FACTORY FUTURES

AGENDA 2013

1. **INPUT: Architecture without humans**

2. **PROCESS: Object Oriented Tectonics**

3. **OUTPUT: Computational subjects**

4. **CULTURAL AND TECHNICAL CONTEXT:**

   4.1 The architecture of production

   4.2 The production of architecture

1. Architecture without humans

Since the mass-integration of information into matter (as in the silicon processor of the first Olivetti pc's) computation has been a radical agent for the transformation of the current productive landscape. Because of its supposedly abstract and invisible character, all too often its spatial repercussions on the productive structures of the city have been ignored.

The shift from traditional industrial activities to our present-day complete *informatization* of production generates an exponential accumulation of data. Far from being weightless, this accumulation of knowledge materializes in highly complex and energy consumptive buildings known as Data Centres: whether embedded within existing edifices or isolated in the landscape, the programmatic requirements of these new, twenty-first century factories are calling for a radical reformulation of traditional architectural parameters such as human occupancy, scale and energy: it's within this emerging scenario that we see the opportunity to explore new prototypes for the industrial complexes of the near future.

How to critically re-assess the architectural notions of *type* and *function* when the centrality of the human has been replaced by the one of the machine? How to exploit these transformations as an opportunity to re-invest the architecture of the factory of a social, political and territorial meaning?

Nor dismissing this scenario as fundamentally anti-architecture, nor celebrating it as a sci-fi dystopia, but willing to re-assess architecture's crucial role within current economic, technical, social and political transformations, the school's ambition is to develop innovative design methodologies and propose new relationships between space, technology and production: by acknowledging the obsolescence of traditional architectural tools to cope with today's programmatic and environmental complexities, our technical research will focus on computational design and manufacturing to explore constructive, generative techniques for spatial and material transformation.

The possibility to integrate organizational, dynamic and constructional parameters into built form through computational means opens the opportunity to formulate new architectural sensibilities. Rather than exhausting the possibilities of these tools in a purely scientific efficiency, we will question their capacity to produce adequate expressions for an increasingly computational society: punctual case studies on the Olivetti cultural and built legacy will help us in re-framing digital architecture precisely as a question of both politics and aesthetics.

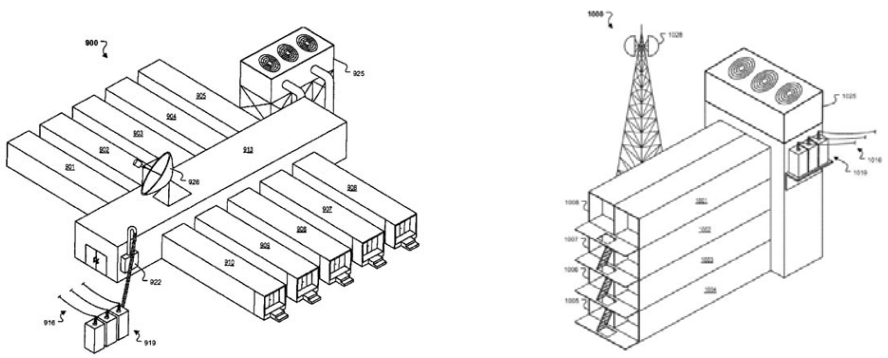

Figure 1: Google Patents for modular and stackable Data Center

2. Object-Oriented Tectonics

As contemporary space of production is increasingly defined by computational logics rather than traditional architectural means, the former definitions and understandings of space as a physical, geometrical entity are diluting into performative qualities of data preservation, analysis, computation. Any serious attempt to understand and operate within this new architectural territory must therefore confront itself with the understanding and use of computational and ambient designed environments.

The research will have a specific technical background that we believe to be particularly relevant for a practice willing to reclaim its role in redefining the contemporary architecture of production: as this space is increasingly characterized by the need to accommodate dynamic processes (environmental, societal, economic...) within material organizations, current developments in ***Object Oriented*** and ***Associative Thinking*** will be explored – both critically and technically - as methodologies allowing systematic applications of computational logics within the architectural discipline.

