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LA "TEORÍA DE SISTEMAS" EN LA TRANSFORMACIÓN DE LA CULTURA URBANA.

Arquitectura, ciudad y territorio entre el profesionalismo y la tecno-utopía (1950-1980)

ACTAS

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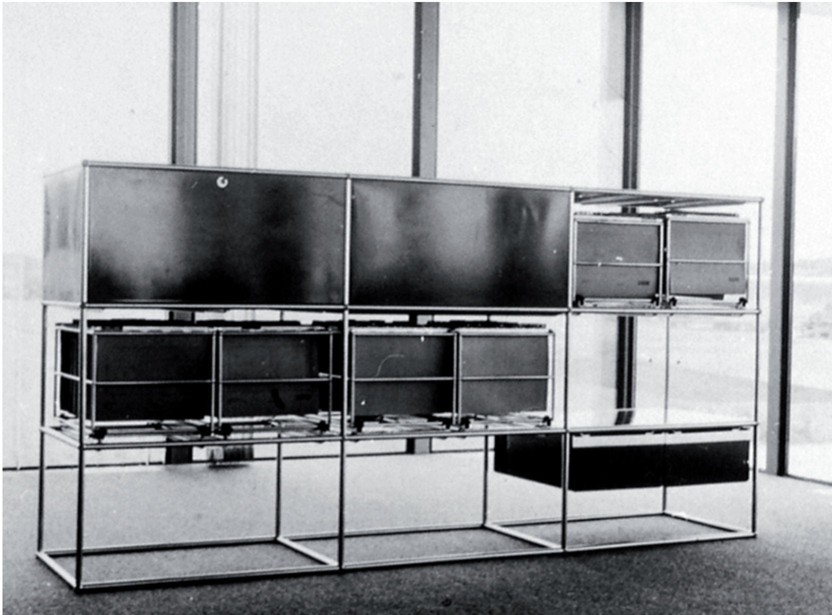
Infrastructure As Space. Fritz Haller's Architecture Systems

Georg Vrachliotis, Karlsruhe Institute of Technology

Anyone who has a chance to take a look at the permanent furniture collection at the Museum of Modern Art in New York will discover there something that appears to be a design object but, strictly speaking, is not. This may sound mad but there is method to the madness, *systematic method*, to be precise. For what appears to be a design object is in fact a system: a simple, yet highly sophisticated furniture system. As its elegant appeal instantly suggests, this is no ordinary object. Small, chrome-plated brass balls, each with six holes, are joined together by chrome-plated tie rods to create a structure that is secured from within by a special thread. These few components suffice to assemble furniture for a whole variety of uses. The "USM Haller" furniture system, developed in 1963 by the Swiss architect Fritz Haller and the entrepreneur Paul Schärer, reveals itself on closer inspection to be a three-dimensional stacking game and geometric modular construction system, the components of which can be infinitely reorganized and expanded as required. Whether used as a bookcase, wall unit, wall paneling, filing frame or reception desk, this furniture system is held to have endless scope. It's fundamental structural quality –modularity– determines its scalability. And its modularity continues within. The hanging file frame that fits exactly into the drawer of a filing cabinet unequivocally dictates a certain way of ordering knowledge, by which documents and files can be optimally compiled, organized, and archived. Every gesture becomes part of a logistical workflow; the furniture system and filing system fuse as a single administrative apparatus. Yet USM is more than just a logistically calibrated microarchitecture and the epitome of functionality. Given its capacity to geometrically organize knowledge and –its unique structural feature– to be reconfigured, time after time, as a different object, it must be read also as a cipher for a superordinate strategy for the system-theoretical development of architecture.

The USM furniture system began life as architecture. Fritz Haller ranked among the most influential Swiss architects in industrial construction in the latter half of the twentieth century. His oeuvre encompasses a remarkable range of very different structures and projects, from residential, commercial, and industrial buildings to entire engineering works. By the 1950s, he and his peers –the architects Alfons Barth, Franz Füeg, Max Schlup, and Hans Zaugg– had become famous far beyond Switzerland's borders as the

“Solothurn school.” Haller’s early projects include a number of school buildings that won him the respect of international architectural circles –the Wasgenring Primary School (1951–54), the Bellach School (1959–60), the Cantonal School Baden (1962–64) or the Brugg-Windisch Institute of Advanced Technical Training (1964–66), to name but a few examples. In the early 1960s, the USM Company commissioned Haller to design a flexible manufacturing facility, its industrial plant at Münsingen. Haller thereupon developed “USM Haller MAXI,” a modular steel construction system with which a single-story manufacturing facility can be built in a range of sizes. The frame composed of supports and trussed girders can be horizontally extended in any direction, as required –an important feature, particularly for industrial construction. Recurrent extensions of the plant, including the addition of various administrative units, were planned for USM on the basis of this first design. Then followed two further steel modular construction systems: the “USM Haller MINI,” a housing system on a scale suited to a two-story family residence; and the “USM Haller MIDI,” a system for planning multistory structures with integrated installation (building) technology, whereby the geometrical order of such technology –the sum of all the various infrastructural systems– was awarded the same importance as the geometrical order of its construction. The crux of all three designs was not the individual building but the system, not the single object but the series, not the monumentality of a project but its flexibility. Such a vision of architecture implies technical precision and constructive system immanence. Montage, understood as the sequential coordination and control of the assembly of construction components, served as a constructive-theoretical key mechanism in Haller’s system environments, regardless of whether the matter at hand was a USM building or a USM furniture system. Each of these architecture systems can be seen as a tool for the geometrization of domestic and professional environments.



