Conspicuous display: stairs historical and modern
Part I: A theoretical introduction and examples of historical stairs in stone, masonry and wood

Estelle Alma Maré
Tshwane University of Technology
E-mail: mare_estelle@fastmail.fm

It is the purpose of this article to explain how the stair as an architectural element not merely serves the function of vertical movement in a manner requiring physical safety, but has often, especially in monumental and ceremonial architectural settings on the outside or inside of historical buildings, been elaborated structurally and embellished as a focal component. Monumental and ceremonial stairs often served as a conspicuous part of the display of power of the patrons, as well as the structural and artistic ability of their appointed designers. By expanding Thorstein Veblens theory of "conspicuous consumption" to include conspicuous material creations throughout the ages, especially in the form of prestigious buildings and structures such as stairs, it will be argued that powerful clients and their architects often created splendid architectural displays which serve as event-spaces, made to the measure of the human body.
Key words: conspicuous consumption, conspicuous display, stairs, human scale

Indrukwekkende vertoning: historiese en moderne trappe
Deel I: 'n Teoretiese inleiding en voorbeelde van historiese trappe in klip, baksteen en hout
Dit is die doel met hierdie artikel om te verduidelik hoe die trap as 'n argitektoniese element nie bloot funksioneel dien om veilige fisieke vertikale beweging moontlik te maak nie, maar dat dit dikwels, veral in monumentale en seremoniële argitektoniese situasies, aan die buite- of binnekant van historiese geboue, struktureel uitgebrei en versier is om as 'n fokale komponent te dien. Monumentale en seremoniële trappe het dikwels gedien as n indrukwekkende onderdeel in die magsvertoon van opdraggewers, sowel as bewys van die strukturele en kunssinnige vernuf van die aangestelde ontwerpers daarvan. Deur Thorstein Veblen se teorie van "indrukwekkende verbruik" uit te brei om indrukwekkende materiële skeppings deur die eeue heen in te sluit, veral in die vorm van geboue en trapstrukture as vertoonstukke, word aangevoer dat maghebbende kliënte en hulle argitekte dikwels indrukwekkende argitektoniese skouspele volgens die skaal van die menslike liggaam geskep het om terselfdetrtyd as gebeurtenis-ruimtes te dien.
Sleutelwoorde: indrukwekkende verbruik, indrukwekkende vertoning, trappe, menslike skaal

The phrase "conspicuous consumption" was formulated by the economist and sociologist Thorstein Veblen in 1899 to describe the way in which members of the upper class spend their great wealth to manifest their social power and prestige publicly. Since the industrial revolution the ostentation of the affluent elite has been interpreted and debated in various ways as a symptom of the consumer society. By expanding Veblen's theory to include conspicuous material creations throughout the ages, especially in the form of prestigious buildings and architectural structures, it will be argued that powerful clients and their architects often created splendid architectural displays, of which a selection of the most felicitous historical examples of stairs are selected for analysis, focussing also on the cultural context of their creation. These, like all stairs that of necessity express the human scale (as the Italian word *scala* implies), are formally innovative, and serve as an expressive link in the spatial composition of buildings, creating a sense of space-time sequence.

Introduction: the stair as an architectural element

There is no better definition of a stair than the statement by the Greek philosopher Heraclitus, (535-475 BCE): "The way upward and the way downward are the same."[1] We do not know the context of this fragment or what Heraclitus actually referred to, except that his worldview made provision for the complementarity of opposites. Indeed, a stair reconciles opposites in a manner that other architectural elements are not capable of to the same extent. Besides its dual direction the stair is both material and symbolic, especially when it becomes an architectural exhibit in its own right.

The stair as architectural element not merely serves the function of vertical movement in a manner requiring physical safety, but is often, especially in monumental and ceremonial architectural settings, elaborated structurally and embellished aesthetically as a focal component on the outside or inside of buildings. Monumental and ceremonial stairs are a conspicuous part of the display of the wealth and power of the patrons and the structural and aesthetic ability of their appointed designers. The stair is an artifact that is often an open-air entity, not attached to a building, but generally it is attached to a building on its exterior or in its interior. Since the time of the Sumerian ziggurats great stairs abound as imperial exhibits. They testify to the tremendous investment of time, effort and ingenuity, amounting to countless man-hours. Therefore, one may surmise that the effort would have been somewhat meaningless without a symbolic meaning attached to the result.

As human beings our upright position necessitates a fine balancing act when we undertake a vertical climb or a descent that poses the challenge of counteracting gravity. Since the earth is not even we are often in a precarious position as bipedal beings when having to ascend or descend a steep incline. *Homo sapiens*, the artificer, solved this problem by inventing a tool in the form of a ladder to move up natural heights where the going was very steep, as evidenced by the remains of a timber exemplar dating from as long ago as the Last Glacial Age, *circa* 110,000 to 10,000 years ago (figure 1). Since *homo sapiens* does not only invent artifacts the ladder became mythologised as the symbol of ascent, as attested by Jacob's dream described in the Old Testament and vividly portrayed by Marc Chagall (1889-1985) (figure 2).

Figure 1
A timber ladder dating from the Last Glacial Age
(source: internet).

Figure 2
Marc Chagall, *Jacob's Dream*, 1973, oil on canvas, 73x92cm, private collection (source: http://jungcurrents.com/jacob-ladder).

More permanent than the ladder as a tool that can be moved, if necessary, is the constructed stair consisting of steps hacked into hillsides where there is an incline. An impressive example is found at Simatai in China, where the Great Wall crosses a hill (figure 3). Such ancient stairs, almost as steep as ladders, are found all over the planet at hilly sites; they often have a more or less straight line of movement but are irregular and hazardous, with steps of varying width and height.

