

Geometry Experiments with Richard Serra's Sculpture

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Abstract

Richard Serra is known for his giant installations composed of sheets of metal which self-support solidly although the viewer may perceive them as unstable and ethereal. Serra first discovered that a heavy steel plate could be supported by the corner of a room. Thus, the space of the room becomes part of the sculpture. By leaning several steel plates one against each other in a cycle Serra finds another way of displaying them securely with different rotational symmetries. These experiments can be made using small cardboard plates. Serra also uses simple geometrical curved surfaces, which includes spheres, toruses, ellipses, cones and cylinders. Easy ways to play with these surfaces in the classroom is the use of plaster bandages which provide students an exciting geometry class.

Richard Serra and Post-Minimalism

Richard Serra was born in 1939 in San Francisco, son of Spanish father and Russian mother. He studied literature at the University of California and art at Yale. Like his father, he worked in steel mills which became an important influence in his later work. Richard Serra has used several techniques and materials in the course of his career but he is well known for his large scale installations of weathering steel, best known as Corten steel.

The work of Serra is usually classified as minimalism, a movement in which a minimum number of simple elements is used to produce the maximum effect. Although Serra has many similarities with minimalism and other styles like process art or land art, probably the term post-minimalism fits better with his work. Post-minimalism takes minimalism as starting point but artworks usually use simple materials with a pure formalist aesthetic and without any contextualization.

Dimension, Balance, Context and Geometry in the Learning of Art and Architecture

This paper is the first of a series of three in which we will explore the work of Richard Serra from three different viewpoints: geometry by means of scale models (this paper), mathematics by means of algebraic equations and computing by means of parametric programming and CAD software.

The main objective of this work is to introduce into students the importance of concepts like measure, scale, balance, gravity, context and geometry from both experimental and theoretical sides. Students are encouraged to explore and interact with space but also to measure it; to design and model surfaces but also to formulate them technically; to challenge gravity but ensure balance. Although these experiences are strictly focused on the work of Richard Serra, we expect they will be useful to understand and practice these concepts in any sculptural or architectural environment.

Conclusions from this pilot experience currently held with architecture students from the University of the Basque Country will be displayed during the Bridges 2013 conference. The first results recently obtained show an enthusiastic response to this interdisciplinary approach to Serra's sculpture.

Weight and Measure

In 1992 Richard Serra was invited by the Tate Gallery to make a new work for the Duveen Galleries and demonstrate the sculptor's response to an architectural space. Serra shows an extraordinary talent for making sculptures for specific sites and his response was "Weight and Measure", a piece composed of two forged steel blocks (1.73 x 1.04 x 2.75 m and 1.52 x 1.04 x 2.75 m)

The Duveen Galleries are a hallway formed by three separated but continuous rooms strung out in a line, featuring a middle room strongly defined by its octagonal shape. First, Serra has to decide how to use the space, whether to place separate works in each room or conceive a work which deals with the entire space. The big focus is the centre octagon which reads as a vertical volume taking the function of a pedestal. The columns around it have an enormous sculptural presence and accentuate the vertical scale of the room.

Soon Richard Serra realizes that the central space should not contain any work and he tests if the central space may be integrated into the installation with sculptural elements in the two side galleries only, leaving the octagon empty. He never reinforces the intentionality of the architecture but redirect it with the physical manifestation of his sculpture. Here it is necessary to create a link between the galleries and across the octagon, activating the entire space. First idea was to use circles, taking the scale of the rounds from the scale of the columns. But the linkage between columns and circles would have been an evident contextualization more adequate to post-modernism rather than post-minimalism.

So the decision is the use of two blocks. Then the sculptor starts a measuring process: the diameter, length and base of the columns, the distance between them, the niches, doorways... everything. Serra decides that the width of the two elements would equal the width between the central columns centered on line with the main axis. He wants a block with depth enough so as to be read as a mass, not as a slice.

Finally Serra defines the height of the forged blocks with two different measures; the lower element with 1.52 m height is placed in the south gallery and the higher element with 1.72 m in the north gallery, so they will appear level due to perspective when entering the hall. He pretends to set a visual field where the entire space becomes a manifestation of the sculpture instead of two separate objects in the opposing galleries. The tension of the piece is based on its difference in elevation. One block reads as horizontal volume with its top view below eye level, whereas the other rise vertically above eye level as you walk towards it. This process allows people to locate themselves in space and to understand space in terms of their physical movement.



