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El granero de la memoria. De las analogías en la obra de Eduardo Souto de Moura

// The grain store of memory. On Analogies in Eduardo Souto de Moura's work

La obra de Eduardo Souto de Moura se basa en la construcción de relaciones entre el lugar y la tectónica de la arquitectura. Descubrió en la reconversión de un granero en Gerês y en el proyecto del hotel en Salzburgo dos estrategias proyectuales de especial relevancia en su obra: el hórreo o *espigueiro* y el silo. La combinación de ambos da lugar a otro tipo tradicional: la casa *minhota*. Combina estas tres tipologías tradicionales con obras arquitectónicas pretéritas o contemporáneas para lograr una obra única y personal. La obra de Breuer es una referencia constante en la trayectoria de Souto de Moura, cuyo método de trabajo se basa en la duda metódica y las analogías.

Eduardo Souto de Moura's work is based on the construction of relations between the tectonics of his architecture and place. He discovered in the conversion of a barn in Gerês and in the hotel project in Salzburg two design strategies of special relevance for his work: the barn structure or *espigueiro* and the *silo* (bulk storage structure). The combination of both gives rise to another traditional type: the *casa minhota*. He combines these three traditional typologies with past or contemporary architectural creations in order to achieve unique and highly personal work. Breuer is a constant reference in Souto de Moura's trajectory and the working method of the former is based on methodical doubt and analogies.

Analogías, arquitectura tradicional, BREUER, construcción, paisaje, SOUTO DE MOURA

Analogies, traditional architecture, BREUER, Construction, Landscape, SOUTO DE MOURA

«To tell the truth, I have been carrying these notions around with me for some time now. Notes which I took in October 1944 are proof of this; but due to one of these strange quirks of the soul, which novelists know only too well, it had lain hidden in this ever-bountiful grain store which we call memory» (Green 2015).

In the work methods of Eduardo Souta de Moura there can be found two constants; the first is his approach to the project from a very special and personal standpoint – from methodological doubt (Adrião and Carvalho 2006): he questions what he has constructed or what he is designing to find the best possible project. Thus, in this way history becomes transformed into another part of the project material (Correia 2016): Souto de Moura continually analyses past or present projects, projects that are both near and far and he reconstructs them to generate something new. The second constant of his method can be described as references by analogy. He recognises the importance of both the copy and the appropriation of the work of others (Bandeira 2011) and adjusts these features to the construction systems at his disposal, to place, to the client and to the programme (Miranda, Pimentel and Treno 2013). He comes to references convinced that similar problems would give rise to analogous construction solutions and systems. Design is a "manifestation of intelligence while designing from scratch shows a clear lack of intelligence because it means losing a whole legacy of available information" (Pais 2000). When he reworks the projects of others, he brings to life his own version of those, based on an analogous reading of the images at his disposal. His "copy" goes much further than that of the form which is never an *a priori* one: his analogous images do not represent the final image he is looking for but, rather, they confirm a decision which had been previously taken (Merí de la Maza 2012a). It is in precisely this way that all the analogies contained in this present article should be understood.

This working method brings about a heterogenous production which makes the task of classifying it a difficult one for critics (Molina 2019). Both memory and material are the two axes which trace and consolidate the coordinates of his work (Fernández-Galiano 2018a). His work arises from an approach to truly disciplinary questions and by not being "carried away" by any kind of dogmatism (Correia 2016). The following themes recur again and again:

- Constructive material nature (Merí de la Maza 2012a). Souto de Moura is more interested in the construction of the relationship between place and the tectonics of his buildings than in the sincerity of construction. He introduces calibrated changes in the place to make it suit the architectonic expression of the construction systems (Correia 2016). He reveals the truth of construction by means of a lie. (Grande 2009, Rojo de Castro 2005).

- The dissolution of the limit (Merí de la Maza 2012) through various project strategies such as carpentry from floor to ceiling or vegetable tints (Daniele 2003).

FIGURE 01 » Left. Unknown. *Espigueiro*. Available: https://arquitectos.pt/?no=2020492816 [Consulted: 15 August 2024]. Centre. Souto de Moura, Eduardo. *Casa minhota*. Source: Sérgio Koch de Araújo. Right. Fehn, Sverre. Drawing of a Vessel. Source: Santiago de Molina.

- Superimposing and working with diverse, opposing or different systems of construction and succeeding in giving a sense of unity to the building (Leoni 2003).

Souto de Moura combines these themes with traditional types and thus he achieves work which is rich in both tone and complexity, and which combines the *Inquérito à Arquitectura Regional Portuguesa* (1961) with works of modern and contemporary architects.

1*

Of grain-stores and *casas minhotas*

Volumes of the *Inquérito* can be found together with other books on traditional Portuguese architecture in Souto de Moura's office in his study (Quintáns 2019). Souto de Moura recognises the importance of the *Inquérito* to recover basic questions which have been forgotten (Adrião and Carvalho 2006) and he has recourse to it in search of inspiration (Maluenda and Encabo 2023). He uses three traditional types which are really two —the third can be understood as the combination of the first two— the barn or *espigueiro*, the *silo* (bulk storage system) and the *casa minhota*. He fuses them with other references by analogy and adjusts them to their surroundings, to the construction systems and to the programme.

The barns or *espigueiros* (fig. 01) are grain-stores which recline on columns, and these protect them from rain and from rodents. They are usually long narrow constructions set on the threshing floor or on the paved floor; they can also be found linked to the living space.

The *silo*, bulk storage space (fig. 01) is a buried grain-store, a cavity which has been excavated in the ground —originally in the form of a cylinder or a vessel— and it is plastered with burned clay to reinforce its walls. In this present article the term *silo* is used as an analogy between the buried grain-store and the stereotomy operation of excavation of the surrounding land which prepared it for the tectonics of the architecture.

The walls in the Minho area, in the north of Portugal, emerge from the ground and they become part of the topography as they blend in with it. The ground

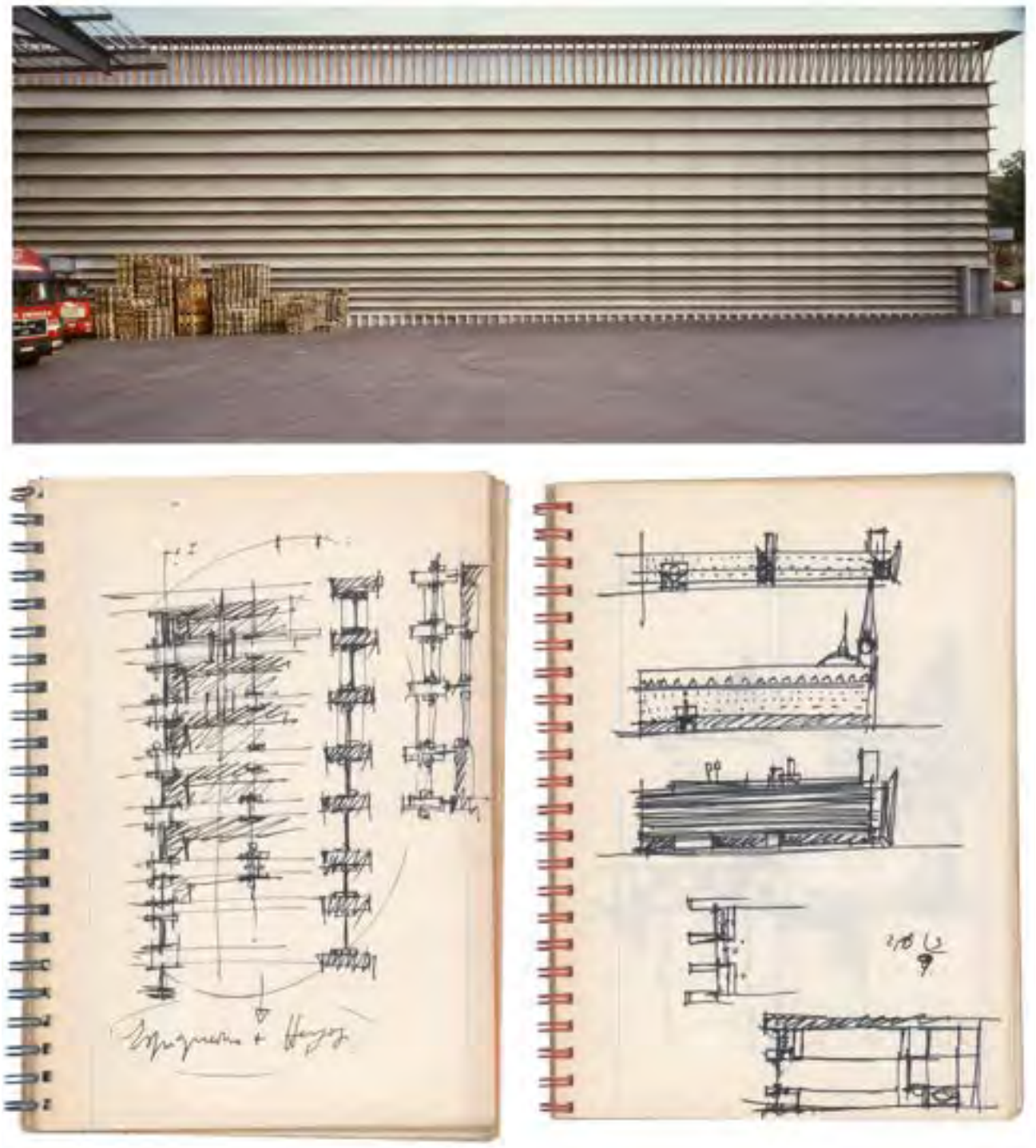


FIGURE 02 » Upper: Herzog &De Meuron, Ricola Storehouse in Laufen. Source: Herzog & De Meuron. Lower left. Souto de Moura, Eduardo. Sketch of the façade of the second version of the hotel in Salzburg, c. 1989. Source: Architecture House, Matosinhos. Lower right. Souto de Moura, Eduardo. Studies of the façade of the second version of the hotel in Salzburg., c. 1989. Source: Architecture House, Matosinhos.

floor of the *casas minhotas* (fig. 01) hidden behind the wall which contains the earth, used to house the wine stores and the farming implements. The house itself on the first floor rises on these walls; the rooms are turned towards an open gallery or a *veranda*, and one can reach these by means of an external staircase. In this present article the *casas minhotas* are defined as a superimposition: a barn or an *espigueiro* which leans on the hidden house behind a wall —and windows reveal its existence—, and it is assimilated to a *silo* in the manner we referred to above.

Souto de Moura spent the summers of his childhood in his grandmother's home, a *casa minhota* (Koch de Araujo e Silva 2013). He uses his memory – his autobiography- as yet another tool for his project, as Aldo Rossi shows- from whom he took the analogous concept and fitted it to his own purposes. Alvaro Siza and Fernado Tavora are also present but not in the sense of direct transpositions but rather as mutual direct insinuations (Esposito and Leoni 2003), as reciprocal influences or, as Tavora comments as "a common house or cathedral of architecture" (Esposito and Leoni 2003) not only as regards the building to which he was dedicating his studies, but, rather, as a means of relationship, as such used to be found among medieval architects. (Molina 2019). The three Portuguese architects look at architecture and landscape in a personal way, they define the project slowly and they test it against the programme, the construction systems and the material (Dorigati 2008).

Here Souto de Moura applied the strategies of the barn, the storage area and the *casas minhotas* to his work in the 1980s. This was the beginning of his creative maturity which would reach new heights in the years to follow.

2*

The barn or *espigueiro*

Souto de Moura set forth a strategy based on the traditional type of barn or *espigueiro* in the second project which he presented to the Town Council in 1989 —after winning the international competition which had taken place in 1987— for the construction of a hotel on a triangular plot of land with the Salzburg Mountain behind it (Trigueiros 2000). The new hotel, which was a regular prism of exact geometry, and a very rigorous construction resolves the limit between the city and its natural surroundings. A sketch with a handwritten note —"*Espigueiro* +Herzog" (fig 02)— reveals the references by analogy the very same year that both architects met when they were visiting Professors in Harvard (Adrião and Carvalho 2006). This note refers to Ricola's Storehouse of Herzog & De Meuron (Laufen, 1986-1987) (fig. 02). Built on an old quarry it also has the stacking of wood as its reference, tectonic constructions on stony elements which raise them up from the ground and thus protect them from the damp. They placed in opposition a technologically advanced construction on the steep side of the quarry, and they expressed the material quality of the façade using traditional materials —zinc and wood— in an innovative way.

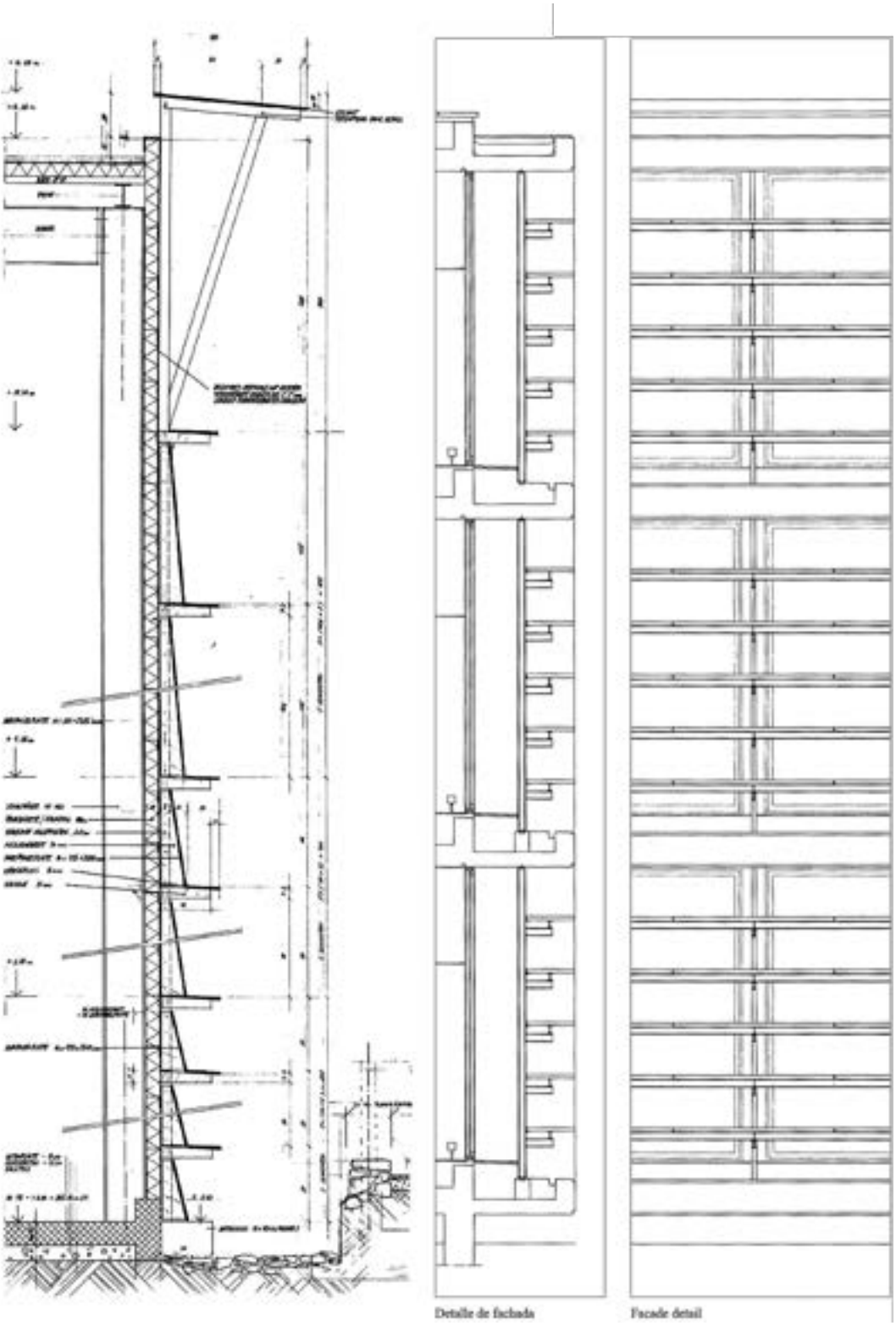


FIGURE 03 » Left. Herzog & De Meuron. Façade of the Ricola Store in Laufen. Source: Herzog & de Meuron. Right. Souto de Moura, Eduardo. Façade of the Faculty of Geological Sciences, University of Aveiro. Source: Eduardo Souto de Moura..

FIGURE 04 » Upper. Souto de Moura, Eduardo. Proposal presented for the second version of the hotel in Salzburg, c. 1989. Source: Architecture House, Matosinhos. Second. Ferreira Alves, Luis. Faculty of Geological Sciences, University of Aveiro. Source: Luis Trigueiros. Third. D'Athouguia, Ruy. Second version of the Nazaré Inn, 1958. Source: Graça Ribeiro Correia Ragazzi. Below. Ferreira Alves, Luis. School of Hostelry and Tourism, Portalegre. Source; ArchDaily.

The hotel, the constructive system of which almost became an obsession (Esposito and Leoni 2003) is based on a barn or an *espigueiro* raised up by means of the successive piling of strips of stone on to steel profiles which modulate the free height of the storeys and the height of the carpentry work, and this generates anisotropic and identical façades, two by two (fig. 02). There is another version of this second project of the Salzburg hotel which was taken up again in the Geological Sciences Faculty of the University of Aveiro (1990-1994) where the references by analogy are as much the store of Herzog &De Meuron as the second version of the Inn at Nazaré (1958) of Ruy d' Athouguia (Ribeiro Correia Ragazzi 2020) (fig. 04).

The reference by analogy between the façades of the store and the Geology Faculty is clear: horizontal elements —plaques of zinc or strips of red marble respectively— lean on cantilever elements which are supported by a sub-structure, and these adhere to the main structure. While the sub-structure of the store is made of wood and the main structure is made of steel, Souto de Moura reinterprets the *brise-soleil* with a substructure of IPN steel profiles and a structure of seen concrete (fig. 03).

The reference by analogy to the Pousada de Nazaré reveals the inmost motivation for the Faculty — namely an architecture which is both atemporal and anonymous, an artefact which is constructed based on a clear idea of order where the most important elements are organisation, the quality of spatial characterisation and the means of overcoming the special features of the programme (Ribeiro Correia Ragazzi 2020). If the *Pousada* generates a tension between nature and the artifice, the Faculty collaborates in the construction of the image and the scale of the campus (fig. 04). He takes up again the reference by analogy of the *Pousada* of d'Athouguia in the project of the School of Tourism and Hostelry (Portalegre, 2004-2011) (fig. 04). The cantilever, as in the *Pousada* reinforces the image of the artifice which is in equilibrium with nature and the reference by analogy of a tectonic construction which is the barn or the *espigueiro*. On the side of the industrial buildings which have been recovered, the façade is hidden, anonymous and sparse: it blends in with the scale of the street and gives greatest importance to that which existed there before.

He gathered together and reworked all these matters in the non-constructed project of the Olivetti Ideal Bank (1993) (fig. 05): a barn leaning on four supports of concrete which housed the communication centres and the toilet facilities, and this situated in an urban environment. The façades are reminiscent of the *strickbau* construction system. The glass ground floor is situated slightly below the gradient and it connects visually with the storage barn in the basement. Each floor has a different response to the programme and these are expressed around a patio and a tree which was there 'previously'. That which is of greatest importance is the organisation of the space and the construction system, as in the block of houses in the Rua do Teatro (Oporto, 1991-2001) and in the three housing units in Lieja Square (Foz do Douro, Oporto, 1992-1995): each storey has the same programme on the same surface but with different distribution.

FIGURE 05 » Upper Left. Eduardo Souto de Moura. Model of the Olivetti Ideal Bank, 1993. Source: Rita Capezzutto. Upper Centre: Llobregat Ruiz, Sergio. Project of the Olivetti Ideal Bank, 2020. Source: Sergio Llobregat Ruiz. Upper Right: Unknown. *Strickbau* system. Source: Silvia Ombellini. Second row. Souto de Moura, Eduardo. Sketch for proposal A of the Braga stadium, 2000. Source: Architecture House, Matosinhos. Third row. Souto de Moura, Eduardo. Model of the Multiuse Pavilion of Viana de Castelo. Source: Architecture House, Matosinhos. Lower. Jacobsen, Arne. Sports Pavilion of Landskrona. Source: Pol Martin Carbonell.

3*

The *silo* (bulk storage barn) and the *casa minhota*

The second type, that of the bulk storage barn, was discovered by Souto de Moura while reconverting a grain store in Gerês (1980-1982), where some of the characteristics of his later work appear: his fascination with ruins and the stereotomy operation to clear the terrain which prepares the location to receive the architectural tectonics. In that case the empty space already existed. The intervention was limited to the insertion of the refuge between the granite walls of the grain store after the removal of the covering and the first floor (Ordóñez-Castañón and Cunha Ferreira 2024).

The architect applied the principle of the bulk storage barn in the Vilarinha Annexes (Oporto, 1984-1988) (fig. 06). This intervention recovers the construction tradition of the north of Portugal, namely that of the house hidden behind outer walls —as in houses in Quinta da Batoca, in Baião and in Moledo— and it takes as image by analogy the Breuer/Bratti house (New Canaan, Connecticut, 1951) of Marcel Breuer and Herbert Beckhard (fig. 06). These dwellings are barely revealed except by a few openings in the granite walls which modulate and correct the terrain to make a place of preexisting artificial orography more natural (Angelillo 2000), in a construction which anticipates the house in Moledo (Moledo do Minho, 1991-1998), which will be analysed in a later section of this article.

Souto de Moura proposed his own version of the third traditional type, —the *casa minhota*— in the house in the Quinta da Batoca (Braga, 1989-1994), where he found ruins which he refused to rebuild. He explains this project as the superimposing of a *casa minhota* and the Berlin pavilion of the brothers Luckhardt (Hannover, 1950-1951) (Trigueiros 2000), if indeed the *casa minhota* is understood *per se* as a superimposition. In reality he concealed two construction systems which he announced in the vestibule where the main staircase is to be found. His sketches refer to the superimposition of the system Dom-ino and the walls of stonemasonry, a reference by analogy to the stone house (Tavole, 1982–1994) of Herzog & De Meuron (fig. 07). In actual fact the analogies go much deeper and speak of the recovery of construction traditions of Tavole and Braga: living spaces with no predefined use, the absence of passageways, built with local stone and having a platform on which the house is supported.

FIGURE 06 » Left. Ferreira Alves, Luís. Annexes in Rua da Vilarinha. Source: Luiz Trigueiros. Right. Massello, David. Breuer/Bratti House. Source: David Massello.

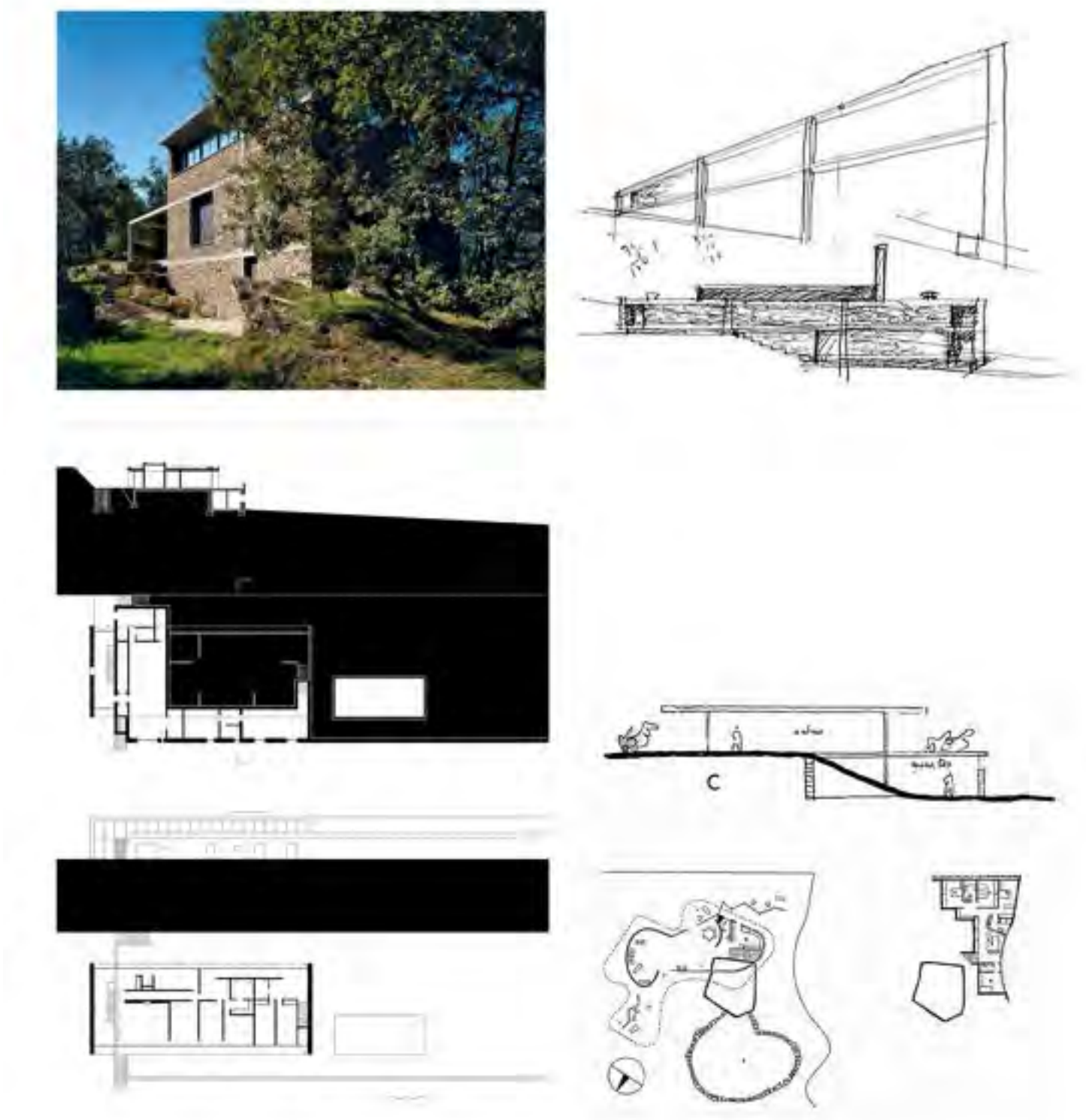


FIGURE 07 » Above left. Spiluttini, Margherita. Stone house in Tavole. Source: Herzog & De Meuron. Above right. Souto de Moura, Eduardo. Sketch of the house in the Quinta da Batoca. Source: Sérgio Koch de Araújo. Lower left. Author. House in la Quinta da Batoca. Lower right. Niemeyer, Oscar. Casa das Canoas. Source: Fernando Aliata.

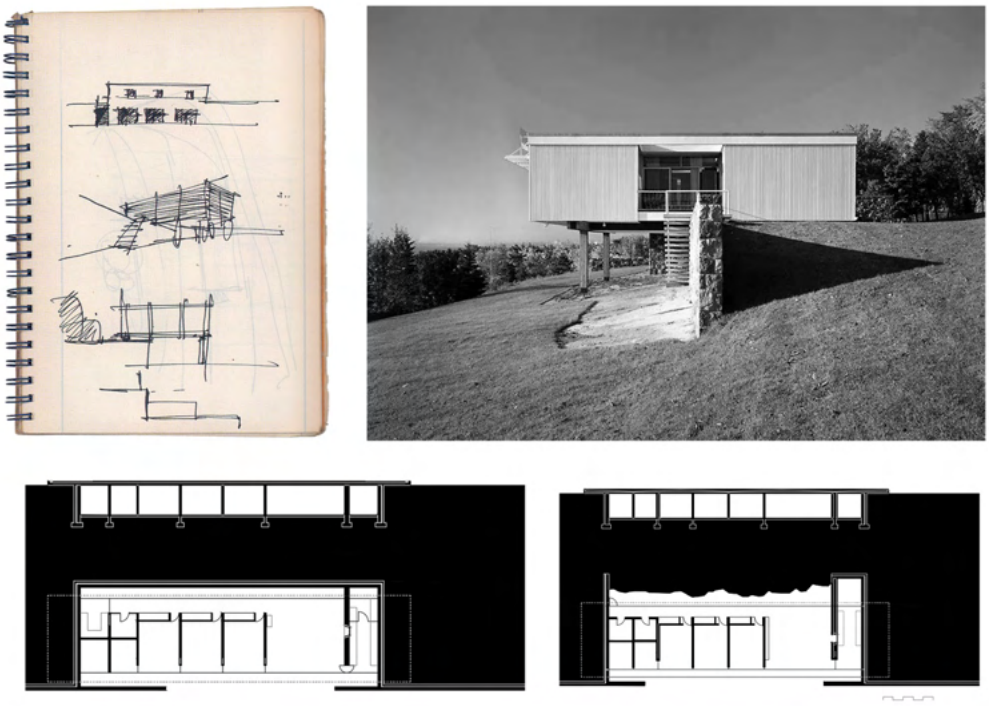
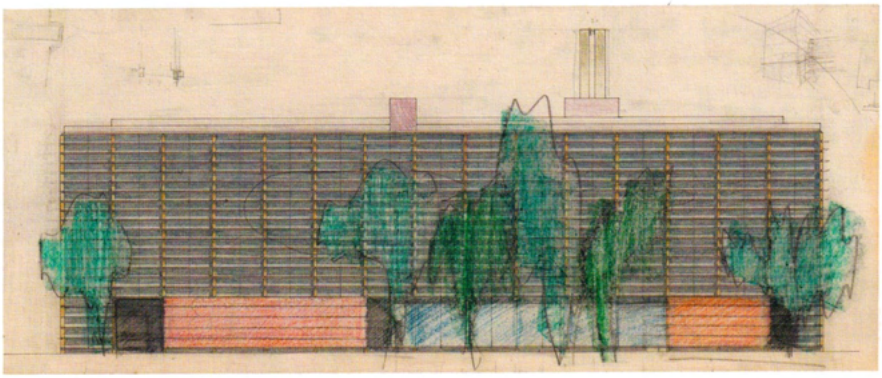


FIGURE 08 » Upper left. Souto de Moura, Eduardo. Sketch of the house in Moledo. Source: Architecture House, Matosinhos. Upper right. Stoller, Ezra. Starkey House. Source: David Masello. Upper centre left. Author. Working project for the house in Moledo. Lower centre left. Author. Constructed version of the house in Moledo. Lower. Breuer, Marcel and Beckhard, Herbert. Breuer House/Robeck. Source: David Masello. Upper centre right. Souto de Moura, Eduardo. Elevation of the house in Moledo. Source: Eduardo Souto de Moura. Lower right. Schnall, Ben. Levy House. Source: David Masello.