Both the *Object Oriented* and the *Associative Thinking* paradigms are holistic approaches concerned with a low-level, non-hierarchical resolution of interaction between entities: through the design of simple rules of interaction between objects and the definition of environments of relations it now possible to explore unprecedented degrees of material differentiation and heterogeneity while generating highly consistent wholes.

The Universal Computer of Alan Turing or the Unidimensional State Agent (or Cellular Automata) of Stephen Wolfram expressed and developed - in the most practical and intimate ways of our daily life - the power of such applications without predefining an order or rule of regulation of higher level than the agents (or components) of these systems. It is a form of intelligence following strict logics of economy of energy through local interactions and exploiting the potential of heterogeneity and discontinuities to produce highly consistent wholes.

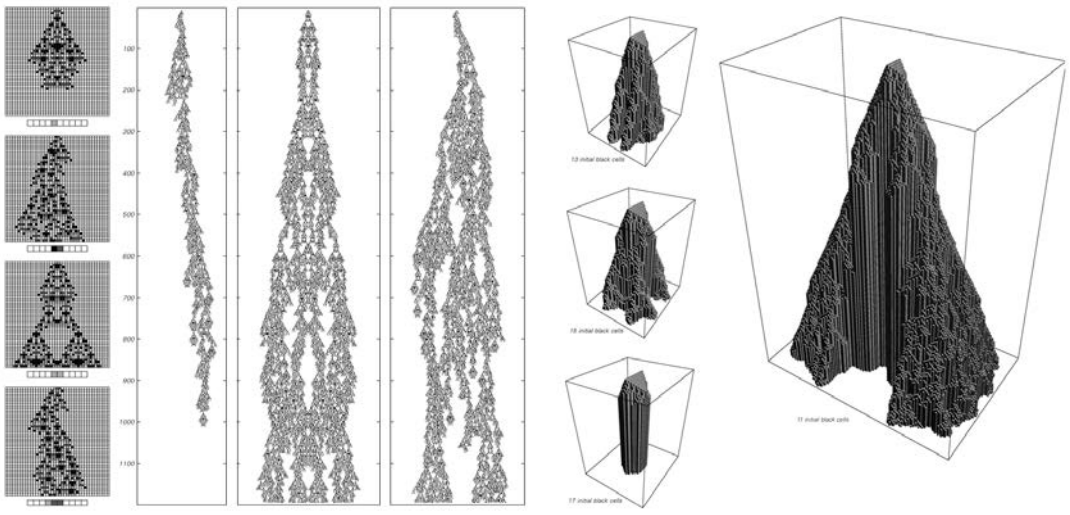

Figure 2: 1d and 3d Cellular Automata from S. Wolfram "The Generation of Form" in A New Kind of Science

Somewhere in between the overdeterminacy of typological thinking and the alleged specificity of generative strategies, we will aim our tools towards a precise re-programming of the factory type and its materialization into innovative, hybrid physical forms and programmes. In order to breed altogether the historical, critical and technological backgrounds of the programme two main trends will be exploited along the two weeks workshop.

Week 1 – Object Oriented Grids

First, the research will focus on **object-oriented n-dimensional grids** in *Processing* and explore grid-based computational methods, discretization strategies and space-filling algorithms (Cellular Automata, Hilbert curves, etc…). Starting from one-dimensional notions of grids, we will then further expand the complexities of our studies to three and four dimensional systems: it is precisely in the possibility of embedding phasing and time-based processes to complex organizational systems that we seek the opportunity to formulate our own responses to the typological and organizational complexities of Data Centres. By scavenging the Olivetti archives in search of an architectural DNA for our proposals, we will bridge between contemporary applications and historical case studies of modern, grid-based approaches to industrial buildings and their role in organizing labour in space.

Week 2 – Integrated Materiality

In the second week we will focus on ***Associative Design*** and the intensive integration of rule-based and physical constraints into predefined architectural components. In sampling specific examples of the Olivetti architectures calling for a complete industrialization of the architectural project, we will explore associativeness as the principle that organises the project in a long chain of relationships embedded in a *File-To-Factory* system. This second phase will make intensive use of Gehry Technologies' Catia based software *Digital Project* and will explore its most powerful aspects on component-based and rule-based approaches (*Powercopies*, *Knowledge Patterns*, *Rules*, *Instantiations*…). Predefined components will be populated in space to explore the physicality of the architectural prototypes developed in Week 1.