Figure 1: *Weight and Measure. Two forged steel blocks installation in Tate Britain.*

Equal Weight and Measures

On August 1, 2000, Richard Serra presented a 90-ton solid steel sculpture at the Colby College Museum of Art in Waterville, Maine, composed of three blocks designed specifically for the sculpture court and scaled to echo the museum walls that surround it. The title “4-5-6” comes from the four feet by five feet by six feet (121.9 x 152.4 x 182.9 cm) dimensions of the three identical 30-ton masses, forged from solid Corten steel, a material that oxidizes naturally to weatherproof the sculpture and produce the warm color fundamental to the sculpture's aesthetic.

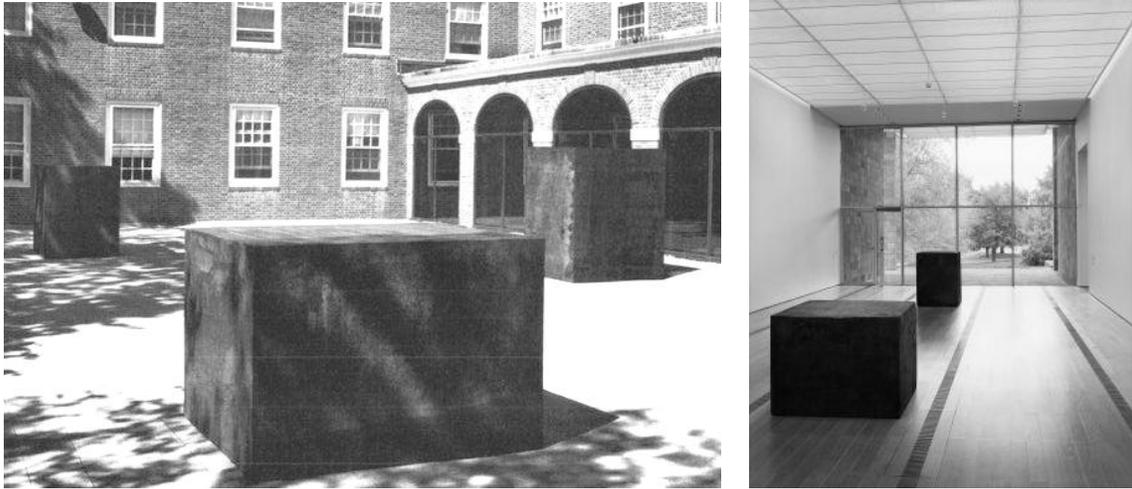


Figure 2: “4-5-6” (left) and “The Consequence of Consequence” (right).

Each of the block-shaped elements rests on a different face to create the illusion that they are different sizes. This discrepancy in configuration leads the viewer to perceive them as having different proportions, perhaps even different weights and volumes. In this case Richard Serra pursues the opposite effect to “Weight and Measure” in which different blocks appear to be of equal dimension due to perspective.

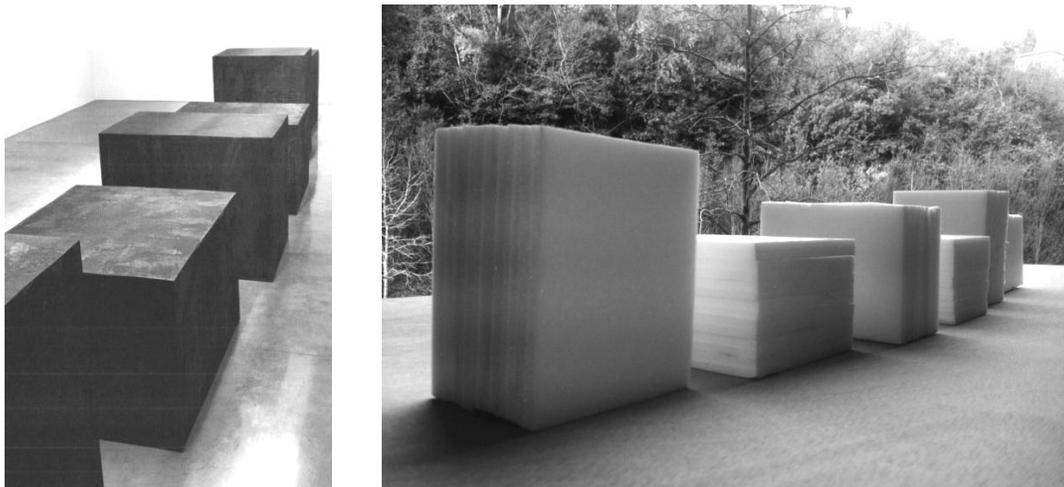


Figure 3: “Equal Weight and Measures” (left) and mock-up made in the University of the Basque Country (right). Students may explore how identical blocks look similar or not in different architectural environments.