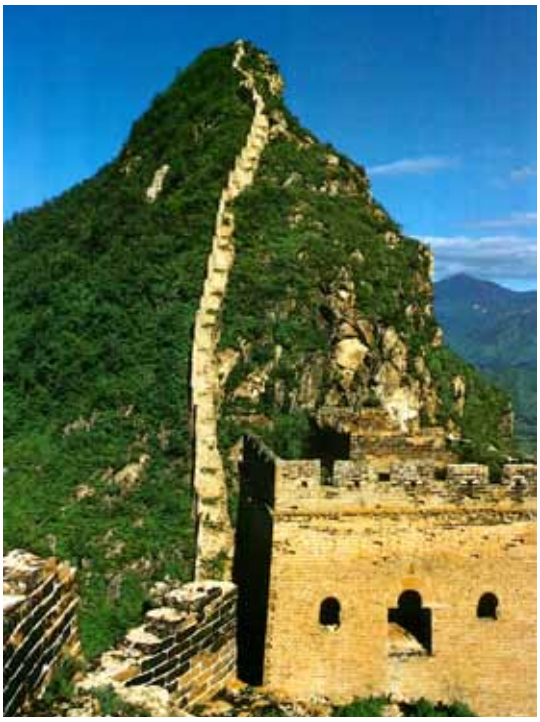

Figure 3
Stair at Simatai, China
(photograph by the author).

Ascent and decent on ladders and stairs require poise, balance and a degree of fitness from users since it demands a kinetic disposition that alters a person's walking rhythm, as demonstrated by Marcel Duchamp (1887-1968) in his *Nude Decending a Staircase*, *No. 2* (figure 4). Vertical movement is unsafe because a fall, if not fatal, can cause a broken limb or concussion.[2] Therefore, designers and builders have tried to standardise and codify the risers and treads of stairs according to an average human scale, calling to mind the Italian word for stair, *la scala*, that also refers to scale or measurement. Safeguards like hand railings or banisters, both in the open and inside buildings, are a requirement and all stairs should be well lit. The standard indoor stair, constructed according to building regulations, is designed for safety, not display. Such stair patterns are conventionally fixed; they prescribe the pitch line, the rise height (*circa* 125cm), the tread depth (*circa* 225 cm), a broad landing after a number of risers or flight of steps, as well as a balustrade for the steadying of balance (figure 5).

Figure 4
Marcel Duchamp, *Nude Decending a Staircase*, *No. 2*, 1912, oil on canvas, 147x89.2 cm, Philadelphia Museum of Art, Philadelphia (source: http://en.wikipedia/wiki/Nude_Descending_a_Stair).

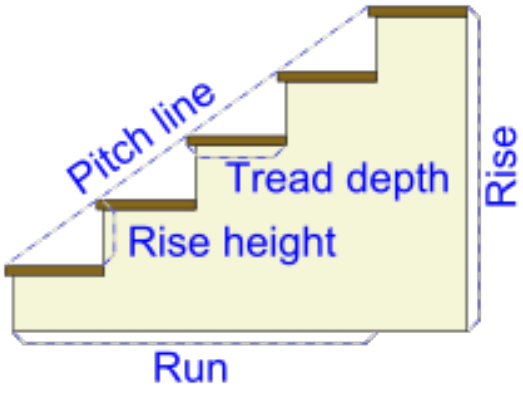

Figure 5
Typical design of risers and treads of a domestic stair.

However, some stairs are actually dangerous, for example the stair of an office building in Switzerland (figure 6). Also a stair, decorated like a psychedelic painting, needs to be approached with caution (figure 7).

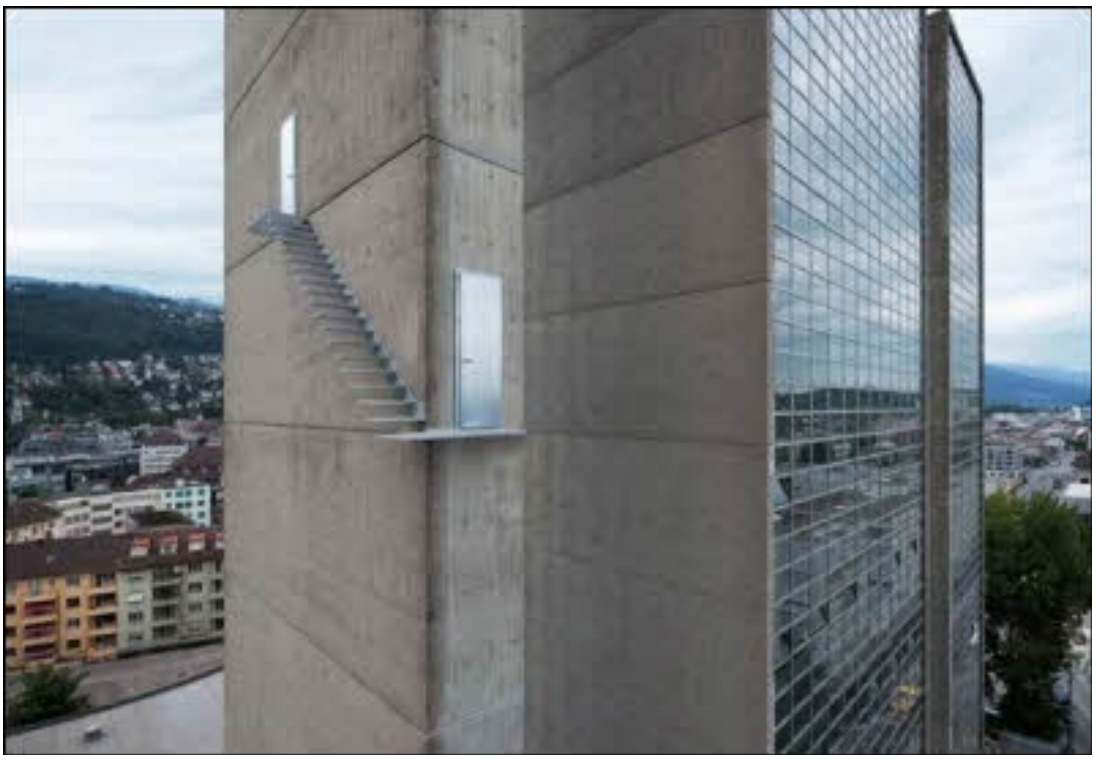

Figure 6
Exterior stair of an office building in Switzerland
(source: internet).

Figure 7
A stair decorated like a painting
(source: internet).

