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
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.
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...
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) BOCA / NFPA 1981 Formally enters building code 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)

ATRIUM

ATRIUM (ā’trē-əm) /ˈeɪtrɪəm; ˈɑː-/ [eye-tree-uh m] 
Latina De Lingua Latina

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

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)


root “dom- - house, household”
Proto-Indo-European "dom-o - house"
Greek - domos - “house”
Russian - dom - “house”
Sanskrit - damah - “house”

1006 exit access travel distance

Chapter 2 Definitions
Chapter 7 Fire and Smoke Protection
Chapter 9 Fire Protection Systems
Chapter 10 Means of Egress
Chapter 21 Masonry Units

Atrium

atrium (ātrē-əm) /ˈeɪtrɪəm; ˈɑː-/ [ey-tree-uh m]

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

cavaeedium - 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) BOCA / NFPA 1981 Formally enters building code 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)

ON THE ORIGINS OF ARCHITECTURE

ATRIUM 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 combusted 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...

“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 assembled 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.

“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…”

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

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

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 fire 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.

Marc Antoine Laugier, Essai sur l’Architecture

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

“Let us look at man in his primitive state… without any aid or guidance other than his natural instincts. He is in need of a place to rest. On the banks of a quiet flowing brook he notices a stretch of grass; its fresh greenness is pleasing to his eyes, its tender down invites him; he is drawn there and, stretched out at leisure on this sparkling carpet, he thinks of nothing else but enjoying the gift of nature; he lacks nothing, he does not wish for anything. But soon the scorching heat of the sun forces him to look for shelter. A nearby forest draws him to its cooling shade; he runs to find a refuge in its depth, and there he is content. But suddenly mists are rising, swirling round and growing denser, until thick clouds cover the skies; soon, torrential rain pours down on this delightful forest. The savage, in his leafy shelter, does not know how to protect himself from the uncomfortable damp that penetrates everywhere; he creeps into a nearby cave and, finding it dry, praises himself for his delight in the delightful forest. The savage, in his leafy shelter, does not know how to protect himself from the uncomfortable damp that penetrates everywhere; he creeps into a nearby cave and, finding it dry, praises himself for his discovery. But soon the darkness and foul air surrounding him make his stay unbearable again. He leaves and chooses four of the strongest, raises them upright and arranges them in a square; across their top he lays four other branches; these are the posts; meeting at their highest point. He then covers this kind of roof with leaves so closely packed that neither sun nor rain can penetrate. Thus, man is housed. Admittedly, the cold and heat will make him feel uncomfortable in this house which is open on all sides but soon he will fill in the space between two posts and feel secure…”

1861 The atrium, at the intersection of occupancy (fire) and enclosure (shelter), short-circuits the origins of architecture debate (GustaveClarence 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 (chiltu)..."

(Primitive Architecture, Guidoni, 1987)
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

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

Sunken Pit in Courtyard A

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.

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)

NOTE TO EDITOR
Due to variability of courtyard as an international typology this section must be expanded.
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 Bancks now stand. Soon after, private buildings - the Basilicae did not yet exist - the Lutumiae, 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

“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 routeways and around the designated civic areas of the town…”

(Roman Domestic Buildings, Barton, 1996)

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)
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…
THE 5 CAVAEDIA

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.

Types (Genera) of Interiors (Cavaedia)

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.

2. **Corinthian** interiors are those in which 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.

3. **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.

4. **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.

5. **Testudinata** interiors are made where there are no great stresses on the building; they provide ample living space on the floor above.
The lengths and widths of atria are formed according to three types:

**Type 1: 5:3** (Plan)

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

**Type 2: 3:2**

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

**Type 3: Diagonal** (i.e., $\sqrt{2}$)

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 atrium:

If 30-40F, 1/3 
If 40-50F, 3-1/2 
If 50-60F, 1/4 
If 60-80F, 4-1/2 
If 80-100F, 1/5

Means of generating sizes of alae (wings):

If atrium = 30-40F, 1/3 
If 40-50F, 3-1/2 
If 50-60F, 1/4 
If 60-80F, 4-1/2 
If 80-100F, 1/5

Means of generating sizes of tablinum (entrance):

If width 20F, 1/3 
For smaller atra, width of tablinum less than 1/3 
For larger, 1/2 width of tablinum

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.

If we use the proportions of smaller atra in the design of larger ones, the tablinum and alae will seem too small.

"If we use the proportions of larger atra in the design of smaller ones, the dependent rooms will seem vacant and oversized."

"If we use the proportions of smaller atra in the design of larger ones, the tablinum and alae will seem too small."

---

The means of generating the sizes of atrium, alae, and tablinum are illustrated in the diagrams. The atrium sizes are based on the length divided into parts and assigned accordingly. The alae widths are determined by the length and divided into parts as well. The tablinum sizes are derived from the atrium dimensions, with smaller atria having a smaller tablinum width and larger atria having a larger tablinum width.

