During periods of sunlight, electricity would not be necessary to light the space."

"The Lowline | The World's First Underground Park." Lowline. N.p., n.d. Web.

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RE-ENVISIONING PENN STATION

The four finalist for the Penn Station competition held by the Municipal Art Society (NY) all had vertical openings that penetrated the building allowing in light and open space – something the current station lacks.



Original Penn Station



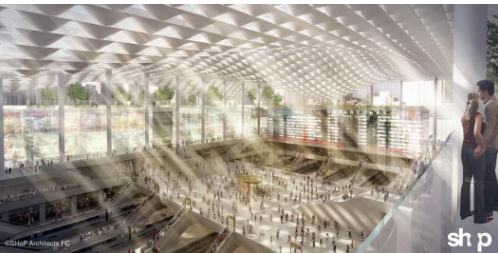
Current Penn Station



Diller Scofidio + Renfro



H3 Hardy



SHoP

"To pass through Grand Central Terminal, one of New York's exalted public spaces, is an ennobling experience, a gift. To commute via the bowels of Penn Station, just a few blocks away, is a humiliation." - Michael Kimmelman



SOM

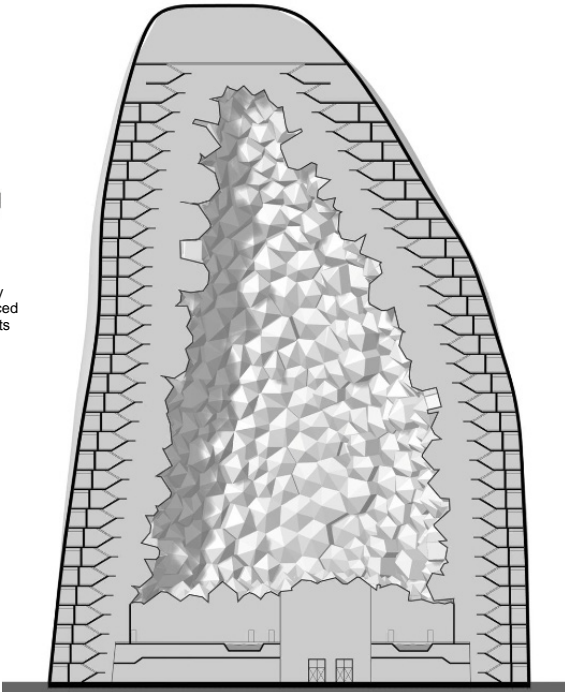


REVIVING PORTMAN

The Amethyst project by NL Architects revives the Portman typology for a hotel design with a large central atrium. The rooms - located around the atrium - are formed to look like Amethyst, a violet type of quartz that protects its owner from drunkenness...



"Amethyst hotel in a way is a Marriott Marquis sliced in the centre, exposing its magnificent interior."
- NL Architects



Section of the Amethyst hotel

"The project could be understood as a mutation of the innovative hotel typology as developed by architect and real-estate developer John Portman: hotel room lining a sensational void."
- NL Architects

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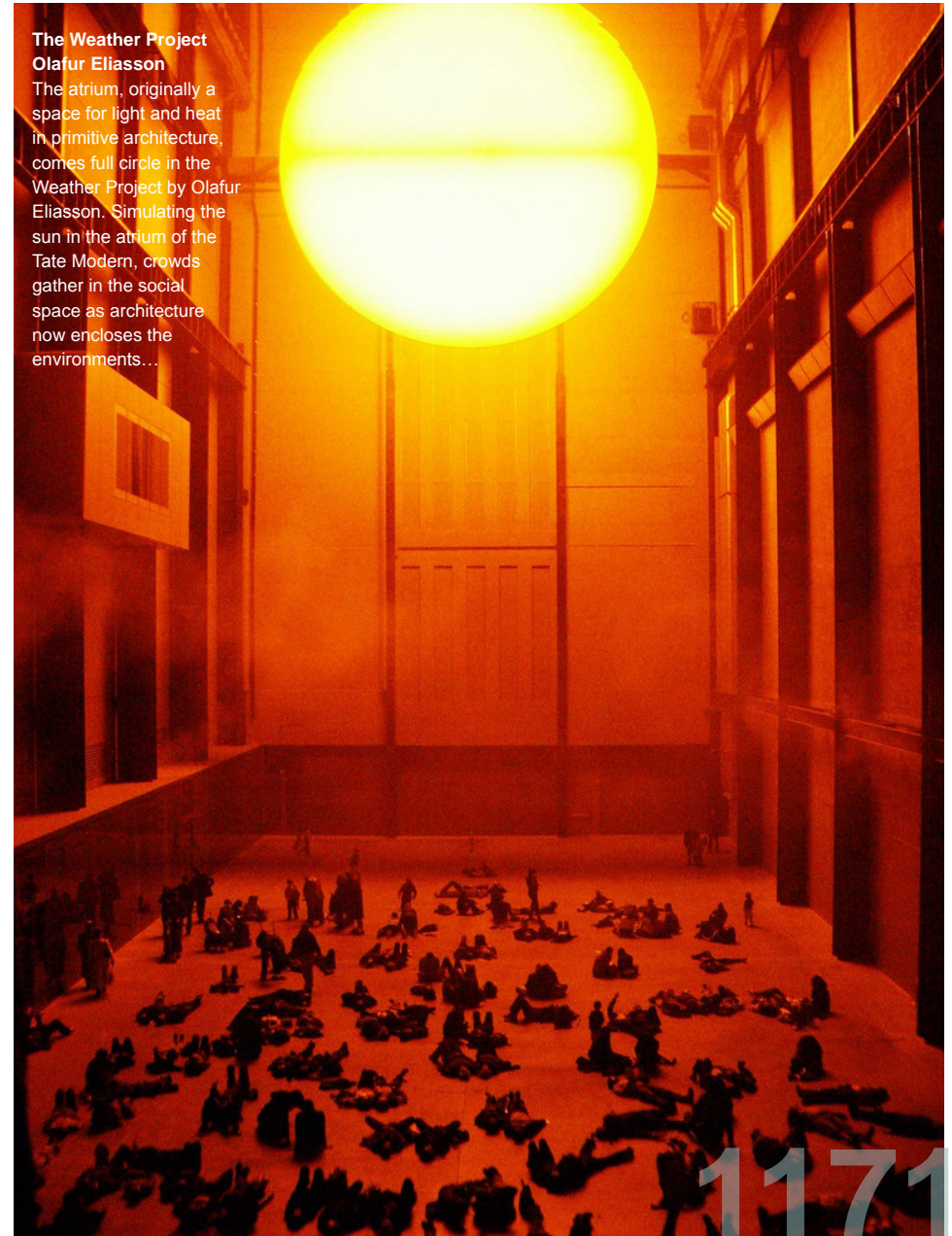
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**The Weather Project
Olafur Eliasson**