In the design of stairs creativity and imagination play an important role. However, the rational analysis of all details is extremely important to ensure the safety of a stair, requiring of the designer the need to apply scientific knowledge of materials and mathematics to the analysis of the problem of how best to structure the technological requirements regarding materials, form, labour, cost, etc., involved to construct a stair in a given context. Psychologically a person without a pathological fear of heights will feel comfortable on a stair that is solid, aesthetically attractive and offers views of an upper and a lower landing. However, not all stairs are straight with a vision of upper or lower landings. They can be made to twist and turn in their allotted space on the inside or outside of buildings, thus obscuring the way up and the way down and aggravating the danger of ascent and descent, but adding to structural complexity and visual attractiveness to satisfy the human need for exploration and discovery. Therefore, designers may devise imaginative conjunctions without transgressing on safety regulations for stairs. Clients or patrons who have the vision and means to commission an elaborate stair to enhance a building's spatial design and visual aesthetics will require special skills from designers, be they architects or engineers, as well as from builders. The Roman architect, Vitruvius (*circa* 80-70-after *circa* 15 BCE), stated in his *De architectura* (I.iii.2) that the ideal building has three elements: it is sturdy, useful, and beautiful. An ideal stair has the same qualities.

The modernist architect, Mies van der Rohe (1886-1969), famously condemned any ornamentation or nonfunctional addition to an architectural structure when he stated that "Less is more", a precept for minimalist design. In response, Robert Venturi (born 1925) punned the refutation that "Less is a bore".[3] I am not partial to the works of either architects, but stairs designed according to the less-is-more motto will undoubtably be a bore. I therefore purport to show a limited selection of the best designed and most inviting stairs on display throughout history, stairs that to a large extent enhance the spatial designs of city spaces or works of architecture and create an event-space, made to the measure of the human body.

Unfortunately the invention of lifts and escalators that are seldom spectacular because of their standardised design, have had a bland effect in the foyers and lobbies of most modern public buildings, in which equally bland, often hidden, stairs are installed, mainly as obligatory escape routes. However, there are exceptions in modern architecture in which the tradition of conspicuous display of stairs enhance movement on a human scale, in spite of the vast spaces in which they may be situated - a topic for the second part of this research dealing with modern stairs.

Ceremonial stairs

When viewing ceremonial stairs one tends to agree with a statement by Peter Smith (1976: 112),"that man has always found emotional satisfaction in the presence of the gigantic. From earliest times he has created artefacts extravagantly larger than life, perhaps to touch the threshold of the heavens... To reach the threshold of heaven the Sumerians graced the city of Ur with a ziggurat, an Akkadian term meaning 'built on a raised area', of which the function was ceremonial and religious. It was constructed as a symbolic mountain with a regular stair, meant to overawe the users by suggesting an ascent to the abode of the gods (figure 8). This stepped pyramid, measuring 46 metres in length, 46 metres in width and 30 metres in height, was built by King Ur-Nammu (*circa* 2112-95 BCE) in honour of the goddess Nanna/Sîn.[4] It is composed of several levels, constructed of mudbrick, faced with baked brick, set in bitumen. Its greatness can still be recognised in the ruined monumental stair that has been partially restored by Saddam Hussein, but damaged in the Gulf War in 1991 (figure 9).

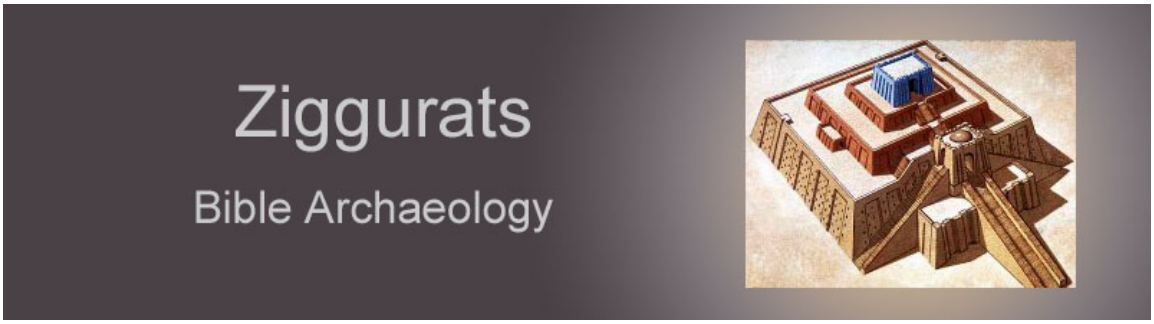

Figure 8
Reconstruction of Ur-Nammus ziggurat at Ur, based on the 1939 reconstruction by Sir Leonard Wooley (source: http://en.wikipedia.org/wiki/Ziggurat of Ur, accessed 2013/05/07).

Figure 9
United States soldiers climb the ruined steps of Ur-Nammu's ziggurat (source: http://en. wikipedia.org/wiki/Ziggurat of Ur, accessed 2013/05/07).

Other notable pyramid temples, reaching heights of up to 45 metres, with steep ceremonial stone stairs were built by the Maya in Mesoamerica whose architectural history spans almost two thousand years (300 BCE - 1500). Like the Sumerians, the Maya were keen astronomers and their elevated temples on the uppermost platforms of the pyramids were most probably also used as observatories for calender calculations, as at Tikal (built between 740 and 750 ACE) where the temple was reached by 365 steps (Kirchner1985: 31) (figure 10).

Figure 10
Monumental stair, Tikal temple pyramid Mesoamerica, built between 740 and 750 CE (source: http://en.wikipwdia.org/wiki/Maya_architecture).

At the third century BCE Sanctuary of Lindian Athena at Lindos, Rhodes, the monumental stair replaced a previously seven metres wide stepped pathway to the temple of Athena. The rebuilt flight of 37 steps, 21.03 metres wide, connects the lower propylaia with an upper stoa, changing the view of the elevated temple at the far end (figure 11). According to Hollinshead (2012: 38), the significance of the sanctuary layout "lies in what was new, especially the scale of the stair and the integrated complexity of the building". Furthermore she states: I would propose that broad steps themselves promote symmetry, as most users will choose a path up the middle of a monumental stairway..., and also describes the function of the broad stair: "Given the steep and uneven terrain, the exceptionally broad stair captured and concentrated the drive of a procession that probably needed gathering for the final ascent" (2012: 39).

