Paper Architecture: The Bureaucracy of Reform after 1968

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This paper examines the origins of architectural programming in France in the years around 1968. It looks at the work of a team of young technocrats led by François Lombard, an engineer obsessed with a new system of design that would replace the architect as the primary author of the architectural project. It tells the story of how Lombard's system emerged from reform movements in architectural education and practice, concluding with its deployment in the project for the Centre Pompidou. The programming group's methods provided one of the ways by which architecture navigated the new computerized world of the late-1960s and early-1970s. They offer us an early picture of a new mode of collective, anonymous, and bureaucratic authorship that found creativity in surprising places and shaped one of the 20th century's most iconic buildings long before the involvement of its architects.

Over two days in early January of 1971, the Institute for Research in Computation and Automation (IRIA) held an international symposium in Paris on the application of computers to architectural design. Architectural computation was still a new field, and systematic assessments of the role of computation in design were only just beginning.[1] At the IRIA symposium, French, British, and American researchers speculated on the future of a field still in its infancy. The final presentation of the event, however, had little to say directly about computers. Instead, it described a managerial system for the modeling of the totality of a building's activities and performance prior to the involvement of the architect.[2] Its author, a young French engineer named François Lombard, argued in his presentation that only such a method could make design yield to the computational methods that the other presenters had discussed over the preceding days. Using a series of diagrams, Lombard presented a process for identifying a building's requirements and controlling its design and construction. Although he called it programming, its scope was much more expansive than later usage of that term suggests. In the mind of its author, this process would take over the role previously played by the architect, offering a new mode of anonymous and collective authorship that was better-suited to a new, computerized world.

In his first two diagrams, Lombard showed the system as a whole; next came diagrams showing the decision-making processes inherent in any design problem, followed by a flow graph showing a typical project workflow and the various intervention points of the building owner, the programmer, the architect, and builder (Figure 1). Through these diagrams, Lombard argued that computation could not be applied ad hoc to isolated design tasks but rather would be productive only when incorporated into a larger, formalized design methodology, particularly one (such as his) that was based on the principles and language of systems engineering.

Like the new discipline of systems engineering, Lombard's work was driven by a utopian impulse, and like IRIA itself, stemmed directly from disruptions and reforms set in motion during the early 1960s. As such, it helps us understand how technological discourse was part of a broader rethinking of the social habits, cultural practices, and technical epistemes that shaped the postwar architectural project. During the mid-1960s, a postwar consumer society, tiring of Gaullist an American imperialism and struggling with transformations to society, cities, and the natural environment, and increasingly mistrustful of government institutions and corporations alike, demanded change, resulting in the well-known protests and general strikes of May 1968. Among the most insidious of these disruptions was what Nora and Minc later called "the computerization of society."[3] In the late-1960s, computerization further destabilized a difficult situation; for example, concerns about American cultural imperialism found voice in worries about the cultural and economic dominance of IBM. Concern was justified: the word in French for electronic computer, "ordinateur," was originally copyrighted by IBM France and only later released for general use.[4] As a strategic response to the perceived cultural dominance of IBM, de Gaulle's government created the so-called Plan Calcul, of which IRIA, the committee that ran the 1971 sympoisum, was the research arm.

No institution was spared the wave of reforms that swept through the later 1960s, and architecture was no exception.[5] The Paira Report on the state of the architectural profession, commissioned before the events of 1968 but completed the year after, questioned the fundamental conception of the architect's role as an exceptional generalist who oversees the totality of a project, arguing that this outmoded view should be replaced by one in which the architect is a specialist member of