The other reference by analogy in the House of the Canoas (Río de Janeiro, 1953) of Oscar Niemeyer (fig. 07), who took advantage of the unevenness of the terrain to build a tectonic platform — where the bedrooms and the private areas of the house are situated— and over that he set a glass box with a cement covering which is supported on metallic pillars. The upper storey is transparent and has views both of forest areas and out on to the horizon. The stair which links the floors to each other is supported on a preexisting rock which anchors the construction to the place, and it makes the architecture resemble nature more and at the same time it makes nature seem more artificial. The ground floor of Quinta da Batoca, which makes use again of the bulk storage barn of the Vilarinha Annexes, is constructed like a concrete box hidden behind the stone wall and it contains the garage and the service areas — but without any passageways. Movement is channelled on the first floor by means of a passageway in the rear façade but this is not the only space which allows movement throughout the house: the public rooms and the main bedroom are joined by means of sliding doors which close against the main façade and thus are evocative of the *verandas* of the *casas minhotas* and of the carpentry of the Carlos Veires house (Povoa de Vazim, 1973-1976) of Álvaro Siza. The structure of the upper floor, as in the house das Canoas, is mixed: cement and pillars of steel. (fig. 07).

Souto de Moura took all these questions that have been previously dealt with to their greatest point in the house in Moledo (Moledo do Minho, 1991-1998), and this project began with the suggested placing of a barn leaning on the walls of the *socalcos* (Fernández-Galiano 2018b) (fig. 08). This initial proposal can be read as a reference by analogy to the Starkey house (Duluth, Minnesota, 1954-1955) of Breuer (fig. 08).

Souto de Moura discovered that it was necessary to reconstruct the terrain, and he opted for the construction of a hidden barn behind the walls of the *socalcos* (Fernández-Galiano 2018b), and this in turn led him to change the covering of the house in Moledo and make it an autonomous element, or, rather, a fifth façade (Fernández-Galiano 2011). This decision relates by analogy the house in Moledo with the House das Canoas of Niemeyer in a redesigning of the house in Quinta da Batoca (fig. 07). Souto de Moura merged the two floors of the Brazilian's structure and of his one floor in the house, thus offering opposing views of the broken rocks —with a forest in the case of Niemeyer—and the horizon. The preexisting minerals anchor this proposal to the place, and they introduce into the project the tension between the natural and the artificial (fig. 08). The other reference by analogy is the Breuer/Robeck house (New Canaan, 1945) of Breuer and Beckhard (fig. 08). The similarity between the floor of the house in Moledo and the upper floor of the Breuer/Robeck house really stands out: both have a kind of *veranda* in the main façade—an inner one in the Breuer/Robeck house and an outer one in the Moledo house— which connects the common spaces. The terrace of the Breuer/Robeck house materialised by means of a pavement of granite stones which contributes to the dissolving of the limit between inner and outer (Merí de la Maza 2012b) (fig. 08). The other reference by analogy between these two houses is the structural composition: both achieve an equilibrium between the extremes of the prism (fig. 08). Breuer and Beckhard made the extremes of the prism of the upper floor seem to move upwards, while Souto de Moura was



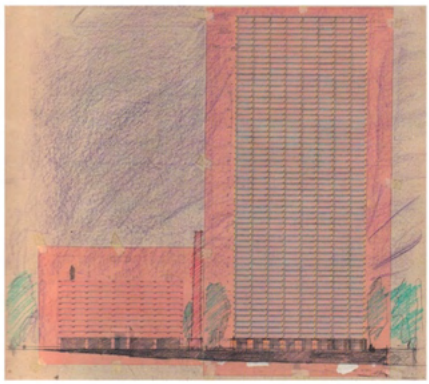


FIGURE 09 » Upper left. Souto de Moura, Eduardo. Project presented for the second version of the hotel in Salzburg, 1989. Source: Architecture House, Matosinhos. Upper right. Souto de Moura, Eduardo. First version of the Burgo Complex of Offices. Source: Architecture House, Matosinhos. Lower left. Pegenaute, Pedro. Pallaresca Complex. Source: Pedro Pegenaute. Lower right. Breuer, Marcel. One Charles Center. Source: Sérgio Koch de Araújo.

content just to have the cover move upwards at a tangent above the terrain to reveal the presence of the house. By cover is understood the abstraction of a barn on a plane leaning on the terrain and these convert the house in Moledo into a reformulation of the *casa minhota*.

It is possible to consider two other projects as deriving from the *casa minhota*, in other words, as *espigueiros* resting on tectonic podiums or, in keeping with the terminology of this present article, the combination of barns and large storage spaces. Here we refer to the Burgo Complex of Offices (Oporto, 1991–2007), an evolution and a materialisation of the second project presented for the hotel in Salzburg, and the Pallaresca Complex (Santa Coloma de Gramenet, Barcelona, 2004–2011); the reference by analogy for the latter is Breuer's project for the One Charles Center (Baltimore, 1960) (Koch de Araújo e Silva 2013) (fig. 09) – which was not built.

4*

Reformulating the barn and the large storage area. In search of new ways

The superimposition or the combination of the barn and the large storage area —the stereotomic excavation which prepares the terrain for the tectonic expression of the building – undergoes an innovative redefinition in the Municipal Stadium in Braga (2000-2004). Souto de Moura received together with the commission the plans of a previous project which engineers and a landscape designer had developed. (Mateus 2004).

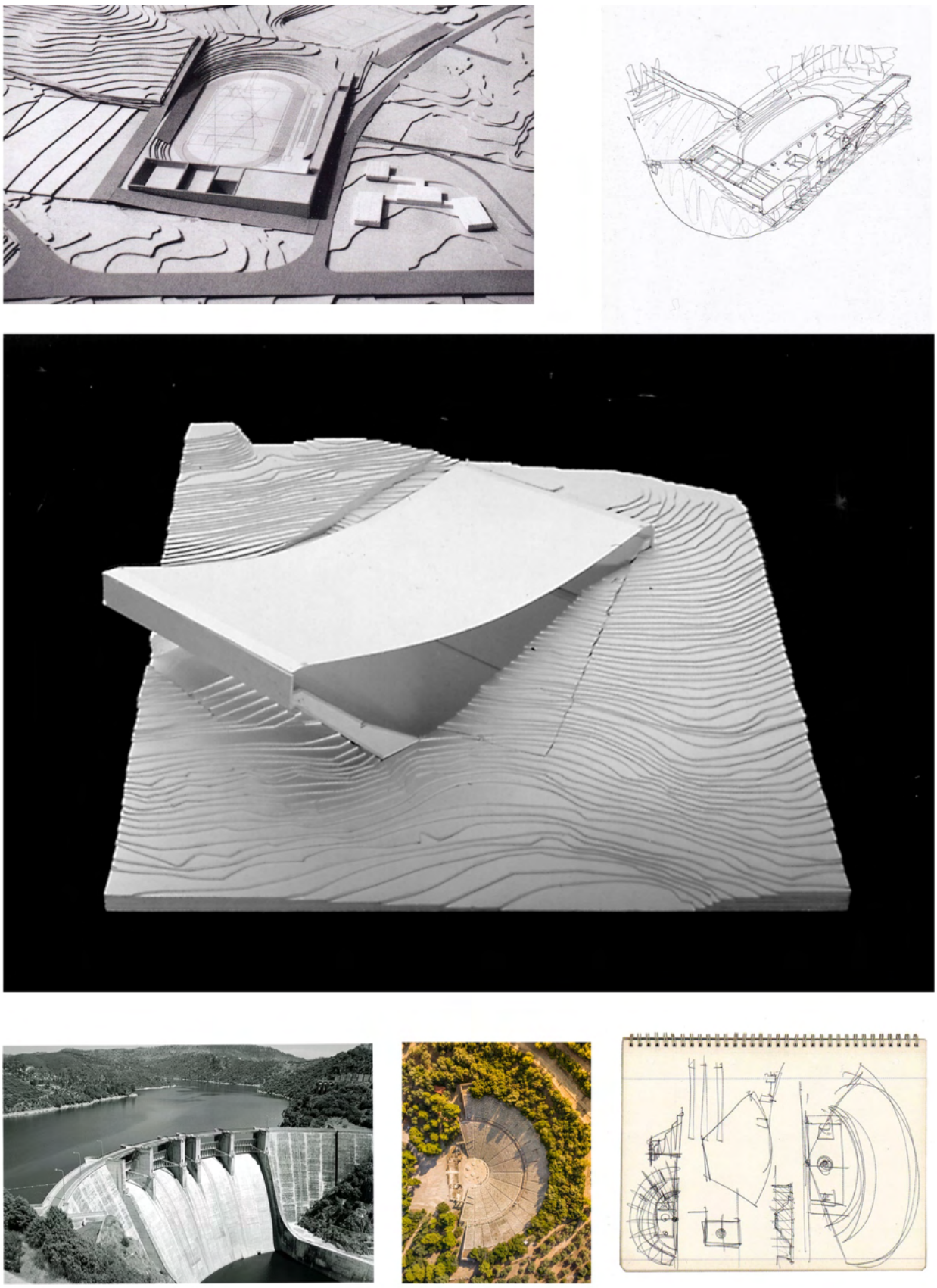


FIGURE 10 » Upper left. Souto de Moura, Eduardo. Model of the Municipal Stadium in Evora, c 1997. Source: Antonio Esposito and Giovanni Leoni. Centre. Meri de la Maza, Ricardo. First model of the Municipal Stadium in Braga,2000. Source: Private Archive of Ricardo Meri de la Maza. Lower left. Unknown. Bemposta Dam. Source. Iberian Docomono. Lower centre. Kleanthous, Dimitios. Epidaurus Theatre. Source: Dimitros Kleanthous. Lower Right: Souto de Moura, Eduardo, Sketch of the Municipal Stadium in Braga, 2000. Source: Architecture House, Matosinhos.

In an abandoned quarry – beside the proposed space he discovered the place to build a stadium which he brought to life with only two bench areas and a roof like that of the Lisbon Expo of Siza (1998) (Merí de la Maza 2012a), and this supposed a huge risk. In parallel he developed two basic projects: proposal A, very similar to the one that was finally built and proposal B, which was developed in the documentation he had been given.[1]

In a certain sense proposal B returns to the *casa minhota* (fig. 05). It is a stereotomic excavation which takes advantage of the original topography to create four seating areas which surround the play area covered by an *espigueiro*: a regular prism which contains the upper seating areas and which was raised on four pillars at the ends which contain the communication hubs. The Olivetti Ideal Bank and the Sports Pavilion (Landskrona, 1956-1965) of Arne Jacobsen (Koch de Araújo e Silva 2013) provided the references for this project (fig. 05). He submitted both projects at a meeting in his study to be decided by the Major, Mesquita Machado. The rest is history. Proposal B it must be noted, did not go to waste: it was recovered by the architect for the Multi-use Pavilion (Viana do Castelo, 2000-2013) (fig. 05).

The antecedent for proposal A can be found in the project (which was not built) for a football stadium in Évora (1997) (Guilherme 2016) (fig. 10), where he reinterpreted the combination of the stereotomic and the tectonic or of the barn and the bulk storage area in a totally innovative way. Two seating areas (one on the long side and the other behind the goal posts) support each other above the slope in the stereotomic operation of cutting into the ground; the other two seating areas both have prismatic volumes of a tectonic nature. The cover of the side seating area follows the slope of the terrain thus achieving its complete integration into the area. The Évora stadium which closes in a U formation, opens out towards the countryside beyond the stereotomic slope of the curve through a vegetal filter (fig. 10).

Souto de Moura considered to be fundamental in the Braga stadium that there should be opposition between the bench area supported on the slope and the flight of the one on the east and these were given a visual equilibrium by the third construction system: the roof (Merí de la Maza 2012a) (fig. 10). The tangential areas and the lightness, as materialised by the articulations (Nozza 2012) also gave a sense of unity to this project and to the two construction systems – prefabricated in the seating area to the west and *in situ* to the one in the east — and these were made from one and the same material – reinforced concrete (Merí de la Maza 2012a). The seating area in to the west of Braga which takes as its reference the Theatre of Epidaurus (Esposito y Leoni 2003, Nozza 2012), was going to be achieved by cutting the rock into the form of seating areas in a stereotomic construction which proved impossible due to the complexity of the circulations (Nufrio 2008) (fig. 10). Under this seating area there ocurred a kind bulk storage area: a Piranesian space which, as in Moledo, looks towards the mountains and places in opposition the cut natural rock and the artificial rock, which is prefabricated concrete. A tectonic podium generated the square which gives access to this seating area.

The east seating area of Braga is the tectonic element which faces the false steorotomy of the opposite seating area. Souto de Moura found it difficult to

[1] Testimony of Ricardo Merí de la Maza made on 23 September 2020 and of Carlo Nozza, 7 October 2020.

calculate the scale of the stadium. Together with Carlo Nozza and the engineers, Souto de Moura visited the dam —*barragem*— of Bemposta (Mogadouro, Bragança), which the architect took as a reference by analogy for this seating area (fig. 10). From this reference they learned and took the scale and the construction systems. The sheets which conform the buttresses or transversal walls of the east seating area are 1 meter thick and are 7.5 meters apart, the same measurements as were found in the dam and which are confirmed by the structural calculations of the stadium.[1] Souto de Moura, whose architecture is nourished by historical sources, took the engineering to a whole new level —and in so doing he greatly impressed Donald Judd— in architecture. (Fernández-Galiano 2018b). And architecture, when it is truly taken up by the collective —and that is the case of the Braga Stadium—, becomes a work of art. (Adrião y Carvalho 2006).

5*

Conclusions

In the 1980s Souto de Moura focused on constructing his own memory and on works that were based on the barn, the bulk storage system and on the *casas minhotas.* This period marked the beginning of his creative maturity which would reach its peak at the end of the 90s and at the beginning of the new millennium and would include works of very different scale but which all had the same conceptual and constructive intensity such as can be found in the house in Moledo and in the Municipal Stadium in Braga.

References by analogy form one of the essential characteristics of his methodology. Projects of his own and those of others, which have been hidden away in some corner of the grain store of his memory, come to the forefront during the process of a project and this continues throughout the entire work. He blends traditional architecture with contemporary architecture, place and constructive systems in order to construct unique and personal works which he tries to keep anonymous (Esposito and Leoni 2003) and he is ever the untamed rebel regarding any attempt to catalogue his work in a superficial way.

The site is the other material of his projects. He fixes his work firmly to place; he interprets the latter in a subjective way, he reconstructs it while giving full potential to that which was there before, or he invents such things to establish relations between the place and the building. Generally speaking, he opts for barn projects in urban environments; the latter form a part of the construction of the scale and of the image of the surroundings. Concern for the ordering and the overcoming of any special features of the programme is of the utmost importance. The bulk storage projects are characterised by the construction of a relationship between the place and the tectonic expression of the buildings by means of the construction of the place itself. The combination of both types reveals the fusion of both intentions in a single project.

Seneca called his library an *horreum* —a barn—. The grain store of Souto de Moura's memory is not so much a storehouse but rather a library which contains previous knowledge which he then reconfigures to construct works which are both unique and personal. As he progressed in his profession, Souto de Moura was not satisfied with the use of the traditional types of barns or *espiguiero*, or the bulk storage unit and the *casa minhota;* he reconstructed

[2] Testimony of Carlo Nozza, 7 October 2020.

them and reformulated them in accordance with his intentions, with the necessities of the programme, with the constructive systems and with his interpretation of the place. The use of traditional types in the work of Souto de Moura has undergone an evolution with the passing of time. It has been shown that the *casa minhota*, which recurs in the work of Souto de Moura may be understood as a combination of the traditional types of barns and bulk storages system. He combines these two types of construction with references by analogy to works of other architects and he achieves totally new and surprising projects as he reconstructs these through the available systems in each situation.

In a totally innovative way, he reformulated the *casa minhota* seeing this as the fusion of both the tectonic and the stereotomic in the Municipal Stadium of Braga, where he uses as references by analogy the dams of the Douro, the theatre at Epidaurus and the roof of the Expo in Lisbon of Álvaro Siza. Souto de Moura becomes a kind of alchemist who blends traditional types and past and recent references with present construction systems of engineering and the place he is interpreting, and he reconstructs those so that they are in keeping with the tectonics of his architecture. Thus, he gives a new meaning to the ancient saying: "*Our gold is not the gold of the common herd*"

Souto de Moura returns again and again to that grain store —be it the barn or the bulk storage system— of his memory, to that "Visual Neufert"(Daniele 2003) which he constructs based on his travels, on his reading, on cultural influences and on the works of architects, both near or far in time and space. One can find references to the work of Breuer in Souto de Moura's work as far back as the 1980s with projects such as the Vilarinha Annexes and right up to the first decade of the 21st century with the Pallaresca Group, and passing by the house in Moledo, one of the most widely published projects of the Portuguese architect.

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02

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Bates' Burrows Lea Farm: la arquitectura del humo de Alison y Peter Smithson.// Bates' Burrows Lea Farm: the architecture of smoke at Alison and Peter Smithson.

La expresión "*historical parallel*" fue utilizada por los arquitectos Alison y Peter Smithson para establecer un diálogo entre la propuesta *Bates' Burrows Lea Farm* (1953) y la torre-fortaleza de *Castle Rising* (1183). La obra será definida por los arquitectos como una forma compacta, aislada, elevada por encima del territorio y protegida gracias al movimiento de tierras en torno a ella. Sin embargo, analizando ambas propuestas, la relación no parece acabar en esa primera descripción. La presente investigación trata de desvelar a través de un análisis comparado, como su concepción espacial se conciben a partir de un mismo arquetipo formal. Un arquetipo protagonista indispensable en la conformación y evolución de la casa inglesa: *el hall*. Un espacio que adquiere unas características muy específicas en el caso de la construcción normanda y cuya esencia sabrán reconocer y trabajar los arquitectos como espacio adaptable a la vida moderna.

Arquetipo,Hall normando, structuring spaces, entramado, formas de vida

The expression "*historical parallel*" was used by architects Alison and Peter Smithson to establish a dialogue between their proposal for *Bates' Burrows Lea Farm* (1953) and the tower-fortress of *Castle Rising* (1183). The work was defined by the architects as a compact, isolated form, elevated above the land and protected by the earthworks surrounding it. However, upon analysing both buildings, the relationship does not seem to end with this initial description. This research aims to reveal, through a comparative analysis, how their spatial conception was based on the same formal archetype. An archetype that is an indispensable protagonist in the formation and evolution of the English house: *the hall*. A space that, in the case of the Norman construction, takes on very specific characteristics and whose essence the architects would try to recognise and reinterpret on as a space adaptable to modern life.

Archetype, norman hall, structuring spaces, framework, ways of living

1*

Introduction

At CIAM X in Dubrovnik (1956), the Smithsons present their proposal *Housing Appropriate to the Valley Section* (1954-56). Where they conceived various forms of association based on the theoretical diagram proposed in the *Doorn Manifesto* (1954). In their panels, the forms of association (*Isolate, Hamlet, Village, Town and City*) produce different forms of occupation: *Bates' Burrows (Isolate), Galleon Cottages (Hamlet), Fold House (Village), Close House (Town) and Terraced Crescent Housing (City).* The aim was to explore new urban forms based on the density of clustering and the mode of appropriation of place. In other words, clustering and place merge into a single entity, giving each projects its own meaning and character. To illustrate these ideas, the architects did not hesitate to use images linked to tradition, the vernacular or historical forms, which implied not only their direct referencing but also a theoretical revision of their conception and validity[1].

In *Bates' Burrows Lea Farm* (1953-1955), the model used by the Smithsons was the tower-fortress of *Castle Rising* (1138) in the county of Norfolk in the east of England. The choice not only shows a personal interest in the forms of the past , but also that the architects were to adopt the ideas of Castle Rising under the heading of "*historical parallel*" (Smithson 2000). A compact, isolated fortress, raised above the land and protected by the earthworks around it (Smithson 2000), Castle Rising would be later used for their *Ground notations (Smithson 1999)(Casino Rubio 2013)*, yet the parallelism also exists in the conception of the interior, where both are structured on the basis of the same formal archetype: *the Hall*.

The Hall is, as Bonet has written, the space of smoke (Bonet 2007), the essential protagonist of the English house and the one that best identifies the English *way of life*, capable of adapting and evolving. For the Smithsons, *"life cannot be forced behind an imposed (mathematical) pattern"* (Smithson 1970), thus the house needs to be an expression of a cultural and social context in which tradition and modernity intersect.

2*

Bates' Burrows as a response to the principles of modern architecture

The Bates' Burrows proposal is unique in that it is the only one of all the houses designed by the Smithsons that is detached from the ground.As Max Risselada points out, this inevitably leads to a comparisons with Le Corbusier's Villa Savoie. As Risselada explains that the similitudes may have been favoured by two circumstances: the possibility of visiting the Savoie villa on the occasion of CIAM IX in Aix-en Provence and the recent publication *of Le Corbusier's Oeuvre Complète* (1946-1952) (Heuvel y Risselada 2007). Both circumstances considered, the architects' first drawings, together with their words, made it clear that the need to elevate the house come from a triple condition.

[1] The book *Ordinariness and Light* contains articles between 1952 and 1960, with many historical references: Edinburgh Castle, Castle Rising, Maiden Castle in Dorset or Mount Grace Priory in Yorkshire...etc. Soraya Smithson confirms Alison's great interest in collecting images of Saxon, Norman and medieval English halls, barns and fireplaces, collected in *the Scrapbook*.

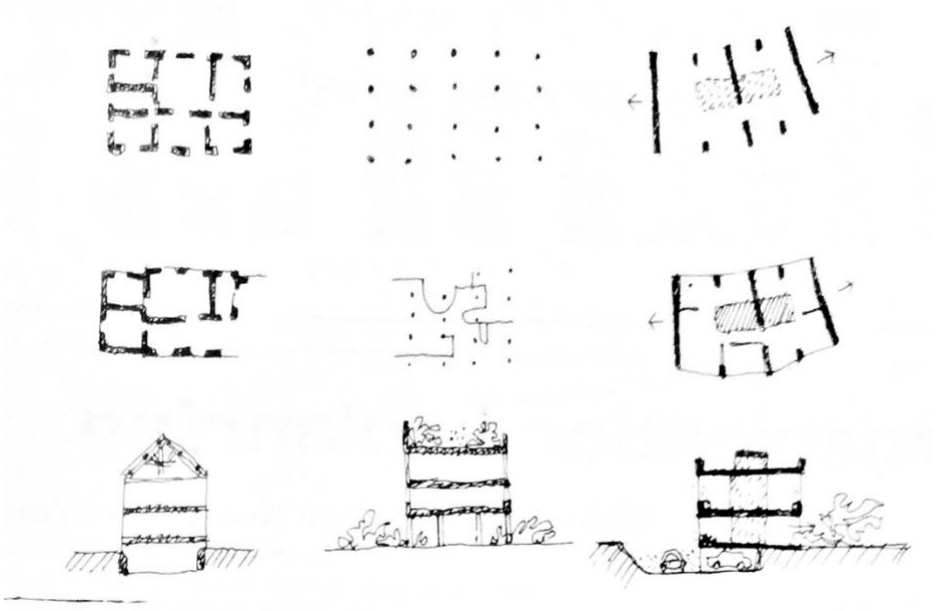


FIGURE 01 » Drawings by PS, extracted from the article "Lightness of Touch," Architectural Design, 1974.

Firstly, the need to look over the *Surrey Downs* landscape. Secondly, the attempt to reduce the footprint of the house as much as possible, interfering as little as possible with the land. Finally, the client's requirement to allow car access to the heart of the house. The solution undoubtedly came close to Villa Savoie but the connections to Castle Rising, as the Smithsons point out, are even stronger.

In fact, the architects were committed to a different way of living and sought to propose a model far removed from modernist orthodoxy, a body of work the considered certainly heroic and to which teachings they were indebted:

> *The ideal house is that which one can make one's own without altering anthing…What we would seem to be looking for is the gentlest of styles, which whilst still giving an adumbration of the measures of internal events and structures (rooms, activities, servicing arrangements, supports), leaves itself open to - even suggests interpretation, without itself being changed. (Smithson 1972)*

The Smithsons worked away from prejudices towards a certain way of making or a certain style. For them the idea of style is simply a form of language, while form acquires value when it shows *"how the thing is"* and *"how it can be used"* (Smithson 1972) . In other words, the form must outline the internal structure necessary for the development of internal life, offering the inhabitant the possibility of making it his own, without altering anything. This debate on form would develop over several decades, and in 1972, the Smithsons' ideas on form became the focus of their inaugural lecture at the *Harvard Graduate School of Design*. Two years later, in 1974, they were published in Architectural Design under the title *"Lightness of Touch"* [2] in the *Collective Design* (Smithson 1974) series. Although Bates' Burrows is a house designed in the 1950s, its formal structure, spatial conception and relationship to place are necessarily linked to them. This paper explores the three principles that constitute Bates' Burrows form: *part-cellular structure, living spaces (or structuring spaces) and separating out "noisy" from quiet* (Fig. 01), which also have significance in earlier forms such as the Castle Rising model.

[2] the title "lightness of touch" and subtitel " Notes from a lecture given at the opening of Gund Hall, Harvard, 16 October, 1972.". P. Smithson defined Heroic Aesthetics: hard, definitive, demanding, pure (colour).

FIGURA 02 » Fragment of the Bayeux Tapestry – Scene 45 – showing the Norman defensive model "motte and bailey." Example of Annesley Castle, extracted from the book English Medieval Castles by R. Allen Brown, 1954.

For the Smithsons, the *five points* of Modern Architecture represented the idea of a finished, hard object, produced by a continuous process of abstraction through the use of right-angle geometry, pure colour[2] and an idealised interpretation of human activities (Smithson 1974) .To this, one needs to add a calibrated mise-en-scène, and even a technical effort to use or produce materials yet to be discovered, in an attempt to create an architecture that was primarily intended to be admired. However, the Smithsons wanted to move away from categorical expressions, rejecting both sentimental attitudes towards the past and technocratic expressions of the future. Bates's Burrows stands in opposition to modernist orthodoxy as a reevaluation of past ways of living, whose constructional, organizational and contextual principles exemplify a new aesthetic.

3*

Castle Rising

Why the choice of Castle Rising? Before the arrival of the Normans, the preexisting model was of Saxon heritage, presenting a very different way of connecting with the place. As we have previously indicated, the Norman fortress is a direct statement of a time and a way of life tied to the primordial space of the Hall. The earliest recorded images of such a way of life appear on the *Bayeaux Tapestry*, a large embroidered cloth about 69 meters long and 50 centimeters high, depicting events and customs in England between 1064 and 1066. Scene 45 (Fig. 02) show the Castle of Hastings, a typically Norman defensive structure known as a "*motte and bailey*". It consists of a tower placed atop a mound of compacted earth layers at least 5 meters high, called the "*motte*", accompanied by a courtyard or "bailey" where the remaining structures are located, all proyected by a ditch and an earth embakment. While the Norman hall is always elevated above ground level, the Saxon model remains in direct contact with the ground.

The consolidation of the conquest was slow and, in response to continuous Saxon uprisings, the Normans built powerful fortresses. By 1078 there were more than 500 castle-fortresses in England. Alison gathered numerous images of such Norman constructions in her *scrapbook* such as *Manorbier Castle* in Wales or *Corfe Castle* in Dorset o *Richmond Castle* in North Yorkshire (Alison Smithson's scrapbook 1945-2002) .

The Norman fortress comprises the keep, the bailey, and a robust perimeter defense. Castle Rising meets these requirements. Built around 1138 by the Albini family of Rising - Aubigny - the complex consists of the central courtyard

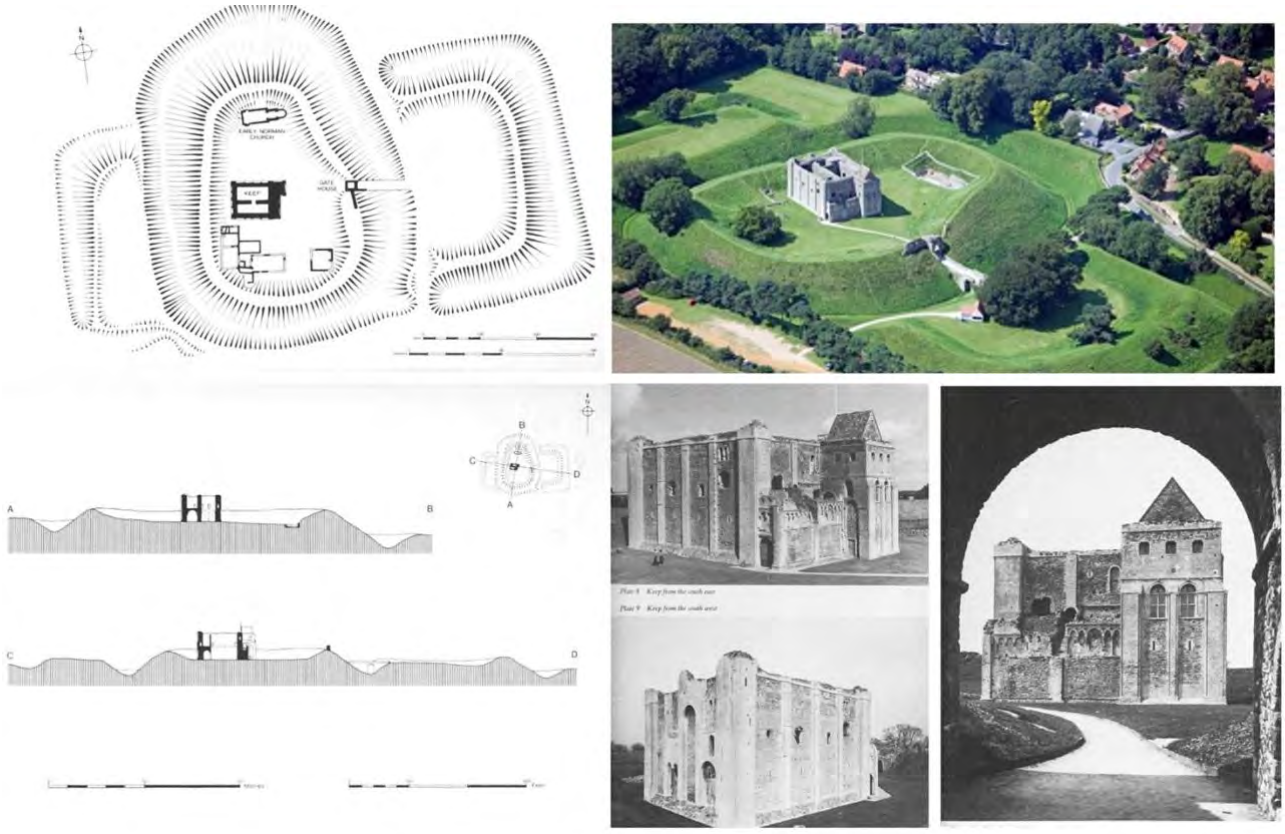
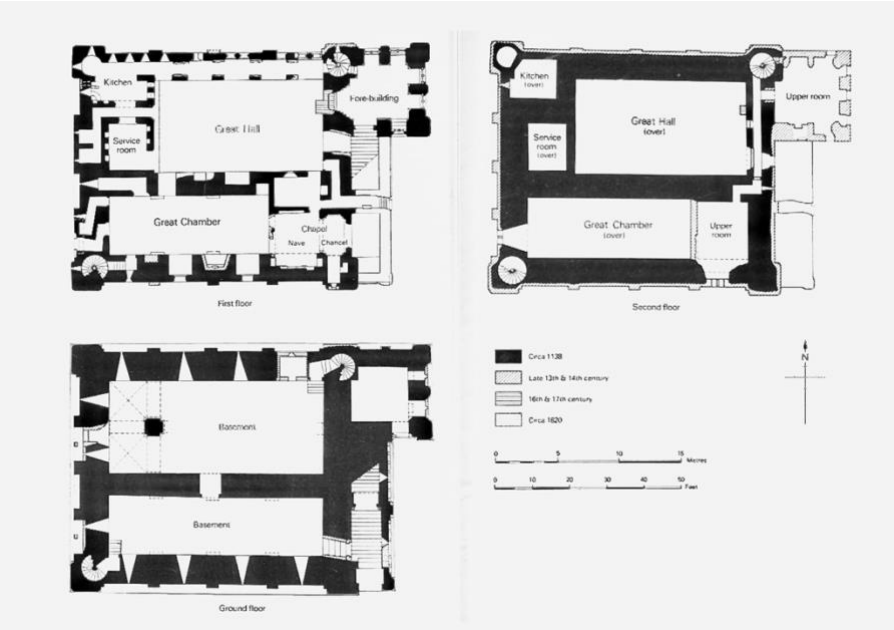


FIGURE 03 » Plan, section, and views of Castle Rising, extracted from the book Castle Rising by R. Allen Brown, 1983.

and two smaller enclosures located to the east and west covering a total area of 5 hectares (Fig 03). The central oval measures approximately 80 yards (73 meters) from north to south and 70 yards (64 meters) from east to west. To define and protect this primary space, a moat and mound were constructed with a crest perimeter of about 350 yards (320 meters). This earthwork was not always uniform, as the historian R. Allen Brown suggests (1983 p.35), by the late 12th century, the inner mound was raised to its current height of 60 feet (18 meters) from the bottom of the moat and 30 feet (9 meters) from the surface of the inner surface. Above this moat and mound, there are archaeological remains confirm that the upper wall was made of stone. Only a small portion of this wall remains, adjacent to the sole entrance to the enclosure, the gatehouse.