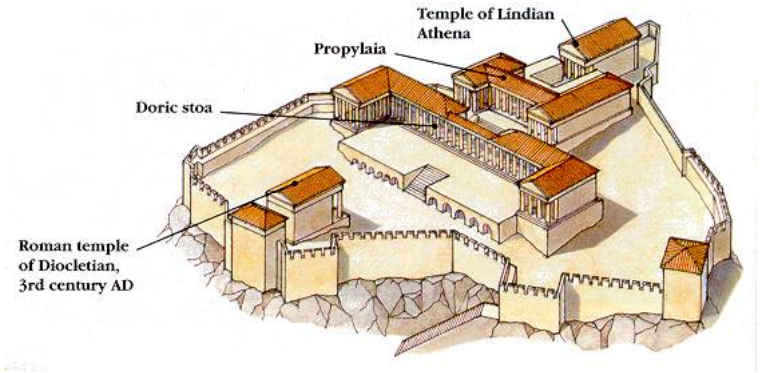

Figure 11
Reconstruction of the sanctuary of Lindian Athena at Lindos, Rhodes, third century BCE (source: http://www.godess-athena.org/Museum/temple).

The monumental stair on the east side of the audience hall, called Apadana, of the palace of Persepolis, Persia (present day Iran), inspired by King Darius I the Great, was built from 518-460 BCE. Its main feature is the sculpted reliefs representing gift-bearers from the king's domain (figure 12). The repeated pattern of figures in a ritual procession along the flanking east wall enhance the sense of spatial sequence to a destination that merits this splendid approach to the palace interior. It was designed not only to impress the viewer with the power of the ruler who occupied the palace, but also to impress all visitors by its display of artistry. The frieze represents the invention of the processional genre that later influenced the Greek sculptors when they decorated the Parthenon with the Panathenaic frieze.

Figure 12
The Apadana stair, palace of Persepolis, Persia, built from 518-460 BCE (source: http:depts.washington.edu/arch350/Assets/Slides/Lecture15, accessed 2013/03/25).

Another stair decorated with sculpture to celebrate the power of the ruler is the so-called *Scala dei Giganti* (Giants' stair) in the internal courtyard of the Doge's Palace in Venice (figure 13). It was designed by Antonio Rizzo (born before 1440-died after 1499) and built after 1483). The two gigantic sculptures at the top of the stair by Jacopo Sansovino (1486-1570) that represent Neptune because Venice ruled the sea, and Mars because Venice was triumphant in war, were put in place in 1565.

Figure 13
Antonio Rizzo, *Scala dei Giganti*, Doge's Palace, Venice, built after 1483
(photograph by the author).

This stair was probably Tiziano Vecelli's (1488/90-1576) inspiration for the setting of his painting, *Presentation of the Virgin Mary at the Temple* (figure 14). The ascent of the small girl seems arduous on the high stair; the scale of her figure is contrasted with the monumentality of the stair.

Figure 14
Tiziano Vecelli, *Presentation of the Virgin Mary at the Temple*, 1534-38, oil on canvas, 775x345 cm, Gallerie dell'Accademia, Venice
(source: http://en.wikipedia.org/wiki/Presentation_of_Mary).

The ceremonial stair in the Escorial

A renowned ceremonial stair is that by Johann Balthasar Neumann (1687-1753) in the Würzburg Residence which was completed in 1774. The stair is part of a formal reception room in which the 23 metres high stair spans an area of 18x30 metres. Not only is this stair a magnificent engineering feat, but its architectural embellishment and the ceiling fresco by Giovanni Battista Tiepolo (1696-1770) makes this one of the most notable stairs ever built (figure 15).

Figure 15
Johann Balthasar Neumann, ceremonial stair, Würzburg Residence, completed in 1774 (photograph by the author).

A further elaborate Baroque stair is the imperial stair in the Winter Palace, St. Petersburg, Russia, built for the Empress Elizabeth I by Francesco Bartolomeo Rastrelli (1700-1771), restored by Vasily Stasov (1769-1848) after a fire in 1837, but retaining the eighteenth-century rococo style, even though massive grey paired columns were added in the mid-nineteenth century (figure 16). In a vast palace with 117 stairs, the principle or imperial stair is called the "Jordan Stair" because on the Feast of the Epiphany the Tzar descended it in state for the ceremony of the "Blessing of the Waters".

Figure 16
Francesco Bartolomeo Rastrelli and Vasily Stasov, imperial stair, Winter Palace, St. Petersburg, Russia, restored after 1837 (photograph by the author).

The royal seat of San Lorenzo de El Escorial comprises a monastery and the historical residence of the King of Spain, in the town of San Lorenzo de El Escorial, about 45 kilometres northwest of the capital Madrid, in Spain. The complex was conceived by Philip II who reigned Spain from 1556-98 and used the wealth accrued to the state from the New World to build the Escorial as a symbol of Spain's central position in the Roman Catholic world.

In 1559 Philip II engaged the Spanish architect Juan Bautista de Toledo (1515- 1567) to design the Escorial in collaboration with himself. After the death of this architect Juan de Herrera (1530-97), who had assisted him at the Escorial since 1562, was appointed the director architect. He modified his predecessor's plans and his austere design found favour with the king. However, the architect responsible for the imperial stair is in dispute (Wilkenson 1975: 65). It has been attributed to Giovanni Battista Castelli (1500 or 1509-1569 or 1579), a painter who was also involved in architectural work at the Escorial., but the main candidate is Herrera. In this regard Cathrine Wilkenson (1975: 83) states: "The most important element in Herrera's design of the impertial staicase was the arrangement of three parallel flights in the extant stairwell. The [thee-part] plan does not appear earlier in Spain... ." She further notes that "The plan of an interior staircase with three parallel arms originated with Leonardo [da Vinci], makes s[poradic appearances in both Italian and French architecture before the Escorial. It is much more difficult to determine how these designs are related and which, if any of them, might have suggested the [thee-part] plan to Herrera" (Wilkenson 1975: 86). The main flight is isolated within the building; it fills the stairwell and becomes a "self-contained composition" (Wilkenson 1975: 86), removed from spatial continuity with its courtyard.

Figure 17
Juan de Herrera, imperial stair, Escorial, Spain
(photograph by Concha Diez Pastor).

A last example of a ceremonial stair was constructed by the Beaux-Arts educated Dutch architect, Sytze Wopkes Wierda (1839-1911), who became the state architect and head of Public Works in the South African Republic (figure 18). This stair is in the Ou Raadsaal on Church Square, Pretoria, of which President Paul Kruger laid the corner stone in 1889. It is a timber construction, of which the central flight leads to the council chamber with its pedimented door.

From the landing at the door of the council chamber two parallel flights on the left and the right go to an upper level, as if imitating the three-part open-well design of the Escorial's imperial stair, albeit on a modest scale.