Haller, Ausstellungskatalog, USM Mo¦êbel-4. Fritz-Haller Archiv/ gta Archiv, ETH Zürich

Haller's architecture systems, like those of so many architects of his generation, were shaped by personal experience of the immediate postwar period: his confrontation, on the one hand, with the enormity of horrific urban devastation throughout Europe and, on the other, with the aesthetic precision of buildings realized in the USA by European architects in exile. In the early 1960s, Haller came into contact with those proponents of industrial architecture who were seeking to combine the aesthetics of Mies van der Rohe with the radicalism of automated construction processes. In comparison with many of these proponents, such as the eloquent Konrad Wachsmann, or the ingenious and enterprising Charles Eames, Haller's psychological makeup seems to be that of the silent yet critical observer. And yet it was he, above all, who was to expand and radicalize the concept of "system" that had previously prevailed in the architectural field, by investigating a variety of scales –from the furniture system, to the construction system, to the city system.

From 1966 to 1971, Haller pursued his research into the geometry of construction systems at Konrad Wachsmann's Institute of Building Research at the University of Southern California in Los Angeles. He built a great number of delicate wire models and modular wooden cubes in this period, and documented them in two work reports. In essence, these comprise a two-part compendium or primer,[1] in which Haller used drawings, photos of his models, and project descriptions to record the results of all his geometry experiments at Wachsmann's Institute. He thereby preserved every step of his research for posterity –in the tiny writing so characteristic of Bauhaus typography. The structural elegance of many of his projects recalls the geometric aesthetics of Concrete Art –Karl Gerstner's programmed color compositions for example.[2] But Haller was not interested in establishing an analogy between industrial construction and Concrete Painting, unlike Richard Paul Lohse for instance, who strove to do so in his essay.[3] Rather, Haller aspired to create a superordinate classification system for construction systems, an abstract meta-system

Haller, Ausstellungskatalog, Kantonsschule Baden-3. Fritz-Haller Archiv/ gta Archiv, ETH Zürich.

for architecture. Every system, Haller maintained, has “characteristic properties in terms of its geometry, the manner of its assembly, and the flow of forces. It must be possible to organize systems on the basis of these characteristics”.[4] What this means for architecture (he continued) is that the design of a building begins, in a sense, with the movement of its various components towards one another. Sequentially conceived construction systems always imply some kind of structural performance. Understanding the sequence in which elements are assembled in real time is accordingly a means to control a highly complex modular system. In this respect, Haller’s experimental models can be taken as an example of structural-scientific fundamental architectural research.

Construction Systems, Traffic Systems, Communications Systems

Fritz Haller’s annual visits to Los Angeles were formative forays. He took the city’s inhospitableness, vastness, and traffic problems back to his native Swiss urban context, and transformed the transport networks of LA into geometricized traffic charts on graph paper. Predictions of an unsustainable global population explosion were common at the time, and likewise contributed to conjuring threatening scenarios of a society supposedly wildly off track. The technological regulation of abstract model worlds consequently seemed an appealing solution. Arata Isozaki’s project “Computer-Aided City,”[5] for example, clearly demonstrates how strongly people believed at the time that “fuzzy” social space could be precisely regulated and controlled by cybernetic models.[6] In Haller’s case, such faith in technology was given expression primarily in his two urban studies, total city –a model, published in 1968, and total city– a global model, published in 1975. In large-scale drawings of impressive elegance, he conjured a futuristic image of a society wholly regulated by infrastructure, in which the architectural object dissolves in an ever-branching network of systems without scale. Haller’s basic premise –analogous to a giant computer network– was that individual nodes in a decentralized communication system can be considered not only on an urban but also on a global scale. He understood urban organization to be a collective endeavor by various scientists –“specialists in cybernetics, mathematics, electronics, physics, biology, geography, technology, psychology, sociology (…)”. In particular Norbert Wiener’s Cybernetics served, in Haller’s eyes, as an avant-garde cultural cipher through which the future vision of a highly technological society could be articulated. Even though Haller never explicitly acknowledged his indebtedness to cybernetics, Wiener was evidently a major influence on his two urban studies and his concept of the city. Hence the pivotal feature of a space was not its individual character but the level of ease with which it could be integrated in a smoothly organized, technological functional matrix. Or, more emphatically put, the issue was to systematize the “socializing function of space”.[7] But the radical geometrization and systematization of living space (Lebensraum) that Haller’s precise drawings evoked, called to mind –especially in West Germany– the only recently buried images of a totalitarian state structure. What looked like a delicate antenna was a transportation system, apparently calculated to perfection for a city of several million inhabitants. When taken to its extreme, as here, the systematization of reality turns out to be a ludic approach to variations in scale: construction nodes become transport nodes then, finally, communication nodes. In this scalability lies the conceptual force of Haller’s architectural vision, but also, in a sense, its methodological limitations. Up for discussion here, once again, was a concept of society in which man –a supposedly free player– found himself increasingly obliged to remain available at all times and for all kinds