The keep, the lord's residence, was rarely placed at the centre of the bailey, rising vertically above the the subsidiary structures. At Castle Rising, the keep consists of three levels (Fig 04) with a stone volume measuring 78 ½ feet (24meters) east to west, 68 ½ feet (21meters) north to south, and a height, of approximately 50 feet (15 meters) from the lower plinth, exclusing the now missing battlemented parapet. One can imagine how these solid structures became, for a long time, the great architectural landmarks that populated English territory. Its elevated position allowed the lord of the manor to oversee his lands and to contemplate his territories. Together with the strong visual control required for defense, the inhabitant also developed an emotional bond with the place. A relationship that gradually shaped the distinctive English affinity for the landscape.



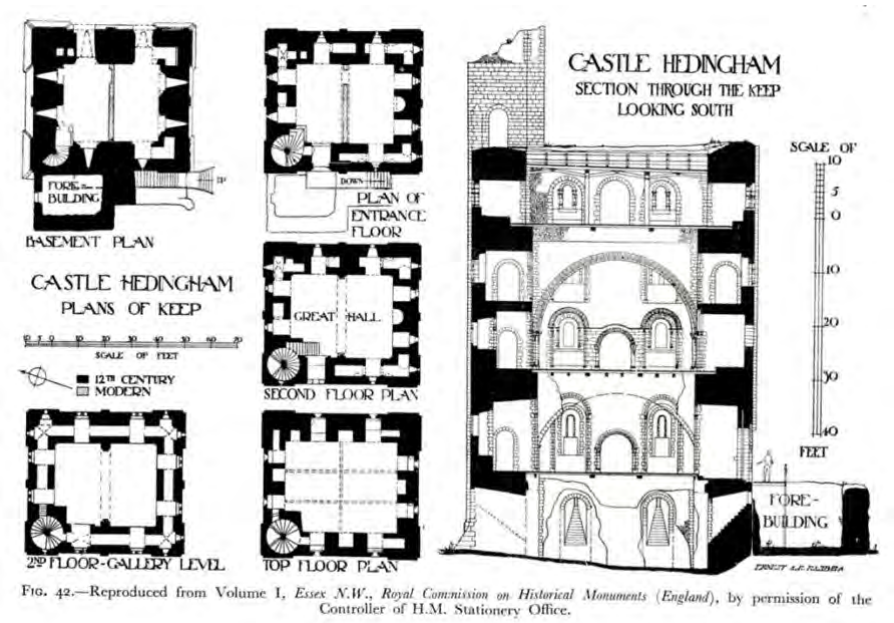


Fig. 42.—Reproduced from Volume I, *Essex N.W., Royal Commission on Historical Monuments (England)*, by permission of the Controller of H.M. Stationery Office.

FIGURE 04 » Castle Rising extracted from the book Castle Rising by R. Allen Brown, 1983.

FIGURE 05 »: Castle Hedingham and A History of the English House from Primitive Times to the Victorian Period by N. Lloyd, 1931.

In the tower, the *Great Hall* is located on the first level. This feature distinguishes it significantly from the Saxon Hall, as the definition of a primarily stone base introduces, a new space bellow it, known as the *cellar*, a concept inherited from the *bassis* of the Carolingian villa. This is why these Norman constructions are also known as "*hall and cellar*". The construction of the base began in the 11th century with barrel vaults, replaced by groin vaults and Gothic arches in the second half of the 12th century, ribbed vaults at the end of the 13th century and, in the 14th century, with Gothic at its peak, lierne or tierceron vaults. In the case of Castle Rising, the base was of wood, of which no traces remain. The cellar's function was to serve as service quarters and storage space.

In other examples, such as *Castle Hedingham* (1130) (Fig.05), the floor plan is smaller and lacks any internal framework, so the segregation of uses is mainly vertical, resulting in a slender tower. At *Castle Rising* (fig. 04), life is organised not only vertically but also horizontally.

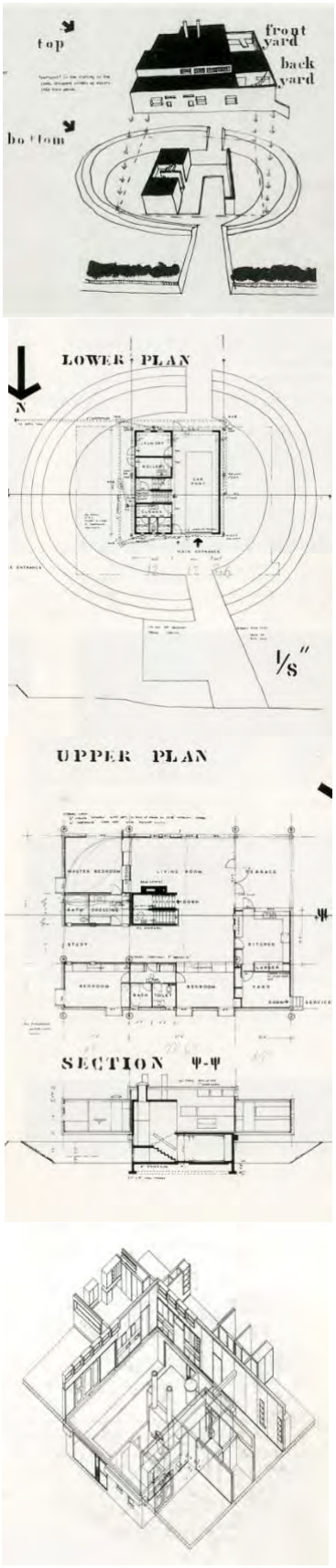


FIGURE 06 » Diagram, ground floor plan, and first floor plan of Bates' Burrows and axonometric of ground-floor and first-floor by Luiz Breda Neto and Peter Salter, extracted from the book Charged Void: Architecture by A.P. Smithson, 2000.

The structural framework on the ground plan -*Part-cellular structure*- enables the configuration of distinct domestic spaces -*Structuring spaces*-. The rectangular Great Hall, measuring 47 by 23 feet, adheres to the standard 2:1 ratio. On its northern side, the passage or gallery serves a dual purpose: to open up the space to the landscape and to provide access to the service area -*Kitchen and service room*- which is located behind it. On the southern side, behind the thick wall housing the large fireplace, lies the private or solar chamber -*Great Chamber*- accompanied by a a small anteroom and the *Chapel*. Both the Great Hall and the private chamber feature double-height ceilings, each equipped with its own fireplace. Strategically positioned staircases at each corner provide access to the lower cellar space and the upper towers.

Accessing the tower and the Hall is a ceremonial act, since, as Brown observes, "*the act of entering the house is the way to enter a culture*" (1983 p.42) and here, the rite of "*ascension*" has a strong spatial and formal component. On the eastern, in direct connection with the gatehouse, an independent structucture known as the forebuilding extends the tower by 20 feet to the north face and 9 feet to the south to the tower as a whole. This volume houses the grand linear staircase and a vestibule that functions as an antechamber. The jorney, along with the waiting area, undoubtedly adds to the symbolic and representational character of the arrival at the Great Hall.

One aspect often observed in medieval works is this interplay between *similarity* and *difference*. That is, *similarity* in the type of construction and the way it is positioned within the territory, and *differences*, in the structuring of the floor plan or the details of its finishes, such as mouldings and ornaments.

4*

The modern analogy: Bate`s Burrows as an evolution of the Castle Rising model.

Living spaces. Structuring spaces.

The free plan advocated by Le Corbusier in the Villa Savoie made the external form possible, but not its internal characterization. The box was the result of eliminating the concept of mass and working with an interior void defined by surface planes which, through their free plastic configuration, allowed the space to adapt to the dimensions of the ideal inhabitant. In their spatial definition, the planes were capable of meeting any functional, aesthetic, or lighting demands the architect was able to imagine. However, for the Smithsons, the complexity of any interior should be based on providing the inhabitant with a container that was "*the direct result of a way of life*" (Smithson 2023).

The first thing one recognizes in Bates' Burrows is a fortress house. This is because live unfolds elevated above ground level, with all domestic life localed on the first floor, including the hall as the main double-height space. Below this level, the basement or cellar is used for storage and service functions: stores, cloaks, boiler, laundry and car port .(fig. 06).

The construction of the modern stereotomic cellar allows modern living to

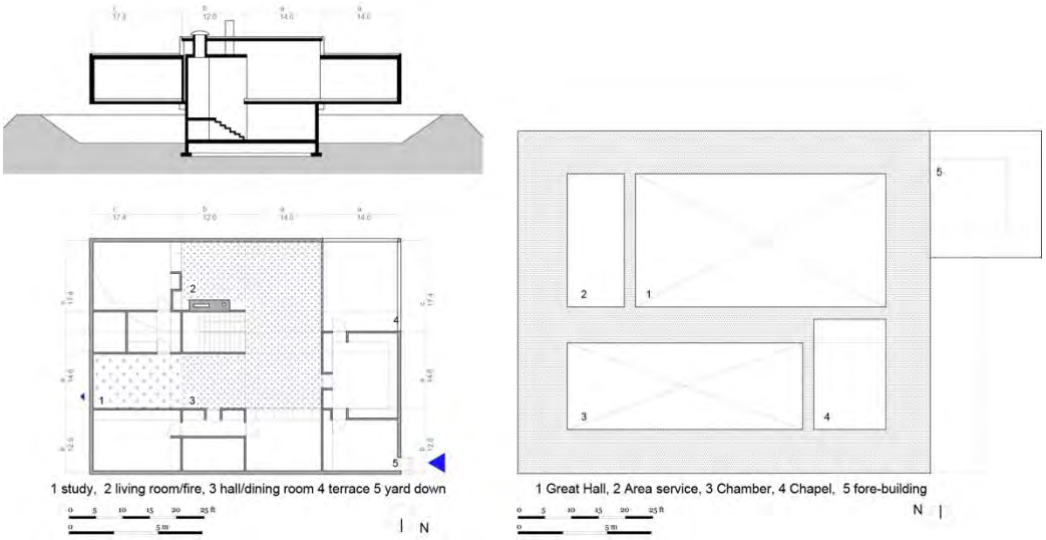


FIGURE 07 » Comparative floor plan schematics, Structuring Spaces, of Bates' Burrows and Castle Rising. (Drawing by the author).

reach the very heart of the house with the car.The way to access the upper area is through a compressed and enclosed entrance, an autonomous volume that houses the staircase and acts as an anteroom leading directly to the main double-height space of the house, the Hall.

The Hall in Bates' Burrows Hall is similar to the Norman Hall at Castle Rising: an elevated space above ground level, protected, taller than the rest of the rooms, and illuminated from above. Reflecting on this change in the cross-section, Alison notes how the architect Norman Shaw was among the first to *"...break with the tradition of the classical series of rooms of identical height (...), he provides the particular form and ambience for each individual function"* (Smithson 1967) .This principle is evident here. From the central void, formed by the living-room, dining-room and study, one moves to the rest of the domestic areas, conceived as three independent functional units: children's quarter, the master bedroom and kitchen-terrace-front yard. Between these, boundaries are defined by thick walls designed to store the necessities of domestic life. (Fig.07) Alison's interior drawings and axonometries perspectives evoke her words for the article "*Beatrix Potter's Place*": an orderly whole with "*objects and utensils of daily use conveniently placed*", and even with "*those things which are necessary for domestic life*",and even "*those things of secondary use (...) that need long-term storage, are in special storage cubicles whose shapes define the space itself*" (Smithson 1967) (Fig.06). This is the "*decoration*" that such "*simple*" spaces require. Ultimately, basic needs are elevated to a poetic level: *simple living, well done.* (Smithson 1967).

In the Hall lies the place where the protective fire is located: *the fireplace*. Here, the grand fireplace, symbol of the economic power and social status in the Norman fortress, has regained the essence of the *inglenook* from the Arts and Crafts dream. Positioned at one end of the living-room, it recreates the intimate Victorian space. At the opposite end, the terrace takes us above ground level with a renewed view of the Surrey Downs landscape.

Part-cellular structure

The modern neutrality promoted by Le Corbusier and his *dom-Ino system* (1914) constituted a construction system that intentionally rejected or concealed the expressiveness of the joints and the relationship between pilotis and slabs.This atectonic definition, enhanced by the use of white, is described by James Stirling during his visit to the villa in Garches:

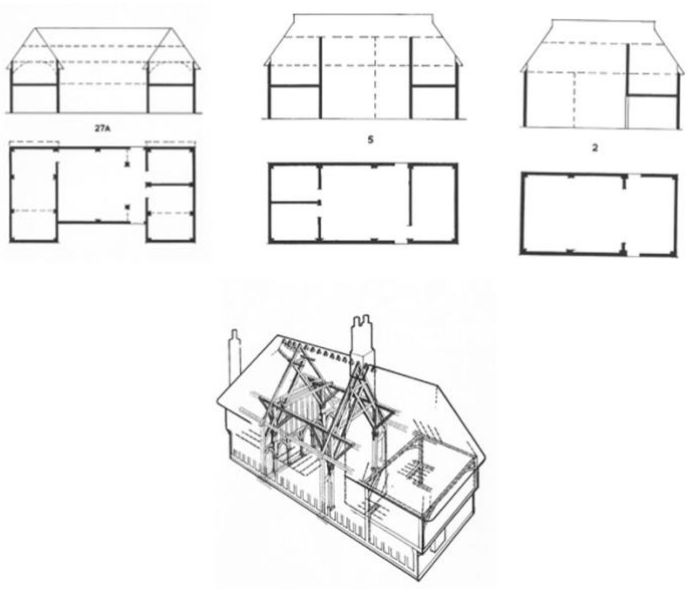


FIGURE 08 »Timber house construction system, extracted from the book Framed Buildings of England by R.T. Manson, 1974.

(...) The body of the house, built according to entirely conventional methods for its time, has concrete block walls plastered to achieve a monolithic, fluid or powdery effect, an aesthetic in keeping with a structural system that did not yet exist. (Stirling 1955).

For modernist orthodoxy, the definition of a neutral and independent support entailed both material and constructive inexpression in favour of maximum spatial expression. In opposition to this aethectonic system, the Smithsons opted for a tectonic framework that maximally expresses materiality and its constructive syntax. This approach was connected to the precise modern forms of Miesian structures, but also to the tradition of timber houses.

Timber framing is a structural system defined by either *crucks or boxframes*. The design and positioning of the framework preconfigure the forms of habitation or, in other words, the "bay" —the distance defined between the main support elements— was never a fixed dimension and could vary from approximately 5 to 20 feet in length. This dimension was determined by available timber's length and the "desired" dimensional needs according to the uses of each space; conditions that ultimately defined the final shape of the house. Therefore, the freedom in size and the tectonic construction system allowed for many variations, as numerous as the inhabitants' needs. R.T. Manson (1975 p.28) defines the *timber house type* as a structure formed by three cells and four bays (fig. 08). If we look at the drawing, we can see that what is defined as a "cell" involves not only the position of the main framework, but also the boundaries that organize the house's functions and areas.

In the Middle Ages, domesticity accounted for a limited number of functions and elements. The lower level was often defined by only three cells: the Parlour, the double-height Hall, and the service areas (buttery and pantry), whereas the upper level was composed of two private areas on either side of the double-height Hall. Variations also reveal how the size of the "bay" was adjusted to organisational criteria, such as the passage tangent to the Hall, clearly defining the medieval "screen". The significance of the system lay not only in its constructive capacity, but also in its ability to outline future domestic needs or to transform in accordance with changing the requirements.

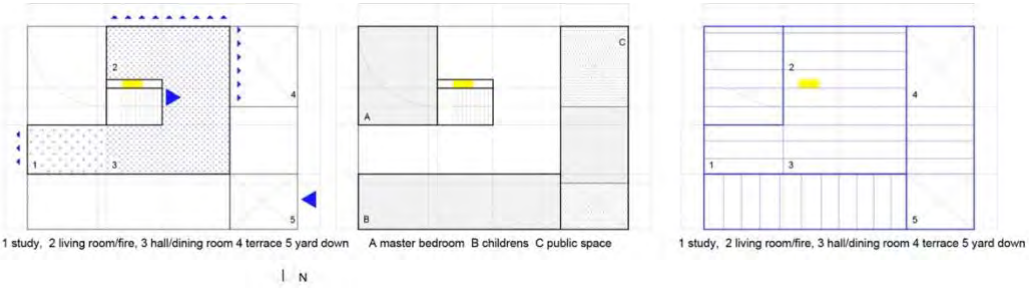


FIGURE 09 »Timber house construction system, extracted from the book Framed Buildings of England by R.T. Manson, 1974.

FIGURE 10 »Axonometric of first-floor steel structure by Luiz Breda and Peter Salter, extracted from the book Charged Void: Architecture by A.P. Smithson, 2000.

This approach is also present in the concept defined by the Smithsons. The upper volume is constructed with a metal structural framework, a *balloon frame*, supported by reinforced concrete bracket beams that are embedded in the lower walls of the base. This design is conceived accordance with the areas that would organize life within the house, as can be seen in the comparative analysis (fig.09) and the axonometric drawing of the metal framework (Fig.10). As a final solution, the framework would be cladded in plywood, both internally and externally, a technique previously used in ships building during World War II.

Separate out "noisy" from quiet

The rectangular upper volume, measuring 43 feet in width by 56 feet in length, seems to levitate above the ground plane. Between the house and the surrounding moat and mound boundary, the idea of the interval as a place emerges. This is transitional space between two realities, where the air is trapped and adheres to the pre-existing structure. The Smithsons skilfully identified the apparent spatial duality that arises when addressing the theme of transition the *space between*. On one hand, there is the need for the building to breathe and extend, embracing the space immediately around it. On the other, the air adjacent to the house works as a space of protection and interior continuity *"(...) will also need inevitable-seeming extensions or "antennae" (...), these antennae will be a building's, reaching into the air, to signal possession of its "adherent aire"* (Smithson 1975) . This dual perspective expands the concept of the boundary, transforming the crystalline limit of modernity into a thick layer available for inhabitation. It creates a new margin with spatial depth that gradually takes on character as the various layers of habitation are added. This new spatial realm becomes tangible only through the definition of the moat and mound, elevated enough to obscure visibility and featuring two access points: one vehicular and one pedestrian. One connected to the infrastructure and the other to the landscape

Moreover, the garden was not meant to be on the roof, but rather in a *"quiet place immediately accessible from the living spaces"* (Smithson 1974) . Here, the open veranda to the southwest - the front yard – becomes an extension of the house. Its construction as an enclosed space is also reminiscent of the garden terrace of the Villa Savoie. Opposite to this elevated piece overlooking the landscape, the back porch—*the post yard*—provides a secondary access to the

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Conclusion

If there is something remarkable about the Smithsons' working process, it is their constant questioning of what the appropriate form for inhabiting should be or, as they themselves asked: "*if there are new uses for which there is not yet a traditional formal language or any previous style (...) then how do we proceed?*"(Smithson 1975) .In Bates' Burrows, form engages in dialogue with history without relinquishing its modernity. As the Smithsons expressed, places captivate us through a deeper recognition that transcends the senses. Perhaps for this reason, this is the house they would have liked to build, a suburban, isolated home that proposes, as a form of occupation, ideas drawn from a contextualised reinterpretation of English medieval architecture.

As Luigi Pareyson (1988 p.35) puts it, the process that takes place in Bates' Burrows is due to the "*fruitful solidarity*" between "*the exemplary character*" of the work used as a model, its exemplarity, and the "*spiritual affinity*" of its continuation, its congeniality. In other words, tradition is established and maintained by innovation, and innovation does not advance if there is no continuity with the past.

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Figures, tables and images

Figure 01. Drawings by PS, extracted from the article "Lightness of Touch," Architectural Design, 1974.

Figure 02. Fragment of the Bayeux Tapestry – Scene 45 – showing the Norman defensive model "motte and bailey." Example of Annesley Castle, extracted from the book English Medieval Castles by R. Allen Brown, 1954.

Figure 03. Plan, section, and views of Castle Rising, extracted from the book *Castle Rising* by R. Allen Brown, 1983.

Figure 04. Castle Rising extracted from the book *Castle Rising* by R. Allen Brown, 1983.

Figure 05. Castle Hedingham, extracted from the book *A History of the English House from Primitive Times to the Victorian Period* by N. Lloyd, 1931.

Figure 06. Diagram, ground floor plan, and first floor plan of Bates' Burrows, and axonometric of ground floor and first floor internal partitions by Luizi Breda and Peter Salter, extracted from the book *Charged Void: Architecture* by A.P. Smithson, 2000.

Figure 07. Comparative floor plan schematics, Structuring Spaces, of Bates' Burrows and Castle Rising. (Drawing by the author).

Figure 08. Timber house construction system, extracted from the book *Framed Buildings of England* by R.T. Manson, 1974.

Figure 09. Drawing identifying the correlation between the double height of the Hall, the organization of domestic areas, and the metal frame of Bates' Burrows. (Drawing by the author).

Figure 10. Axonometric of first-floor steel structure by Luiz Breda and Peter Salter, extracted from the book *Charged Void: Architecture* by A.P. Smithson, 2000.

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Rediscovering the fridge. Journey through artworks and spatial proposals featuring the refrigerator // Redescubriendo el frigorífico. Recorrido por obras de arte y propuestas espaciales protagonizadas por el refrigerador

This investigation recognises the identity of the fridge as a symbolic object in the contemporary life through the work of artists and architects from different means and moments of the 20th and 21th century. The discussed works move from food voyeurism to the mutability of this appliance into a construction element, demonstratic its enigmatic nature. Considering an esthetic value in this device, which was originated as functional, the quantity of works of art featured by it manifests an intimate connection between our digestive tract and the machine.

Esta indagación reconoce la identidad del frigorífico como objeto simbólico en la vida contemporánea a través del trabajo de artistas y arquitectos de distintos medios y momentos de los siglos XX y XXI. Las obras comentadas viajan del voyerismo alimentario a la mutabilidad del electrodoméstico en elemento constructivo, poniendo en evidencia la naturaleza enigmática del mismo. Contemplando un valor estético en el aparato originado como utilitario, la cantidad de obras protagonizadas por él manifiestan una relación íntima entre nuestro aparato digestivo y la máquina.

fridge, postmodern art, contemporary art, architecture, food

frigorífico, arte posmoderno, arte contemporáneo, arquitectura, comida

Notwithstanding that the fridge hasn't awaken an aesthethic interest in the artistic production as vibrant as other domestic inert items like the window, the chair, the bed or the bath, it seems to be the most frequent appliance in visual arts.

Before being refilled, the refrigerator is a vacant residence. A series of rooms sized according to the food pyramid categories and positioned depending on the thermal demand of each group. It was designed to fit among the rest of the kitchen furniture, and its height cannot surpass the range radio of an adult's arm. Made to be suitable for the domestic culinary size and for the capacity of our stomach, it is flexible with our purchasing power, as it's able to chill a scarce and an extensive amount of products. Its dimension adapts to that of an human adult's body just as the bed in which we lay does, and the orifice in the wall that we cross from one room to another, or the same way a coffin takes us in precisely.

Something in they way it looks, the content or the meaning of the domestic refrigerator has drawn the attention of photographers, sculptors, painters and conceptual artists of the 20th and 21th century around the world. Hereunder, some of their work will be commentated. For that matter, they selected works will be grouped in three typologies differentiated among them based on the contextualisation of the appliance at issue. In the first section, works that portray domestic fridges in its most habitual location, the private residence, will be remarked. Next, the perspective will be shifted to the interior of the refrigerator with a couple of works that suggest the incarnation of the human body into the machine. Lastly, other two initiatives will be presented that pay tribute to the fridge once it's constituent purpose has ceased. This journey aims to confirm an aesthethic collective interest in the domestic refrigerator, as well as to discover the possible motivations underneath this tendency.

1*

At home

Kitchen innards, the physical place where food is conserved at home, prolongate the life of our sustenance. Introducing this device, apparently a petty one, the discussed works in this section lead to both individual and communal reflections. The work of the three authors are carried out at home, uncovering an aesthethic value in the everyday life. From pictorial portrait to documentary photography, they evince the emotional bond that can be originated between an object and a subject when what they share is the nourishment.

Being the sixties the moment when fridges began to be manufactured more often and to become popular in Spain[1], it's possible that *Nevera de hielo* (1966) by Antonio López García is the first spanish pictorial portray of one (fig. 1). This master has celebrated more than one refrigerator and it's contents by painting it.

[1] The first electric cool-boxes where imported from other countries, and so they were accessible just for a few homes. It wasn't until the 1960 decade that they started to be manufactured at a bigger scale and, therefore, to be popular in Spain (MONTESINOS, 2013, 164).

FIGURE 01 » Diptych: [left] Antonio López, *Nevera de hielo*, 1966, [right] Antonio López, *Nevera nueva*, 1991-94, oil on canvas, 240 x 190 cm.

Previously, in 1963, he had painted and engraved a fragment of a cool box and its surroundings. That ice cupboard was often located in the coolest place of the house, just as a cellar. It was once of the predecessor of the electric refrigerator we know today. Both images, *La fresquera* with the nuts, the soup dish and an oil tin above it and *Nevera de hielo* with one of its doors open and traces of an ingestion over it, show modest daily rations that are also deserving of the iconographic reverence. It was in the ultimate decade of the last century, when we've gotten accustomed to its presence in our homes, when he painted another one, this time wide opened. López look at this wrapper generating a suggestive image of it. Allied to the style of other of its personal paintings, he framed this place exalting its relevance: the fridge is something more than an inert item. In *Nevera nueva* (fig.1), this kitchen skyscraper erects itself lonely in an empty room, with only the fresh products preserved in it.

The empty rooms of López's refrigerators are inhabited. The warmth that Nevera nueva instills is partly caused by the relief of discovering that the painter and its family, not only could afford a new refrigerator with freezer, but could also fill it up. In the same way, the warm light that lights up from the right rop corner in its interior, oxygenates the room like a heart pumping blood to a whole organism. The chromatic coldness that dominates the surface of the canvas it's compensated with the filled up shelves.

Getting closer to the gastronomical portraiture of still lifes, López open refrigerators show one's own diet. The unease that often arises when checking other people's food, also appears in these scenes causing the same wonder as the classic still life painting, but in an icy and lethargic version. If Clara Peeters would have known the 20th century appliances, perhaps she would have portraid the lunch boxes and would have placed the vegetables in polystyrene drawers. In a casual encounter between a fridge and the Belgian artist's still lifes, the following collage gather an intimist contemporary self-portrait with her plentiful compositions of the 17th century (fig. 2).

FIGURE 02 » *Leaning out a fridge containing Clara Peeters still lifes*, 2024, collage, author's photography.

Moving about towards photography, seems pertinent to give a space to the distinguished North American photographer William Eggleston, pioneer in the use of colour photography in visual arts, and specially interested in mundance actions and objects. He was one of the first artists who collect the inside look of a refrigerator. Specifically, a 1970's Memphian freezer (fig. 3). It seems that Eggleston, just as López did in painting, crystallised the refrigerator as a place for introspection.

«Brought into the home, incorporated into daily life and socialised to perform a particular role, refrigeration shifted category from 'novel' to 'normal' and from 'luxury' to 'necessity'»[2]. Once established as ordinary appliance in the North American house, when pre-cooked frozen edibles were on sale, it prepared itself to abandon the fashionable status to be neglected for the rest of the century and beyond. It was then when Eggleston beaten triviality by seeing in it a gastronomic cave.

[2] (WATKINS, 2008, 204)

FIGURE 03 » William Eggleston, *Untitled (Freezer)*, 1971-73, dye transfer print, 11 x 17 in.

By way of a biographical portrait, he left proof of the foresight ability of its owner, or his interest in cooked products, characterising the inhabitant in a deeper way than freezing its countenance. In this case, the artist found a bigger interest in the frozen compartment, perhaps for being a miraculous novelty tat of storing food for months. To paralyse rottenness, the same way that it can be done with a photographic camera, is a quarrel against the fleeting nature of our matter. The fascination of this image goes beyond its peculiar secrecy and its pale colour palette. It lies in the powerful ability to battle with the deterioration, within the fridge and on the photo paper.

A decade later and in Japan, Tokuko Ushioda also showed interest for open refrigerators. Her project *Reizōko* in Japanese and *Ice Box* in English collects fifty seven kitchens in about thirteen years, from 1981 up until 1994 (fig. 4). Its single edition from 1996 includes black and white photographs arranged in pairs in a one hundred and twenty eight pages book, in a way that each pair of images show the same refrigerator with its door closed and open.