Other of Serra's works explore this concept further: "The Consequence of Consequence" (2011) is composed of two 8.5-ton massive steel blocks standing opposite each other. They are the same dimensions but one is laid horizontally and the other vertically, so that their height, length, and width are positioned differently. Opposite each other, the blocks create a force field of two poles with tension in between. "Equal Weight and Measures" (2006) pushes human perception to the limit by arranging in a line six equal blocks (190.1 x 160 x 129.5 cm) in different orientations. The installation also implies repetition, the possibility of a field in which blocks go on and on.

Strike: The Search for Balance

While experimenting with how to stand thin plates of hot-rolled steel in a room, Serra discovered that once a plate was wedged into the corner, the plate remained standing in perfect balance and stability without any other external element. The unexpected discovery of the potential of a plate bisecting a corner moved Serra to consider the entire room as the space of the work and part of the sculpture. In order to fully appreciate it, the viewer had to enter the space and walk around the steel plate. Visually it appears first as a rectangle, then as a thin vertical edge and lastly as a rectangle again as one walks across the room.

The erection of "Strike", a steel plate of 246 x 732 x 4 cm thick into a corner initiated Serra's large scale site specific installations. One of the most outstanding is "Bilbao-Circuit" made up of four massive sheets of steel of 240 x 1150 x 3 cm thick conceived to be placed at the four corners of the room, leaving an open space in the center. Spectators may circulate between them, dividing and conditioning the exhibition space which becomes part of the sculpture.

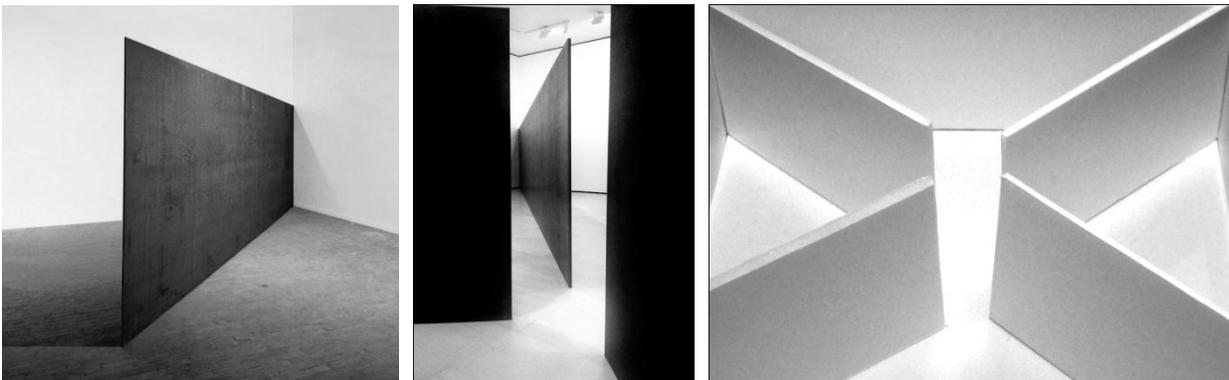


Figure 4: "Strike", detail from "Bilbao-Circuit" and its scaled model made with 4 cardboard pieces.

Richard Serra became primarily concerned with the stacking of metal sheets self-supported by their own weight. Other pieces were prevented from falling by using devices like cylindrical props ("Sign Board Prop") or a set square ("Right Angle Prop"). Most of his pieces stands by virtue of equilibrium and gravity ("Kitty Hawk") and emphasize the weight and nature of materials ("Two Plate Props").

By leaning several steel plates one over each other, Serra finds another way of displaying them securely with different rotational symmetries ("House of Cards", "Five Plates Counter Clockwise Pentagon", "1, 2, 3, 4, 5, 6, 7, 8").

Soon Richard Serra discovers that these works could be transferred to large scale, site-specific installations ("Terminal", "Fulcrum", "Charlie Brown"). After 1970 Serra realizes that his studio days are behind him.