of purpose. It therefore initially seemed advantageous for him to keep his commitments as flexible as possible –a social strategy that was, or perhaps we should say, still is promoted in the cause of "freedom" and "networking"– yet behind the facade of which often lurks a "regime of short-term time".[8] David Harvey would probably speak here of "space-time compression and the postmodern condition".[9]

In the mid 1970s, the idea that communication was the invisible glue of a society –an idea still strongly indebted to Wiener's cybernetic machine theory– was given a decisive boost by technological innovation. The already popular notion that communication no longer implied anything physical or tangible was underpinned suddenly by the palpable image of a new artifact, the integrated circuit, more commonly known to us today as the "microchip." A patent for the first prefabricated integrated circuit was filed as early as 1959 by engineer Robert Noyce, the founder of the *Intel* computer company, and it marked the start of an unprecedented process of miniaturization in the field of microelectronics and silicon research.[10] The technological potential to wire transistors, capacitors, windings, and resistors in ever-increasing numbers in a miniscule space took things to a scale barely visible to the naked eye. On the one hand, the architectural field began to seek a means of artistic expression for this so-called era of microelectronics. On the other, the fact that millions of transistors could be precisely interconnected on a silicon platelet no more than a few square millimeters in size seriously flummoxed even the most imaginative of architects.

Haller too, succumbed to the fascination of the microchip. In an interview in the late 1990s, he recalled that, "normal geometry no longer sufficed for an understanding of [the interpenetration of technology and culture]. We had to find a language that could represent interconnected contexts. One example is the development of a computer chip. (...) When one sees the chip as an image on a vastly enlarged scale, it resembles the paintings of Mondrian. This is the new world. The structure of a chip is like the structure of a house. There are horizontals connected to verticals. Some chips consist of hundreds of superimposed levels. The chip is something our senses can no longer grasp. We freak, and think it is inhumane. Yet this is where the world really begins".[11] Whatever Haller may have meant by "normal geometry," he was clearly referring here to the enormous complexity of the circuitry that the microchip –"man's most complex work"– integrates in a minimal space.[12]

Barely two decades later the microchip and architecture systems metaphor first mentioned by Haller in his Karlsruhe lectures of the late 1970s attracted unexpected attention. In 1990, the Museum of Modern Art in New York showed the exhibition "Information Art –Diagramming Microchips," and thereby triggered an unprecedented wave of inspiration in the architectural field. Huge photographs of silicon platelets actually no bigger than a fingernail were hung on walls as works of art, offering insight into the depths of their circuitry. But what was groundbreaking about the MoMA exhibition in New York was not its visual impact per se but its depiction of scale, i.e. its architectural effect. Toyo Ito described the epochal impact of this exhibition on architecture with a rhetoric that addressed the microchip not so much as an artifact but as the start of a completely new and contemporary iconography of technology: "Until then, despite all the advances made in the microelectronics field, we were unable to translate the aesthetics of the microelectronic era into art. In the

machine age, one could draw inspiration from the appearance of mechanical objects, such as aircraft, ships and automobiles, or from the components of such machines, but since the dawn of the new electronic age, we have failed to come up with structures visible to the human eye that could serve as icons for this new era. (...) With microchips, on the other hand, things look quite different. Microchips actually generate images in an entirely other way than mechanical objects do. These images do not so much represent form as an intermediate space. One could describe this space as a kind of invisible field in which all kinds of patterns become visible once it is permeated".