Three trends will be explored to offer both variation and differentiation parameters:

- Top-To-Bottom: The use of the generated grids as driving geometries for the instantiation of the components
- Bottom-Up: The disregard of the grids and the instantiation of components by iterative processes (the previous components defining the boundaries of the following ones)
- Middle-Out: The transition between both approaches by mixing predefined and iterative grids.

3. OUTPUT: Computational subjects

By critically reclaiming the architecture of the factory as the *locus* where the dimensions of production and subjectivity most strongly collide, our ambition is to explore the raise of information economy and Data Centres as an opportunity to establish new relationships between material and human agencies and to reflect upon the cultural potential of a computational society. In retooling the Olivetti industrial aesthetics as the promotion of a new subjectivity within the ecology of mass production, we will represent our architectural proposals in the form of large scale posters addressing the critical relationship between information economy, contemporary logics of architectural production and subjectivity.

Using graphical production as the vehicle of our ideas, our intention is to invest the possibility of an endless heterogeneity granted by digital architecture with new meaning and representation coupled to new use and function: the question we want to raise is how the computational machine can give rise to a process of *subjectivisation* through the creation of singularities by way of architecture.

It's within the horizon of a new industrial architecture that we seek the opportunity to create a different perception of contemporary production through the construction of singularities and affects in the built environment of the workplace. Such a stance is not whether architecture would live better off a technocracy devoid of human occupancy, or whether it might eliminate work altogether, but rather how it might change subjects' relation to work and the workplace: the potential of an endless production of heterogeneity from within the computational machine and its derivative architecture will be tested against the promise of actuating subjectivisation as a product of architecture.

Figure 3: Xanti Schawinsky's poster for the Olivetti MP1, the company's first portable typewriter

3. Theoretical Cultural and Technical Context of the Research

3.1 The architecture of production:

Placing itself at the intersection between Industry and Architecture, Factory Futures insists on the Olivettian project as an archetypical model to trigger future resolutions in the practice of design. In awareness of the particular social/political/economic conditions out of which it has emerged and of the contrasting environment in which present-day industry is fundamentally embedded, the Ivrea Visiting School takes the Olivetti factories as a starting point to re-elaborate those questions in their contemporary form. This year, the design philosophy behind M. Zanuso's Olivetti factory in Scarmagno will constitute the architectural DNA of our design experiments through which to reframe the relationship between architecture and contemporary modes of production.

"Una fabbrica a misura d'uomo" (a factory at human scale), became the hallmark of the Olivettian modus operandi. Zanuso himself recounts how the intention of Adriano was to put up structures which were at once informed by the so-called 'functionalist' principles of performativeness and transparency, whilst at the same time aspiring to a serendipity between the labourer and his work environment. Siding to the positions Walter Gropius had expressed in the construction of his "Fagus Fabrik" by which an increment in productivity could be achieved by means of qualitative design strategies, in the years prior to his death, Olivetti initiated a series of collaborations with renowned architects such as Louis Kahn, Kenzo Tange, Gabetti e Isola, Gino Valle, Ignazio Gardella, and many others, locating his factories within a lineage whereby avant-garde architecture and contemporary logics of production would be emphatically related. The factory in Scarmagno designed by Marco Zanuso, can be regarded as an instance in which this parallel was undertaken in the most radical and eloquent way.