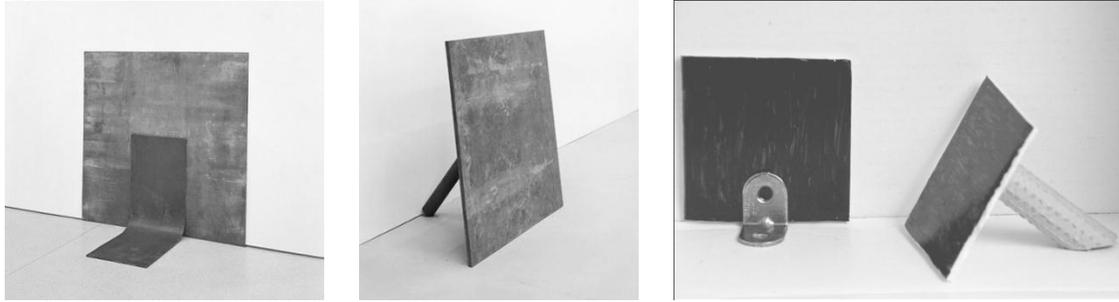


Figure 5: *“Sign Board Prop”, “Right Angle Prop” and scaled models for education.*



Figure 6: *“Kitty Hawk”, “Melnikov 2” and scaled models for education.*

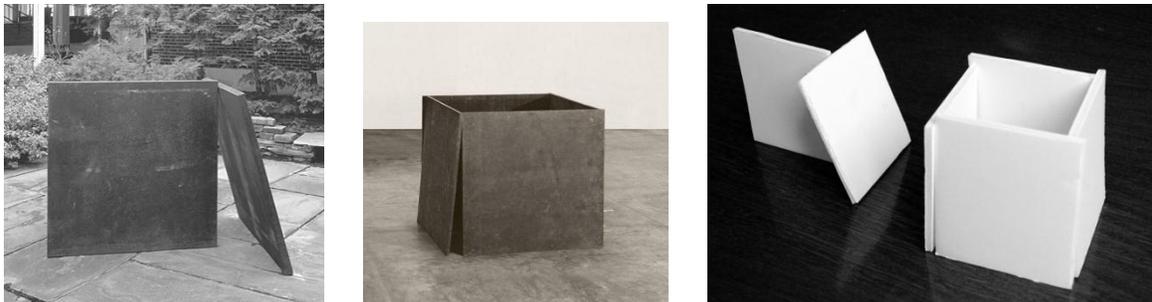


Figure 7: *“Two Plate Prop”, “House of Cards” and scaled models for education.*

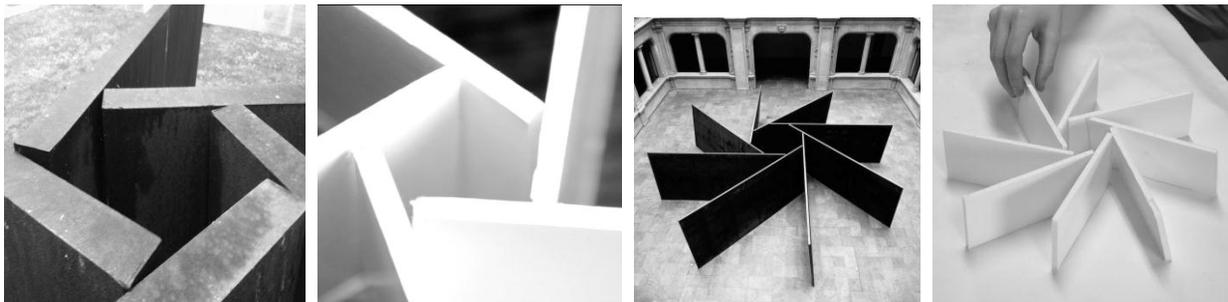


Figure 8: *“Five Plates Counter Clockwise Pentagon”, “1, 2, 3, 4, 5, 6, 7, 8” and scaled models for education.*

Tilted Arc: Curves in Equilibrium

In 1981, at forty years old, Richard Serra was already a notable artist and received a commission to erect a sculpture in New York Federal Plaza. “Tilted Arc” was a cylindrical section with a shallow curvature of dimensions 36.6 m length, 3.66 m height and only 6 cm thickness, made with Corten steel, an unconventional industrial material. As its name suggests, the sculpture was slightly tilted over the ground producing an effect of weightlessness although its curvature made it particularly stable. Relieved of any symbolic role and introduced into the real space of the viewer, sculpture took on an intense relationship to the spectator.

For Serra, the site was an extension of the sculpture and could not exist unless it remained in its exact location. To remove the work was to destroy the work. Unfortunately the sculpture was considered disruptive to the open space of the plaza and was removed, causing much controversy.



Figure 9: “Tilted Arc” (left) and an easy experiment of stability for straight and curved surfaces. A straight sheet of foam board will easily fall under a gentle blow. The curved sheet will resist the blow or will slide instead of falling.

In 1983 Serra produced “Clara-Clara” a sculpture consisting of two identical conical elements so arranged as though one is standing upside down. As one of the arches is broader at the bottom than at the top, the top edge describing a more closed curve than the bottom edge. The second conical element is inverted, so the broader arch is placed at the top. Both pieces are placed back to back so the two arches form a narrow passageway in the middle. The deviation from the vertical makes the passageway between arches the climax of the optical experience, producing the sense of losing balance.