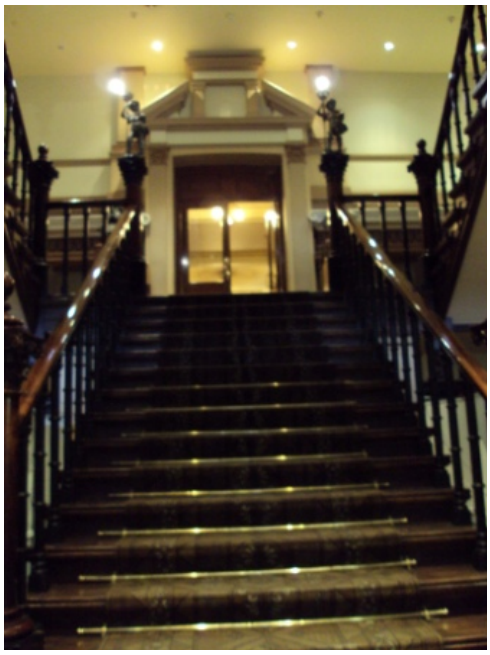

Figure 18
Sytze Wopkes Wierda, ceremonial stair, Ou Raadsaal on Church Square, Pretoria, completed after 1889 (photograph by the author).

Monumental stairs linking city spaces

The Scalinata della Trinità dei Monte, called the Spanish Steps, in Rome is the most renowned open-air stair, a testimony to the of elegance of Rococo Rome (figure 19). It was designed by Allesandro Specchi (1668-1729) and Francesco de'Santis (1679-1731) and constructed from 1723-26.[5] Its main function is to link the Piazza dei Spagna with the church of SS. Trinità dei Monte (built in 1459; facade by Domenico Fontana in 1595).[6]

The steps consists of 135 steps, made up of multiples of three, which number symbolises the Trinity to which the church on the upper level of the Piazza della SS Trinità is dedicated. It is a symmetrical, albeit irregular, cut stone structure, consisting of changing shapes that open many vistas to a person who has multiple choices of the pathway up and the pathway down, which directions are not visually identical, but offer (figures 20a and b). At the level of the lower piazza the stair starts with three steps and proceeds to a stretch of three parallel flights of twelve steps, proceeding to a convex section in which the steps divide into opposite directions, linked again after a landing in a concave section, after which there is another separation, forming two separate convex stairs that reach the upper piazza.[7] This is an unprecedented stair and Bruno Zevi (1978: 208) refers to it as "An extraordinary, antiperspective invention...".

The design ingenuity manifest in the structure and shape of the Spanish Steps entices pedestrians to pleasurable movement, as Lotz (1969: 41) attests: "Ihre Stufen, Absätze und Läufe machen den Aufstieg leicht und bequem" (figure 21). Not only does it fulfill its function superbly, it is one of the most splendid architectural displays in a cityscape. Paul Zucker (1955: 16) describes the integration of stair and piazza as a unique spatial and visual experience that "represent the climax of stage effects in Roman city planning on a larger scale".

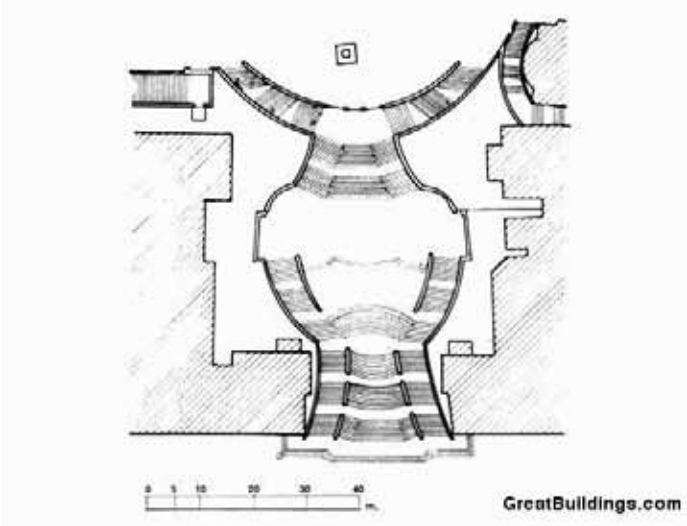

Figure 19
Plan of the Spanish Steps, Rome, designed by Allesandro Specchi and Francesco de'Santis, constructed from 1721-25 (source: http//www.google.zo.za/search?q=spanish+steps).

Figure 20a
Aerial view of the Spanish Steps, Rome (source: http//www.google.zo.za/search?q=spanish+steps).

Figure 20b
View of the Spanish Steps, Rome, decorated with azaleas in May (photograph by the author).

Figure 21
Spanish Steps, detail of steps constructed of cut stone (photograph by the author).

In modern cities lower and higher geographical areas are often linked by means of stairs where a street would be impractical, for example the renowned Primorsky Stair, better known as the Potemkin Stair,[8] in Odessa, Ukraine. It was designed in 1825 by Francesco Boffo who worked for a St Petersburg firm, and constructed between 1837 and 1841 by John Upton, a British engineer (figure 22). The initial 200 steps, of which only 196 remain, connect the Odessa harbour with the city that is situated on a high plateau. This stair is not particularly artistic, even though it has some built-in optical illusions. A person looking down the stair sees only the landings, but a person looking up sees only the steps. The stair is 27 metres high, but extends for 142 metres. A century after the Spanish Stair the designer reinvented perspective, albeit a built-in false perspective, caused by the fact that the bottom step is 31,7 metres wide and the top step is 12,5 metres wide. Once again, the way up and the way down are not visually the same.

Figure 22
Francesco Boffo (architect) and John Upton (engineer),
Potemkin Stair, Odessa, Ukraine, constructed from 1837-41
(source: https://www.google.co.za/search?q=potemkin+stair).