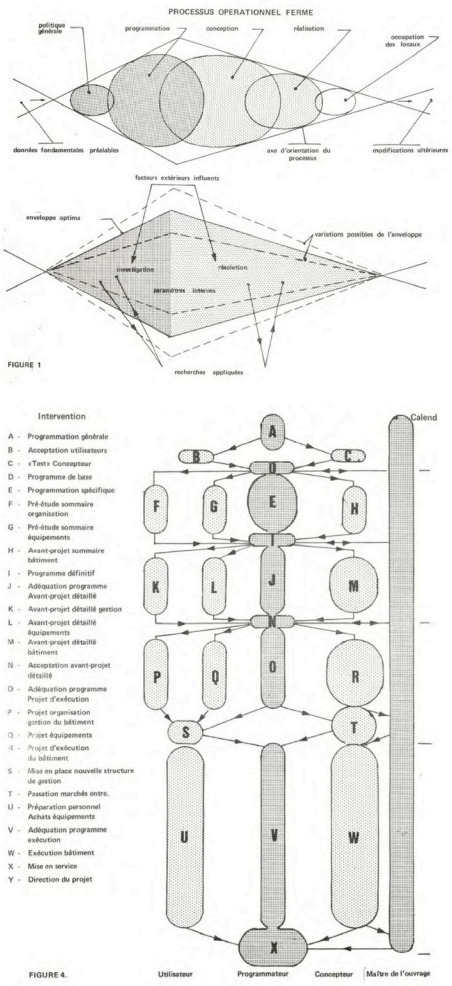

Figure 1. Diagrams from Lombard's IRIA presentation. IRIA.

a larger interdisciplinary team. Like the profession, architectural education too was under scrutiny, and reforms were proposed to liberate it from the academicism in which it was hopelessly mired and usher it into new territory where pedagogy was based on the emerging role of the architect in society, technical and intellectual in nature and armed with the latest social sciences.

Lombard exploited these institutional instabilities. Equipped with an undergraduate degree from the Ecole Centrale des Arts et Manufactures and a master's degree in civil engineering from Berkeley, he worked as an intern in the engineering department of SOM, where he was exposed to the workings of a large American firm. On returning to France, he joined the office of Jean Fayeton, an engineer with a practice in industrial buildings and housing and therefore with intimate knowledge of the technical problems of architectural production in the difficult early postwar years. Fayeton was also familiar with institutional administration and the civil service, having acted as director of the architectural section of the Ecole des Beaux-Arts. His 1967 report on reforms to architectural education attacked academicism, arguing that architecture and urbanism were now determined by a wide range of factors that education should reflect, including mass production and consumption, changing social needs, the shift from the architectural object to the integrated environment, and the arrival of new potential opportunities for the architect. As Lombard later wrote, in this new *querelle*, the role of the ancients was played by architects educated before 1968, closely aligned with the academy and formalist in sensibility, while the role of the moderns was played by a diverse group that included the older generation of the rationalist tradition such as Fayeton and Prouvé, but also the new generation who graduated after 1968 and who benefited from the critical and sociological approach of recent reforms to the pedagogical units.[6]

Lombard considered himself a modern, of course. In January of 1968 he moved from Fayeton's studio to the Directorate of Architecture at the Ministry of Culture, where a lively discussion of reforms in these areas was already underway. His former employer wrote an enthusiastic letter of introduction that stressed the young engineer's experience in the US and his early unpublished writings on design methods in architecture and engineering. In those early notes, Lombard offered a sweeping reassessment of the role of the architect. Echoing the Paira Report's conclusions, he argued that the conception of the architect as a master coordinator who controls a project from start to finish is widely and justifiably contested. "It is outmoded," he declared, "to think of the architect as the queen in a game of chess, capable of moving in any direction."[7] Instead of playing a role for which they were ill-prepared, architects should act as participants in a team of specialists. Lombard offered the large American architectural firm as a model. There, he argued (accurately or not), when faced with a difficult problem the designer is asked, "What's your strategy?" Methodology and strategy steer the project, he recalled, with architects modestly contributing where their expertise allows. In these early notes, Lombard presents a reformed profession in which the architect's role of project overseer, left vacant, would be filled by an operational process managed by a new type of technocrat: the programmer.

This was exactly what the Directorate of Architecture wanted to hear. Lombard was hired and given relatively free reign to develop his ideas into a series of treatises and reports. Since the Directorate was responsible for regulating architectural education and practice it had considerable powers to change things, making it the ideal place for Lombard to develop his early reformist thinking into a fully-fledged methodology. In late 1969, he was assigned to the Lichnérowicz Commission's inquiry into the future of architectural research and within six months was leading Working Group 3, named Research into Operational Processes. At the group's first meeting, everyone agreed that any agenda for future architectural research should include the study of new methods for realizing projects: "It is