“Clara-Clara” occupies a key position in Serra’s work and proved to be extraordinary fruitful as many of his next works operated with conical arcs: “Olson”, “Berlin Junction”, “Running Arcs”, etc.



Figure 10: “Berlin Junction” and its simulation with plaster bandages molded over two conical pots.

Snake and Torqued Ellipses

One of the highlights of the inauguration of the Guggenheim Bilbao Museum was “Snake”, a colossal work of 180 tons weight composed by three enormous serpentine ribbons of hot-rolled steel which is permanently exhibited since then. The three ribbons create two tilted passages that produce a strange sense of dynamism and instability.

Although it is not easy to interpret the geometry of “Snake”, it is composed by six conical sections. Figure 11 explain visually how each conical piece is twisted and assembled to produce the three ribbons and the two passageways with different width.

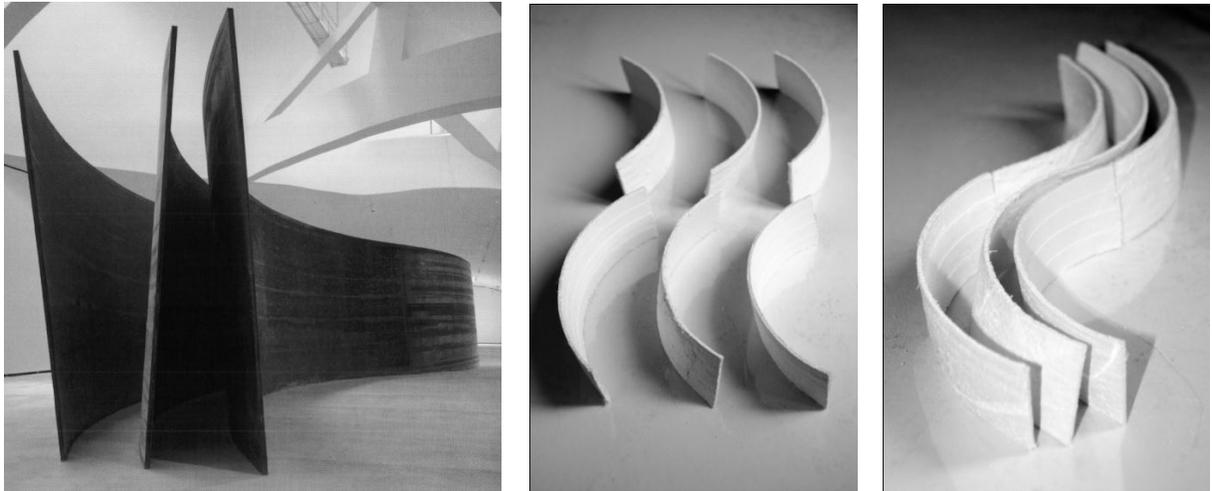


Figure 11: “Snake” made up with six conical sections. Each one was made using the same technique described in Figure 10 for the sculpture “Berlin Junction”.

“Snake” preceded Serra's Torqued Ellipses collection, the artist's most important exploration on the physicality of space and the nature of sculpture. The Torqued Ellipses seem to defy gravity and logic, making steel appear fluid and ethereal. These sculptures create surprising experiences as viewers walk in and around them and provoke a dizzying sensation due to a confusing perception of space and motion.



Figure 12: Torqued ellipses are the result of the extrusion of a surface from a planar ellipse into another with same dimension but different elevation and rotation along its vertical axis. This process can be simulated with two elliptical wood templates joined by a metal shaft which allows rotation. Plastic film and plaster bandages cover the surface.

The Matter of Time

In 2005, Richard Serra presented in the Guggenheim Bilbao Museum a collection of eight giant sculptures, ranging from 44 to 276 tons, which the author considers the most important installation of his career. “The Matter of Time” shows the evolution of the artist's sculpted forms, exploring the dialog between matter, time and space. The last two works presented in this collection feature sculptures made from sections of toruses and spheres in which the steel is so light that it seems to float.

Serra creates environments with differing effects on the viewer's perception as they walk in and around them. The entirety of the 130 m gallery participates in the sculptural field and creates unanticipated passages of space in motion that are distinctly different though their weight, mass and gravity. Students are challenged to analyze and reproduce this collection using plaster bandages.



Figure 13: “The Matter of Time” and “Between the Torus and the Sphere” in Guggenheim Bilbao Museum.



Figure 14: Students working with inflatable toys and plaster bandages to produce sphere and torus sections.

References

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