Turning movement: spiral and helical stairs

A discussion of winding stairs should start with the mention of the one that spirals up the interior of Trajan's Column on Trajan's Forum in Rome, a monument completed in 113 ACE, that still testifies to the greatness of Imperial Rome (figure 23). Designed by Apollodorus of Damascus (*circa* 50-130 CE), the column, placed on a 6,3 metre high square plinth, with an interior space intended to hold Emperor Trajan's (98-117 CE) ashes, reaches up to a height of 34,4 metres. It is topped by a gilded sculpture of the emperor standing on an almost five metres high circular pedestal that is placed on the viewing platform. The exterior surface of the column shaft is covered by a spiralling band of relief sculpture, recounting his victories in the Dacian Wars (101-2 and 106-6 ACE) in a realistic manner. The continuous exterior sculptural spiral band has a counterpart on the inside in the form of an interior stair which is a great engineering feet (figure 24). Its 185 steps are carved with great precision from solid marble drums from Luna (a site close to Carrara), each weighing 32 tons. This stair affords a climbing experience within the length of the column shaft that involves a long, twisting ascent, punctuated only by rectangles of light from which only the sky is visible. On reaching the viewing platform wide vistas of Rome open to the spectator. Higher up the glittering sculpture of Trajan was the highest element in Rome, befitting a ruler whose divinity was undisputed.

Since it is difficult to see the rising exterior sculptures from the ground, the real purpose of the column, might have been the ascent to the viewing tower from which vantage point the newly constructed market of Trajan, excavated into the Quirinal Hills, is viewed directly below.

Figure 23
Trajans Column, Trajan's Forum, Rome, completed in 113 CE
(source: http://en.wikipwdia/wiki/Trajans_Column).

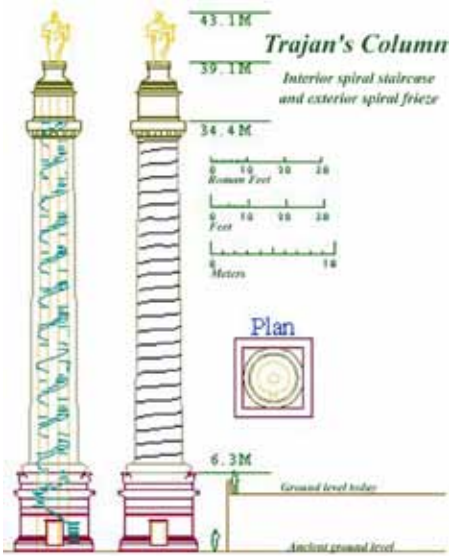

Figure 24
Diagrammatic representation of the interior stair of Trajan's Column, Rome (source: www.mmdtkw.org).

An exemplary medieval spiralling stair is that of the Leaning Tower of Pisa (built from 1173-1319). The 296 well worn stone steps winding around the interior of the *campanile* has broad treads and relatively low risers (figure 25). Why would the Church build such an elaborate bell tower adjacent to the cathedral, requiring an exorbitant amount of material and thousands of skilled labourers? The answer is: to be visible and audible to the faithful.

Figure 25
Interior stair, Leaning Tower of Pisa, built from 1172-1319 (photograph by the author).

On the outskirts of Venice a small palace is given a special status with an exterior stair (figure 26). This palace is called Palazzo Contarini del Bovolo, because of the snaillike shape of the stair. The palace was designed by Giovanni Candi (1440-1506), but the stair that gives the building its distinctive character is attributed to Giorgio Spavento di Pietro (1440-1509).

Figure 26
Giovanni Candi and Giorgio Spavento di Pietro Palazzo Contarini del Bovolo, Venice, built from 1499 (photograph by the author).

Leonardo da Vinci (1452-1519) was a versatile inventor and empirical researcher of natural phenomena, including human anatomy. He also made sketches of kinetic movement showing the human figure in the act of climbing upwards as well as a figure at the top of a ladder.[9] He furthermore made sketches of stairs, among which is one of a crossed stair, a sketch that is of importance for the investigation of stairs attributed to him (figure 27).

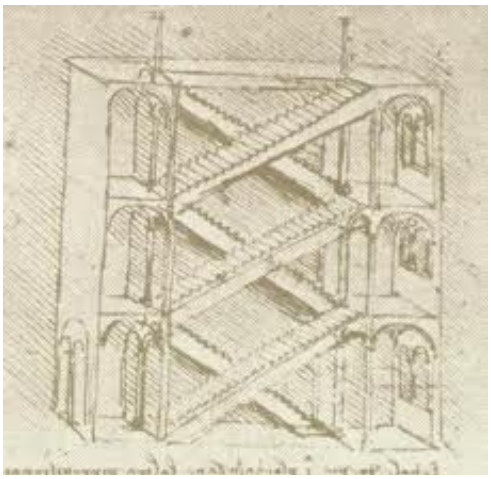

Figure 27
Leonardo da Vinci, sketch of a crossed stair, Manuscript B, 68v (source: http://www.leonardo3.net/leonardo/machines_eng.php).

It has been suggested that Leonardo may have designed the Château de Chambord in the Loire Valley for Francis I, since the structure of the remarkable double spiral stair at its centre points to an extraordinary architect (figures 28a, b and c).[10] What in Leonardo's oeuvre would make it plausible to ascribe the design of the double or crossed spiral stairs to him? Perhaps the idea phrased by Martin Kemp (2006: 176) that, in Leonardo's estimation, the principle that informs the work of the human designer is "to work in perfect concord with natural cause and effect [...]". Defining a spiral stair calls to mind a growth pattern, as described by (Hemenway 2008:139): "As a spiral progresses up a stem a certain number of leaves are formed before the spiral arrives back at a point directly above where the first leaf has emerged and creates another

leaf. The relationship of the number of turns a spiral makes to the number of leaves that emerge can be written as a fraction and is called ranking." The spiral represents a growth pattern that can be rendered in precise mathematical terms and applied to a stair that winds around a central supporting column. The crossed spiral stair is an innovative construction since its two spiral flights wind in opposite directions, as in the case of the crossed stair above (figure 29). In Chambord that would have made it functionally possible for the king and the members of his household to use different stairs in the same space without encountering each other.

Figure 28a
Attributed to Leonardo da Vinci, interior view of the double spiral stair, Château de Chambord, 1519-47 (photograph by the author).

Figure 28b
Attributed to Leonardo da Vinci, view of the double spiral stair from below, Château de Chambord (photograph by the author).

Figure 28c
Attributed to Leonardo da Vinci, view of the double spiral stair from outside, Château de Chambord (photograph by the author).