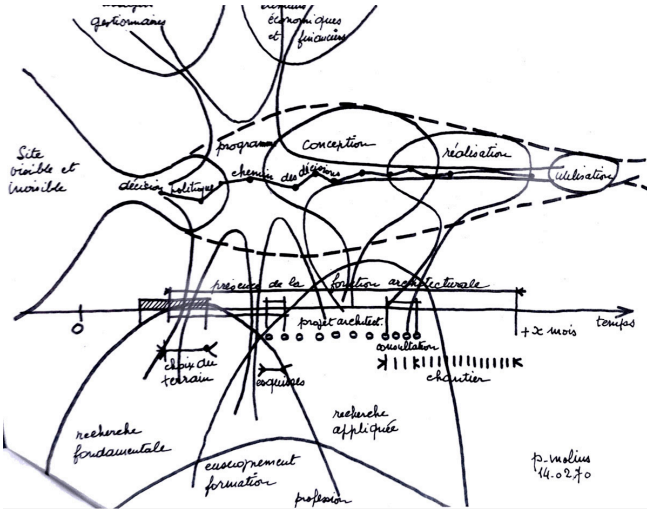

Figure 2. Sketch by Molins, 1970, 20120112_168, Archives Nationales.

no longer acceptable," Lombard argued, "that the process of creating a building be conducted in secret, as an architectural monologue, or by 'flirting' with the client." Instead, architectural creation should be based on an objective process, which might look something like this: break down building functions into subsystems ("approche mathématique"), establish an equilibrium within each sub-system ("approche biologique"), define the relationships between sub-systems along with the forces that orient these relationships ("approche physique"), and analyze the sub-systems parametrically.[8]

Despite rejecting architecture's academic tradition, Lombard used drawing extensively, and asked others to do the same. A culture of diagramming was thriving in the Directorate of Architecture, mainly in the planning activities for the Villes Nouvelles where the new field of urban programming brought together interdisciplinary teams of engineers, economists, landscape architects, sociologists, and financial experts to indentify the infrastructure and amenities needed by the future inhabitants of entirely new cities. Beyond simple lists of requirements, urban programming proposed a method of control for design, procurement, and construction based on techniques of analysis, scenario planning, and testing established in the fields of economic planning and organization theory in France and in the United States.[9] In the Directorate of Architecture, Lombard would have been exposed to these emerging methods and their graphic techniques. Lombard and his close collaborator in the working group, Pierre Molins, illustrated their meeting notes with diagrams of their new process (Figure 2). Lombard later used this graphic language in several reports and articles that followed that year, including the IRIA presentation, and eventually in the operational process that produced one of the most famous buildings of the late-postwar period.

LIVRE ROUGE

On December 11, 1969, President George Pompidou announced a project for a new cultural center in Paris that would bring together a collection of institutions into a single building: a public library (the first in Paris), modern and contemporary art museums, a center for industrial design, and a research laboratory for contemporary music. Like IRIA and the Plan Calcul out of which it was born, the project for the Centre Beaubourg (as it was originally called) was part of a broader strategic response to the disruptions of the mid-1960s. The institutions from which the Centre was to be composed were already facing a new public raised on electronic media, suspicious of high culture, and simultaneously fascinated and worried about computerization. These institutions were also undergoing changes to their operations and modes of artistic production as result of computers. Librarians now talked about interconnected networks of databases, and visual artists and musicians had been producing new work using computers since the early-1960s. The overall character of the new building quickly materialized: it would be a vast information processing system, a space of both leisure and education, where the public would enjoy free access to books, audiovisual materials, artworks, computer databases, and even the latest news and weather forecasts, while artists and musicians would be given access to computational tools previously affordable only by large corporations. It was an information utopia, a distributed intelligence of documents, objects, and users within a single building.

No existing architectural design methodology could deal with the programmatic complexity inherent in such a proposal. Developing one that could demanded embracing the essential idea behind the project: If the building was to operate as a giant information processing system, then why not design it as if it were one? If viewing an artwork or listening to a performance were treated as the flow and storage of information, if visitors and administrators were treated as users of a system, if institutions and departments were treated as functional modules and submodules interconnected using the logic of the interface, then this architectural information utopia might be realizable.