The atrium, originally a space for light and heat in primitive architecture, comes full circle in the Weather Project by Olafur Eliasson. Simulating the sun in the atrium of the Tate Modern, crowds gather in the social space as architecture now encloses the environments...



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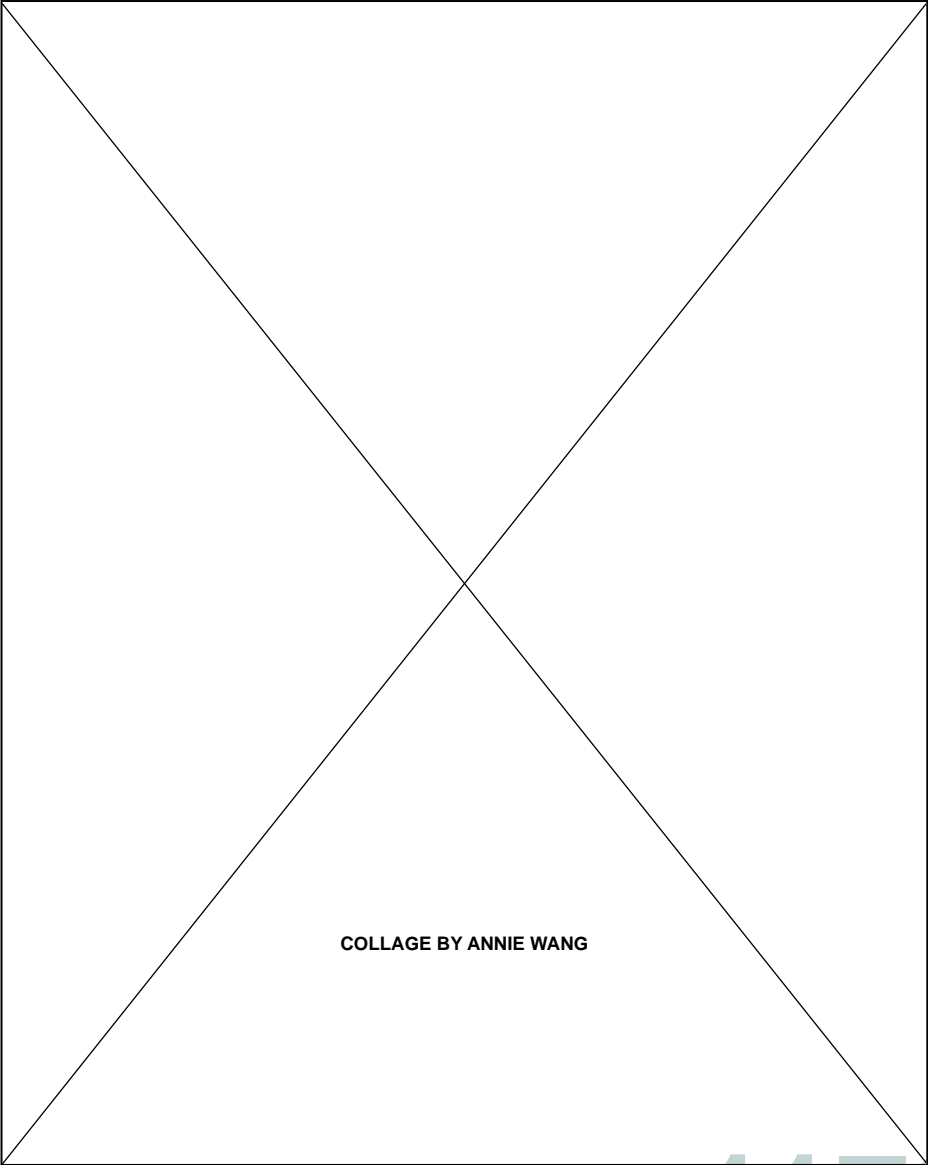


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[image sources to be completed]

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...Architectural history has overlooked the significance of one of its oldest and most fundamental elements. Present at the origins of architecture and characteristically essential to almost any contemporary design (over two floors), the atrium consistently finds itself in the lapse of history's judgment - perhaps due to its consistent presence...However, as the atrium acts as the auspice for all vertical openings in a building, it is at once the space - in the form of the courtyard - that protects primitive tribes from surrounding threats - and elsewhere, the mezzanine, allowing the viewer to see the stage in the theatre for the upper class. But it is this same variability that makes the atrium everywhere and nowhere, causing its most important contribution to architecture and society to go unnoticed. As the central space in the building in which people gather, the atrium is an element of collectivity that has played a core historical role, as a catalyst or antagonist, in the urban development of mankind through social interaction...