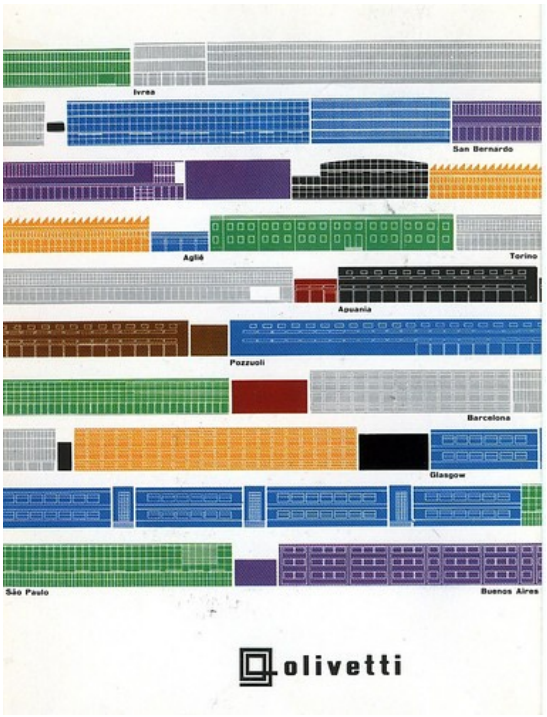

Figure 4: Giovanni Pintor'si poster illustrating the Olivetti factories around the globe

Approximately 15 km away from the Olivetti headquarters in Ivrea, the factory in Scarmagno was part of a broader renovation program the Olivetti company had brought forward between 1968 and 1970. Rather than providing elaborate spatial organizations in which each quarter was at the same time distinguished by its function and related to logics of the production chain, the need was now to shape flexible and climatized ensembles in which the process of production could be adapted to the company's variable requirements. Zanuso's response to the new program consisted in a systematic endeavour establishing a direct relationship between architectural elements, technological circuitry, mechanical production and a qualitative organization of the work-environment. The factory in Scarmagno can be understood as a sophisticated application of a series of basic, yet effective, architectural principles determining the entirety of the project from overall to detail. In terms of layout for instance, the building (a loose arrangement of four interconnected plants with secondary facilities attached) follows a rectangular grid of 18 by 12 meters suggesting a potentially endless development of the factory in all 4 directions.

Correspondingly, the structure of the building, a trilithic aggregation of prefabricated elements (pillar, primary beam, secondary beam) assembled in a quasi-primitive way (the elements are 'simply' laid on top of one another), was planned to be extendable with no further modification but the addition of supplementary components and the relocation of the envelope. The architect provides no longer a finite building but an open-ended system in which the disposition of architectural elements is ductile to the requirements of the production line.

The specificity of the design of the modular components of the Scarmagno factory reflects these changes in the status of factory space; it is a step away from run-of-the-mill engineering and seems to hint to the possibility of customization within the horizon of mass production, a concept that was by all means unusual and possibly informed by Zanuso's background as industrial designer.

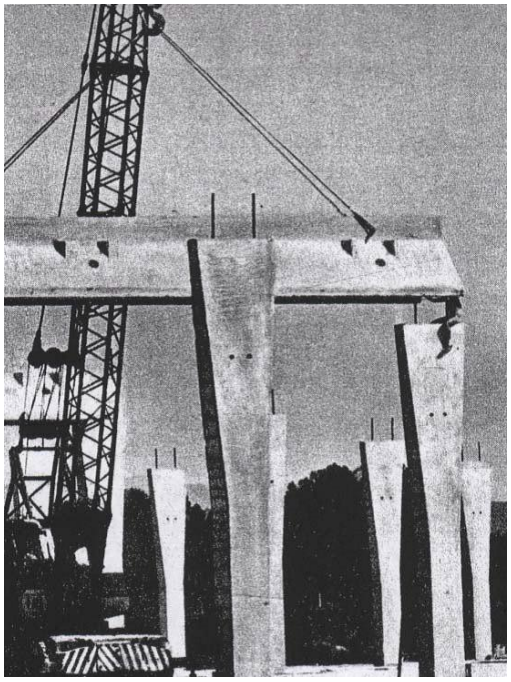

Figure 5: assembly of prefabricated elements for the Olivetti complex in Scarmagno. Ivrea, 1968

When pointing out which aspect of the building was most challenging in the design process, Zanuso places emphasis on the intricacy of the internal infrastructure. Having to provide a climatically controlled environment in which the production line could have had maximum flexibility on ground level, the solution consisted in the development of a stratified roof structure whereby the technical requirements could've been solved independently from the functioning of the factory. The roof was therefore organized in different intersecting layers each of which matching a particular technical requirement: the first layer consisted in the lighting of the factory, the second in its ventilation (the ducts of which were inserted in the V shaped secondary beams), the third in the power supply system which could operate the entirety of the factory's infrastructure all the way throughout.