Images of 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...

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.

Villa of Mysteries, Pompeii

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

Vitruvius’s 5 Caveaedium, the Tuscan, Corinthian and Tetrastyle are best for the collection of water as they all have inward sloping roofs. Although the displuviate has an opening for water, it has an outward sloping roof which would deflect water rather than funnel it. The testudinate caveaedium has no compluvium, meaning no water can enter.

[Com’plu’vi’um] – the rectangular opening in the middle of the inward sloping roof of an atrium

[Im’plu´vi´um] - the shallow rectangular basin in the middle of the floor of an atrium

According to Vitruvius’s 5 Caveaedium, the Tuscan, Corinthian and Tetrastyle are best for the collection of water as they all have inward sloping roofs. Although the displuviate has an opening for water, it has an outward sloping roof which would deflect water rather than funnel it. The testudinate caveaedium 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...

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

House of the Tragic Poet (Long Section)

House of the Marine Venus

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)

“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)

“The twenty-nine figures in the painting are gathered in groups that represent different moments in the sacred ceremony, in which human activity mixes with that of the divinities who participate in the rituals…”
(Domus, Donatella Mazzoleni)
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)

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

"...the town of Bath has always been famous as a great religious centre and for its thermal springs with their curative associations. At 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..."

(Curiffe, 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 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...

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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.

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.
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...

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, Venizia, Italy

Somerset House, London, England

Piazza San Pietro, Vatican City

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 tawaf. 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'anic account of the rebuilding of the Ka'bah by Abraham and Isma'il (Ishmael), and the Zamzam well, a sacred spring. Immediately to the east and north of the courtyard are al-Safa and al-Marwah, two small hills which pilgrims must run or walk between in a ritual known as the sa'y."

(Encyclopedia Britannica)

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.

19 BC Western Walls

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)

Harlech Castle, built toward the end of the thirteenth century, is sited on a hill with an outer bailey 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.

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[NOTE TO EDITOR]
Section to be expanded
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 etchings 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

1836 Haviland’s Eastern Penitentiary Courtyards

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...

1796 Kilmainham Gaol (Victorian Wing built 1871)

Prisoner’s Treadmill in Coldbath Fields Prison

1868 Strangeways Prison
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

1791 Panopticon Plan and Section

“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

Built Panopticons

Presidio Modelo
Isla de la Juventud, Cuba

Haarlem Prison
Haarlem, Netherlands

Stateville Correctional Center
Crest Hill, Illinois, United States
[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...

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.

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

The mezzanine in the theater creates a central space similar to that of an atrium.
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 Bontempts, 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

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

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

The Crystal Palace during the Exhibition

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.

“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

1850 Sir Joseph Paxton’s sections of the Crystal Palace were designed and sketched during a railway tribunal.”
ADAPTING THE PAXTON MODEL
The Crystal Palace prompted a revolution of buildings 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’Opéra

“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)
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

1887 National Building Museum (Formerly United States Pension Office)

1893 Bradbury Building, Wyman and Hunt

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

The Arcade, Providence, Rhode Island

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)
“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)

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

Section to be expanded

1920s Le Bon Marche Extension

1952 Southdale Mall

1979 Atlanta Apparel Mart

Terminal 21 Bangkok
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 a plate placed at the top of the atrium, with words such as: generosity, loyalty, integrity, and sacrifice...

AEG Turbine Factory
Built in 1909, Peter Behrens’ 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.

1906 Central work space in the Larkin Administration Building.

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
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...

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
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.

**Exeter Library Section**

- Original scheme O’Connor and Kilham Architects
- Floor Plate = 11930 SF
- Atrium = 1515 SF
- A1 = Floor Plate - Atrium
  - A1 = 10415 SF

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

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

- 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%)

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

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

*Seen from the outside through the glass facade, the Book Court draws students inside and efficiently uses the central space as an access to all main rooms and areas of the building.*
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.
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 corporation’s dream where the consumer never has to 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.

“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, 1990)
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.

“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”


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
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.
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.

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.

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

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.

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.

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.

“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)
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.

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. Burke’s 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.
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


1:51:18 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.

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...

Peachtree Plaza Hotel Atrium (Architect: John)

Man-made river flows through the atrium of the Hyatt Regency San Antonio. (Architects: Thompson, Ventulett, 1976)

1976 Westin Bonaventure Hotel (John Portman and Associates)

Peachtree Plaza Hotel Atrium (Architect: John)

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.
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.

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

(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 “world’s tallest atrium” at 590 feet.

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

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...

1999 Reichstag Dome

UN Assembly Building

2007 Prisoners in the Philippines CPDRC correctional facility re-enacting Michael Jackson's Thriller in the prison courtyard.
When Saddam Hussein was captured in December 2003, he was found in a one-man “spider 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.
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)

“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)
locked from the sanitary side shall be capable of being unlocked simultaneously without unlatching upon a signal or command from the building.