FIGURE 04 » Image composition with two gelatin silver print dyptych by Tokuko Ushioda: [up] *46A/46B Hayama Kanagawa, Ice Box* project, 1994, [down] *11A/11B Shibuya Tokyo, Ice Box* project, 1994.

The idea of the project emerged when Ushioda shared room with a fridge in the apartment she inhabited with its child and the also photographer and the author's husband, Shinzō Shimao. In about twenty three square meters, the new machine stood out for its size and resonance. In conversation with the Canadian Center for Architecture, the artist reveals the impressions that lead her to start this project,

> I wondered why three people needed such a big thing. But I thought okay, even if it was half-broken, it's usable. For two or three years we used it and it was so strong that our vegetables froze immediately. The motor made a lot of noise, especially when I was sleeping. When I looked at the refrigerator, it made me wonder what kind of life I was leading. We slept right beside it and the loud sound it made above my head at night made me sit awake wondering what would happen to me in the future. [3]

[3] **CCA, Canadian Center for Architecture. "Familiar Observations. Tokuko Ushioda in conversation with Stefano Graziani and Bas Princen". 2022.**

Other noteworthy documentary works that have looked over foreign kitchens exposing the its owners lifestyles are *Fridge Food Soul* by Oliver Degorce, *Refrigerators* by Mark Menjívar or *Show me your fridge* by Sandra Junker (fig. 5), this last one including portrait of the owners in their home environment. Those projects take on the portrayal of people trhough the food they choose to consume, their quantity, how they organise it in the different partitionsor the state of their conservation. As the close-up of a digestive system, the refrigerator is the stand, the siege that delimits and that goes unnoticed and the food it accommodates narrate the story that the observer reads. One thing that is essential and that make a distinction between Ushioda's process and those other approaches, is that Tokuko includes the exterior appearance of the machine and its surroundings. The framing of her images covers more than just the appliance's door. This is facilitated by the use of a 6x6 inch camera, Zenza Bronica S2 model, with square aspect ratio. Within the fifty six homes, not all the fridges are situated in a kitchen and not with the same arrangement. The refrigerator can be found in a transit place, in the threshold that differentiates one room from another, between an atrium and a living room, indiscritely in a dining room or closer to the laundry room than to the oven. Often it rests on wood floors, inappropiate for a wet room like the kitchen. It was also seen with its back turned to a glass door and with an unusual orientation in relation to the adjoining furniture.

FIGURE 05 » Triptych composed of: [left] Oliver Degorce, *Fridge Food Soul*, 1993-2017, [centre] Mark Menjívar, *Owner of Defunct Amusement Park. Alpine TX, Refrigerators* series, 2007-2012, [right] Sandra Junker, *London, Show me your Fridge* series.

It was also established in an office, or next to a clothes line, transfering the warmth that it emits to the damp fabrics. In many cases, the cold cupboard is hugged by bottles and jars that await outside for space to be liberated in its interior. If its roof has free height, it is oftentimes occupied by food bags, magazines or vases. Some family uses two nearly identical fridges, one next to the other, both brimming with products. Other machines that are out of the norm, have a unusually extended width. Thus, as a typological catalogue, the work gathers up a variety of refrigerator designs.

Generating that twofold sequence, a veil is lifted in a way that accentuates the nudity sensation. Initially, with the refrigerator door closed, it draws the attention to the context, when it's only one more facade in the kitchen scenery. In that moment, the glance searches for information in the furniture and products around them, paying attention to the objects and graphics that hung and lay in the surfaces. When the door opens, as entering in an unfamiliar bedroom, all the attention goes to its contents. This *Goyarian* effect of *The Clothed Maja*, *The Naked Maja*, emphasise the impression of accessing a confidential space.Uncovering culinary private universes, each image that those artists produced including the freezing closet, ensue as a biographical report when they are isolated, and as an anthropological research as a whole.

2*

In the body

The refrigerator has also participated as a habitable facility in the arts. As coffin where to introduce the body, or as machine with which to connect some human organs. In relation to the interactions between the architectural objetc and the human body, is worth mentioning the research carried out by the architects couple Elizabeth Diller and Ricardo Scofidio, expressed in the text titled *Flesh. Architectural probes* (1994). Among other issues, in it they reflect and invent on the encounters between the organic and the artificial, enriching the synergies that can be produced with the human postures and actions and the forms and uses of architecture and its quotidian objects. In *The Mutant Body of Architecture*, the analysis by Georges Teyssot which introduces *Flesh*, he encourages to the redefining of the relationships between human and artificial bodies:The first task architecture ought to assume, therefore, is that of defining and imagining an environment not just for "natural" bodies but for bodies projected outside themselves, absent and ecstatic, by means of their technologically extended senses. Far from assimilating the tool with the body according to the mechanistic tradition of Cartesian dualism, we must conceive tool and instrument "like a second sort of a body, incorporated into and extending our corporal powers" (Leder, The Absent Body, p. 179). It then becomes possible and even necessary to lofically invert the terms of our proposition on the role of architecture. The incorporation of technology is not effected by "imagining" a new environment, but by reconfiguring the body itself, pushing outward to where its artificial extremities encounter "the world".[4]

[4] TEYSSOT, Georges. "The Mutant Body of Architecture". In: DILLER, E. and SCOFIDIO, R. *Flesh, Architectural probes.* New York: Princeton Architectural Press, Inc, 1994, p. 16.

In accordance with Teyssot's posture, which he interprets that Diller and Scofidio have, architecture must fix the attention towards the evolution of the human body to adapt to it. To work on discovering how to equip it to «inhabit the world», as he declares in the following paragraph.

In this context, the «natural body» can be interpreted with the concept of the ciborg, that is a living being that interacts uninterruptedly with artificial tools, or that incorporate prothesis, merging together with the machinery. This way, the machine and the human entities share functions inside or outside of themselves.

The work that more accurately exemplifies an earthly bond, nearly prosthetic, between the human body and a refrigerator, appears in *In the Kitchen* performance by Helen Chadwick, presented in 1977 at the Chelsea College of Art & Design of London (fig. 6). It's a series of interactions in which the artist fuse together with different devices, putting together a kitchen formed by an oven, a washing machine, a fridge and a sink. These four furnitures are meticulously built with PVC fabric and metal structures that give it shape. The result is a set of pieces of volatile appearance although realistic which can be worn. In a carnal act, the human figure of the artist incarnates with the refrigerator.

FIGURE 06 » Helen Chadwick, In the Kitchen (Fridge), 1977, colour archival pigment print, 29.9 x 20 cm.

A female body is contained in the rectangular prism, which pretends to be into operation through a lighted bulb in its interior and a suspended wire that comes out from it. The artist bring to light that which remains hidden in the daily movements of routine. That which is perceptible, although not visible, the hetero-patriarchal roles that sustain, in certain moments and places, familiar unities. To this effect, Chadwick combines the body and the machine to reveal, in an illustrative and direct way, how the living organism of women and their functions merge with those of the kitchen. How the identity of the housekeeper is blended with the kitchen tools. The appliances, specially comercialised in their origins by means of sexist gender discourses that baptised them as the work machinery for her.

This way, just as the human rush around operating synchronically with the electrical devices, the proximity between the biological body and the technhological one narrows. The products purchasing, their conservation, storage and their preparation got optimised thanks to the studies around ergonomics that started to be applied to product and architecture design in the beginning of the 20th century in the domestic space with the purpose of mediating between the space for the human body and the new space for the machines[5]. Consequently, a correspondence among subjects and objects of different nature occurs and one cannot complete a task without the other, getting trapped in a common functioning to serve their purpose.

[5] **Eduardo Prieto talks about the mecanisation and, specifically, of the ergonomics of movements and equipment of the domestic kitchen, in the North American context of the beginning of the 20th century (PRIETO, 2019, 95).**

Case of our body, what the fridge harbours ends up being a part of the matter we are made of, and the artist makes it evident bringing our palate closer to the human flesh. She suggests that her own being is available as manageable stock for the consumption. The colours of her figure stand out on the white box. Her skin tone recalling a coocked chicken thigh, her eyes some eggs, her lips a chili pepper and her pubic area a chocolate sponge cake.

Suggesting an act of cannibalism or a severe feminist denunciation, Chadwick sacrifies herself to satiate our intellectual appetite. Another way of making the soma uncomfortable with coldness is generated with the project *Fresko* by the Berlin studio lead by Sam Chermayeff with the collaboration of Arno Brandlhuber (fig. 7). By a need of incorporating fresh food for its direct sell, the design office decided to conver the establishment in a fridge.

They materialised this concept with various resources. In the first place, including a refrigerating room inside of the store, ocuppying about a ninth part of its surface. This way, the cold enclosure stayed in the centre of the room to be visited by the clients through a glass door. In the second place, a metallic and grey appearance was applied to all of the interior surfaces, covering the whole establishment up with the usual look appliances have. This is achieved by using grey tonalities, similar to that of the refrigerator façade, in the carpentry, shelves and other surfaces, as well as with an ashen floor. In the third place, an interior vertical finishing of projected grey insulation evokes the frost that gets accumulated in the bottom of fridges and freezers at times. This brings the sensation that there is a thermal layer that protects its interior from the external conditions. In addition, the glazed façade allows it to be perceived from the street as an industrial refrigerator.

In this Italian shop with fresh and ready-to-eat products, the clients get to experiment the environmental conditions where the product they are interested in, need to be kept. For a moment, they share that space. They need to cross a first threshold towards a space with hermetic look with respect to the urban space. After that, a second verge needs to be traversed to get to the fresher products. This way, the visitor is pushed to circulate inside of an electric device. The body needs to endure the new conditions, abandoning its comfort temperature to access the ambrosia. This way, the project alters the definitions of habitable space and temporary room. It shakes up the segregation between the back room and the window display, as well as amid the management and the purchase of the product. Therefore, the notions of intimacy and publicness dance, disrupting the traditional shopping ritual.

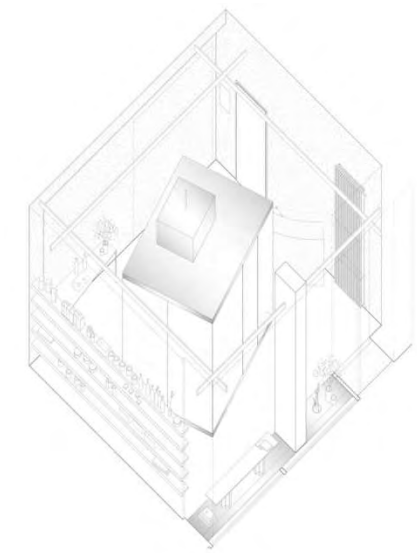

FIGURE 07 » Diptych: [left] Sam Chermayeff Office and Arno Brandlhuber, axonometry of the *Fresko* establishment, 2021, [right] Sam Chermayeff Office and Arno Brandlhuber, *Fresko* interior establishment, 2021. Oliver Helbig photography.

To reach the bottle of a sparkling wine, a creamy Robiola or a gianduja chocolate and nuts bar, requires of that type of meddling to finally celebrate, with greater satisfaction, the reward of its enjoyment. Paradoxically, the act of buying becomes more intimate. The consumer enters an otherwise unaccesible place to fulfill its needs.

Coming closer to Teyssot standpoint, we can look at the practices brought here as dispositions where the human body adapts its system to the electrical cooler and its processes, and vice versa. The following works also scour, deliberately or not, the cyborg notion. Of different means, aesthetic and purposes, both examples demonstrate and cause an intimate relationship with the refrigerator, in a way that the object inserts itself in our daily routine and, more discreetly, can also penetrate our collective identity.

3*

Out of kilter

When the refrigerator is dedicated to its function in an effective way, it goes unnoticed, so we don't normally spare an expense on the matter that it constitutes it. Yet, that reinforced shelving occupies a volume that becomes excessive once it stops cooling down our food. When it leaves our feast neglected, the presence of an object that was completely acceptable, turns into a dead weight that we need to get rid of. The works presented in this section show fridges out of kilter, meaning, liberated from its original mission, agitated and disrupted.

One of the posothumous identities that the refrigerator has acquired is that of the menhir, in the art work *Stonefridge: A Fridgehenge* by Adam Jonas Horowitz (fig. 8). With the aspiration of carrying out an architectural satire of the Stonehenge, in 1997 the artist started a bureaucratic fight to be allowed to build a cromlech in the technological waste era. Located in a landfill at the northwest of Santa Fe, New Mexico, from 1998 until 2007, the even arrangement was about five meters high and had around thirty meters of diameter. Not being all the appliances exactly the same design, colour and height, they were very similar to each other. As sculpted stones, they were erected like columns linked by lintels. Mass production and planned obsolescence could favour the access to the required quantity of similar refrigerators that ended up shaping a new portrait of the end of the 20th century society.

The artist had to start all over again after seeing her first composition of used appliances shattered by the public services. Then, he saw himself as a Sisyphus with a fridge on his back, trying to raise a futuristic structure, at the same time primitive, that symbolised the wastefulness of machines, of the food they shelter as well as of the Freon they function with and that itself consumes the atmosphere.[6]

[6] (FARB HERNÁNDEZ, 2014)

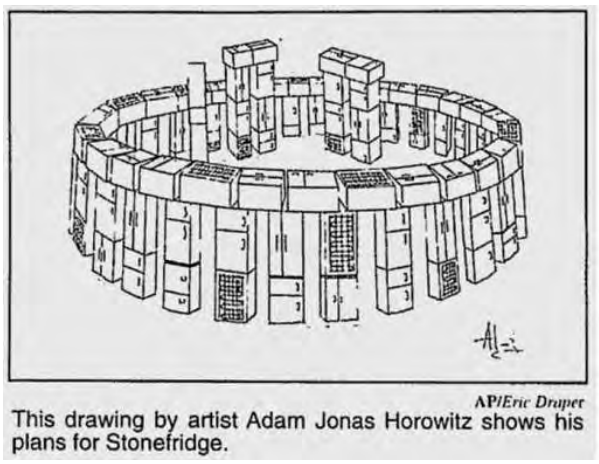

FIGURE 08 » Diptych: [left] Adam Jonas Horowitz, *Stonefridge*, design sketch, 1997, [right] Adam Jonas Horowitz, installation photography, 1997.

Disturbing a natural piece of land with about one hundred and thirty artificial cavities perceived as trash, Horowitz brought to the forefront the consequences of our supposed-to-be technological prosperity. A harmonious display of one of the attributes of the idiosyncrasy of the Capitalocene.[7]

In the New Mexican landfill where it was erected, guided towards the dawn in the summer solstice, the organic waste coexists with the artificial. The piled up food remains with those arranged by Horowitz, which held up their shape, impassible in the face of electricity lack and the absence of calorific energy of the foodstuff. Dry and vacuous, retired if not deceased, they bade farewell with no beat and no other light than that of the sun.

We observe this massive, comical and critical intervention without the affection that artists in the first section were bringing with their occupied homely fridges. The inactivity of each of the heaped refrigerators dissolves the connection that normally exists between our willpower and its content. Even so, this is also a social portrait of us, this time focusing in that which endures more than flesh, the skeleton of our repasts.

Another artist that has been dedicated to include out of service refrigerators in his installations is the German author Thomas Rentmeister. Covered up in Penaten baby cream as well as with Styrofoam or polystyrene, Rentmeister has introduced them spread or arranged as a tower, gathered in nature or in an art gallery. As matter volumes, they give shape to compositions of a magnetic immaculate appearance.

This recycling effort give rise to sculptures that the artist leaves spotless, coating the refrigerators in skin cream for neonates, providing them with a new birth with another identity. Every time, he displays them with their doors closed and even sealed together with an insulation component. Their previous usage remains obsolete then. Only their exterior surfaces, their external volume, interact with its surroundings. Braced to slabs and walls or mutually supporting each other, they form a neat cementery of appliances.

[7] Capitalocene term is used here according to the definition that scientifics like Jason Moore or Donna Haraway have given. Moore describes in a few words as «the "Age of Capital" in-nature» confronting it with the Antropocene notion as «the "Age of Man" and nature» (W. MOORE, 2014, 39), which is less suitable for what we are trying to refer to here, as the era in which the humanity has established complex relations with the Earth's resources and ecosystems. When asked about the Antropocene, Donna Haraway manifests her preference for this other term to define the last centuries, «Very much a part of that [the industrial humanity] are the exchange networks, the financial networks, extraction practices, wealth creations, and (mal)distributions in relation to both people and other critters.(…) The mass extinction events are related to the resourcing of the earth for commodity production, the resourcing of everything on the earth, most certainly including people, and everything that lives and crawls and dies and everything that is in the rocks and under the rocks» (HARAWAY, 2015, 233).

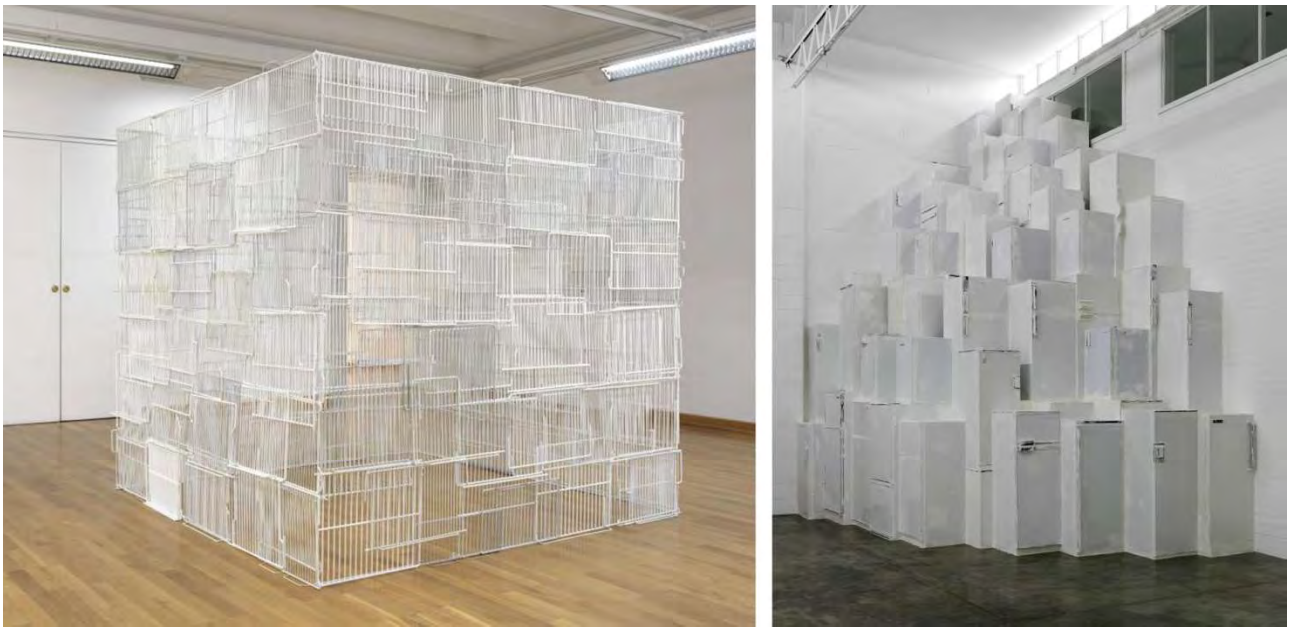

FIGURE 09 » Diptych: [left] Thomas Rentmeister, *Untitled*, 2012, refrigerator shelves, cable ties, 190 x 210 x 210 cm, [right] Thomas Rentmeister, *Nearly 100 fridges in a corner*, 2008, refrigerators, Penaten baby cream, Styrofoam, 705 x 536 x 370 cm.

The air-tightness the machines procure seems to be meant to inter the prior life they had, standing now untouchable in front of us. In constructions like *Muda* (2011 and 2012), the sculptor induces an imposing ambience where the refrigerators strike as beautiful. They reveal against our gastric appetite, shut to our mouths.

In *Untitled* (2012) (fig. 9), Rentmeister employs part of the interior components of the refrigerators, their shelves. Working as lines, they draw a prism to assemble a room. It is another reconfiguration of the fridge, this time delimited by its interior partitions, lighter and more permeable. The mounts that used to save the products are converted, altogether, into a self-supporting framework. The empty shelves transform their use and they annul its identity as nourishment bearers.

Both, the monumental *Fridgehenge* by Horowitz, and the works by Rentmeister, in addition to alluding to the consumer society and the growing quandary of their residues, discover another identity for this appliance. In *Nearly 100 fridges in a corner* (fig. 9), each unit is a pilaster. Forming steps, it's an amphitheatre custom-made for the Australian Greenway Art Gallery in a changing ascent, with potential to be transmuted into a place of stay and game.

In any of those building hypothesis, those fridges have been completely devoided of the responsibility of providing us with edible food. The attentive look we give when a refrigerator opens up with a hopeful hunger is nullified by Rentmeister. He breaks the brain connection we establish between fridge and food, and give them an identity beyond the alimentary altar.

With their transformations, the two artists pervert the aesthetic and ethic that is usually given to monuments. In that exertion, rather than generating a waste burial, as it could be expected from the premise they are based on, they create sepulchres with compositional and political strength.

4*

Conclusions

The analysis undertaken highlights the private and personal nature of the object in question. Therefore, the artists intervene with a lurid desire to violate a personal space and make it public. Those art works that unfold the appliance's doors, access a private property. In a different way, those which show fridge in abandonment, down the street or in a public room, also turn it into a morbid object, as they decontextualize an individual fragment linked to a digestive system. That aggression is uncomforting at the same time that seductive, since it reveals an intimate place we frequent although remains, as our stomach, hidden.

Each of the commented works belongs to different movements. While López and Eggleston are close to intimist art or even confessional art, Ushioda documents a reality with a voyeuristic approach. Different paths are those traced by Chadwick or Horowitz, who bring reflections with a social connotation. At the same time, Sam Chermayeff Office project might not have the experimental intentions attributed to it in this text. Standing in another line is the surrealism and minimalism of Rentmeister, who express in a unique language.

Despite of some works being parallel to an intimist outlook and others pursuing beauty or activism, they all share an identification of the fridge as an organic object, in the sense that it takes part in the biological processes of those who owned it, and in the sense that is part of us, of our collective identity. All of them assume, intrinsically, that it is an organ (or device), who plays a role in the chain of action of our maintenance activities. An abundant number of art works are featured by the refrigerator, from which only a few have been mentioned here. Because of its frequency, it could be appropriate to recognise this as an artistic tendency in the contemporaneity.

Embracing the appliance aesthetic, which tends to come off as vulgar and less noble than a marble worktop or wooden furniture, the artists brought in this journey have confessed certain vulnerability at the refrigerator's feet. In an act of humbleness and acknowledgement, they kneel before it. As a visual ode to conclude this text consolidating the symbolic meaning of the protagonist of the analysis, a series of photographs have been produced revering the current pre-stomach of the author of this research (fig. 10). This physical nearness is also intended to identify the emotional proximity we sometimes keep with habitual gadgets, as well as recognise our current technological dimension.

FIGURE 10 » Diptych: *Reverence and hug to a double door domestic refrigerator*, 2024, author's photographies.

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04

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Sistemas y dispositivos para el suministro de agua en la Hispania romana (Parte I)

// Systems and devices for water supply in Roman Hispania (Part I)

Los condicionantes hidrológicos, con fuertes desequilibrios entre cuencas hidrográficas, junto a la desigual pluviometría y una orografía accidentada, supondrán los principales inconvenientes con los que se encontraron los ingenieros romanos en Hispania para proporcionar a las ciudades un adecuado suministro de agua. Estos impedimentos supusieron una oportunidad para el logro de una eficaz gestión en el uso y distribución del agua, a lo largo de un territorio tan complejo. Sobre técnicas y usos de dispositivos, en Hispania se aportaron soluciones propias por dichos motivos. Esta primera parte abordará los sistemas que intervenían en el suministro, dejando para una segunda entrega al acueducto y sus subsistemas, así como en las propias ciudades.

The hydrological conditions, with strong imbalances between river basins, along with uneven rainfall and rugged terrain, posed the main challenges faced by roman engineers in Hispania in providing cities with an adequate water supply. These impediments became an opportunity to achieve effective management in the use and distribution of water across such a complex territory. Regarding techniques and the use of devices, Hispania contributed its own solutions for these reasons. In this first part, the systems involved in the supply will be addressed, leaving the aqueduct and its participating subsystems for a second installment

1*

Introduction

"It is the waters that make the city"
Pliny the Elder (Natural History, XXXI, 4)

This text will introduce a crucial aspect for the proper functioning of cities and other smaller localities: the water supply to their populations, within the context of Roman Hispania. It will be shown that this interest was inherited by the Romans from previous civilizations, as access to water has always been fundamental for human settlement in a territory. The matter became more complex when humans decided to live in communities, as they accepted that their well-being and security would be greater than if they lived apart from others.

There is abundant research on the water supply systems implemented by the Romans in the vast territory they dominated, and more specifically in Hispania. It is also evident that the intervention of the Roman State was decisive. Their engineers developed a science, with complex systems and devices that were part of the design of hydraulic infrastructures, both on a territorial and local scale. Rome undertook this task as a strategic decision in its policy of dominance and exercise of power.

This article does not aim to be an exhaustive study of the elements that were part of Roman hydraulic installations; much has already been written about it. To contextualize the topic, a brief historiographical introduction is necessary. Thus, there is evidence of interest in Roman hydraulic infrastructures in Spain as early as the 17th century, related to the existence of Roman aqueducts south of the Turia River (DIAGO 1653, as cited in HORTELANO 2008:70). This is possible thanks to the chronicles of Francisco Diago, who describes the ruins belonging to València la Vella, which he identifies with the Roman city of Pallantia.

This interest in Roman infrastructures continued in the mid-18th century. For the first time in our history, an initiative related to the cataloging of historical and architectural heritage was developed. The task was directed by the Spanish Crown during the reign of Ferdinand VI, and the responsibility fell on Luis José Velázquez de Velasco y Cruzado, Marquis of Valdeflores, who was assisted by the academic and draftsman Esteban Rodríguez Tizón, brother of the architect Ventura Rodríguez (SALAS 2010:13-14). The city of Mérida was part of the first stage of a journey that took place from 1752 to 1765. (Figure 01).

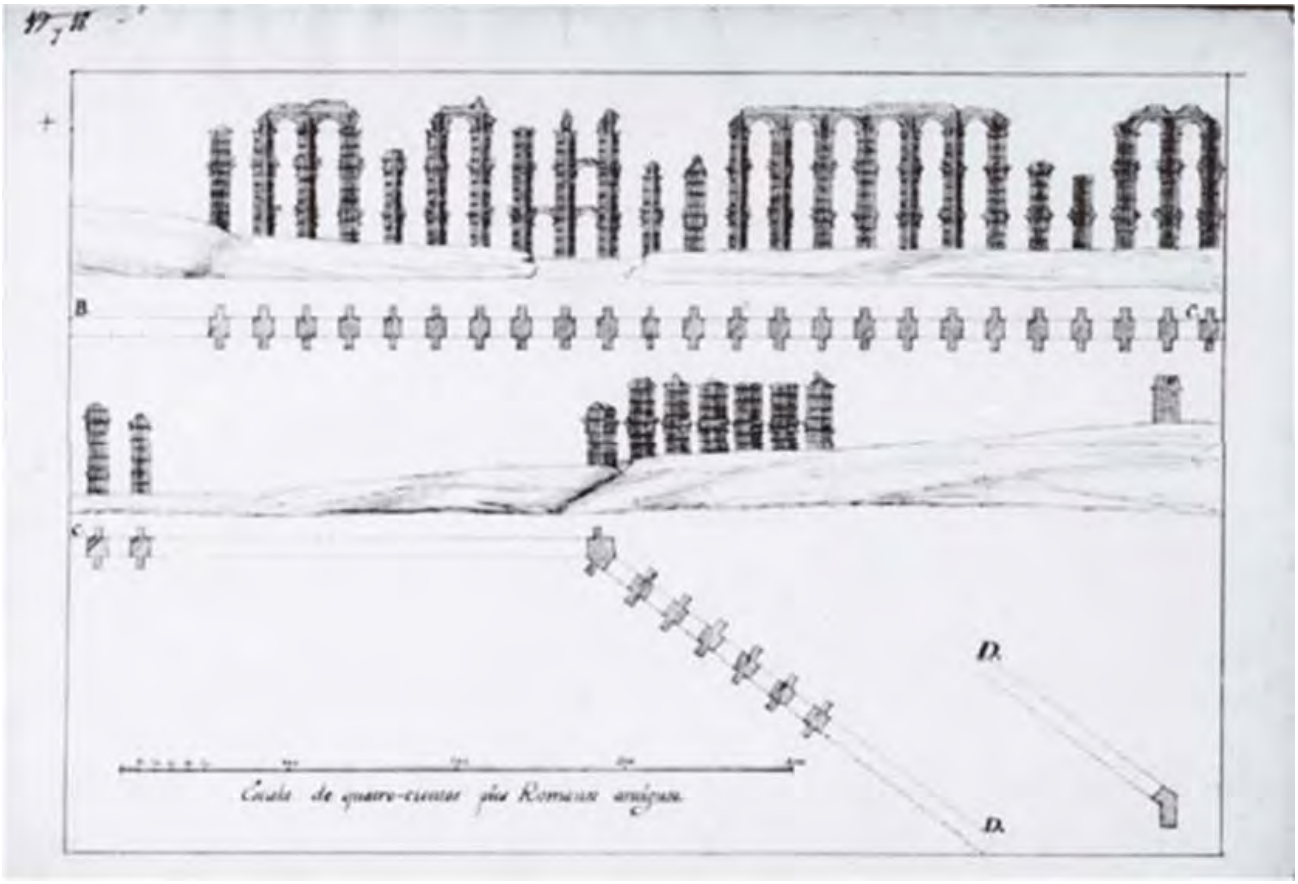

FIGURA 01 » Acueducto de Los Milagros. Drawing by Esteban Rodríguez.

Source: Gabinete Cartográfico de la Real Academia de la Historia. Signatura BA-VI e 87.

At the end of the century, the publication "Viaje de España" (1772-1794) by Antonio Ponz became a reference for understanding the state of Spanish artistic heritage and its works, including the remains of the Roman presence in the Iberian Peninsula.

During the 20th century, various research works were carried out, such as those by the civil engineer Carlos Fernández Casado, which gained special momentum from the late 1970s, when the political regime in Spain changed. With the beginning of the present century, archaeological studies related to the water supply systems to Roman cities increased; at this time, the support of certain institutions, such as that provided by the Tagus Hydrographic Confederation, which wanted to know the state of the Roman water supply to the city of Toledo (ARENILLAS and BARAHONA 2009:95), became important.