In December 1969, just as the Lichnérowicz Committee's work started, Lombard overheard in the corridors of the Ministry of Culture news of Pompidou's new project and immediately suspected that the model on which he had been working might be what was needed to handle the project's complex program and unrealistic deadline. That summer, Lombard was named head of the programming team, which would be responsible for writing the brief for the international design competition, managing the competition process, identifying of new requirements, and verifying that the architects' design consistently met the needs articulated in the program over the course of the project.

In November 1970, a press conference at the Ministry of Culture announced the international design competition. The brief was detailed beyond precedent. The 1955 Sydney Opera House brief

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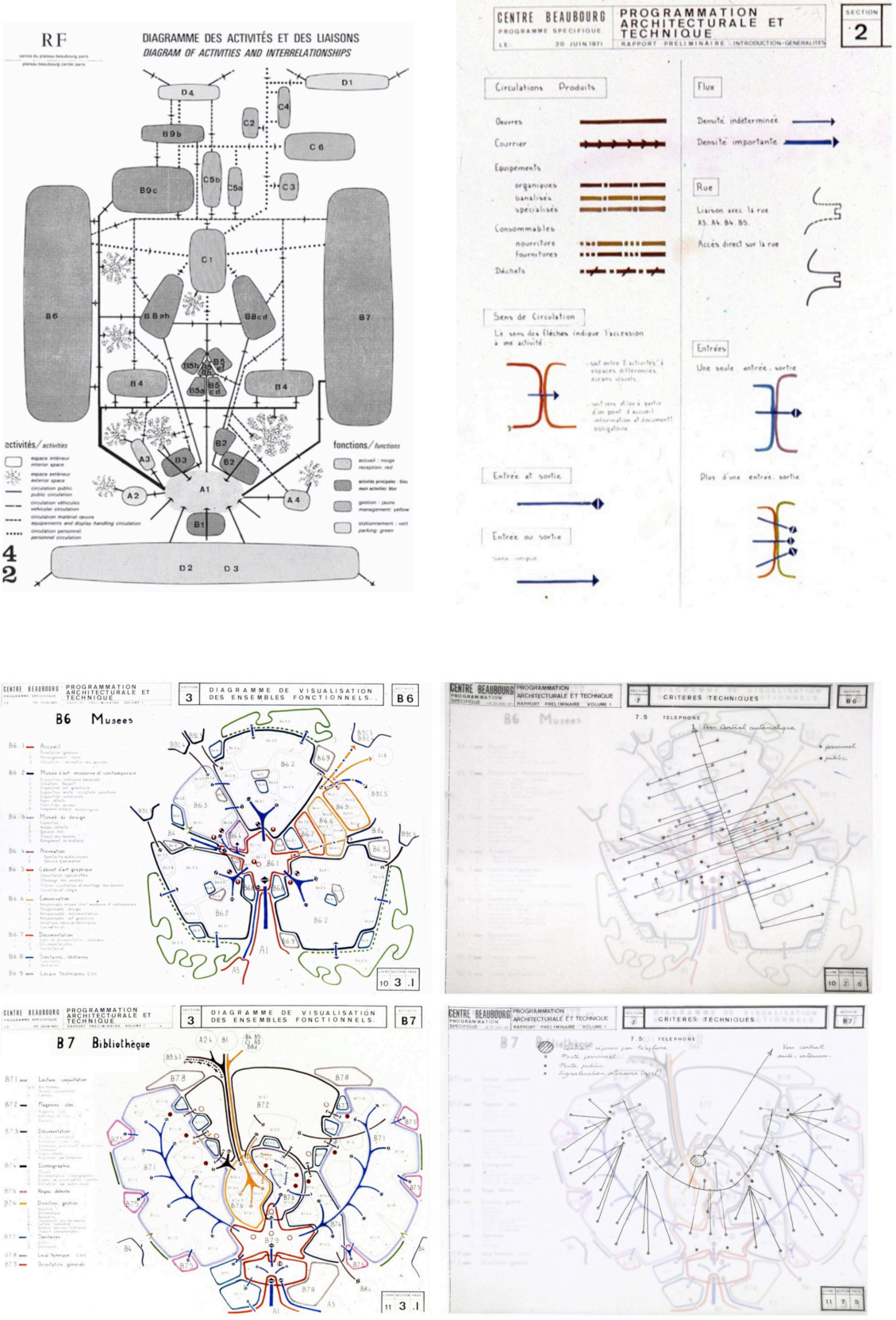