The pattern itself is unimportant. What counts is the visualization of a space in which new patterns can be generated at any time".[13] Both Ito and Haller were fascinated by the aesthetics of technological miniaturization. The microchip was the state-of-the-art expression of a novel operative system of describing non-conflictual architecture. Yet for Haller –in contrast to Ito– its primary defining feature was not its aesthetics but the system underpinning it, i.e. the organizational structure of the microchip. Haller regarded the technical artifact from a system-theoretical viewpoint. This may also explain why, even though he frequently spoke of the microchip in metaphorical terms, his abiding interest was actually its complex order. Haller's aforementioned opinion that "the structure of a chip is like the structure of a house" demonstrates that the matter here, for him, was methodological, if not to say, strictly a task of installation technology. The question was: Which tools are

Haller, Ausstellungskatalog, USM Mu¦ênsingen-2. Fritz-Haller Archiv/ gta Archiv, ETH Zürich

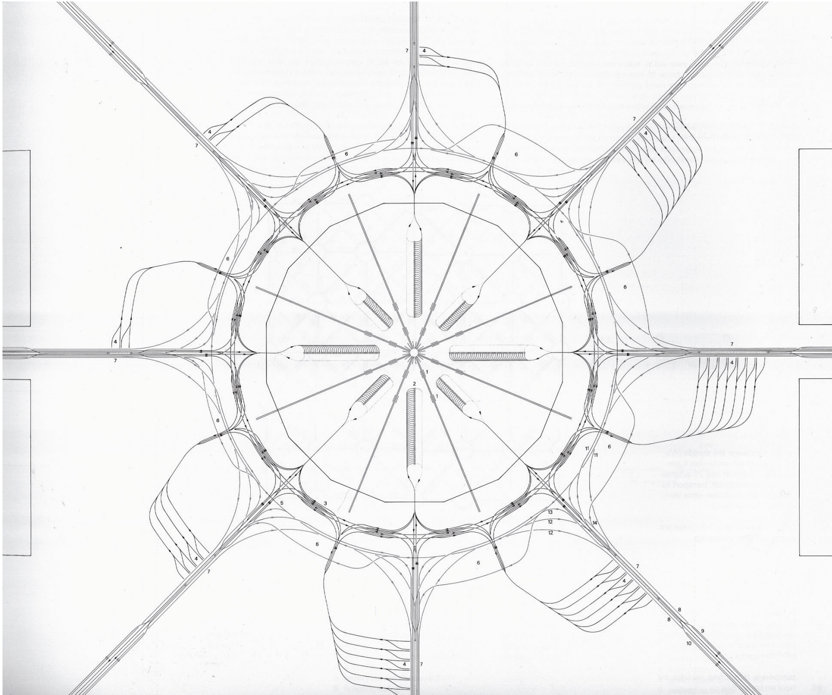
required in order to transfer the fascinating microchip phenomenon –its ability to combine within itself maximal complexity and non-conflictual structures– to the planning of a building?

Haller considered this question in terms of installation technology. This, he presumed, was the most promising way of approaching the future development of system-theoretical planning aids. The focus of his research therefore was the, in architecture hitherto largely neglected question as to how not only all the structural components of a building but also the totality of its infrastructural systems could be modularized and organized -like the structure of a microchip– non-conflictually in a technical system.

Together with a small team of architects and information scientists, Haller had begun exploring the potential of digitization for architecture in the mid 1980s.[14] One result was the planning software that Haller baptized "Armilla" –in reference to the eponymous short story in Italo Calvino's *Invisible Cities.* The objective was to develop a program system that "can be broadly applied in the planning of circuit networks and the alleged intelligence of which should lead to higher quality solutions for the installation and coordination of modular circuit networks".[15] Ultimately, it was hoped, the computer would help the architect achieve the non-conflictual permeation of all circuitry by means of visualization and computerized calculus. In parallel, Haller applied the concepts and methods of information technology to architecture, so as to be able to depict a planned building in the programmed software structures and describe it in a database.[16] This virtual guise and the all-seeing eye of a software program added a new dimension to the term functionality, which had previously been practically synonymous with convertible construction systems. By implication, industrial construction was radicalized and expanded in equal measure: radicalized, insofar as this concept of functionality shielded the total systematization of architecture from view and thereby quite literally reduced the building to a purely technical artifact; and expanded, insofar as Haller's pioneering achievements put the focus on installation technology, until then always a blind spot in the history of industrial construction.

The extent to which Haller's architectural investigation of the invisible circuitry of a building was perhaps also an early response to the profound spatial and temporal changes then taking in the logistical landscapes of the burgeoning consumer and service society, is open to question. There can be little doubt, however, that every step towards the systematization of architecture corresponds also to a putative gain in "symbolic world domination."

Therein lies the potential of a system-theoretical approach to architecture and also, in a sense, its limitations. In the world of software, space dissolves in the description of space, time in the description of time, the body in the description of the body. And it was by combining these contradictory sides of the same coin –spatial processes of dissolution on the one hand, and symbolic descriptive techniques on the other– that Haller succeeded in taking architecture systems to a new level of abstraction, and in adding a new chapter to architecture's historical quest for the ideal relationship between industrialization and flexibility.



Haller, ts2. Fritz-Haller Archiv/ gta Archiv, ETH Zürich

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