Furthermore, it is necessary to differentiate between the implementation of these installations in pre-existing cities and in newly founded cities, as the construction and urban complexities they present are also different.

To analyze these structures and infrastructures, and those that are known, the moment when hydraulic building activity began systematically has been considered, particularly with the construction of aqueducts considered as a system of systems: with the arrival of Augustus to power. In addition, the provincial organization of Hispania, also the work of the same emperor, must be added (Figure 02).

FIGURA 02 » Administrative organization of Hispania during the Early Empire..

Source: Own elaboration based on BELTRÁN F. y MARCO, F. 1996:83.

A large part of the Roman hydraulic infrastructures, especially those that served the interior of cities, have disappeared or are buried. Some are still functioning, others have been repurposed for other uses, and a third group includes those that are assumed to have existed, based on observations in other European cases.

It seems reasonable to consider that Roman engineers would systematize the design and devices, adapted to the particularities of each area, given the vast territory they controlled. This would facilitate construction and the economy of auxiliary means, as well as the necessary personnel for execution. By comparison with other locations, it could be known if this initial approach is feasible. Additionally, it must be taken into account that part of the unused water also served to ensure the good condition of the sanitation and cleaning of the channels intended to evacuate wastewater.

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2*

State of the issue in Roman Hispania"

It can be stated that Rome made it possible to take the first steps towards the introduction of what is now known as running water. Many of their constructions were lost over time or destroyed, and very few have survived to this day.

As early as 312 BC, the city of Rome had its first aqueduct, the Aqua Appia; previously, the Romans obtained water through direct intakes from the Tiber River, springs, and wells (SALINAS 2007:10). In Hispania, it took longer to see

such constructions until the territory came under Roman control, although the peoples who inhabited the Peninsula until then had their own water supply systems.

The definitive boost to hydraulic constructions began with Emperor Augustus, at the start of the Principate, when he gained absolute power in 29 BC. This activity began alongside the administrative restructuring of the territory. In this endeavor, the water supply to cities, whether pre-existing or newly founded, became a priority and essential. Generally, no newly founded Roman city was established where water from a good spring could not reach; however, this principle was not immutable and adapted to the peculiar circumstances of the Hispanic territory.

For the Romans, water was the most important, even strategic, resource, to the point of ensuring that their settlements had the highest possible quality and abundance (MUÑIZ, 2015: [video 1]). To this end, they executed engineering constructions throughout the Roman Empire to bring water to the final urban consumption. The Romans were not satisfied with access to springs or large rivers, both close to urban settlements; either because the flow of the former was not adequate or because the water quality of the latter did not meet desired standards. In this regard, Vitruvius' Book VIII provides valuable information on the required quality of this water. The water had to be of high quality and its supply had to have a large flow. At the same time, a long-term perspective was necessary to ensure the supply to cities for many years (MUÑIZ, 2015: [video 1]).

To understand the knowledge of these infrastructures in Roman Hispania, it is necessary to delve into history and refer to two aspects. On the one hand, the studies of Fernández Casado in 1983 are significant; they mention the difficulty in finding research related to city water supply systems. He links this circumstance to the existence of what he calls the law of archaeological finds by private works, which necessarily predates the Spanish Historical Heritage Law 16/1985 of June 25. This law would have caused the suspension of works, sometimes indefinitely, upon the accidental discovery of archaeological remains during private construction.

What are the consequences of this situation?? In many cases, builders, to prevent the competent authorities from finding out, acted quickly, destroying everything found. Therefore, plans could not be drawn up nor could the findings be documented. Related to this, paradoxical situations have materialized over time. An example was the construction of the Archaeological Museum of Málaga on the same foundations as the Roman theater. There have also been cases where, prompted by the same rulers, significant Roman remains have disappeared. An example is the remains of an imperial Roman villa that fell victim to the pickaxe for the construction of the AVE in the city of Córdoba.

On the other hand, the few Roman water distributions still in use today (such as some sections of aqueducts) are in an advanced state of deterioration. This is due to centuries of abandonment, urban and territorial transformations. Additionally, some materials, such as those used in conduits, were looted or simply deteriorated over time, as in the case of some wooden pipes.

It should also be noted that, in addition to aqueducts for external supply, cities had their own supplies, such as wells in homes and cisterns, some predating the arrival of Rome; the former drew water from the subsoil and the latter collected rainwater. Thus, this dual supply allowed the population of Rome to withstand the siege by the Ostrogoth king Totila during the Third Siege of Rome between 549 and 550 BC. The Ostrogoth sovereign interrupted the water supply to the city through the aqueducts to force the city's capitulation. However, far from achieving this, ancient sources indicate that the population only lamented that these events prevented them from using the baths (SÁNCHEZ 2019:442)

3*

Hydraulic systems used in the Roman context

> Let the majesty of your Empire be adorned with the appropriate prestige of public buildings
>
> Vitruvius (The Ten Books on Architecture. Dedication, Book I)

Written sources provide a valuable starting point for understanding these systems. Numerous publications are related to aqueducts as part of the infrastructure that supplied water to cities. However, there is not as much information about the existing systems at the territorial level, within the Roman provincial organization that allowed the administration of the Peninsula; nor about how the territorial connection with the distribution within cities was made, understanding everything as a complete system for each city. The origin of this situation can be found in the absence of regulatory norms, contributing to this situation:

a. The limited work dedicated to archaeological research, which increased significantly from the 1970s onwards. Dams, weirs, aqueducts, cisterns, and fountains have mainly been the objects of these investigations.

b. There is a lot of bibliography, even prior to the 20th century, but not many detailed analytical works, such as those on the construction systems used. In the field of representation, there is more indeterminacy, with graphic documentation not entirely accurate. There are accounts and definitions, but detailed and individualized studies are scarce. A good example of this state is related to the analyses carried out around aqueducts (JIMÉNEZ 1976:199).

c. The construction of public works that have destroyed archaeological remains in their path.

d. Additionally, the essence of the following statement can be extrapolated to other territories: “Thus, despite the significant development that urban archaeology has experienced in the city of Seville in recent decades and the constant increase in the number of interventions, the stratigraphic record of Roman contexts remains particularly scarce today” (GARCÍA 2007:126).

Thanks to the exceptional state of conservation of certain archaeological excavations, it has been possible, despite the difficulties in finding reliable information from other sources, to establish certain initial hypotheses. The case of Pompeii (Figure 03) is a paradigmatic example; the circumstances of its disappearance, buried under ashes for centuries, have made it possible to preserve the main devices and layouts of the water channels of a Roman city. This has allowed us to understand in great detail how water supply to an urban environment was possible. Thus, a hypothesis is proposed: that this model was adopted throughout the Roman Empire. Although there isn't evidence to verify this, it seems plausible that it was possible.

It should be noted that this topic gained special relevance thanks to the support and impetus of some state administrations, such as the studies related to the Roman water supply in Toledo. These works were carried out by the Tagus Hydrographic Confederation between 2005 and 2009 and provided abundant information on the water supply to Toletum; above all, they marked a before and after regarding the theories that had traditionally been accepted as true on the subject (BARAHONA 2014:206).

FIGURA 03 » Water distribution in the city of Pompeii, with its main elements and conduits.

Prepared based on the work of OLSSON 2015:18, 91.

Many publications have so far informed us about the current state of research related to the water supply to Roman cities. It also happens that the level of studies does not correspond to the entirety of the cities in Roman Hispania. This seems to be because this field of work is in an incipient stage, for which two possible reasons are estimated: the lack of research work on this line of work or the absence of general archaeological studies. In fact, it is from the 1980s onwards that significant archaeological interventions took place, such as the one carried out in what was the Roman city of Gades; this task made it possible to reveal a large number of archaeological traces in this location (LARA 2018:142).

Vitruvius and Frontinus, through their writings, are the sources that allow us to understand how these systems were executed and under what design and quality parameters. The goal was to achieve a water supply in the best conditions for the cities of the Empire, a strategic objective for the survival of the Roman State. These are two key authors for understanding the importance that Rome placed on water, even from the time it was a republic.

We must be grateful that the texts of these two sources have reached us because, otherwise, certain information would only have been discovered through archaeological work. They are primary sources that give us access to the knowledge and philosophy that made it possible for the Romans to undertake these still ambitious engineering projects.

Vitruvius (80-15 BC), who served Augustus, records in Book VIII of his treatise De Architectura, in a monographic manner, the necessary actions to locate, obtain, transport, and store water for distribution in the cities of the State (RUIZ and DELGADO 1991:79). Rome made it possible to end the dependence on the topographical conditions where cities were or would be established, thus achieving a regular and quality water supply. This policy was extended to all territories under its political and territorial control, with large civil engineering works never seen before.

Frontinus (last third of the 1st century AD), senator and soldier, who in his cursus honorum reached the magistracy of curator aquarum. This position was granted to him by Emperor Nerva in 97 AD and provided him with the capacity to manage the water supply infrastructure to the city of Rome (PANIAGUA 2016:22). As a result of this dignity, he wrote De aquaeductu urbis Romae at the end of the 1st century AD, which is a technical report that recorded all the actions he carried out in the performance of his duties. In this text, not only is the problem of water supply to Rome addressed, along with the solutions adopted; it also provides a relevant compendium of regulations applicable to hydraulic works in all Roman domains (RUIZ and DELGADO 1991:89).

Frontinus not only deals with the supply to cities but also to their ager. In addition to what has already been mentioned, the text identifies two critical stages of water supply to Roman cities (LARA 2018:142):

- Collection and channelling: capture and weirs, dams, aqueducts.

- Distribution in the urban space: cisterns, fountains, nymphaea, and channels buried under the pavement, as well as wells in homes.

In addition to these resources, we have archaeological sources that allow us to better complete the picture of the systems and devices involved in the water supply to Roman cities. In this sense, it should be noted that water always constituted a fundamental element for Roman society; the works and various hydraulic devices, in fact, constitute the most notable sign of Romanization of a city in the Empire.

At this point, we can proceed with the description and study of each of the components that enable the functioning of the water supply infrastructure. The knowledge of these devices allows us to contextualize the complex installations in the urban and historical context of each studied city: storage and regulation systems, transport, storage, channels, distribution, and regulation of flows and pressures.

Dams

Dams, given the volume of water they held and the height they reached, utilized various organizational structures (Figure 04). They were integrated into the territorial system that provided water supply to populations from outside, considering the water scarcity that the Romans had already observed. Sometimes, the exploitation of springs, which is the preferred source of supply, would participate in the territorial system in a mixed manner with the dams. In certain territories with low natural regulation of river flow, the Romans opted for the construction of a significant number of these components. Examples include the cases of Mérida and, occasionally, in the Guadiana basin, on the right bank of the Ebro, and the left bank of the Tagus.

The reason why some areas have low natural regulation of the terrain is due to the presence of depressions where it is more challenging to exploit river flows; therefore, artificial regulation through dams is necessary. Additionally, in those same territories, springs and sources provide low flow rates. Thus, water accumulation was viable during the most favorable times, making it possible to have sufficient distribution capacity throughout the rest of the year (ARANDA 2003:494-495).

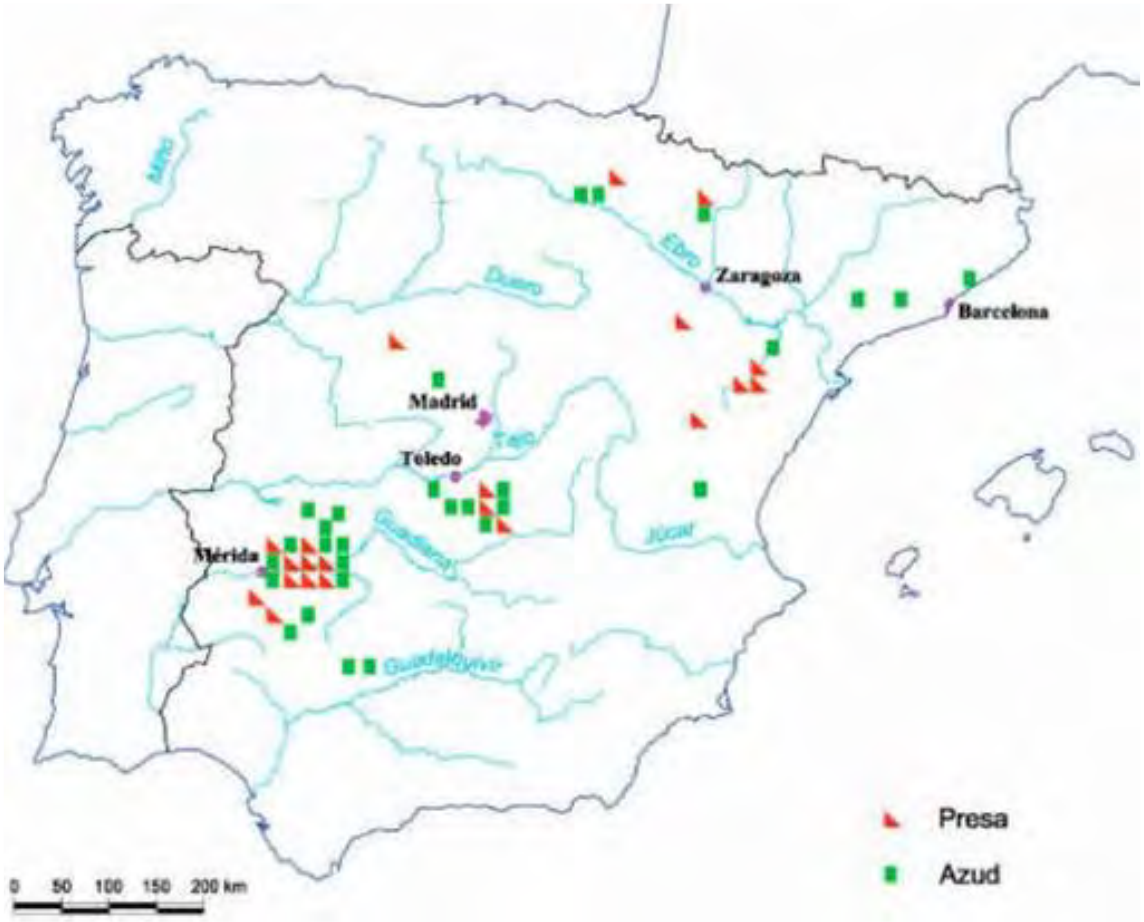

FIGURA 04 » Distribution of Roman dams and weirs in Spain.

Source: CASTILLO 2007:67

These are elevated constructions that function by gravity, meaning that the weight of the materials forming them is capable of withstanding the horizontal thrust exerted by the water on them. They are designed to retain considerable volumes of water. In the case of the Ebro basin, the dams are located halfway along significant rivers, providing real regulation capacity. Regarding the Tagus and Guadiana, the structures are located at the river heads or in small reception valleys, where the river flow is lower. These circumstances conditioned the structural and construction solutions of each area: in the Ebro, the dams are masonry, like the one in Almonacid de la Cuba, conceived as regulation elements. In the central-western part of Roman Hispania, filling systems and impermeable screens were used, such as in Cornalvo and Proserpina, whose role was to serve as storage reservoirs at the beginning of each river structure (ARENILLAS 2003:72).

The construction solution predominantly adopted by Roman engineers was the screen wall, whose function was to provide watertightness to the system. It consists of a main element of opus caementicium, whose primary function was to facilitate the watertightness of the dam; it was backed on both sides by walls of opus incertum, which sometimes served as lost formwork. Occasionally, this screen wall could be solely of opus incertum. Upstream, it could consist of opus quadratum in buttresses (Figure 05), and downstream, it always had a large earth embankment or backfill; this latter element was a compacted material fill that withstood the entire thrust of the impounded water, which made the dam wall unstable when it was empty (Figure 06) (ARENILLAS 2003:73-74).

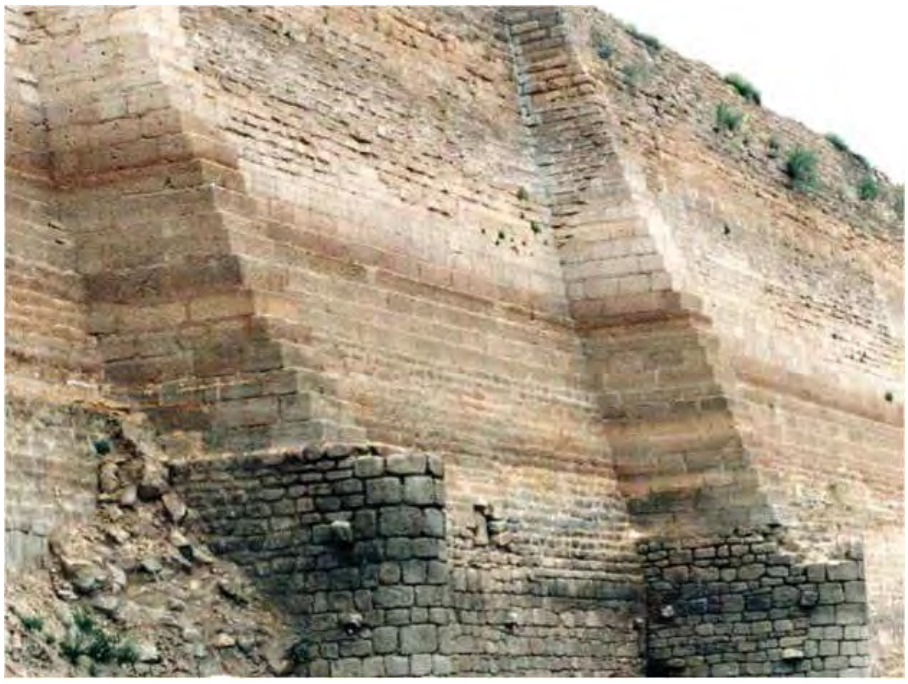

FIGURA 05 » Walls and buttresses in the Proserpina dam.

Source: FEIJOO 2006:160

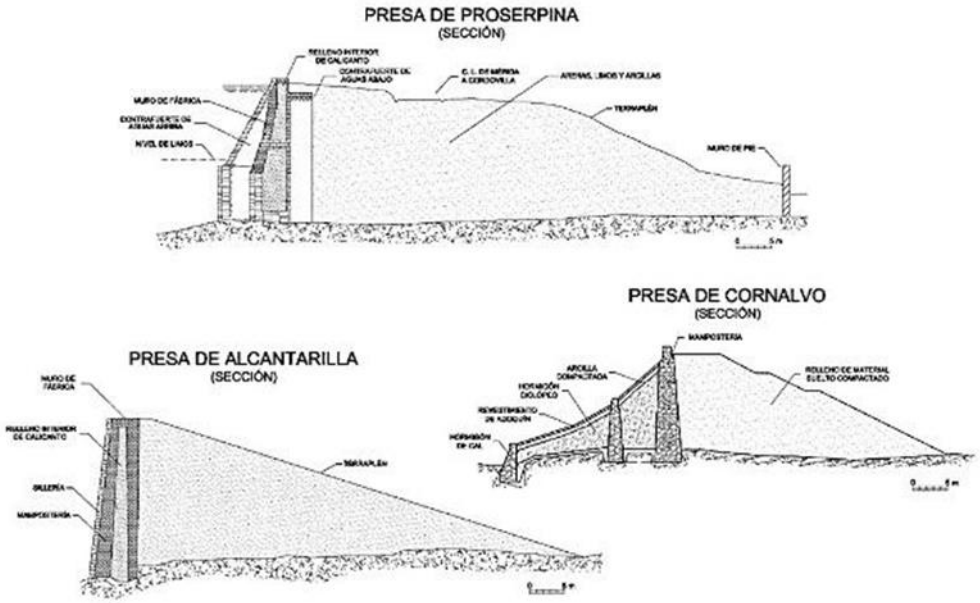

FIGURA 06 » Typical construction sections of three dams in the Guadiana and Tagus basins.

Source: ARENILLAS et al. 2002: Figure 10.

This impermeable screen had its variants, such as in the case of Alcantarilla: an *opus quadratum* wall upstream and *opus caementicium* fill, along with another of *opus incertum* and *opus quadratum* downstream. Or as in Cornalvo, where three parallel opus incertum walls are located upstream, increasing in height as they approach the main wall. The spaces between these walls contain concrete, gravel, clay, and sand fills. This specific feature in Cornalvo could be related to much later reconstructions after the Roman period, as the model it presents is not the one adopted by Roman engineers for dams like Alcantarilla and Proserpina; this does not invalidate the fact that it was originally of Roman construction and later transformed (MARTÍN 2000:668-669)

Weirs

The term "weir," of Muslim origin, is reserved for small dams; their purpose is to raise the river level to divert part of its flow for other uses, such as supplying the specus or channel of an aqueduct, or even for irrigation channeled by ditches. Their capacity to regulate river flow is less than that of a dam, as the river overflows them, although they retain a significant volume of water. Unlike dams, their purpose is not to store water but to raise the river level for diversion. This design factor determined their smaller size. They were located at the heads of hydraulic systems, such as aqueducts. They can have buttresses, like in Consuegra (Toledo) or Villafranca (Teruel); without buttresses, curved with rows of ashlars directly supported on clay layers, like the example of Cubalmena for the supply of Los Bañales, acting as a discharge arch (Figure 07).

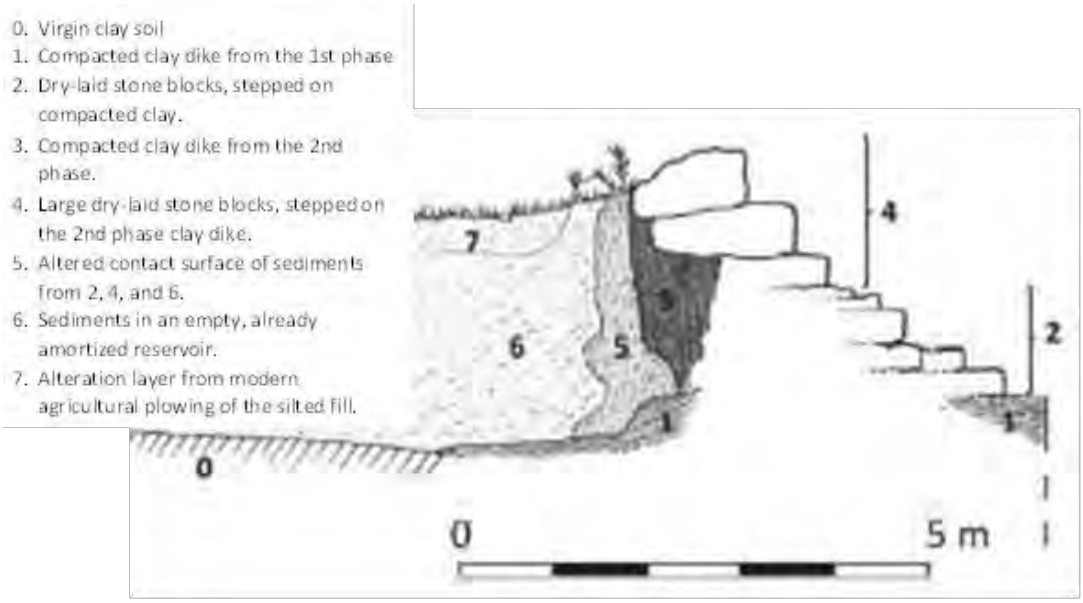

FIGURA 07 » Construction section of the Cubalmena weir.

Source: own elaboration based on ANDREU and ARMENDÁRIZ 2011:208

Weirs would act as decantation devices initially, although they would later drag particles from the banks due to erosion by the advancing water. They are not a direct capture from a spring, which is ideal, but as some authors state, they are "second category" (FEIJOÓ 2006:155). Referring to what happened with the waters transported by the Aqua Anio Vetus and those from its captures, Frontinus comments the following (PANIAGUA 2006:265): "The two Anios spring less clear as they are captured from the river and often, even in good weather, they become turbid because the Anio river, despite originating from a clear lake, drags sediments from the banks, which detach due to the current, thus becoming turbid before reaching the conduits. This inconvenience is suffered not only with winter and spring rains but also with summer ones, a season when that purity in the conduits is most appreciated."

When opting for this type of capture, the main drawback was that the water became dirty with silt. For this reason, it was necessary to have a piscinae limariae next to the capture point for decanting the fluid before its discharge into the specus (VENTURA 1993:62).

Putei

Wells, or putei, are water collection elements existing in cities, even before the arrival of the Empire in Hispania, but they continued to function even when Roman cities were supplied with running water through aqueducts. They are vertical excavations, predominantly circular in plan; the first section consists of a brick or even ashlar mouth to enhance their durability and preservation (SÁNCHEZ 2019:433).

They allow access to the groundwater levels existing in the subsoil of some cities or by utilizing the permeability of nearby rivers (Figure 08), even taking advantage of karst systems like the one in the city of Tarraco. Sometimes they also acted, optionally, as a reservoir or cistern to accumulate rainwater. Like cisterns, they provided water in case of any supply interruption, whether from aqueducts or other reasons. Many domus were self-sufficient in cities like Augusta Emerita, as they had a well or cistern, in addition to the water supplied by the public network; for illustration, in this city, its inhabitants even preferred the putei. In some neighborhoods of this city, some wells have been documented, excavated in rock, with depths of up to 12 meters (ALBA 2007:165-167). They were also excavated to serve the baths (SCHATTNER and OVEJERO 2007:102).

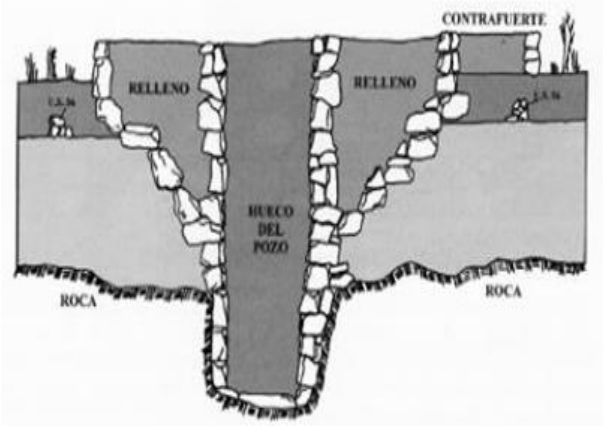

FIGURA 08 » Well in Marroquíes Bajos, Jaén. Source: BARBA 2007:Fig.26 and 28.

Cisterns

Cisterns are elements for collecting rainwater that are complementary and/or alternative to putei, although they can also be public. They served, among other purposes, to collect occasional excess water from aqueducts or for storage during droughts (MARTÍNEZ 2007:268). Cisterns and putei offered the possibility of maintaining a water supply capable of addressing and covering possible supply contingencies, both for regular consumption and other purposes, to the point that they made the development and inclusion of private baths possible (ALBA 2007:166). In pre-Roman Hispania, there was already an established custom of water supply with central cisterns to collect rainwater in *oppida*, excavated in the ground (CASTRO 2016:109).

Many examples have been found and documented (Figure 09). Unlike *castella aquarum*, cisterns store rainwater for consumption; they do not redistribute water as *castella* do (MONTELEONE 2018:22)

Vitruvius only recommends their use in the absence of groundwater that supplies springs or if it is not possible to capture it through putei. Some appear completely buried, but originally they were semi-buried to facilitate inspection and maintenance tasks. They could be excavated in rock (GONZÁLEZ 2007:50) or constructed with *opus caementicium* in their walls and waterproofed with *opus signinum*.

The spaces are covered with barrel vaults of *opus quadratum*, *opus caementicium*, or *opus latericium* to preserve water quality. Generally, they were located in public spaces, associated with fountains, squares, or monumental buildings, due to the role water plays in Roman society and the citizens' right to use it. But they were also found in private spaces, such as the *impluvia* of *domus*; an *impluvium* is a square cistern located in the center of the atrium of a domus, at a lower level than the *atrium* to facilitate the collection of rainwater, where it was stored after being collected from the inverted roofs of the same atrium or patio (GONZÁLEZ 2002:415).

Recent research suggests that they also served as elements within a complex pressure control system (MUÑIZ 2015: [video 2]).

FIGURA 09 » Cistern in the Iberian settlement of Cerro de la Cruz in Almedinilla, Córdoba. Source: CASTRO 2016:109.

Castellum aquae

The term castellum aquae is a generic reference to any Roman construction whose function was the temporary storage and distribution of water from an aqueduct. Examples include diversion boxes, collection boxes, redistribution boxes, and towers. Depending on the type of water use, it is differentiated between castellum publica, as part of aqueducts and city distribution, and *castellum privata*, intended for several concessionaires for private use of aqueduct water (MARTÍNEZ 2007:268). In a *castellum,* regardless of the type, water is constantly entering and exiting; it is a passage point where the outflow is regulated and managed (MONTELEONE 2018:22). They can be found both on a territorial and urban scale, in aqueducts and within cities.

They can adopt various functions, and therefore, other terms are also added according to documentary sources (MARTÍNEZ 2012:142), such as:

- *Castellum divisorium* or *dividiculum:* A device located within the city walls, at the highest point of the terrain. It connected with the specus; from there, after cleaning, flow regulation, and decantation, the water was redistributed or branched through several conduits. The one in Nemausus, now Nimes, has ten conduits, and the one in Pompeii has three, each intended for a different neighborhood or use. For illustration, the one in *Nemausus* (Figure 10) is used due to its excellent state of preservation and the current absence of similar remains in Spain. For its preservation, a protective structure was built, giving it the significance of a castellum or building (MARTÍNEZ 2007:268). This term was created in the 19th century (MARTÍNEZ 2012:142).

FIGURA 10 » Exterior of the *castellum divisorium* in *Nemausus,* now Nimes.

Source: LA ROMANITE AU COEUR DE NÎMES https://nimesromaine.wordpress.com/wp-content/uploads/2014/01/castellum_3.png.

The number of pipes or conduits departing from this device depended on the services to be covered, neighborhoods, and the size of the locality, as well as the existence of other aqueducts that also served the same city, with their respective castellum divisorium. Additionally, the surplus water was used for cleaning the urban sanitation system (MUÑIZ 2015: [video 1]).

Vitruvius provides a series of recommendations related to the construction typology of this structure, which he considers relevant by stating: "When the water reaches the city walls, a reservoir and three cisterns will be built, connected to it to receive the water; three pipes of equal size will be adapted to the reservoir to distribute the same amount of water to the adjacent cisterns, so that when the water overflows the two lateral cisterns, it begins to fill the central cistern. In the central cistern, pipes will be placed to carry the water to all public pools and fountains; from the second cistern, the water will be directed to the baths, which will provide the city with annual income; from the third, the water will be directed to private houses, ensuring that there is no shortage of water for public use. The reason that has driven me to establish this water distribution is that individuals who have water in their own homes must pay taxes for the maintenance of the aqueducts." (VITRUVIUS and OLIVER 2004:319).

- *Castellum aquae* with *piscinae limariae,* for decantation and water cleaning (Figure 11) (MARTÍNEZ 2012:142).