Figure 29
Diagrammatic model of the crossed double stair of the Château de Chambord (source: http://www.leonardo3.net/leonardo/machines_eng.php)

The exterior spiral stair at the Château de Blois, rebuilt by Francis I from 1515-19, is also attributed to Leonardo since its mathematical calculation of a spiral growth pattern structure once again points to an extraordinary architect (figure 30).[11] This stair enhances the facade of the castle and makes the interior spatial design intelligible from the outside.

Figure 30
Attributed to Leonardo da Vinci, external spiral stair, Château de Blois, rebuilt by Francis I from 1515-19 (photograph: the author).

A helicoidal stair

This stair is a remarkable element in the Palazzo Barberini, Rome, that at present houses the Galleria Nazionale dArte Antica, Rome. The site in Rione Trevi was purchased by Maffeo Barberini who became Pope Urban VIII. Three great architects were commissioned to design the Palazzo, Carlo Maderno (1556-1629), assisted by his nephew Francesco Borromini (1599-1667), and Gianlorenzo Bernini (1598-1680). The work that Maderno started in 1627 was finished by Bernini in 1633.

After the death of Maderno Borromini collaborated with Bernini as the appointed architect. However, Borromini left his mark on the building in the form of a stair that leads from the central two-story hall to the *piano nobile*. This small stair, called the *scala elicoidale* (helicoidal stair), is a work of genius (figures 31a and b). It is similar to a spiral stair, but elliptical and has no central support.[12]

Figure 31a
Francesco Borromini, helicoidal stair from below, Palazzo Barberini, Rome, completed 1633
(source: http:en.wikipedia.org/wiki/Palazzo_Barberini).

Figure 31b
Francesco Borromini, helicoidal stair from above, Palazzo Barberini, Rome, completed 1633
(source: http://en.wikipedia.org/wiki/File:Borromini-treppe).

On the other side of the great hall Bernini's winding stair is on a square plan with a less complicated winding form (figure 32).

Figure 32
Gianlorenzo Bernini, stair from below, Palazzo Barberini, Rome, completed 1633
(source: http:en.wikipedia.org/wiki/Palazzo_Barberini).

The symbolism of the winding stair

In a painting, entitled *Philosopher in Meditation*, Rembrandt Hermanzoon van Rijn (1606-1669) depicts an elderly man seated at a window, with to his left a stair, winding from a patch of light on the floor into a dark space above (figure 33). Seemingly the stair symbolises the ascent of the man's thoughts, from the known to the unknown, since in the case of a turning stair the destination above is not visible. Enhanced by the chiaroscuro effects Rembrandt's rending of the winding stair refers to a complex artefact with a symbolic purpose.

Figure 33
Rembrandt, *Philosopher in Meditation,* 1632, oil on oak panel. 28x34 cm, Musée du Louvre, Paris
(source: http://en.wikipedia.org/wiki/Philosopher_in_Meditation).

A sculptural stair

The Biblioteca Laurenziana in the Monastery of San Lorenzo, Florence, was designed by Michelangelo Buonnarotti (1475-1564) in 1523 for Guilio Medici (later Pope Clement VII) to house his collection of manuscripts and printed books. Work commenced in 1524, was only completed in 1560 by Bartolommeo Ammanati according to Michelangelo's plan.[13] It consists of a double volume vestibule with a centrally placed free-standing triple stair evolved in April 1525, the middle one projecting beyond the sides, leading to a longitudinal reading room on an upper level (figure 34).[14] More so than Michelangelo's other works it difficult to interpret stylistically; it has a quality that was referred to as *difficoltà* by his contemporaries. The massive stair occupying a restricted floor space is an enigma. It has the appearance of a sculptural object placed centrally in the high, confined vestibule space, leading to the longitudinal library space on a higher level. The central steps are rounded, bulging towards the visitor on ground level; the flight then continues in an irregular series of seven and five, while the steps of the symmetrical flights abutting on both sides are straight and joins up with the last five steps of the central flight. These side stairs are especially uninviting and dangerous looking without outside balustrades.

Figure 34
Michelangelo Buonnarotti, stair in the vestibule of the Laurentian Library, Florence, started in 1524 and completed in 1560
(source: http://www.atttav.com/florence/laurentian-library).

According to Charles de Tolnay (1975: 135), "instead of indicating an upward direction, [it] seems in the centre to run down and spread like a cascade of lava, contained only by the secondary stairs on either side". It links the vestibule space into a field of forces in which the architectural elements defining the wall – the volutes, double columns, and architrave – seem to act independently, contrary to their traditional architectural function. The strangeness of the vestibule design is explained by De Tolnay (1975: 135): "This architecture is not in proportion to man and is not made for him. It has independent dimensions and carries within itself a peculiar and more powerful life. It is the spiritual preparation for entrance to the reading room."

James S. Ackerman (1961: 117) has a further interpretation: "To anyone familiar with Michelangelo's sculpture it should be no surprise to find the evocation of compression and frustration in his architecture as well. Here, in an enclosed space [the vestibule], he had the opportunity to engender in the visitor the ambivalence between action and immobility which we imagine his *Moses*, for example, to be experiencing." Even if not refuting Ackerman's insight, it is proposed that a more meaningful interpretation of Michelangelo's design could be opened by comparing it to his slave figures, especially the so-called *Awakening Slave* (figure 35), an unfinished sculpture intended for the tomb of Pope Julius II. It represents the human body as composed of inert matter against which an inherent spiritual force strives for release. Likewise, the stair leading to the Laurentian Library is made to appear heavy and sagging downward. Upward movement to the library on the first floor will afford the spiritual release. It is indeed "the spiritual preparation for entrance to the reading room", as De Tolnay states.

Figure 35
Michelangelo, *Awakening Slave*, Galleria dell'Accademia, Florence, 1525-30, marble, 2,76 high (photograph by the author).

Going to the opera

There is a vast difference between going to the opera and going to a library. "Going to the opera" implies a leisurely *passegata* to view the other guests and enjoy the surroundings, especially when ascending by means of a ceremonial stair in a vast foyer. This should not be a case of *gradus at Parnassum*, implying that the path to Parnassus, that is to learning or the practice and understanding of art, is arduous. Unlike the effect of the stair in the vestibule of the Laurentian Library, the ceremonial stair in the Palais Garnier, housing the Opera de Paris, seems to diminish gravitational heaviness and affords the ascending visitor a visual experience of the opulent design as a counterpart of the expected music in the hall (figure 36).