Figure 3. Top left: Competition brief diagram. Top right and bottom: Diagrams from the Livre Marron. Courtesy of Hélène Dano-Vanneyre.

had focused mainly on competition regulations, building code extracts, and site constraints, with the architectural program described in an abrupt single page of text. The 1961 Boston City Hall brief was considerably more detailed and included tables of space requirements and adjacency matrices but no diagrams, but the 1967 Amsterdam City Hall brief returned to the terseness of the Sydney program. All of these earlier documents resembled what British architects called the "briefing," a compiled list of spaces, arrangements, materials, budgets. In the United States, the AIA manual discussed such documents as early as 1920, but, as the programming innovator William Peña noted, early building programs were generally "without goals, concepts, and a problem statement" and so were neither synthetic nor strategic.[10] In contrast, the Beaubourg brief was not only detailed (specifying, for example, the precise performance requirement for flooring, and the exact model of the institution's mainframe computer system) but also explicitly strategic in that, as Lombard later recalled, it rejected existing institutional structures in favor of "a purely functionalist and structuralist definition."[11] This was clear from the document's principal program diagram (Figure 3 top left), which showed the museum and library—what Lombard called the two great nerve centers of the Beaubourg Center—connected by a network of smaller functions, a representation of "the 'biological' equilibrium of the Centre."[12]

At that time, this biological metaphor would have been understood, in cybernetic terms, as part of a larger conception of the building as an information processing machine. The brief first focused, Lombard later explained, on the needs of the visitor and the multiplicity of activity that would be offered. "This is how, little by little, the idea of stacking and integrating information sources at different levels took shape: topical information, permanent information, thematic information, specialized information."[13] All of this organizational innovation was supported by a computational and audio-visual infrastructure: Beaubourg was the first cultural institution to use these new tools and so the brief specified the latest IBM 360 computers as well as the closed-circuit television systems required for surveillance.

LIVRE MARRON

With the competition launched and the competitors busily working on their entries, programming turned to the preparation of the *programme spécifique*, or detailed program, the document to be given to the winning architects and engineers to produce the definitive scheme used for construction bids. Lombard and Molins now worked full time on the project. The next steps consisted of two phases: the first involved working closely with administrators and department heads to define the detailed objectives for all activities within each department, and the second involved the writing of a performance specification for those activities in a language comprehensible to users and designers alike. Administrators were asked to analyze their own departments as "functional ensembles," and to model their internal processes as a set of sub-systems using a detailed questionnaire template and the same graphic language used by Lombard and Molins. Programming then used this documentation to develop a performance specification for each department to be integrated into the master program document, an enormous binder nicknamed the Livre Marron.

The graphic work produced for this document was strikingly inventive, particularly the diagrams drawn by a young Hélène Dano, later head of architecture at the Quai Branly museum (Figure 3). The Livre Marron used a two-pronged graphic strategy. First, topological diagrams described the functional sub-systems that made up each department. They described the connections between these sub-systems using a taxonomy of material and immaterial attributes of interfaces, the invisible protocols governing administrative and social behavior, along with their reification through visual, acoustic, and physical boundaries of varying degrees of permeability. Second, flow diagrams examined the movement of objects and information through those same functional elements. In some instances, homologous systems such as telephones and computers were drawn on translucent vellum sheets that could be overlaid onto the sub-system diagrams. The resulting images constitute a fully architectural design system, involving conventional disciplinary concerns such as symmetry, part-to-whole relationships, pattern, typology, and even the pure pleasure of drawing.

METAMODEL

Returning to Lombard's IRIA symposium presentation one might reasonably ask how exactly programming at the Centre Beaubourg can be understood as computational. The most straightforward answer is that programming was above all a technique of information collection, organization, and communication. Early studies of architectural computation list programming as a potential domain of application for computerized databases,[14] and in 1981, an AIA guide to programming argued that programming is in essence an information processing system since it involved the collection of data followed by its organization and communication as information.[15]