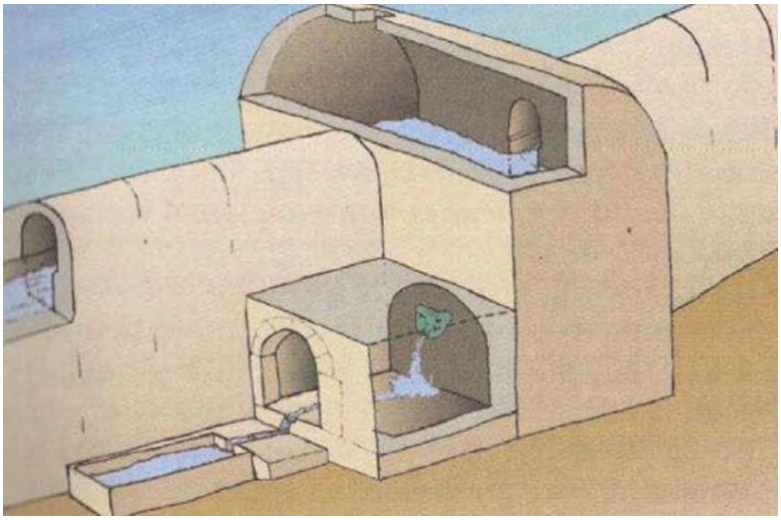

FIGURA 11 » Reconstruction of a *castellum aquae* with *piscinae limariae,* next to a fountain.
Source: FEIJOÓ 2002:387.

- *Castellum aquae* used for inspection, cleaning, or aeration. They are equivalent to the so-called sand traps seen in Segovia (Figure 12) (MARTÍNEZ 2012:142).

FIGURA 12 » First *castellum aquae* for decantation of the aqueduct in Segovia, known as La Casa de la Piedra.
Source: Francisco Javier Espejo.

- Secondary or *second-order castellum aquae, which was the terminal device participating in the distribution system within cities (MARTÍNEZ 2012:142).*

- *Castellum aquae for pressure breakage (like the turris aquae), for pressure control in conduits with steep slopes (MARTÍNEZ 2012:142).*

- Castellum aquae *with overflow regulator function, if the specus exceeded its admissible capacity, sometimes becoming a fountain attached to the aqueduct.*

FIGURA 13 » Terminal secondary castellum aquae with turris aquae function in *Pompeii*.

Included for illustrative purposes of what likely existed in Hispania as well.

Source: https://www.flickr.com/photos/h_savill/2475322869.

Their arrangements and construction forms could be diverse, such as: tower (*turris aquae*) (Figure 13), boxes (*puteus*), pillar (column), or building (*castellum*). Their walls were not intended to contain water but to preserve various components (*inmisairium, emisariu*, *calices, piscinae limariae*, etc.) (MARTÍNEZ 2012:142), so their structure only needed to respond to the stresses derived from the construction itself as a container, not from the device it housed.

4*Conlusions

The complex water situation of the Peninsula, with territories of especially arid climates and low rainfall, along with areas with abundant water resources, does not allow for a single supply solution for each population in the provinces of Roman Hispania. The baths and public baths required a constant and sufficient flow, so the solution of cisterns, which had been used since pre-Roman times, did not guarantee these services continuously.

Some authors estimate that cisterns only collected rainwater, but this hypothesis contradicts the above; to these functions, another of extraordinary importance must be added: the cleaning of the sewer system with the surplus water. Sometimes the water collection, which made these water demands possible, took place several kilometers from the city in question, although constructive evidence of the existence of conduits that made this possible hasn't always been found.

In this sense, it is worth highlighting the difference in nomenclatures adopted to describe the same concept. For example, in Corduba (Roman Córdoba), a turris aquae was also identified, but it was called a second-order castellum; this difference in denominations for the same concept has posed an additional difficulty in analyzing the information and drawing these conclusions. Thus, based on the analyzed data, it can be hypothesized that these towers or second-order castellum must have existed in Roman cities in the same way as in Pompeii, to perform the same function: controlling the pressures of the installation. The cisterns, as in the city of Bilbilis, would have had a similar role in cities with rugged topographies, such as Carthago Nova.

The water collection and distribution systems, following the Roman model almost entirely, were not recovered until the mid-19th century, thanks to the Industrial Revolution. Running water, a true luxury even today in many parts of the world, including in so-called First World countries, was a sign of modernity and progress 2000 years ago thanks to Roman engineering

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Un nuevo Renacimiento. No hay luz sino oscuridad
// A New Renaissance. There is no light but darkness

Este artículo plantea una analogía entre la Edad Media y la actualidad, destacando los desafíos ambientales y sociales.

En la era medieval, las condiciones difíciles llevaron al surgimiento del Renacimiento, un periodo de avances artísticos y científicos. De manera similar, el texto sugiere que los problemas modernos podrían abrir paso a un nuevo "Biorenacimiento", basado en la biología y la sostenibilidad.

El enfoque se centra en el uso de hongos y su micelio como materiales de construcción sostenibles, inspirados por investigaciones actuales y proyectos como la colaboración de la NASA. Estos materiales ofrecen beneficios como biodegradabilidad, resistencia, y eficiencia térmica, con aplicaciones en diversas industrias, incluyendo la arquitectura y la medicina.

La propuesta es aprovechar estas innovaciones para crear un modelo de economía circular, contribuyendo a una sociedad más ecológica y autosuficiente.

This article draws a parallel between the Middle Ages and the present, highlighting today's environmental and societal challenges.

Just as the harsh conditions of medieval times eventually led to the Renaissance—a period of significant artistic and scientific advancement—current issues may pave the way for a "Bio-Renaissance" grounded in biology and sustainability.

The focus is on using fungi and mycelium as sustainable building materials, inspired by recent research and projects like NASA's. These materials offer benefits such as biodegradability, resilience, and thermal efficiency, with applications in various industries, including architecture and medicine.

The proposal aims to leverage these innovations to establish a circular economy model, contributing to a more eco-friendly and self-sustaining society.

Mico-arquitectura. Construcción basada en micelios

Myco-architecture. Construction based on mycelium

Jesús López de los Mozos

A new Renaissance. There is no light but darkness

It was cold, and the sun barely managed to filter through the clouds of dust and mist. A new day began with the same gray as always. The dirt streets, turned to mud from the previous day's rain, were no exception today. The footprints of boots and animals mixed with human waste and rotting food scraps to the sound of "water coming down" falling from the windows, creating a dark, foul-smelling mass at the edges of any European village we might describe. The stench did not go unnoticed by each villager, forced to live in a constant state of nausea and resignation.

The harvests were usually scarce, the ground hard, and the rain had not softened the fields enough to plant a garden. Alongside the tithes to be paid, hunger quickly took hold. So much so that a piece of stale, moldy bread soaked in water seemed like an excellent option.

Only surviving the diseases that struck each winter remained, spreading from peasant to peasant like rats, as common as the villagers themselves, lurking in the corners with a cloud of plague over their backs.

The bells rang, and every good Christian man and woman headed to a small Romanesque church, rough, gloomy, and stony, at the call of God, as faith in the divine was the only hope in an illiterate society, filled with red-haired witches condemned by any well-fed cleric whose name instilled even more fear in this terrified population.[1]

It is true that a thousand years separate us from the darkest time of the Middle Ages, and to this day, we can find certain analogies to that era.

The weather can be equally freezing or scorching, with less and less difference, as climate (or climate change) is a relevant topic of our time. Despite a sewer system refined and inherited from the Romans and Persians, the streets are not always the cleanest, nor are the manners of the inhabitants the most refined, seeing the city as an "entity" that does not belong to their immediate environment beyond the doors of their homes. Not to mention the outskirts between the countryside and the city, turned into a home for broken sofas, used tires, and all kinds of debris from the city's finest construction sites.

Food does not nourish because experts cannot agree on the three, four, or increasingly numerous nutrition pyramids on which human diets should be based, allowing companies that poison the soil—now increasingly sterile and impoverished—a free hand. Meanwhile, in European cities, each of us generates 132 kilograms of waste per year, while in another part of the world, people face long weeks of involuntary fasting. Simultaneous epidemics of hunger and obesity.[2]

FIGURE 01 » Author: OpenAI Year: 2024
Title: Medieval Alley
Description: AI-generated illustration representing the figurative idea of hardship in medieval life

01 » Reinterpretation based on (Martínez García, 2009, Historia Medieval en Europa, Editorial Universitaria).

02 » Smith et al., 2020, Environmental Sustainability Journal

Unfortunately, pandemics are not foreign to us in the 21st century, like other diseases that technology—the cornerstone of our civilization—has failed to eradicate.

The bells no longer ring; instead, we hear a small jingle in our pocket, with an intent not very different from that of the cleric, as we are bombarded with tons of well-crafted, biased information that aims to instill fear and misinformation in equal parts. Controlling the masses remains of utmost importance.

We only have a glimmer of hope, and it is that history advances one step forward and two steps back. Thus, history does not repeat itself, but it often rhymes far too much. And the answer to such darkness in its day was none other than the Renaissance—a revolution like no other, where architecture and art benefited from great advances that influenced aesthetics, construction techniques, materials, and functionality. Humanity became the universal measure, and physics was challenged with cathedrals reaching for the sky, open to natural light, symmetrical, harmonious, and subtly light. The Renaissance moved beyond religious exclusivity, allowing architects to innovate, creating and improving gardens, plazas, palaces, town halls, and libraries, bringing them closer to the people.[3]

03 » Giovanni, 2018, Renaissance Architecture and Society, Cambridge University Press

So, if in such a distant era, as described above, where desolation was the daily bread, and from such darkness arose one of the most fruitful and significant periods in human history, taking a qualitative and quantitative leap from that reality, would it not be possible for us to experience the same fate?

It is 2015, and outer space continues to fascinate our species. After decades of debating humanity's future, where our next home will be, and engineering advancements, we are beginning to consider the idea of living on the moon, on Mars, or in any place with conditions that somewhat resemble our blue planet.

And it is only with a construction challenge of this magnitude that we can expect the best of our ingenuity.

Construction up to our era has consisted of the sustained and technical stacking of various materials, increasingly sophisticated, with some cohesive element so they can work together in an artificial cave that we now call "houses." Isolated houses; semi-detached; houses on top of other houses in the form of buildings; houses for working, known as offices; or much larger houses to store airplanes, which we call hangars.

In other words, innovation has not been significantly different from what the Romans did. The materials have changed, and we can now make skyscrapers almost a kilometer tall, but they are still built by stacking and connecting materials.

Allow me to explain.

There is a general agreement among specialists that the 20th century was to physics what the 21st century will be to biology. In that same year, architect Neri Oxman, director of the innovation team at MIT's Mediated, made a subtle and revealing comparison. For example, a human limb, starting from a stem cell, can create a nail in its outermost layer, a cuticle that protects the nail's insertion into the skin, itself composed of a breathable, waterproof epidermis; a dermis that can generate body hair for thermal comfort against the cold; hypodermis to store energy in the form of fat; protecting ligaments, tendons, and muscles that compress and tense until reaching the bones that structure us. We could make the same exercise with the plant world with a tree, its roots, branches, leaves, etc.

Nature does all this on its own, with instructions that biology has yet to fully uncover. Now, to assemble any car, it takes between 70,000 and 90,000 different parts made in specialized factories scattered hundreds of kilometers around the world. And even with the complexity involved in creating a car, you could instruct any human to build one by following specific steps, but you cannot ask a human to assemble, manufacture, or create a body in the same way as a car and have it function afterward. This is where a new paradigm emerges, and biology plays a crucial role.

Our gaze turns back to space, and before venturing to live there, the first idea competitions about how to live on Mars or the Moon begin, led by companies like NASA, AIRBUS, or renowned architects like Norman Foster.
Curiously, while imagining the future, many of the finalist proposals look back to the past, to a time when homes were erected or spread out with a few ropes and animal skins, where nomadic life prevailed, with only the essentials and all frivolities relegated to a distant concern.

Thinking about inhabiting a house millions of kilometers away from everything we know implies rethinking construction methods, and here comes a technology that has taken its first steps in recent years: 3D printing. Its function is simple—three axes (X, Y, and Z) and a hopper through which to pour some type of viscous or molten material. Practically, it's not far from traditional rammed earth or superadobe. However, with robotic precision and the curing times of materials, it allows for very refined and increasingly complex forms that "grow" their walls.

Although materials must still be implemented separately, we can draw an analogy with the growth biology discussed earlier or at least understand construction as a novelty compared to what has been done so far, as the geometric sections of a wall can be configured to be more resistant or to contain air chambers that provide greater stability and thermal comfort inside.

FIGURE 02 » Author: OpenAI Year: 2024
Title: Habitats on Mars:
Description: AI-generated image of a possible construction using biological 3D printing

Although materials must still be implemented separately, we can draw an analogy with the growth biology discussed earlier or at least understand construction as a novelty compared to what has been done so far, as the geometric sections of a wall can be configured to be more resistant or to contain air chambers that provide greater stability and thermal comfort inside. But among all these favorable technical features, one stands out if you travel to Mars: you cannot bring materials with you; instead, you must use what you find there.[4]

04 » Johnson & Brown, 2022, Journal of Advanced Architectural Engineering,

Thus, once again, we come to a dead end; if we rely on the natural cohesion of particles, water plays an essential role in construction, and we don't have enough on our planet to carry tons of it to build and live.

This opens the door to a new way of thinking, where the inert has little place.

"It is dark, and I feel forgotten. Barely any light reaches me, and I feel trampled by everyone. I am buried, pressed against the cold, hard ground, on the verge of disappearing. And from the depths, I feel that the same weight that crushes me pushes me upward. Slowly, silently, and unseen, I transform. And finally, I realize that I have not been buried but planted to emerge with the strength and resonance of life."

This brings us to the cornerstone of this text. As we read in this metaphor about darkness and growth, the future is not barren nor does it form a wasteland. Rather, it lies beneath our feet, where the largest living being on the planet, fungi, resides.
To date, approximately 148,000 species of fungi have been identified and described. However, recent estimates suggest that the total number of fungal species could range from 2.2 to 3.8 million, indicating that a vast majority remain undiscovered.

Among them, Armillaria ostoyae, also known as the "honey fungus," is the largest living organism in the world, located in the Malheur National Forest in Oregon, USA. Its mycelial network (the underground structures that form its main body) spans approximately 9.6 square kilometers and is estimated to be at least 2,400 years old, although some believe it could be even older.

This fungus grows underground and connects various trees in the forest, absorbing nutrients from them, making it a parasitic organism. Its vast underground filament network, though invisible to the naked eye, makes it the largest known individual organism in terms of area occupied.

This organism did not go unnoticed by NASA, and since 2020, they have explored the potential of fungi as an innovative resource for building sustainable habitats in space.

Instead of transporting large amounts of building materials, NASA is studying the use of mycelium, with its filamentous capacity to grow and structure itself in varied shapes. This natural material is not only durable but also capable of self-repair, adapting to different environments and forms, and eventually decomposing without leaving waste, making its applications ecological and contributing to a cradle-to-cradle circular economy.

Its versatility continues to grow, constantly astonishing us, as it has been historically maligned by humans due to its potential toxicity for the less fortunate who consume it. However, in recent decades, science has found promising and revolutionary applications for fungi, spanning medicine to architecture. Witnessing its versatility, we see how this natural kingdom breaks into the innovations of the future, offering solutions to both current problems and challenges yet to be imagined.

In **medicine**, fungi have been essential since Alexander Fleming discovered penicillin, an antibiotic derived from Penicillium notatum, transforming bacterial infection treatments (Fleming, 1929, British Journal of Experimental Pathology). Today, other fungi like those from the Ganoderma genus, commonly known as reishi, are studied for their immunomodulatory and anticancer properties. Current research also examines psychedelic fungi compounds, like psilocybin, for treating mental health disorders such as depression and anxiety.[5]

05 » Carhart-Harris et al., 2016, The Lancet Psychiatry

Architecture and construction are continually seeking sustainable materials, and fungi offer a viable, eco-friendly alternative. Fungal filaments are used to create strong, biodegradable biocomposites that can replace traditional materials like concrete. In collaboration with NASA, mycelium materials have been developed for Mars habitats, leveraging their autonomous growth and structuring ability [6]

06 » NASA, 2020, Myco-architecture Research Initiative), promising sustainable architecture both on Earth and beyond.

NASA has also inspired projects like The Living, an architecture studio that built "The Hy-Fi Tower" in New York, a temporary pavilion made entirely of mycelium bricks. This biodegradable fungus created a sturdy structure that, upon dismantling, reintegrated into the environment without leaving waste (Beyer et al., 2019, Architectural Innovations in Sustainable Design). This example shows how myco-architecture can replace polluting materials with eco-friendly solutions, fueling interest in sustainable urban construction.

In materials engineering, researchers are developing **mycelium biocomposites** as alternatives to plastics and synthetic foams. These materials are used for insulation panels that maintain stable interior temperatures while reducing carbon footprint. They are not limited to housing; packaging companies are experimenting with mycelium to create durable, compostable packaging, helping reduce single-use plastics in various industries .[7]

07 » Jones et al., 2021, Green Materials Science Journal)

Fungi also show promise for **construction in disaster-prone areas.** For example, flexible and lightweight mycelium materials can absorb seismic vibrations more effectively than traditional materials. In Japan, experiments are underway to build earthquake-resistant structures using mycelium and reinforced bamboo, benefiting seismic constructions and providing a quick, safe, and economical alternative for temporary shelters in disaster zones .[8]

08 » Tanaka et al., 2022, Journal of Sustainable Engineering Solutions

In **Materials Engineering**, the strength and flexibility of mycelium are also being explored in creating biodegradable textiles and packaging. Companies like Ecovative Design have developed mycelium-based materials to replace polystyrene and other single-use plastics.[9]

09 » Bayer & McIntyre, 2015, Ecovative Design Research Report).

In the fields of **Chemistry and Biotechnology,** fungi offer intriguing applications through their unique enzymes, capable of breaking down materials that would otherwise be difficult to treat. Some fungal species can decompose plastics and toxic waste, a significant advantage in bioremediation. The fungus Pestalotiopsis microspora, for instance, has demonstrated the ability to degrade polyurethane, opening up possibilities for plastic waste treatment.[10]

10 » Russell et al., 2011, Applied and Environmental Microbiology).

In the specific case of **cleaning up oil and diesel spills,** some fungi can degrade hydrocarbons present in petroleum spills, making them effective for cleaning diesel and other fuel spills. Notably, the fungus Amorphotheca resinae has shown a high affinity for breaking down hydrocarbon compounds in petroleum, transforming them into less toxic substances. This ability makes it a valuable resource in the bioremediation of contaminated environments.[11]

11 » Torné & Sanz, 2018, Journal of Environmental Biotechnology)

One remarkable application is **the elimination of radioactive elements**, where fungi also show promise in the bioremediation of radioactive waste. The fungus Cryptococcus neoformans, for example, can absorb and concentrate radiation while growing in contaminated environments, such as those in Chernobyl. This fungus uses melanin in its cells to protect itself from radiation, absorbing it and, in a sense, "feeding" on it. This ability is being studied as a potential solution for cleaning radiation-affected areas, proposing a biological and safe approach to treating nuclear contaminants.[12]

12 » Zhdanova et al., 2000, Mycological Research)

In **agriculture**, mycorrhizal fungi help improve soil health and crop productivity by facilitating nutrient and water absorption in plants. Additionally, entomopathogenic fungi, such as Beauveria bassiana, are used as biopesticides to control pests without relying on harsh chemicals, promoting a more sustainable agricultural model.[13]

13 » Gillespie et al., 2016, Journal of Invertebrate Pathology)

Mycelium has also gained ground in the fashion industry, particularly in **textiles** and plant-based leather as an alternative to animal leather. Brands like Stella McCartney and Adidas have created fashion and footwear products using mycelium materials developed by companies such as Bolt Threads.

This "mushroom leather" has a texture and durability similar to traditional leather, but its production is less harmful to the environment. Mycelium textiles also allow designers to work with a sustainable, adaptable, and biodegradable material that reduces the fashion industry's environmental impact.[14]

As an **alternative food source**, fungi, beyond their traditional use as food, have given rise to innovative meat substitutes. Companies like Meati Foods use mycelium to create alternative "meat" that is high in protein and fiber, providing a healthy, eco-friendly option for those seeking to reduce meat consumption. Mycelium thus becomes a regenerative food source that requires far less water and land compared to traditional livestock, marking a trend toward sustainable nutrition.[15]

Lastly, some researchers are exploring how fungi can generate energy through **bioelectricity**. Scientists have discovered that certain fungi produce mycelial networks capable of conducting electricity, functioning as "biobatteries." These "electric fungi" could be used to power small devices in remote areas or integrate into agricultural monitoring systems that run on biological energy, transforming energy production into something biologically integrated.[16]

As can be observed, this "tiny" being, barely visible at the surface, has many areas of influence. However, they all share a common trait with other living beings, with unique characteristics due to the kingdom to which they belong: they need to eat.

The kingdoms of fungi, plants, and animals are three of the most important groups of organisms on Earth, each with unique characteristics defining their roles in ecosystems. At the cellular level, fungi are more similar to an ant than to a watercress, as they lack chloroplasts. However, their reproduction is more similar to a fern, as they reproduce through spores. When it comes to nutrition, they enjoy a good rotting log for their enzymes; they are heterotrophic organisms, unlike plants that need water and sunlight.

And this point is key, giving rise to the wordplay that names this writing. Among all their characteristics, fungi can be cultivated in the most "extreme" conditions imaginable—or at least one that is a synonym for life for most animals and plants: our dear sun. This is the primary reason they can be taken into space and continue to grow in a box, in a cave, or in the back of a space cabin. Not needing sunlight is a significant advantage, sparing them irreversible damage while they remain sheltered in their chosen environment.

Their role in ecosystems is essential as decomposers, recycling nutrients into the soil and forming symbiotic associations with plants. And it is here, once again, that a new opportunity arises within our immediate world and in the different ways of thinking about everything that surrounds us.

14 » Bolt et al., 2020, Fashion and Sustainability Review)

15 » Stevens et al., 2023, Food Science and Future Foods).

16 » Carter & Liu, 2021, Journal of Bioelectric Systems).

Returning to human construction and manufacturing of everything that has existed, it has always been understood as a system in which resources are reused and reintegrated into a continuous cycle, known as the "circular economy" since the earliest civilizations. However, this approach began to "end" with the rise of the Industrial Revolution in the 18th century. With industrialization, the economic model shifted toward a linear system based on extraction, production, consumption, and disposal, fueled by abundant natural resources and growing mass production capacity. According to Murray, Skene, and Haynes (2017), "the shift to a linear production model was driven by new industrial capabilities and an increasingly competitive global economy, leaving behind the sustainable resource cycle that once defined agrarian societies".[17]

17 » Journal of Industrial Ecology,

However, as unpromising as all this may seem, this model persists as it generates something we are increasingly aware of, resonating from the earlier paragraphs with the cry of "water coming down" from the windows: waste.

Industries generate millions of tons of waste each year, representing a significant portion of global pollution. According to the World Bank, approximately 2.01 billion tons of solid waste were generated worldwide in 2018, nearly half of which comes from sectors like construction, manufacturing, and mining. This waste includes metals, plastics, chemicals, and hazardous materials that severely affect the soil, water, and air. Without proper management, the amount of industrial waste could increase by up to 70% over the next 30 years, adding pressure on natural resources and reinforcing a linear economic model that limits reuse practices [18]

18 » World Bank, 2018, What a Waste 2.0: A Global Snapshot of Solid Waste Management to 2050).

FIGURE 03 » Author: OpenAI Year: 2024
Title: Micelium bricks:
Description: AI-generated image of examples of bricks made of micelium

So, if construction—implicit in our profession as architects—is one of the largest sources of global waste, and on the other hand, we have nascent biology capable of providing solutions to problems we have clumsily created, why not unite them?

This is the approach and theoretical framework of my doctoral thesis, which seeks to explore how the remarkable fungi and their incredible characteristics can somehow minimize the impact of construction or optimize it to create a positive effect that enhances the overall process without sacrificing the technical efficiency achieved so far.

To this end, we began studying the fungal kingdom, cross-referencing data based on different parameters. First, we examined how fungi feed and classified them accordingly. Since they cannot produce their own food and depend on organic matter, we identified three categories: **saprophytes, parasites, and symbionts**. Saprophytic fungi feed on dead organic matter, decomposing it and releasing nutrients into the environment.

Parasites, on the other hand, obtain nutrients from other living organisms, often causing diseases in plants, animals, or even humans. Finally, symbiotic fungi establish mutually beneficial relationships with other living beings, as seen in mycorrhizae, where the fungus associates with plant roots, facilitating nutrient and water absorption for both.

Only saprophytes are suitable for decomposing waste, providing us with a key clue: “dead organic matter.” Thus, we need to find waste suitable for being food for our fungi.

Through an in-depth search and by country, with Spain as a focus to standardize and concentrate the process as much as possible, data from the National Statistics Institute (INE) showed that approximately 6.3 million tons of waste were produced in 2021 in the agriculture, livestock, forestry, and fishing sectors. This waste includes crop residues, prunings, and other organic waste typical of agricultural activities. Proper management of this waste is essential to minimize its environmental impact and promote sustainable agricultural practices.

So, we now have the ingredients to formulate a hypothesis: Can we generate an “optimal” biomaterial for architecture by combining agricultural waste with an abundant, native saprophytic fungus from the peninsula, using cultivation techniques that are easy to standardize and replicate?

For several years, our architecture university has collaborated with other seemingly unrelated departments in microbiology and soil studies to create such materials.

Combining knowledge and techniques, but above all moving away from the increasingly necessary professional isolation, we have begun to cultivate oyster mushrooms (Pleurotus ostreatus), common mushrooms (Agaricus bisporus), and reishi (Ganoderma lucidum).

The choice of these fungi is based on a selection process considering their bioavailability, proliferation capacity (for instance, Boletus edulis, more characteristic of the Iberian Peninsula, is still much more challenging to cultivate due to its specific growth conditions), and their emerging properties in medicine and in trials with the biomaterials produced.

Initial tests were conducted in the material testing laboratories at the European University of Madrid.

The procedure, carried out under regulatory standards, aimed to study the behavior of the fungus fed and rooted with agricultural residues, specifically wheat waste sterilized by autoclave, when subjected to tests of tension, compression, thermal insulation, and sound absorption.

The initial test results were promising, showing considerable room for further improvement. Among the findings, the material can withstand 38 kg/mm² of surface pressure, making it consistent enough to be self-supporting and suitable for furniture and other, currently non-structural, elements.

Its excellent thermal insulation capability, with a thermal conductivity coefficient of 0.0059 kcal/m²h°C, maintained external temperatures of 125°C at bay for nearly 2 hours, with the internal surface reaching only 45°C.

The next steps we are taking involve testing its behavior and finish when we mix agricultural waste with other starch-rich residues, such as those resulting from beer production.

The rise in beer consumption has spurred a notable expansion in artisanal production, which has been well-received by consumers seeking unique flavors and traditional brewing processes. However, this growth also brings an environmental challenge: the management of brewers' spent grain. During brewing, approximately 85% of the waste produced is this by-product, consisting of barley or other grains left after fermentation. It is estimated that 20 to 25 kg of spent grain are generated for every 100 liters of beer produced—a considerable figure given the large-scale global beer production [19]

19 » Sustentable Digital, 2023, June 21. "Brewers' Spent Grain: Circular Economy to Reduce Waste and Climate Change."

This is where we are conducting new trials and studies in collaboration with biologists internationally, cultivating mycelium under optimal conditions to later inoculate it into these substrates and again test its properties against previous results.

Although this “technology” is still in its early stages, we can expect the upcoming discoveries to be highly promising.

The uses and applications of mycelium in industry and architecture are beginning to emerge. Over time, we will be able to measure and estimate the impact generated by these biomaterials in complex ecosystems such as cities, creating specific actions, such as energy savings and thermal efficiency, compared to traditional materials by evaluating their carbon footprint, usability, waste, and recyclability. Given the points discussed above, it’s easy to think that the winning fungus is unmatched.

As Henry Ford once said, “Failure is simply the opportunity to begin again, this time more intelligently.” In part, we have reached this point thanks to a series of failures, some better managed than others. But if we must start anew, let’s do it better—standing on the shoulders of giants with the wisdom of nature, leaving behind our own dark age to embark on a new Bio-Renaissance.

FIGURE 04 » Author: OpenAI Year: 2024 Title: Bio-Renaissance:

Description: AI-generated image of examples of possible Bio-Renaissance City

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06

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Hacia una arquitectura industrial: La influencia del artículo *But today we collect ads* de 1956 en la arquitectura de posguerra de Alison y Peter Smithson

// Towards an industrial architecture: The influence of the 1956 article *But today we collect ads* on Alison and Peter Smithson´s postwar domestic architecture.

En junio del año 1955 los arquitectos Alison y Peter Smithson escribían un primer borrador de lo que pocos meses más tarde, en noviembre de 1956 y de la mano del número 18 de la revista ARK, se convertiría en su célebre artículo But Today we Collect Ads. Comprendido por muchos autores como el manifiesto a favor de una nueva arquitectura pop, deudora de la reciente fascinación del mundo de la cultura por los objetos de consumo de la posguerra, But Today we Collect Ads iba a significar, sin embargo, el primer alegato realizado por los Smithson a favor de una arquitectura verdaderamente industrializada. Así este artículo, que complementa su texto con la publicación de los mecanografiados originales del artículo, busca no solo acentuar la importancia que este tuvo en la obra de sus autores, sino llevar a debate la certeza ampliamente asumida de que el Movimiento Moderno fue un movimiento profundamente industrializado.

Smithson, objetos, Pop, industrialización, prefabricación, anuncios

Ablinger works are played with many different formats, including concerts, installations, performances, operas for natural and urban environments, conceptual music, etc.

In June 1955, architects Alison and Peter Smithson wrote a first draft of what a few months later, in November 1956 and in issue 18 of ARK magazine, would become their famous article But Today we Collect Ads. Understood by many authors as a manifesto in favor of a new pop architecture, indebted to the recent fascination of the world of culture with post-war consumer objects, But Today we Collect Ads was to be, however, the first plea made by the Smithson in favor of a truly industrialized architecture. Thus, this article, which complements its text with the publication of the original typescripts of the article, seeks not only to emphasize its importance in the work of its authors, but also to bring to debate the widely assumed certainty that the Modern Movement was a profoundly industrialized movement.