To achieve maximum degree of independence between the multiple vectors running through the factory, its layout consisted in the articulation of a number of different, and yet highly related, modes of circulation. In terms of human circulation for instance, the factory was divided into four main plants each of which with auxiliary elements (entrances, changing rooms, mensas, offices, etc.) attached to its exterior thus amounting to a clear separation between the work environment and the social realm. Similarly, in terms of energy supply and ventilation, each plant was provided with an external power station which, branching over the building's roof structure, was able to administrate the microclimate of the factory in relation to particular areas of operation. The result was that, occurring on two distinct levels (namely the ground level and the roof), the different and yet complementary systems could be coordinated independendtly, even though perfectly integrated in the same architectural ensemble. It was mainly via this particular operation that the architect managed to give birth to what still today is considered to be a key iteration of the factory typology.

In the words of Marco Zanuso, the design of the Olivetti factory in Scarmagno (as those in Crema and Marcianise which shared the same prefabricated system) was undertaken as a participatory practice of which the end-product (provided that it is proper to label it as such) was no more than the result of a convergence of multiple data from the most disparate disciplinary fields. As the architect himself explains, the 'democratic' nature of the project resided exactly in it being the unmitigated outcome of all decisional activities which took place in the design process. The choreographic nature of Zanuso's work as planner in mediating the relationship between commissioners, the production line, and the users of the building (namely the labourers) established a transdisciplinary approach which will be instrumentally be sheds new light on a procedure which is steadily proliferating.

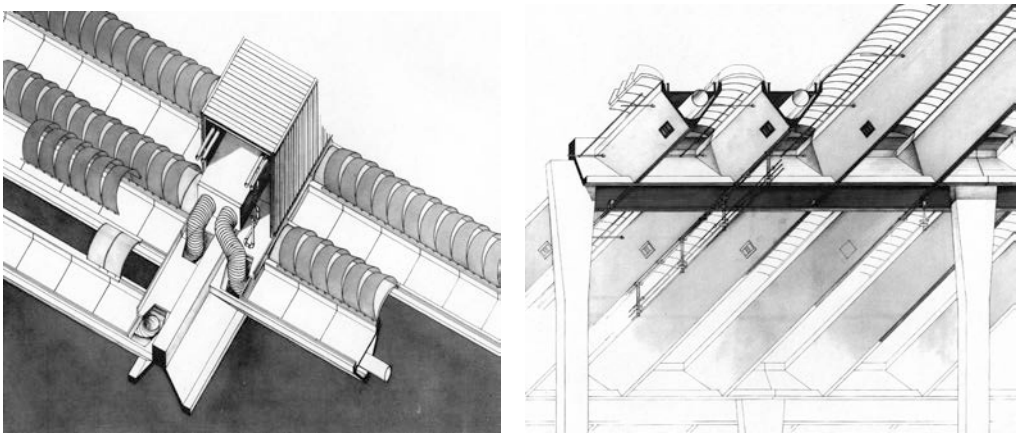

Figure 6: drawings of the integrated mechanical systems of the Scarmagno Factory

3.2 The production of architecture

While on the one hand the evolution of productive systems has informed the construction of the work environment, on the other the practice of building – the 'productive' aspect of architecture – has changed too. Factory Futures will confront this scenario through the development of projects that try to open up new speculations on contemporary environments of production, and also as a reflection on the ways in which architecture itself is produced nowadays.

From this point of view a paradigmatic example of architectural practice involved with issues of production is the architecture of Albert Kahn; the author of several legendary plants for Ford from the 1910s to the 1930s, Kahn was also one of the first practitioners to organize his own office as a machine with precise tasks defined for each employee. In Kahn's practice, architecture followed a fordist division that resembled the organization of the factories he was designing. In both cases the revolutionary aspect of this new form of organization was the idea that the worker would keep his place and the object of production would travel through space and be handled by different people – the car, as well as the architectural project, which would be dealt with at different scales by different groups of professionals: architect, engineer, detail draftsman, economic manager, construction site manager.