A second answer can be found in Lombard's insistence on a graphic method based on the composition and decomposition of interrelated sub-systems. There are fundamental differences between the Livre Marron diagrams and the simple spatial adjacency diagrams that were already a part of architectural programming's toolkit. Adjacency graphs were topological representations of rooms and static relationships between them; in contrast, the Livre Marron drawings showed interrelated operational sub-systems, not spaces. And while earlier spatial relationship graphs showed static structures that could be described by tabular data, the Livre Marron deployed a detailed syntax and semantics for describing movement and flows. Such notational systems were already used in design methods research and were well-known. The September 1969 issue of L'Architecture d'aujourd'hui, for example, published a translation of the 1961 article by American researcher Philip Thiel demonstrating an elaborate language for kinetic spatial notation akin

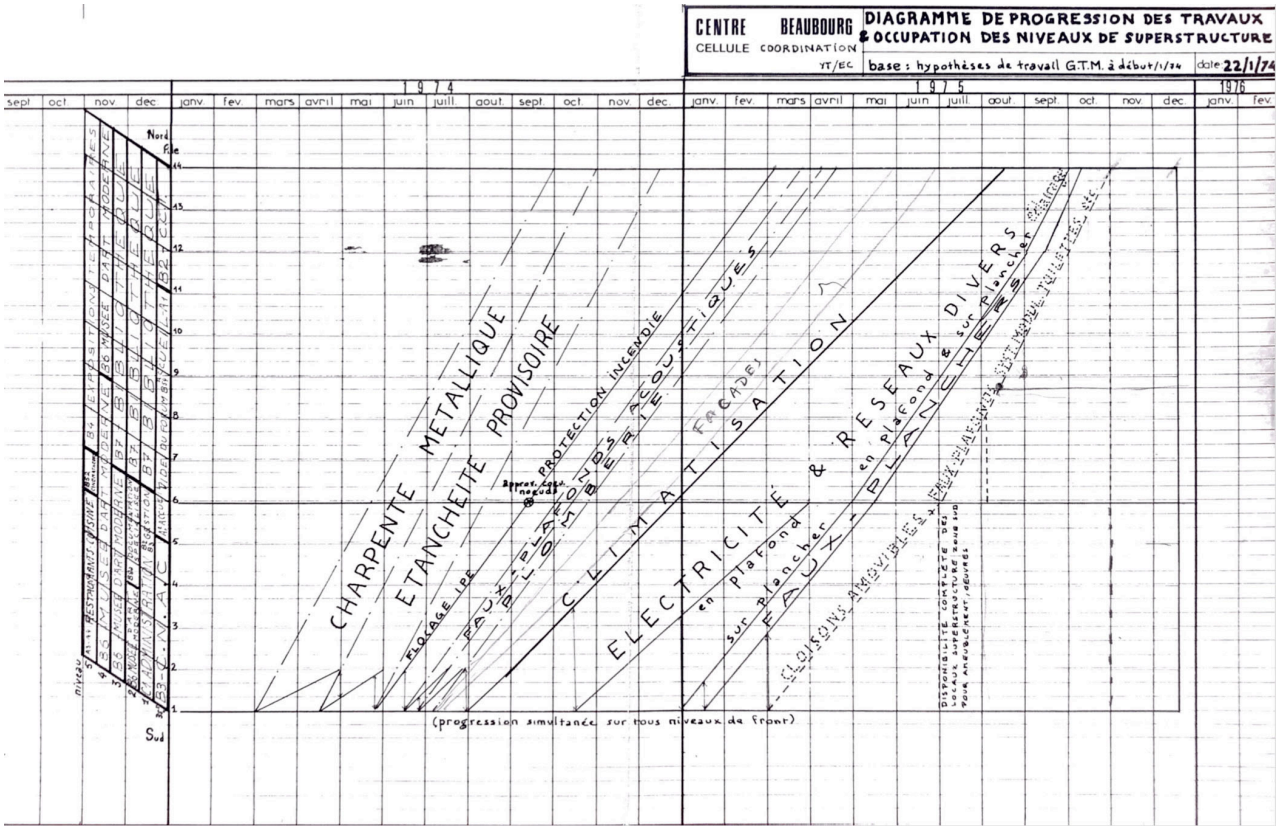

Figure 4. Construction timetable, Programme spécifique. Archives Nationales.

to the one developed by the sociologist Edward Hall.[16] Finally, the sub-systems diagram, like all network graphs, was literally computable. While Lombard's diagrams never reached the stage of actual computability, we can see an example of their potential in, for example, Milne's computable clusters.[17]