Smithson, objects, Pop, industrialization, prefabrication, ads

"Gropius wrote a book on grain silos,
Le Corbusier one on airplanes,
And Charlotte Perriand brought a new
object to the office every morning;
But today we collect ads."
ALISON y PETER SMITHSON. But today we collect ads. [1]

1*
Introduction

In November 1956, architects Alison and Peter Smithson published in issue 18 of ARK[2] Magazine what would undoubtedly be one of their most famous and at the same time misunderstood articles of their entire literary production. Promoted by Reyner Banham –at the time one of the leading figures of the Independent Group[3] alongside the Smithsons– as a "manifesto for a new Pop architecture", the article But Today We Collect Ads would represent, on one hand, the synthesis of the British couple's experience as part of the aforementioned group and, on the other, the authors' vindication of an architecture paradoxically distanced from Pop, definitively built around the values of post-war industrialization, and eager to incorporate the consumer objects massively imported after the end of the conflict from the United States to Europe.

"The transformation of every-day (sic) object to fine art manifestation happens in many ways. The object can be rediscovered – object-trouvé or l´art brut – the object itself remaining the same: a literary or folk myth can arise and again the object itself remains unchanged; or the object can be used as a jumping off point and is itself transformed." [4]

A synthesis of some of the principles most widely shared by all the members of the group, the text of no more than three pages in length (figs. 4, 5 and 6) represented first a plea for the conceptual use of consumption as a new source of artistic inspiration. Understood as a symbol of a society to which art and architecture had to learn to listen again, the images of magazine advertisements from the United States such as Look, Life or Ladies Home Journal, showing the influence of the new mass culture in 1950s America, seemed to encourage the Smithsons to take the initiative in the construction of new discourses. In this sense, and in the same way that the Modern Movement had used automobiles, airplanes and ships as model objects for its new approaches, the new post-war movement seemed to choose a collection of color advertisements.

"Advertising has caused a revolution in the popular art field. Advertising has become respectable in its own right and is beating the fine arts at their old game. We cannot ignore the fact that one of the traditional functions of fine art, the definition of what is fine and desirable for the ruling class, and therefore ultimately that which is desired by all society, has now been taken over by the ad-man."

(...)

"They are good images and their technical virtuosity is almost magical. Usually have involved as much effort for one page as goes into the building of a coffee-bar. And this transient thing is making a bigger contribution to our visual climate than any of the traditional fine arts."[5]

2*

The object

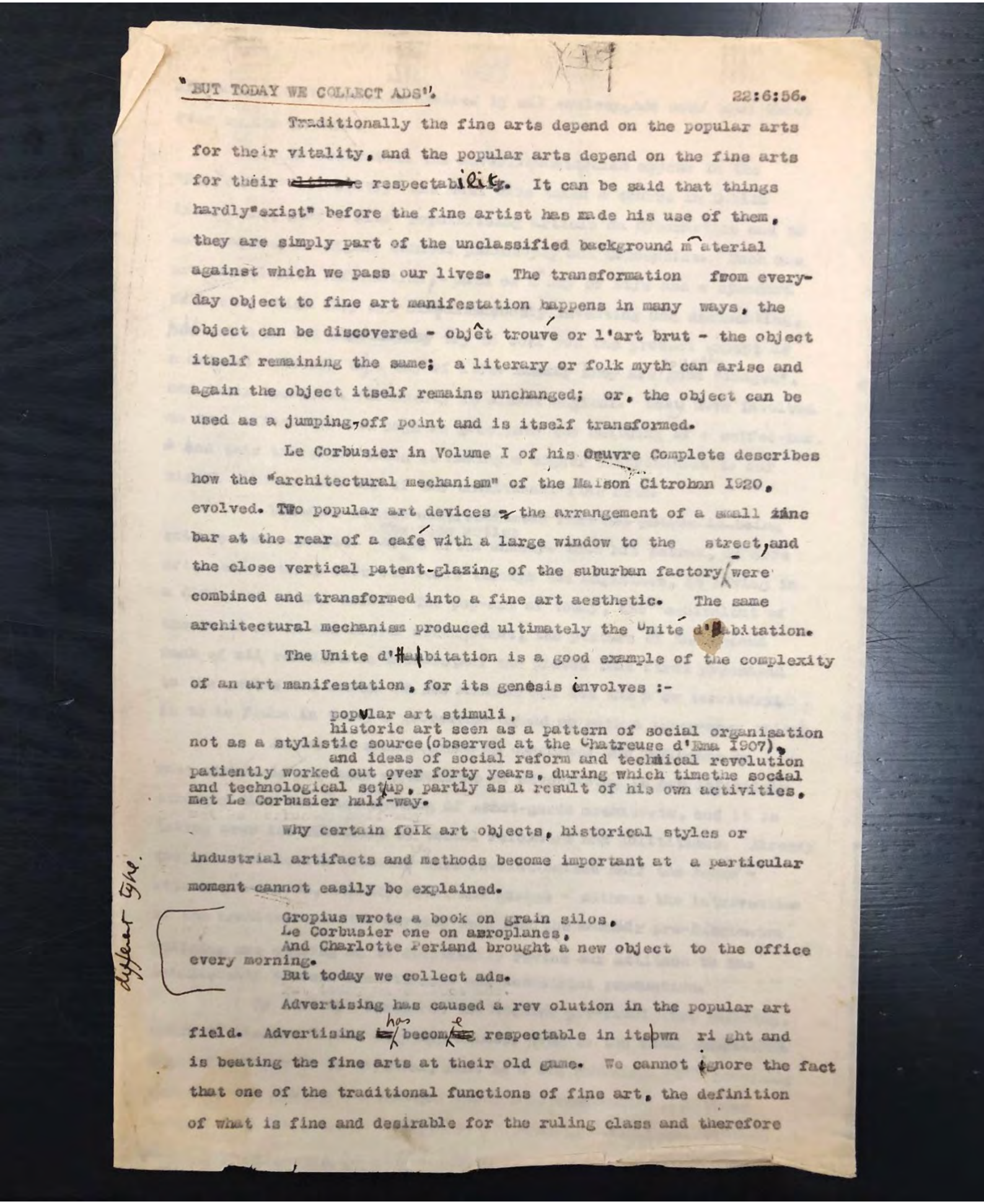
Assumed the value with which consumption and its graphic representations contributed to the making of new postulates, the article thus focused its narrative on the analysis of the concept of the object not only through its social variables but also as an argument through which to analyze and construct domestic space. The text should not be interpreted in any sense, as Banham claimed, as a manifestation in favor of a new pop architecture[6] -the Smithsons had symptomatically crossed out the word pop from the original typing of the text[7], not including it in the article finally published- But Today We Collect Ads was to be, on the contrary, and as we will see below, a plea in favor of a truly industrialized architecture built from an *objet-trouvé* found within the world of industry.

This analysis, far from the fascination with which Banham and other members of the Independent Group were observing the consumerist phenomenon, was therefore going to focus its gaze on the inevitable and necessary acceptance of such consumption as the building organism of a new domestic space. Thus, the new consumerist object, symptom of an effervescent world but also indicative of a new industrial and industrialized reality, emerged in the Smithsons' minds as an opportunity to incorporate an infinite capacity of industrial products -preexisting, preconceived and predesigned- into a new spatial reality far removed from the tabula rasa of the Modernism, and close to the idea of a collage composed of existing objects.

"Already the mass production industries have revolutionized half the house – kitchen, bathroom, utility room, and garage– without the intervention of the architect, and the curtain wall and the modular prefabricated building are causing us to revise our attitude to the relationship between architect and industrial production". [8]

Thus, through the idea of "appropriation" inherited from the objet-trouvé, the Smithsons were to begin to move away, at least partially, from some of the principles most firmly rooted in pre-war architecture1. In this respect, and while it was true that for architects such as Le Corbusier the reference to the existing object -automobiles, airplanes, and ocean liners- was obvious, it was no less true that this reference had until then been fundamentally metaphorical.

f indeed architecture had come close to considering the "foreign object" as a source of inspiration, this consideration had so far been nothing more than allegorical. [9]



'BUT TODAY WE COLLECT ADS'. 22:6:56.

Traditionally the fine arts depend on the popular arts for their vitality, and the popular arts depend on the fine arts for their ultimate respectability. It can be said that things hardly "exist" before the fine artist has made his use of them, they are simply part of the unclassified background material against which we pass our lives. The transformation from every-day object to fine art manifestation happens in many ways, the object can be discovered - objet trouve or l'art brut - the object itself remaining the same; a literary or folk myth can arise and again the object itself remains unchanged; or, the object can be used as a jumping-off point and is itself transformed.

Le Corbusier in Volume I of his Oeuvre Complete describes how the "architectural mechanism" of the Maison Citrohan 1920, evolved. Two popular art devices - the arrangement of a small zinc bar at the rear of a cafe with a large window to the street, and the close vertical patent-glazing of the suburban factory were combined and transformed into a fine art aesthetic. The same architectural mechanism produced ultimately the Unite d'Habitation.

The Unite d'Habitation is a good example of the complexity of an art manifestation, for its genesis involves :-

popular art stimuli,
historic art seen as a pattern of social organisation not as a stylistic source (observed at the Chatreuse d'Ema 1907),
and ideas of social reform and technical revolution patiently worked out over forty years, during which time the social and technological setup, partly as a result of his own activities, met Le Corbusier half-way.

Why certain folk art objects, historical styles or industrial artifacts and methods become important at a particular moment cannot easily be explained.

Gropius wrote a book on grain silos,
Le Corbusier one on aeroplanes,
And Charlotte Perland brought a new object to the office every morning.
But today we collect ads.

Advertising has caused a revolution in the popular art field. Advertising has become respectable in its own right and is beating the fine arts at their old game. We cannot ignore the fact that one of the traditional functions of fine art, the definition of what is fine and desirable for the ruling class and therefore

FIGURAS 1,2 y 3 » First page of the original typescript of the article But today we collect ads, written by Alison and Peter Smithson dated June 22, 1955. Source: Francis Loeb Library, Harvard University Graduate School of Design. Image photographed by the authors in the library archive.

ultimately that which is desired by all society, has now been taken over by the ad-man.

To understand the advertisements which appear in the "New Yorker" or "Gentry" one must have taken a course in Dublin literature, read a "Time" popularising article on Cybernetics and to have majored in Higher Chinese philosophy and Cosmetics. Such ads are packed with information - data of a way of life and a standard of living which they are simultaneously inventing and documenting. Ads which do not try to sell you the product except as a natural accesory of a way of life. They are usually good "images", and their technical virtuosity is almost magical. Many have involved as much effort for one page as goes into the building of a coffee-bar. And this transient thing is making a bigger contribution to our visual climate than any of the traditional fine arts.

The fine artist is often unaware that his patron, or more often his patrons wife who leafs through the magazines, is living in a different visual world. The pop-art of today, the equivalent of the Dutch fruit and flower arrangement, the picture of the second rank of all renaissance schools, and the plates that first presented to the public the wonder of the machine age and the new territories is to be found in today's glossies - bound up with a throw-away object.

As far as architecture is concerned the influence on mass standards and mass appirations of advertising is now infinitely stronger than the pace setting of avant-garde architects, and it is taking over the functions of social reformers and polititians. Already the mass production industry have revolutionised half the house - kitchen, bathroom, utility room, and garage - without the intervention of the architect, and the curtain wall and the modular pre-fabricated building are causing us to drastically revise our attitude to the relationship between architecture and industrial production.

By fine art standards the modular pre-fabricated building, which by its nature can only approximate even to the ideal shape for which it is intended, must be a bad building. Yet generally speaking the schools and garages which have been built with these systems kick the pants off the fine art architect operating in the

same field. They are especially successful in their modesty, the ease with which they fit into the built hierarchy of a uni community.

In theory the curtain wall too cannot be successful. For the building is wrapped round with a screen whose dimensions are unrelated to its form and organisation. But the best post-war office block in London is one which is virtually all curtain wall. As this building has no other quality apart from its curtain wall, how is it that it puts to shame other office buildings which have been elaborately worked over by respected architects and by the Royal Fine Arts Commission.?

[illegible] To the architects of the twenties "Japan" was the Japanese house of the prints and paintings, the house with its roof off, the plane bound together by thin black lines. (To quote Gropius "the whole country looks like one gigantic basic design course.") In the thirties Japan meant gardens, the garden entering the house, the tokonoma.

[illegible]

For us it would be the objects on the beaches, the piece of paper blowing about the street. the throw-away object and the pop-package.

For today we collect Ads.

Ordinary life is receiving powerful impulses from a new source. Where thirty years ago architects found in the field of the popular arts techniques and formal stimuli, today [illegible] we are being edged out of our traditional role by the new phenomenon of the popular arts - advertising.

Mass production advertising is establishing our whole pattern of life - principles, morals, aims, aspirations, and standard of living. We must somehow get the measure of this intervention if we are to match its powerful and exciting impulses with our own.

3*

The industry

In this sense, the step proposed by the Smithsons through But today we collect Ads started from a consideration of the object as something "real" and directly usable. Escaping from its allegorical variables, the object was interpreted for the first time as a material capable of forming by itself a new architectural strategy, this time based on the objects provided by the new mass culture. In its most obvious version, represented by furniture, household appliances and prefabricated construction elements, the object was appropriated by the domestic space from its industrial nature, anonymous and far from that old need of the Modern Movement to achieve the absolute design and the total work of art. Unlike these assumptions in which the furniture and the gadget were understood either as equipment - that is, as an element belonging to the building - or as an element exclusively designed for a specific place, the Smithsons' object was born from an intentional loss of status[10] and design, from which it could be used in its anonymous, standard and, in short, prefabricated version.

(…) To both purism and Bauhaus, furniture was "equipment". But for us, looking back over 30 years, it is obvious that it was realm "anonymous equipment" but furniture as in any other period. It was in the same aesthetic and carries the same idea as the architecture".
(…)
"For the architects of the twenties real anonymous hardly existed. On the one hand, things they selected like the sink, and white tiles, were craft objects retaining something from the unself-conscious phase of the industrial revolution. On the other hand, the appliances they chose – cooker with plain "functional" shapes were an accident in the industry, as much due to naivité and disorganization as to any desire of clean lines." [11]

"One of the fundamental tenets of the old Modern Architecture was the industrialization of building, and in the absence of genuinely industrialized building techniques the architects of the twenties concerned themselves primarily with creating a formal language in the spirit of the machine. This language was no child of real technology ". [12]

4*

House of the Future + Appliance Houses

In this sense, the first examples provided by the Smithsons in favor of this new truly industrial architecture were to emerge precisely in 1956, the year of the publication of But today we collect Ads. Headed by the House of the Future of that same 1956 (fig. 4) and the Appliance Houses drawn between 1956 and 1959, this series of projects would be the beginning of a way of doing whose

theoretical framework had been established in the article that has motivated this analysis. Thus, in the first place, The House of the Future -understood in a certain sense as the predecessor of the Appliance Houses- was based on a unique concept: the household appliance as an industrial object generating architectural space. By rejecting any element that was not considered a machine, the house completely eliminated the distinction between traditional furniture and equipment and conceived itself as a homogeneous assembly - similar to a boat, a car or a submarine- where the movable and fixed elements were fused. From this point of view, even the most characteristic objects of domestic life, such as the bed or the table, were transformed into simple household appliances, giving rise, at least metaphorically[13], to Le Corbusier's dream of a true living machine.

Secondly, the first projects of the so-called Appliance Houses, apparent heirs of the House of the Future, nevertheless managed to introduce revealing changes. Thus, The Snowball Appliance House (1956)(fig. 5) replaces, in a symbolic and significant way, the space destined to the garden in the House of the Future by an open, free area without specific planning. The movable objects, now encapsulated in forms similar to prefabricated caves, are no longer fixed to the perimeter and acquire the capacity to occupy the central space of the floor plan. Even more eloquently, the 1958 Strip Appliance House (fig.6) moves the prefabricated cubicles completely away from the perimeter, allowing some functional capsules to be dispersed in intermediate areas. The proposal therefore starts with the grouping of appliances and other prefabricated elements in cubicles (called Appliance Cubicles by the Smithsons), which leave an open and available space around them. The residual, along with everything that Western culture used to associate with concealment, thus became the central axis of a floor plan design strategy whose main objective was to preserve flexible space.

These floor plan layouts would be accompanied by their respective proposals in section, as well as their constructive approaches. Regarding the section, the project description included in the article The Appliance House[14] specified the need for general, zenithal and artificial lighting that would reach each of the spaces in the house, including the storage cubicles. This statement, which could not be cross-checked with any section as these were not provided in the project documentation, nevertheless led to the assumption that these cubicles did not reach, at least for the most part, to touch the roof slab. This hypothesis, which clearly accompanies the idea of a continuous house -of “loose” cubicles in the middle of a free floor- would be confirmed when analyzing the construction system of the house. In it, the resolution of the roof slab by means of a single slab, responsible for resolving the existing light between the lines of support (facades and party walls) allowed maintaining absolute independence between the envelope of the house and its interior cubicles. As Nieves Fernández Villalobos[15] points out, this independence ensured that two of the essential principles of the project - flexibility and prefabrication - were consolidated.

This self-sufficiency made the cubicles, prefabricated pieces of white Formica, the true replaceable and obsolescent elements of the project. Thus, if in the House of the Future it was the entire house that, in an obvious concession to consumerist principles, was understood as a disposable object, it was now the cubicles, those great accumulators of server spaces, that bore witness to the influence that prefabrication and the consumer society were having on the Smithsons.

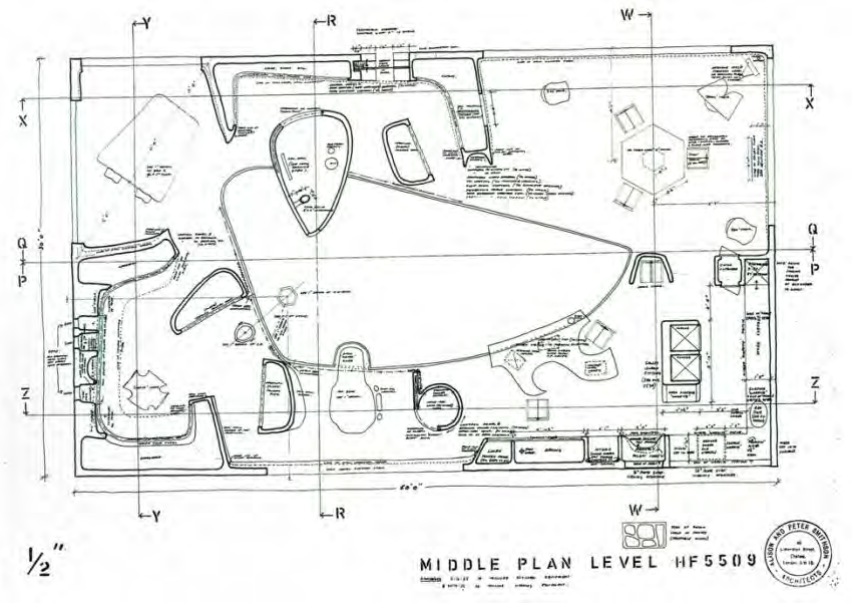


FIGURA 4 » House of the Future. Alison and Peter Smithson. 1956

FIGURA 5 » Snowball Appliance House. Alison and Peter Smithson. 1956

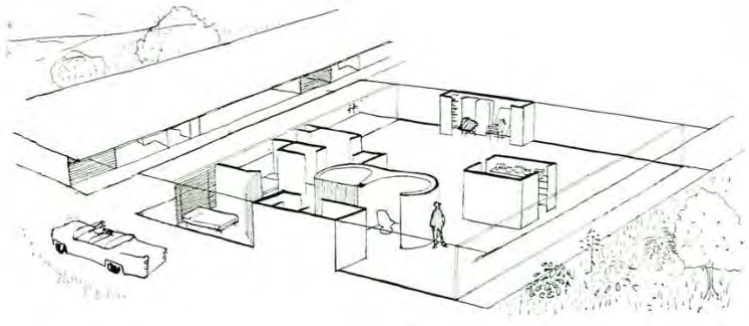


FIGURA 6 » Strip Appliance House. Alison and Peter Smithson. 1958

5*

Towards a definitively industrial architecture

In conclusion, it is necessary first of all to emphasize the importance of a text in whose essence we find not only an interesting reflection on the influence of the consumer society on the architecture of the 1950s, but also some of the fundamental principles that were already governing the architecture of Alison and Peter Smithson and that would govern an important part of postwar domestic architecture. These principles were built as this text has tried to convey around an object or collection of objects that the Smithsons had simply called ads. In this sense, ads were, for the British couple, nothing more than those new products (household appliances, light mass-produced furniture, standardized construction solutions, etc.) in whose combination it was possible to imagine a new, truly industrialized architecture.

This new architecture would not be a pop architecture, at least from the aesthetic and conceptual point of view imagined by Banham, but pop in terms of the pictorial method used, the collage, which had in its raison d'être the grouping of existing objects. These, integrated into the architecture through standardized elements and above all autonomous to the envelope, as had occurred in the House of the Future and in the Household Appliance Houses from 1956 to 1958, allowed the birth of a spatial strategy in which the configuration of objects -especially household appliances- would be able to create a new spatial order independent of the usual hierarchy made up of partitions and walls. As Professor Juan Herreros[16] points out in this regard, it would be this transformation -the one caused by the independence of the movable from the immovable- the one responsible for opening a new path that would transform the traditional typological system governed by partitions into a topological system governed by the association of objects.

Ultimately, these objects, the product of a consumer society whose essence was the industrialization longed for by the Smithsons, were to be, as we have stated, the spur towards an architecture that, unlike that proposed by the Modern Movement, would finally be built around a process of true industrialization. In this sense, and accompanying Alison's previously mentioned words, we can understand But Today We Collect Ads as a manifesto in which, far from being associated with the fascination for pop and consumerism, the Smithsons bet definitively on a truly industrial architecture. Compared to it, the architecture built by the Modern Movement could be interpreted as a pre-industrial movement, with artisanal roots, conceptually belonging to the beaux arts, and for which the use of technology had been only an allegorical phenomenon. A movement in which metaphorical objects were to give way to industrial objects and in which Le Corbusier's dwelling machine would finally transcend the world of connotation to become a tangible reality. A movement that the Smithsons needed to understand as heir to the architecture of the late nineteenth century, in order to build, at last, an architecture consistent with the industry of the twentieth century.

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1 SMITHSON, Alison; SMITHSON, Peter. “But today we collect ads”. ARK. Nº. 18 (1956)

2 Ibid.

3 The Independent Group was founded in 1952 by some of the most promising artists and architects of the new post-war generation in the United Kingdom. Among them were Reyner Banham, Richard Hamilton, Eduardo Paolozzi, Nigel Henderson and the Smithsons themselves. Between 1952 and 1956, the year of its dissolution, the group's artistic production would be represented through various manuscripts, paintings, drawings, collages and above all through two temporary exhibitions: Parallel of Life and Art (1953) curated by Alison and Peter Smithson, Eduardo Paolozzi and Nigel Henderson and This is Tomorrow (1956) in which a group already practically dissolved would participate in two separate teams. We can consider the artistic contribution of the Independent Group as the first manifestation of pop art in European history.

4 SMITHSON, Alison; SMITHSON, Peter. “But today we collect ads”. ARK. Nº. 18 (1956)

5 Ibid.

6 In relation to this concept, the theorist Dirk Van den Heuvel expressed: “In later years, the Smithsons themselves expressed discontent at being classified as promoters of Pop Art. They disapproved of complete submission to this new consumer and its technological innovations, the likes of which boy band Archigram would propagate in the not-too distant future. Even but Today we collect Ads reveals a sense of reservation rather than unconditional acceptance.” See: VAN DEN HEUVEL, Dirk; RISSELADA, Max. From the house of the future to a house of today. Rotterdam: 010 Publishers, 2010. p. 78.

7 As can be seen in the penultimate paragraph of page 3 of the original typescript of But today we collect ads the phrase “We are looking to the pop art more urgently and with less assurance” is written and in turn crossed out by the authors. The version published in November 1956 does not include it (fig. 3).

8 SMITHSON, Alison; SMITHSON, Peter. “But today we collect ads”. ARK. Nº. 18 (1956)

9 Proof of this distancing was the CIAM X, held in Dubrovnick in August 1956, the same year the article was published, in which the Smithsons led the critique of the postulates promoted by the masters of the Modern Movement.

10 On this subject, see: BAUDRILLARD, Jean. Le système des objets. París: Éditions Gallimard, 1968.

11 SMITHSON, Alison; SMITHSON, Peter. “The future of furniture”. Architectural Design. (1958)

11 SMITHSON, Alison; SMITHSON, Peter. Changing the Art of Inhabitation. Mies pieces, Eames dreams, The Smithsons. London: Artemis, 1994.

13 In a metaphorical way since the house is actually a very handcrafted house. Unable to build it in plastic as planned, the House of the Future is actually a handcrafted wooden construction.

14 SMITHSON, Alison; SMITHSON, Peter. “The Appliance House”. Architectural Design. (1958). P.177

15 FERNÁNDEZ VILLALOBOS, Nieves. La Casa del Futuro de Alison y Peter Smithson. Barcelona: Fundación Caja de Arquitectos, 2012.

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Water–sensitive neighborhoods: Sustainable water management as a strategy for urban regeneration in times of climate emergency.

// Barrios sensibles al agua: Gestión sostenible del agua como estrategia de regeneración urbana en tiempos de emergencia climática.

En el contexto de emergencia climática, gestionar las aguas pluviales y escorrentías urbanas plantea retos que requieren la implementación de soluciones sostenibles y resilientes. El proceso de "impermeabilización" de las ciudades resalta la urgencia de repensar los modelos de crecimiento urbano y su impacto en los ecosistemas hídricos. Este artículo analiza el diseño sensible al agua, promoviendo una sinergia entre el ciclo hidrológico y la planificación urbana bajo el concepto de Water Sensitive Cities. A través de los casos de Kronsberg en Hannover y Augustenborg en Malmö, se evidencia cómo la gestión integrada de aguas pluviales y la adaptación de la morfología urbana al ciclo hidrológico ofrecen soluciones viables, apoyadas tanto institucional como académicamente. En este artículo, se exploran soluciones de manejo integrado de aguas pluviales que combinan beneficios recreativos, funcionales y estéticos, evidenciando que estas estrategias no solo mejoran la estructura urbana, sino que crean entornos atractivos y seguros para la comunidad.

Ciudades sensibles al agua, gestión de aguas pluviales, cambio climático, resiliencia, regeneración urbana

In the context of the climate emergency, managing urban stormwater and runoff presents challenges that demand the implementation of sustainable and resilient solutions. The "impermeabilization" of cities highlights the urgent need to rethink urban growth models and their impact on hydrological ecosystems. This article examines water-sensitive design, fostering a synergy between the hydrological cycle and urban planning under the concept of Water Sensitive Cities. Through the case studies of Kronsberg in Hannover and Augustenborg in Malmö, it is demonstrated how integrated stormwater management and the adaptation of urban morphology to the hydrological cycle provide viable solutions, supported both institutionally and academically. This article explores integrated stormwater management strategies that combine recreational, functional, and aesthetic benefits, showing that such approaches not only enhance urban structure but also create attractive and safe environments for the community.

Water sensitive Cities, stormwater management, climate change, resilience, urban Regeneration

Jennifer Roldán Carvajal

Water–sensitive neighborhoods: Sustainable water management as a strategy for urban regeneration in times of climate emergency.

Introduction

In his book Nature and City, Ian McHarg states that urban planning must respond to the form of natural processes, and water is a crucial component of urban systems. This suggests that the way cities are built should derive from natural processes, with the hydrological cycle serving as a fundamental process that provides basic conditions for shaping urban morphology (McHarg, 1998, p. 18-19). In the context of a climate emergency, significant new challenges arise in urban water management, requiring adjustments that not only mitigate risks but also promote a new water culture based on sustainability and urban resilience (Soto & Herrera, 2019). Certain dynamics converge to increase vulnerability to these phenomena.

On the one hand, cities have experienced in recent stages a growing process of "impermeabilization." By the late 17th century, cities began to undergo notable growth, further intensified by rural exodus throughout the 20th century. The mass migration to urban areas caused an imbalance between the rate of land-use change from rural to urban and the rate of demographic growth, with the latter being significantly higher. The urgent need to urbanize streets led to adaptations such as soil sealing and water channeling. Climate change and rapid urban expansion have generated various issues related to water use and management, including the urban heat island effect, water pollution, and urban flooding

On the other hand, recent studies indicate a current global trend towards the concentration of the population in urban areas. Among these, the UN-Habitat report *"World Cities"* (UNhabitat, 2022, p. 39) reveals that in the 1950s, approximately 33% of the global population lived in cities. Seventy years later, this figure had increased to 56%, and it is expected that by 2050, cities will house 68% of the global population. This process of demographic concentration in urban environments occurs alongside the increase in the number of people living in flood-prone areas. In this regard, the study *"Resilient Cities for the World"* by C40 Cities estimates that by 2050, 7.4 million people in high-risk areas will face flooding (C40 Cities 2024:4). Additionally, the United Nations World Water Development Report predicts that the urban population suffering from water scarcity will double, from 930 million in 2016 to between 1.7 billion and 2.4 billion people by 2050 (UNESCO 2024: 14) The significance of this phenomenon led the European Environment Agency (EEA) to establish a research group in 2012 to study the impact of soil sealing* and propose guidelines and preventive policies for improvement and compensation (SWD 101, 2012).

**Soil Sealing: The paving of soil with non-porous materials, such as asphalt or concrete, restricts the soil's natural ability to infiltrate water. This use of impermeable materials impacts the water cycle, biodiversity, and urban ecosystems.*

All of this underscores the importance of discussing current urban growth models and their impact on water ecosystems, as well as the interaction of inhabitants with supply and sanitation services. It highlights the need for synergy between the hydrological cycle and urban planning, promoting reflection on the concept of Water Sensitive Cities (Georgi, 2024, p. 14-18), originated in Australia and internationally adopted. (Molina & Villegas, 2015).

In the European context, the Water Framework Directive and other derived sectoral legislations outline new challenges in urban environments that require the application of unconventional water management strategies and a reformulation of urban design (European Parliament, 2007, p 27-29). These measures demand a regulatory, legislative, and socioeconomic framework at the state, regional, and local levels, based on citizen participation, influencing urban planning and socioeconomic policies, and ensuring the viability of the measures to be implemented.

In summary, the objectives of this article are, first, to describe and analyze the principles of water-sensitive design, focusing on how the urban ecosystem is configured to create a complex and restorative network of pedestrian-oriented outdoor spaces that encourage daily social interaction. This is based on the study of two specific cases with institutionally and academically validated positive outcomes**: Kronsberg in Hannover, Germany, and Augustenborg in Malmö, Sweden. Second, this article aims to serve as a foundation for future academic and practical work and to support decision-making in response to new urban dynamics and climate challenges, emphasizing decisions grounded in the incorporation of natural processes into the design of urban structures.

***There is abundant information on the monitoring of these cases. The bibliographic references include significant examples of this accumulation of knowledge.*

The methodology of this study is based on a review of the literature and theoretical references, as well as the analysis of two practical case studies. The conclusions are derived from the study of the information gathered and the results of the theoretical references, as well as the synthesis of the two case studies: Kronsberg in Hannover and Augustenborg in Malmö, which have successfully addressed the integrated management of stormwater and the adaptation of urban morphology to the hydrological cycle as a natural process. Let's look at these two cases.