There is a long time interval between Michelangelo's stair in the cramped foyer of the Laurentian Library and that in the Opera de Paris, by Jean-Louis Charles Garnier (1825-1898), which was inaugurated in 1875. In the design of the grand stair in the Second Empire style[15]

the architect expressed the insight visually that the path to pleasurable entertainment like opera is light. He sublimated the heaviness of stone, masonry and iron of which the stair is constructed in the way it sweeps up gracefully from the foyer to the hall, affording the ascending guests in their evening dresses an opportunity to show off their status.

Figure 36
Jean-Louis Charles Garnier, ceremonial stair, Opera de Paris, inaugurated in 1875 (photograph by the author).

Postscript

The end of the nineteenth century concludes the era of stairs built in stone, masonry, timber and iron. A new era of design was inaugurated in the twentieth-century by means of new structural materials such as concrete and aluminium. Consequently the design of stairs meant for display changed – as will be discussed in the second part of this research to be published in a later issue of this journal.

Notes

1 Quoted from: http://www.brainyquotes.com/authors/h/heraclitus.html.

2 See "The characteristics of stair falls and injuries", in Templer (1992).

3 See Venturi (1966).

4 For further information about ziggurats, see Gill (2011: 42).

5 For a synopsis of the history and form of the stair, see Norberg-Schulz (1980: 28).

6 It is probable that a sketch by Gianlorenzo Bernini (1598-1680) showing the *Scalinata di piazza di Spagna* in the Nationalmuseum, Stockholm (CC 790) "deeply affected the eventual appearance of the Spanish Steps..." (Marder 1980: 289).

7 For a full description of the stair, its symbolism and history, see Lotz (1969).

8 The Odessa stair was made famous in Sergei Eisenstein's 1925 silent film, *The Battleship Potemkin*. According to the fictionalised account in the film soldiers opened fire on the people on the stair on June 1905.

9 This sketch is housed in the Royal Library, Windsor.

10 For an overwiew of the work, see De Tolnay (1975: 227).

11 Leonardo illustrated his skill in designing double stairs with square plans (Manuscript B, folio 68 *verso*, and Manuscript B, folio 47 *recto*), and also a double spiral stair on a circular plan (Manuscript B, folio 69 *recto*).

12 Tanaka (1992: 85).

13 For an overview of the progressive stages of the design of Michelangelo's Laurentian stair, see Wittkower (1978: 26-43).

14 A helicoid, defined as follows: "The (circular) helicoid is the minimal surface having a (circular) helix as boundary. It is the only ruled minimal other than the plane... . [...] The helicoid is the only non-rotary surface which can glide along itself..." (quoted from Weisstein 2013: 1). Borromini's stair obviously has no relationship to a helicoid which is shaped like Archimedes's screw.

15 The Second Empire style is a decorative mixture of neo-Renaissance and neo-Baroque styles, combined with Beaux-Arts symmetry. For a detailed description of the construction and style of Garnier's Paris Opera see (Mead 1991).

Works cited

Ackerman, James S. 1970. *The Architecture of Michelangelo*. Chicago: University of Chicago Press.

De Tolnay, Charles. 1975. *Michelangelo: Sculptor, Painter, Architect.* Princeton: Princeton University Press.

Gill, Anton. 2011. *The Rise and Fall of Babylon, Gateway of the Gods.* London: Quercus.

Hemenway, Priya. 2008. *The Secret Code: The Mysterious Formula that Rules Art, Nature, and Science*. Köln: Evergreen.

Hollinshead, Mary B. 2012. Monumental steps and the shaping of ceremony, in Bonna D. Wescoat and Robert G. Ousterhout (eds.), *Architecture of the Sacred: Space, Ritual, and Experience from Classical Greece to Byzantium*. Cambridge: Cambridge University Press.

Kemp, Martin. 2006. *Seen / Unseen: Art, Science, and Intuition from Leonardo to the Hubble Telescope*. Oxford: Oxford University Press.

Kirchner, Dieter. 1985. A look at the past, *Austria Today* (4): 26-32.

Lotz, Wolfgang. 1969. Die spanische Treppe: Architectur als Mittel der Diplomatie, *Römischer Jahrbuch für Kunstgeschichte* (12): 39-94.

Marder. Tod A. 1980. Bernini and Benedetti at Trinità dei Monte, *Art Bulletin* 62(June): 286-9.

Mead, Christopher Curtis. 1991. *Charles Garnier's Paris Opera: Architectural Empathy and the Renaissance of French Classicism*. Cambridge, Mass.: The MIT Press.

Norberg-Schulz, Christian. 1980. *Late Baroque and Rococo Architecture*. Englewood Cliffs, NJ: Prentice-Hall.

Rowland, D. and Howe, T.N. 1990. *Vitruvius. Ten Books on Architecture*. Cambridige: Cambridige University Press.

Smith, Peter. 1976. The orchestration of cities, *RIBA Journal* (March): 111-2.

Tanaka, Hidemichi. 1992. Leonardo da Vinci, architect of Chambord? *Artibus et Historiae* 13(25): 85-102.

Templer, John. 1992. *The Staircase: Studies of Hazards, Falls, and Safer Design*. Cambridge, Mass.: The MIT Press.

Veblen, Thorstein. 1988. *Theory of the Leisure Class*: *An Economic Study in the Ecolution of Institutions.* New York: Macmillan.

Venturi, Robert. 1966. *Complexity and Contradiction in Architecture.* New York: Museum of Modern Art Press.

Weisstein, Eric, W. 2013. Helicoid, from *Math World*, A Wolfram Web Resource, http://mathworld.wolfram.com/Helicoid.html, retrieved on 2013/05/30: 1-2.

Wilkenson, Cathrine. 1975. The Escorial and the invention of the imperial staircase, *The Art Bulletin* LVII: 65-90.

Vitruvius. See Rowland and Howe.

Wittkower, Rudolf. 1978. Michelangelo's Biblioteca Laurenziana, *Idea and Image*: *Studies in the Italian Renaissance.* London: Thames and Hudson: 11-71.

Zevi, Bruno. 1978. *The Modern Language of Architecture*. Seattle: University of Washington Press.

Zucker, Paul. 1955. Space and movement in High Baroque city planning, *Journal of the Society of Architectural Historians* 14(1): 8-13.

Estelle Alma Maré is the present editor of the SAJAH and an extraordinary professor of architecture at Tshwane University of Technology, Pretoria.