This organization of labour shattered the last illusions that factories could be designed in the same way cathedrals had been – a conviction that is still very much present in the first cases of industrial buildings designed by architects, such as for instance the well-known AEG Turbine Factory by Peter Behrens (1910). Behrens himself had been hired a few years before as 'artistic consultant', a role that makes clear the architect's vaguely post-art-nouveau mandate to aestheticize industry; accordingly, the AEG was conceived as powerful landmark, a modern monument of sorts, characterized by a sculptural volume and aggressively expressive facades. On the contrary, very early in his career Kahn's work will emerge as a quintessentially managerial practice aimed at handling movement and behaviour rather than expressing identity. From the multi-floor Highland Park Plant (1909), which hosted a rudimentary assembly line but still presented itself as a traditional building with windows and a readable form, Kahn's designs evolved fast into the generic type best represented in the gigantic River Rouge complex (1917 onwards), a one-floor immense carpet of productive space lit from above, a landscape more than a building, completely conceived in order to maximize the productive performance. River Rouge's scale – both in terms of building area, and in terms of complexity of the architectural project – initiated an entirely new way to look at production (industrial and architectural), a way that focused on the process rather than on the content: as much as the assembly line workers did not have to understand the finished product, architecture itself lost in the River Rouge scheme any ambition to representation to simply become shelter and frame for pre-choreographed movements.

Scarmagno, the AEG and the Ford plants all show how forms of architectural production mirror the forms of production at large. Factory Futures is interested in this mechanism not as a casual occurrence, but rather as one of the driving constants of design practice.

It has been argued, most notably by Mario Carpo, that the ‘albertian paradigm’ – the act of putting forward a project as quintessential moment of architecture – might have come to an end thanks to ever more refined techniques of digital design which override the idea of an architect mastering all aspects of a fixed, predetermined project. If architecture has therefore been albertian for more than five centuries, we are facing the possibility of a post-albertian architecture where the idea of project is weakened by the infinite possibilities of customization that are offered both through computer-based generative processes, and through a more direct and flexible interaction with the user. In each case, the (traditional) architect is rendered virtually useless, and the moment of architectural ‘labour’, or ‘production’, is shifted upstream to the design of software rather than focusing on the making of space.

While this scenario seems frightening and unfamiliar, again, it should hardly be surprising if we consider the way in which architectural production has followed the general trends of production. Also for the medieval master mason it would have been frightening to imagine a world in which he would have lost his artistic autonomy to an outsider – an intellectual – dictating the overall appearance of the building. And for the beaux-arts trainees working in Behrens’ studio, the assembly line of Kahn’s office might have seemed unfamiliar and somewhat inhuman. But again architecture today is facing, as any other productive context, a radical shift. To understand this shift we should look at how things are produced in general today.

Generally speaking, a limited number of broad contexts of production are visible in the contemporary city. Both in the industrial context (in which goods are produced) and in the so-called post-fordist context (in which knowledge is produced) the presence and labour of man is required, albeit in different ways. But a third more elusive context is emerging; it is a context of production that doesn’t coincide precisely with the other two, and which is focused mostly on logistics and service. This context doesn’t require human labour to function. To be specific, obviously, it does require workers, but in a minimum quantity, and often not directly present on the premises. If in the 1980s the concept of unmanned factory was applied with little success to traditional industrial production, the last decade has shown that other kinds of unmanned factories are very much becoming a quintessential part of our landscape in the form of data centres, warehouses, logistic hubs. They are not strictly speaking industrial spaces as no goods are produced there; neither they are post-fordist creative centres, as it isn’t the creativity of people that is channelled and made productive there. This condition is paradoxical and difficult to deal with since there is no previous architectural blueprint for an architecture that does not require the presence of man.

However, it might be exactly in such an extreme condition that the chances of survival of a post-albertian architecture might be tested. This is the reason why Factory Futures proposes to take the most extreme case of contemporary production environment – the data centre – to explore a territory where the architect is no longer an organizer of matter and space, but a designer of systems with multi-layered components and complex relationships.