403.5.1.3 Stairway communication systems. A telephone or other two-way communication system connected to an approved permanently 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 (22.86 m) 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 1023.

403.5.6 Emergency escape and rescue. Emergency escape and rescue openings specified in Section 1028 are not required.

403.6 Elevators. Elevator installation and operation in high-rise buildings shall comply with Chapter 37 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 (36.57 m) 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 5002.4.

403.6.2 Occupant evacuation elevators. Where installed in accordance with Section 3008, passenger elevators shall be provided that shall be permitted to be used for occupant evacuation.

SECTION 404
ATRIUM

404.1 General. In other than Group H occupancies, and where permitted by Section 712.8.9, the provisions of Section 604.1.3 through 604.1.7 apply to high-rise atriums, atriums, and structures containing vertical openings defined as "Atriums."

404.1.1 Definition. The following term is defined in Section 2.1.3.

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 and Cohousing shall be used in the atrium space.

Exception: The atrium floor area is permitted to be used for any purpose in one story building where the individual space is provided as an outdoor atrium in accordance with Section 903.1.13.

404.3 Automatic sprinkler protection. An approved automatic sprinkler system shall be installed throughout the building.

Exceptions:
1. That area of a building adjacent to or above the area served by a sprinkler system shall not be sprinklered provided that portion of the building is separated from the atrium portion by not less than 180 fire stops constructed in accordance with Section 604.3.1.2. Fire stops shall be constructed in accordance with Section 611.6 or 2.4.4.4.1.
2. Where the ceiling of the atrium is more than 55 feet (16.74 m) above the floor, sprinkler protection at that elevation shall not be required.

[F] 404.4 Fire alarm system. A fire alarm system shall be provided in accordance with Section 907.7.1.6.

404.6 Exit access travel distance. Exit access travel distance for areas open to the atrium shall comply with the requirements of Section 907.6.8.1.

404.7.1 Emergency and smoke openings. Where required access to the exits is not through the atrium, exit access travel distance shall comply with Section 907.6.1.

404.8 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 907.8.

404.9.1 Exit travel distance outside the atriums. Where required access to the exits is not through the atrium, exit access travel distance shall comply with Section 907.6.1.

404.10 Interior exit stairways. A maximum of 50 percent of interior exit stairways are permitted to be through an atrium.

SECTION 405
UNDERGROUND BUILDINGS

405.1 General. The provisions of Sections 405.2 through 405.6 apply to buildings having a floor area used for human occupancy more than 16 feet (4.88 m) below the finished floor of the lowest level of exit discharge.

Exceptions: The provisions of Section 405.2 are not applicable to the following types of buildings:
1. One- and two-family dwellings, sleeping units, and retirement units in accordance with Section 903.3.1.
2. Parking garages provided with automatic sprinkler systems in compliance with Section 603.5.
3. Fitted guideway transit systems.
4. Grounds, 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 an occupant load less than 10.
6. Pumping stations and other similar mechanical and electrical spaces integral to the use of the building, such as periodic use by service or maintenance personnel.
7. Construction requirements. The underground portion of the building shall be Type I or Type II construction.

405.1.1 Construction. The underground portion of the building shall be Type I or Type II construction.

[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. Water flow switches and control valves shall be supervised in accordance with Section 907.2.18.

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 (18.28 m) below the finished floor of the lowest level of exit discharge shall be divided into no fewer than two compartments of approximately equal size. Each compartment shall extend through the highest level of exit discharge and shall include 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 smoke barriers in accordance with Section 709. Penetrations between the two compartments shall be limited to plumbing and electrical piping and conduits that are firestoped in accordance with Section 714. Doorways shall be protected by fire door assemblies that are automatic-closing by smoke detection in accordance with Section 716.8.3.6 and are installed in accordance with NFPA 80 and Section 716.5.3. Where provided, each compartment shall have air supply and an exhaust system independent of the other compartments.

405.4.3 Elevators. 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 714.8.3.

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 smoke and smoke products in accordance with Section 909 and the provisions of this section. Smoke control shall consist of smoke barriers to the general area of fire origin and maintain means of egress as a viable means of egress.

405.5.2 Compartment smoke control systems. 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] 405.6.1 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 405.11 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).” 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.
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. 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 building’s 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
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.
John Portman's vision of future atria
**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.

“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.”

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...

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.

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

“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
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…
bibliography


[bibliography to be completed]
A group of students from the Harvard University Graduate School of Design, led by Rem Koolhaas/AMO and Stephan Trüby, and organized by Dean Mohsen Mostafavi were engaged in a multi-year research studio in Rotterdam and Cambridge, which formed the basis for this book and the exhibition “Elements of Architecture” at the 2014 Venice Architecture Biennale. The introduction of the atrium and luminaire into the second edition of Elements was a Thesis/Research project by Hasan Hachem in collaboration with Robert Svetz (Advisor) at Syracuse University School of Architecture.
…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...