The third and most important way in which programming's methods can be understood in computational terms is that both programming and computation involved the design of metamodels. In other words, the act of modeling the requirements of a building simultaneously modeled knowledge about design. As its organizers stressed, the IRIA symposium, as well as IRIA itself, had focused on fundamentals of new knowledge, not merely automation. The decade that followed saw the birth of software engineering and the emergence of design formalisms for large information systems. Indeed, nobody before this point used the term "design" to apply to the making of software. As computers became more powerful and their uses wider-ranging, the complexity of its design problems quickly grew. In response, engineers proposed a formal object-oriented method to replace the improvisational and ad hoc approaches on which these practices had until then survived. These methodologies, all of which relied extensively on novel graphic representation, allowed the software engineer to work entirely within the metamodel, not in code, and to develop around them an autonomous body of practical and theoretical knowledge. In France, the MERISE methodology offered a characteristically managerial vision of object modeling for system design, including typologies of patterns of interaction within an organization.[18]

What started as personal obsession soon became the law of the state. The programming group's work played a central role in reforms to the procurement of public buildings in France, resulting in a 1973 law (Décret 73-207) requiring a formalized process for the awarding of projects, and in 1985 the law Maîtrise d'Ouvrage Publique, which mandated the standardization of programs for public buildings and officially recognized programming as a profession. But in the years around 1968, the notion of reform itself was added to the long list of things to worry about. In June, the students at the Ecole des Beaux-Arts wrote a manifesto that agreed with the top-down changes proposed by the state in substance if not in method. While the students affirmed the new curricular direction—to recast architecture as a social science—they criticized the erosion of architectural autonomy and self-determination implied in what they called the "pseudo-reforms emanating from the work of the 1967-68 commissions. […] Students, along with their instructors," they protested, "wish to be masters of their own education."[19]

A decade later, after the opening of the Centre Pompidou, suspicion of the heavy-handed administrative control latent in the bureaucracy of reforms and explicit in the technocratic systems such as programming boiled over. In a 1978 television program produced for the Open University, the art critic Michael Baldwin sneered that the Centre could only be understood as "a synthetic product of directorial paranoia and lightheadedness in the face of the experiences of 1968. It is a symbol of and instrument in an administrator's perception of high culture and an administrator's conception of the masses."[20] The building, he went on, is in essence "a symbol of consensus articulated in the aesthetic language of security systems." Jean Baudrillard offered a similar complaint: "[Beaubourg] is a bit like the real danger nuclear power stations pose, not lack of security, pollution, explosion, but a system of maximum security that radiates around them, the protective zone of control and the deterrence that extends, slowly but surely, over the territory."[21]

Both of these critiques, however, relied on the same distinction between administrator and masses operative in the systems of domination they attacked, and were thus already outmoded by the time they were written. Earlier, Lombard unintentionally pointed this out by placing the building's administrators under the same regime of programmatic control as its visitors. An advertisement in the 1977 issue of the journal *Crée* dedicated to the opening of the Centre Pompidou could not be clearer on these new conditions: promoting the Thomson-CSF closed-circuit television systems installed at the Centre, it simply declares, "Color television for [artistic] production, black-and-white for protection."[22] Like these cameras, programming strove to make the totality of the building's activities yield to information, as a diagram from later in the process eloquently makes clear. Along the left we see the form of building itself absorbed into a construction schedule for various trades (Figure 4). Vast structural components are reduced to markers of increments of time, concealing the labor and the raw material necessary to this process. Despite the creativity of this drawing and the system of which it was a part—and it was indeed an act of profound architectural creativity—it nevertheless asks us to reflect on whether its administrative response to its conditions was adequate or appropriate to the changes demanded in 1968. As we can now clearly see, information technology will dominate human enterprises not from above (as Godard worried in his 1965 film Alphaville) but from within by exposing the informational traits latent in everything. Lombard may have been right when he argued at IRIA that such thinking was a prerequisite to computational design activity, but as everyone now knows, it also became one of the principal systems of domination in the decades that followed.

ENDNOTES

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11. Lombard, "La longue aventure du Centre Beaubourg," 103.
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22. Crée, no. 46 (February 1977): 18. See also Gilles Deleuze, "Postscript on Societies of Control," October, no. 59 (Winter 1992): 3–7.