1*

Integration of the Water Cycle into Urban Structure Design.

Kronsberg, Hannover, Germany.

Basic Information

The Kronsberg neighborhood emerged as a result of the World Expo "Hannover Plan 2000," as part of the program "City and Region as Exhibition." This exposition was inspired by the theme "Man-Nature-Technology," and the Kronsberg eco-neighborhood project was presented under the name "Ecological Optimization Kronsberg," where water was highlighted as one of the key natural resources in the design. Today, Kronsberg is a model of a sustainable neighborhood that demonstrates a holistic vision in integrating actions with social, environmental, and technological impacts.

The neighborhood was developed over an area of 140 hectares to accommodate up to 15,000 residents. Previous studies showed that a conventional development in this location would irreversibly harm the natural water cycle, causing flooding issues. For this reason, the design focused on an integrated approach aimed at minimizing the impact on the pre-existing hydrological process. Groundwater recharge, as well as surface and subsurface runoff, was required to follow its natural course, as it did prior to urban development.

The Urban Structure and Its Adaptability to Flooding: Retain to Infiltrate.

In Kronsberg, an urban model was proposed that prioritizes the on-site retention and infiltration of rainwater, maximizing groundwater recharge. At the same time, new spaces for urban vitality were created, such as tree-lined and shaded streets, pathways connecting green spaces, and recreational rain gardens*** within residential blocks. The surface water management system in the neighborhood preserves and enhances natural drainage sources, preventing complications from flooding. Based on these design principles, some key data can be presented.

The amount of permeable land in the neighborhood reaches 61% of its total surface area. Parking lots and residential access areas were constructed using stone pavers, while permeable materials were used on plots, preserving green spaces. These strategies were implemented to promote the natural processes of evaporation and groundwater recharge. For instance, the installation of green roofs as a primary rainwater retention system aimed to reduce runoff velocity and enhance evapotranspiration. However, green roofs account for less than 30% of the total, as they were only required for roofs with a slope of less than 20%. (See Figure 3).

*****Rain Garden: A green area designed to capture, retain, and naturally infiltrate rainwater, often integrated into a larger green infrastructure network. They reduce the percentage of surface runoff, help restore the water cycle and decrease the risk of flooding.*

FIGURE 01 & 02» By the author based on (Eckert, Schottkowski-Bähre & Kastner, 2000, p. 16). Urban structure plan of Kronsberg & Landscape plan + ecology.

The "Ecological Optimization Kronsberg" project was based on the idea of creating a decentralized and semi-decentralized stormwater management system. This system includes underground components such as conduits, reservoirs, and absorption and drainage boxes, as well as surface elements like channels, rain gardens, bioswales, and open ponds. These systems were implemented on both public and private plots.

Stormwater management is achieved through regulated discharge and gradual drainage, which slows down the flow and prevents soil saturation during heavy rainfall (See Figures 1 and 3). Less than 50% of rainwater from green areas and impervious surfaces is directed to the sanitation system (See Figure 3). This decentralized approach to stormwater management alleviates the burden on the public network, relying on strategies that increase and preserve permeable soils, allow water to enter and exit, and retain or channel bodies of water, creating floodable areas.

** Urban stormwater management approach that involves the use of detention basins (Mulden) and infiltration systems (Rigolen) to manage and control the flow of rainwater in urban areas.*

Open ponds temporarily retain rainwater, raising their water level. Subsequently, the water drains through open grass channels containing bioswales with the Mulden–Rigolen system*. A sluice gate controls the flow of rainwater until it reaches the public retention ponds and basins. These water retention areas, which are part of the urban and recreational design of the neighborhood, naturally drain the water or overflow the excess into the sanitation network.

The design includes numerous gardens within the blocks, sidewalks, and bike lanes, accompanied by shaded tree-lined axes, playgrounds, and a network of paths with permeable pavements that connect access to residential areas, common spaces, and two rain boulevards. This urban design approach, sensitive to natural processes, not only preserves the ecosystem's balance but also benefits the physical and mental health as well as the social life of the residents, especially children and the elderly, by providing comfortable recreational spaces. Water and nature are integrated as key elements in the design of public spaces, linking surface water systems as recreational settings and incorporating a diversity of uses. This enhances urban vitality and improves the quality of public space.

Intervention, Social and Urban Impact: The Proposed Urban Model as an Activator of Vitality. The Role of Water.

The intervention and social and urban impact of the stormwater control systems are classified according to the public or private nature of the plots. For example, on public plots between parking areas and sidewalks, rainwater is filtered through bioswales (Mulden-Rigolen system), and approximately every 10-12 meters, a native tree with large foliage is planted to provide shade along the sidewalk, inviting pedestrians and encouraging urban life and social interaction.

Additionally, two boulevards were constructed, one to the north and the other to the south (see Figure 2), starting from the hill park in the east and ending at the tramline in the west of the neighborhood. Both green-blue corridors are part of the pedestrian route and serve as central axes for the public space, along which various services and amenities are located.

These boulevards were designed as infrastructures for the retention and transport of rainwater, equipped with vegetation, pathways, urban furniture, small-scale clearings, gravel streams, water play areas, and spaces for contemplation, encouraging children's curiosity and play.

The diversity of activities and the promotion of social use that it implies inspires the design of Kronsberg, where the main axes for the retention and transport of rainwater are complemented by a network of services, uses, and diverse activities. This encourages the regular use of the space at different times of the day, for various purposes, and by different people, strengthening the identity of the place and ensuring its urban vitality.

In the private areas, each block of collective housing has interior parks at the center of the plot, surrounded by large residential blocks.

FIGURE 03 » Graphs of Percentage of Permeable and Impermeable Sealed surfaces and connection to the public drainage system. (Source: Water Concept Krosnberg, 2000)

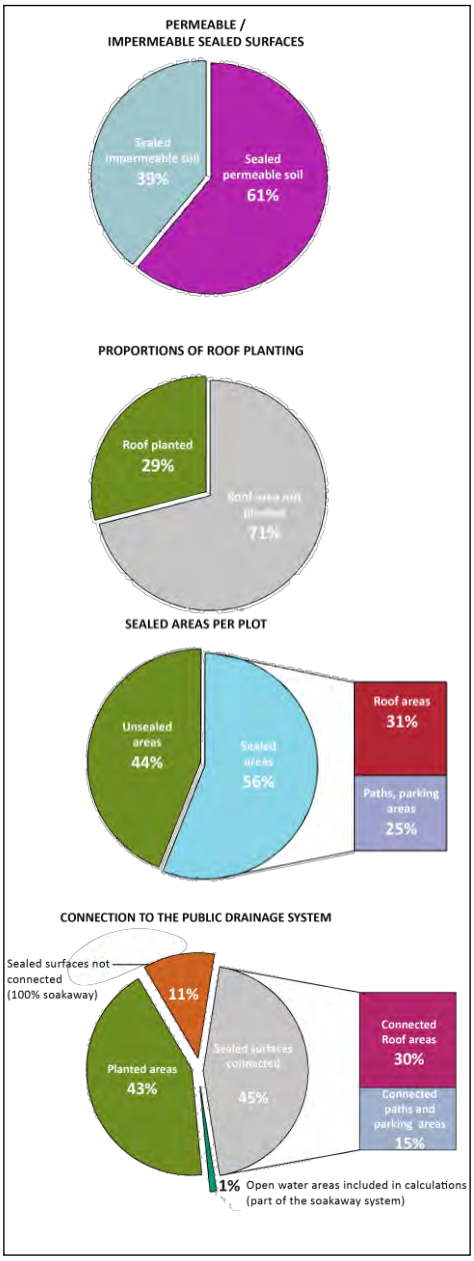


FIGURE 04 & 05 » By the author based on research and consulted sources. (Eckert, Schottkowski-Bähre & Kastner, 2000). Water system plan and aquatic landscape plan.

These permeable ground spaces include areas for free play and systems for the onsite collection and filtration of rainwater. The required percentage of trees and vegetation was specified to contribute to evapotranspiration and water infiltration, ensuring that the interior gardens have an environmental quality comparable to that of a park.

The design of the interior gardens required the approval of multiple stakeholders, including the municipal water authority of Hannover and the residents themselves. To comply with water retention regulations and landscape goals, strategies such as channels, ditches, ponds, and cisterns were implemented for onsite water retention. Each block of housing uses the floodable areas as opportunities to create free play spaces for children and social interaction areas for adults. During rainfall, the water is visible, and in its absence, these areas become green spaces. (See Figures 4 and 5).

The design of Kronsberg has turned the constant rainfall into a positive feature of the neighborhood's identity. Currently, the district is mainly home to young families with small children, attracted by the quality of the public space and the play opportunities offered by the water-sensitive urban design. It is common to see children playing in the interior parks of each block, riding bikes along the bike lanes, running through the network of landscaped paths that wind between the blocks, and enjoying the boulevards. Therefore, it can be said that water management in the neighborhood not only represents an approach to a more circular urban metabolism that aims to mitigate environmental impacts but has also become one of the key elements of its residents' identity. (Coats, 2009)

2*

Integration of the Water Cycle into Urban Structure Design.

Augustenborg, Malmö. Sweden

Basic Information

The Augustenborg neighborhood, covering an area of 32 hectares, was one of the first social housing developments in Malmö, built and delivered in the early 1950s. Initially, the neighborhood thrived, but the sanitation system, designed according to the standards of that time, proved inadequate. This combined system collected both wastewater and rainwater, causing system failures during heavy rainfall, leading to flooding in basements, garages, and ground floors.

Over time, Augustenborg experienced a marked economic decline, along with the associated social problems. The neighborhood became one of the most vulnerable in Sweden, with high unemployment rates and low purchasing power. Many homes were in poor condition, with moisture issues and poor insulation. The situation worsened with health problems among residents due to the diversion of sewage into water bodies during floods.

Urban Regeneration Process and Citizen Participation

In 1998, an inclusive ecological urban regeneration project called Eco-City Augustenborg was launched. The main objective of this project was to adapt to climate change and address the flooding issues of the neighborhood. Various environmental improvement measures were adopted, including CO2 reduction, waste management, sustainable mobility, energy efficiency, as well as social programs. These proposals were well received by the community, as they were seen as opportunities to create new jobs within the neighborhood.

The Eco-City Augustenborg project was a collaboration between private and public actors, the city of Malmö, and the active participation of Augustenborg residents. Community workshops, informational, social, and cultural events, talks, and community organizations were held. Funding came from both local and international European sources. However, the Sustainable Urban Drainage System (SUDS) was implemented by MKB, the water management department of the City of Malmö.

In 2010, Augustenborg was awarded the UN Habitat World Habitat Award in recognition of its pioneering climate resilience, efficient water management, and remarkable social transformation. The achievement of the Eco-City Augustenborg project underscores the importance of cooperation between government, citizens, and other key stakeholders to address current urban challenges, with a special focus on climate change adaptation and the promotion of social justice.

FIGURE 06 & 07 » By the author based on research and consulted sources. (Mansson, Persson, 2024, p. 20). Urban structure plan of Augustenborg & Landscape plan + ecology.

Urban Structure and Its Adaptability to Flooding: Local Open Rainwater System

In Augustenborg, the residential buildings had an invasive tendency in the landscape, which led to the need to rethink the relationship between the built and natural environments. Through the creation of "green axes, green roofs, and blue axes," a fusion between the natural and artificial habitat was achieved. The management and introduction of water into public spaces and green areas acted as an effective solution to mitigate the negative impacts of urbanization, such as soil pollution and the increasing risk of flooding due to rainfall. This approach aimed not only to adapt to the challenges of climate change but also to utilize water flows to enrich the urban landscape. The goal was to foster spaces that would serve as meeting points in proximity to water, strengthening the resilient identity of the neighborhood, while the green areas adjacent to water bodies would become urban landmarks.

Specifically, four fundamental strategies are implemented for the retention and delay of runoff: 1) the installation of green roofs and drains that direct water from the rooftops to channels or permeable soils; 2) storage in small ponds; 3) channeling through slow-moving flows in gutters and ditches; and 4) the creation of large infiltration surfaces. Let's examine this further.

The global relationship of the neighborhood shows that 58% of the soil is permeable. The incorporation of 2,100 m² of green roofs on buildings in the neighborhood and 10,000 m² of botanical garden on the rooftop of the industrial complex, inaugurated in 2001, helped to sustainably and efficiently counteract the flooding effect by gradually collecting, evaporating, and filtering rainwater through moss on the roofs or redirecting it towards downspouts (see Figure 8). Ninety percent of the rainwater from rooftops (non-gardened) and hard surfaces is channeled into the open water system, consisting of ditches that end in wetlands and ponds. In this way, green roofs helped reduce runoff by approximately 50% through increased evaporation and retention, enabling a better water balance.

Seventy percent of the rainwater that falls on green roofs is retained on the roof. Additionally, the green roofs have contributed to improving the thermal insulation of buildings and increasing urban biodiversity, serving as habitats for birds and other species, while also enhancing the overall landscape image of the neighborhood and increasing the green area of the neighborhood by 50% (see Figure 7).

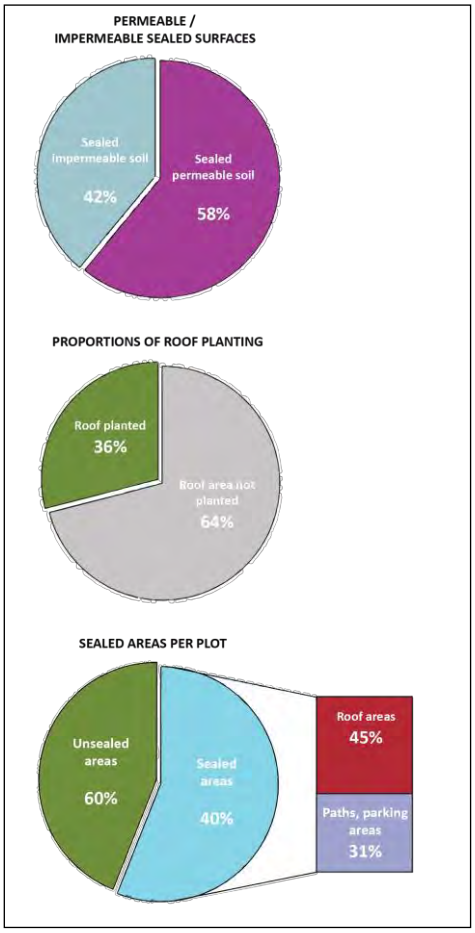
Additionally, the urban drainage system proposed to solve the flooding problem was designed as a decentralized, integrated drainage system in two stages. In Stage 1, the rainwater flows from east to west, and in the second stage, the section runs along Lönngatan Street and ends in the northwest with the drainage of excess rainwater into the municipal network. Gardens in each of the residential blocks were adapted with a 6 km network of open-water channels that run throughout the neighborhood, leading to 10 retention ponds distributed across the area. This way, the runoff flows slowly, preventing peak flows. Thanks to these strategies, the project managed and delayed the water to avoid potential flooding, reducing the volume of water entering the sewage system and providing a local water balance in the neighborhood (see Figures 9 and 10).

The actions implemented for runoff management in Augustenborg are based on the availability of adequate permeable areas for the infiltration and storage of rainwater, as this increases the effectiveness of flood mitigation. In this regard, Augustenborg could be considered an example of the approach presented by the author Michael Hough in his book *Nature and the City*, where he argues that the percentage of collected water depends on the physical characteristics of the soil, topography, and vegetation. Therefore, the larger the infiltration areas, the greater the volume of water collected. (McHarg, 1998, p. 33- 35).

In Augustenborg, the water management systems are multifunctional. They provide recreational, functional, and aesthetic value. Space is not solely material, but also a setting where social action arises (Leal, 1997). The ditches that flow into wetlands and ponds not only collect and infiltrate water, but also create recreational spaces, urban attractors, and new microecosystems. The children's play areas and green spaces in the residential parks are designed to manage and temporarily store rainwater during heavy precipitation events. Additionally, a rainwater gutter was constructed along a bicycle path, efficiently integrating sustainable solutions into the urban mobility infrastructure.

The green and blue infrastructure planned for the neighborhood successfully provided safe recreational spaces for its inhabitants. The parks and play areas, designed to temporarily store water during rain, become leisure spaces when they are not flooded. These green spaces not only improve the quality of life by offering places for recreation, but also enhance urban safety by transforming

FIGURE 08 » By the author based on research and consulted sources. Graphs of Percentage of Permeable and Impermeable Sealed surfaces.



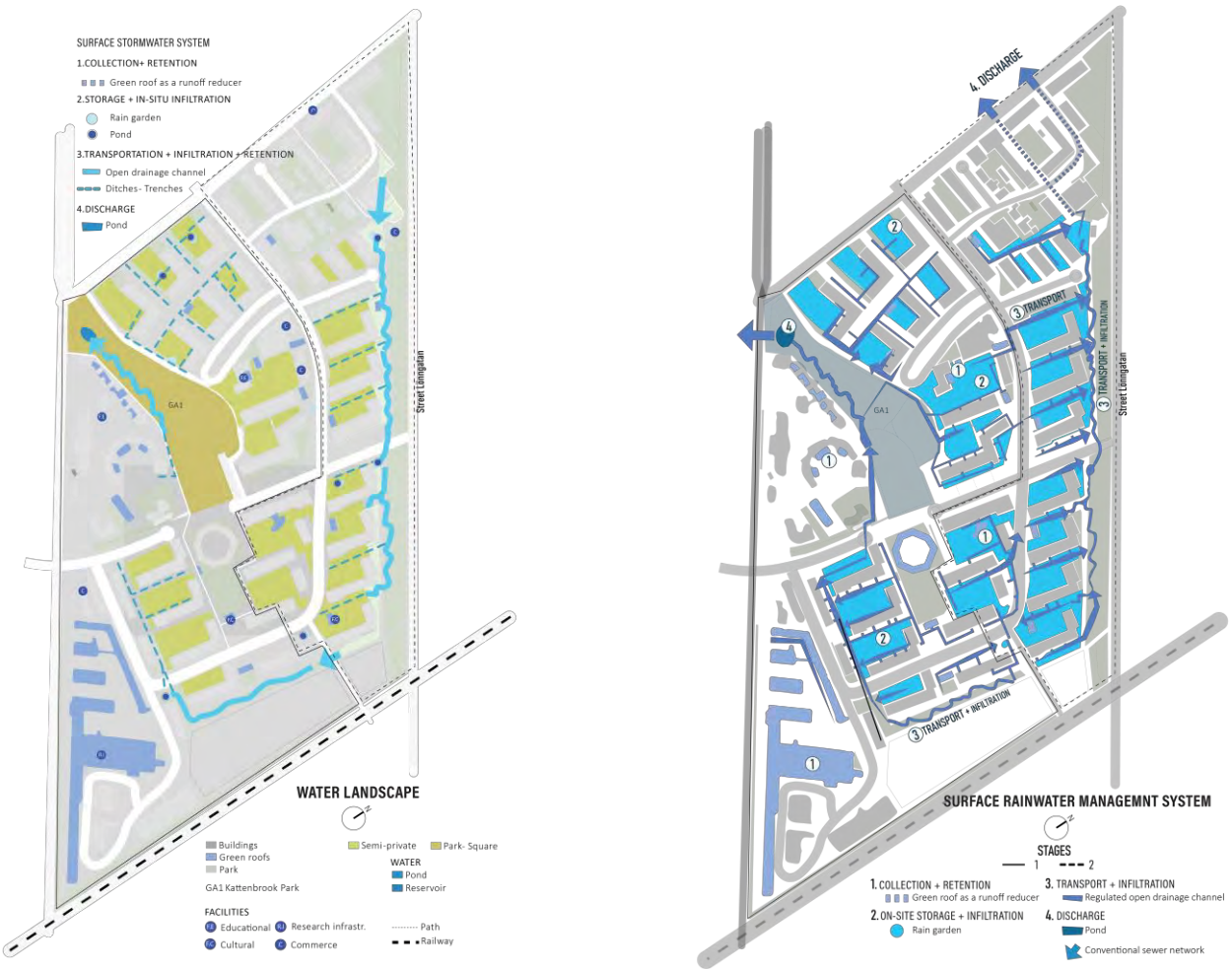


FIGURE 09 & 10 » By the author based on research and consulted sources. (Mansson, Persson, 2024, p. 206-211). Water system plan and aquatic landscape plan.

potentially problematic areas into active places, monitored by the community. (See figure 17).

For example, the neighborhood has a total of 30 gardens as spaces for dispersal and play, which foster social diversity and the accomplishment of multiple activities. Each housing block plot has an average of 60% permeable soil (See figure 8). The variety of uses for the public gardens ranges from children's play areas and benches to pathways and bike lanes, promoting generational and cultural diversity, and ensuring social interaction and exchange. This diversity of uses and users contributes to greater social cohesion, neighborhood security, and strengthens the neighborhood's identity. Encouraging informal surveillance and reducing isolation through various activities in public spaces enhances security, as increased foot traffic allows for natural supervision of the residential area (Michaud, 2002, p. 55).

The constant presence of green spaces and quality bodies of water activates urban life, encouraging residents to spend time outdoors and engage in community activities and initiatives. The microecosystems created by wetlands and ponds not only provide microclimates and enrich local biodiversity, but also educate and raise awareness among the community about the importance of sustainability and the management and care of water as a limited resource.

The implementation of these water management systems has been fundamental in the urban regeneration of Augustenborg. The transformation of the neighborhood from a decaying area to a model of resilience and sustainability has significantly improved living conditions and attracted new

families, especially young families with small children, who seek a quiet, safe, and dynamic environment. Residents have been able to dignify their quality of life, and the results of this urban intervention had a significant socioeconomic impact on the families in the neighborhood. It demonstrates that stormwater management directly influences the structure of the neighborhood and that the combination of recreational, functional, and aesthetic benefits creates a balanced and safe environment, which not only meets the residents' needs but also serves as a model for sustainable urban planning.

Conclusion

The neighborhood of Augustenborg, in decline, faced multiple challenges: frequent flooding, high unemployment rates, constant immigration, and some of the lowest income levels in the city. Additionally, the saturation and poor management of sanitation networks caused severe public health issues. To address this situation, a collective participation process was implemented, involving a variety of stakeholders, from neighborhood residents to technical experts. Community-guided action plans were developed, focusing on both the specific needs of residents, because, as Attili and Sandercock (2005) point out, when a group organizes and acts upon its environment, it begins to perceive itself as a subject rather than an object.

The global design framework for the action plans focused on the development of an amphibious system that integrated a control cycle for rainwater. This system allowed for the gradual absorption of floods, transforming recurrent flooding into a design opportunity. Therefore, the neighborhood transformation design was inherently linked to the rain gardens, which facilitated controlled flood levels and provided spaces for dispersion and recreation. Additionally, as observed in the detailed analysis plans of the neighborhood, each water management system implemented in the Augustenborg project was simultaneously realized through the integration of technical infrastructures and public spaces. Thanks to greater urban complexity (Aquilué & Ruiz,2021, p 8), Augustenborg became an example of successful resilience, strengthening the sense of belonging and rootedness among its residents. It is a true case of social transformation.

Kronsberg, on the other hand, was an urban planning strategy that took advantage of the city's expansion as an opportunity to reimagine the traditional approach to the design and management of stormwater. Rather than treating water as a problem to be solved, it was decided to integrate it as a key element of the urban landscape. The approach was to manage rainwater on the surface, allowing it to filter slowly into the ground and creating dynamic and resilient landscapes that evolve over time.

Additionally, a "blue urbanism" approach was adopted, transforming Kronsberg into a garden neighborhood with permeable soil parks between the plots. These green spaces formed a network of biotopes, including wetlands and

native vegetation, which promoted biodiversity. This redesign of the urban landscape not only solved flooding problems but also contributed to the protection of underground aquifers, establishing Kronsberg as an example of sustainable planning.

The success of Kronsberg lies not only in its ecological design but also in the diversity of uses and activities that connect the different elements of the aquatic landscape. The proximity between amenities, workplaces, homes, and services is key to fostering an active and vibrant urban life. The appropriate population density, with people occupying the streets for different reasons and at different times of the day, ensures the neighborhood's vitality and safety. This balance between urban functions, connectivity with the natural landscape, and social diversity has been fundamental in consolidating a safe and dynamic environment.

The analysis of these two case studies identified three main design principles organized within a controlled flooding system, which includes: 1. Rainwater capture, 2. Runoff channeling, and 3. Water storage. Additionally, these design principles are complemented by a flexible urban structure, composed of: 1. Rain gardens, 2. Axes formed by ditches, and 3. Nodes, such as ponds or reservoirs, which shape recreational public spaces. The final result is neighborhoods designed under an amphibious system that sustainably manages and utilizes water. Therefore, in the context of urban hydrological processes, it is essential to ensure the continuity of the water cycle within urban environments through a systemic vision that aligns with the network of services, uses, and activities. The integration of these natural processes into urban design acts as a catalyst for diversity, vitality, and urban comple

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BIBLIOGRAPHIC REVIEW

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The future was built yesterday / El futuro se construyó ayer

*Ciudades sin lugar. Utopías urbanas en la ciencia ficción **

(*) MUÑUMER, Carmen. Editorial EDICIONES ASIMÉTRICAS, Madrid, 2023, 180 pages. ISBN: 9788419050670

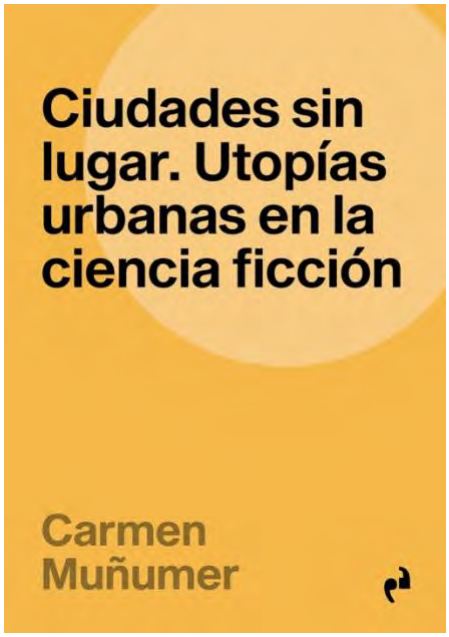
Throughout history, utopias have been envisioned as proposals for a new model of society, often articulated around an architectural idea. Carmen Muñumer points out that imagining this city means questioning the future by starting from an analysis of the present. Beyond a formal appearance, it involves the "desire to improve the relationship with its inhabited environment." Based on this idea of utopia and its translations into architecture, the author explores the relationship between modern architecture and science fiction cinema as the perfect symbiosis to reflect on the city of the future. Through the materialization of a series of architectural ideas brought to life on screen, it becomes possible to envision a new society while, in many cases unconsciously, exposing concerns about the present. The evolving relationship between imagined architectures and existing cities reveals societies' changing attitudes toward the future and the potential of architecture as a driving force for change.

"The predictions of science fiction are regularly surpassed by events, but the important thing is not their accuracy but the extrapolative process that produced them." This quote by Phil Hardy can summarize the central thesis of *Cities Without Place: Urban Utopias in Science Fiction* (*Ciudades sin lugar. Utopías urbanas en la ciencia ficción*), in which the author, a specialist in the History and Aesthetics of Cinematography, explores the relationship established throughout the 20th century between science fiction cinema and architecture, two disciplines that have mutually influenced each other since the early days of the seventh art. The design of spaces shown in films is connected to the filmmakers' interaction with the art of their time and their connection to avant-garde artistic movements. Initially, the cinematic medium was understood as an appropriate vehicle for conveying architectural avant-garde ideas, originating from the prestigious position of other artistic disciplines compared to this new form of expression. The genre allows for an exploration of how a society views its future, and the constructed environment where the stories unfold serves as a significant indicator of perceptions of human relationships, including aspects such as politics, economics, and power dynamics.

Soon, however, the tables turned, and cinema began to gain preeminence over other arts due to its popularity, enabling a rich exchange. Initially, architectural ideas that were never intended to be constructed—reflecting an idealized vision of society—became the settings for films, offering a way to test their viability. Over time, these settings started to become the real spaces where the lives of audiences played out, and the optimism toward modern architecture as a transformer of society began to decline. Realized architectural works thus became the backdrop for pessimistic visions of the future, ceasing to serve as tools to improve the living conditions of their inhabitants.

FIGURE 01»

Ciudades sin lugar. Utopías urbanas en la ciencia ficción.
MUÑUMER, Carmen.



. Between *Metropolis* and *Blade Runner*, the author explores some of the most significant science fiction films, showcasing their shifts in ambition, quality, and imaginative capacity. At the same time, she points out the concerns of the societies that produced these films and how their fears or visions of the future are translated into cinema. Muñumer notes that the greater the gap between reality and the space depicted on screen, the more avant-garde and utopian the architectural proposal becomes.

During a period when modern art and architectural movements were flourishing, Fritz Lang's *Metropolis* absorbed a vast array of avant-garde influences, synthesizing them into an urban and social model that was far removed from the realities of the early 20th century. *Metropolis* thus becomes a foundational work for analyzing the gap between the architecture represented in the film and that of the time it was made, exerting significant influence on subsequent productions.

At the other end of the spectrum lies *Blade Runner*, with its “vision of an increasingly less perfect future.” This film, another cornerstone of architectural analysis, is noted by Muñumer for its ability to design a world brimming with historical references, enabling its portrayal of Los Angeles in 2019 to become “all places, in all times, simultaneously.”

The structure of the book allows the author to effectively develop and argue her theory about the depiction of utopias in science fiction cinema and the potential of modern architecture to transform the city. While the text’s brevity may leave some analyses lightly sketched, its conciseness is one of its strengths. It is noteworthy that the relationships between cinema and architecture are tied together by the representation of architecture in films. There has been a mutual transfer between the two disciplines, which was more symbiotic in their early stages, as the visibility provided by cinema validated architectural proposals, while science fiction films gained prestige through their connection to avant-garde movements. However, this symbiosis has diminished over time.

Another intriguing connection between cinema and architecture is based on the use of editing as a tool for spatial manipulation. Muñumer recalls the exchanges between Sergei Eisenstein and Le Corbusier through this mechanism, which enabled one of the clearest transfers between the two art forms. This exchange moved away from formal imitation and instead focused on the generation of spaces and the use of time as an architectural phenomenon.

In her conclusions, Muñumer is more optimistic about architecture’s capacity to develop life-enhancing environments. Drawing on Heidegger’s assertion that humanity will "reach the essence of dwelling when it builds from dwelling and thinks for dwelling," and reclaiming, via Lefebvre, the value of utopia as a vehicle for imagining the future from the real, she places her hope in the symbiosis between cinema and architecture to envision a possible ideal city.