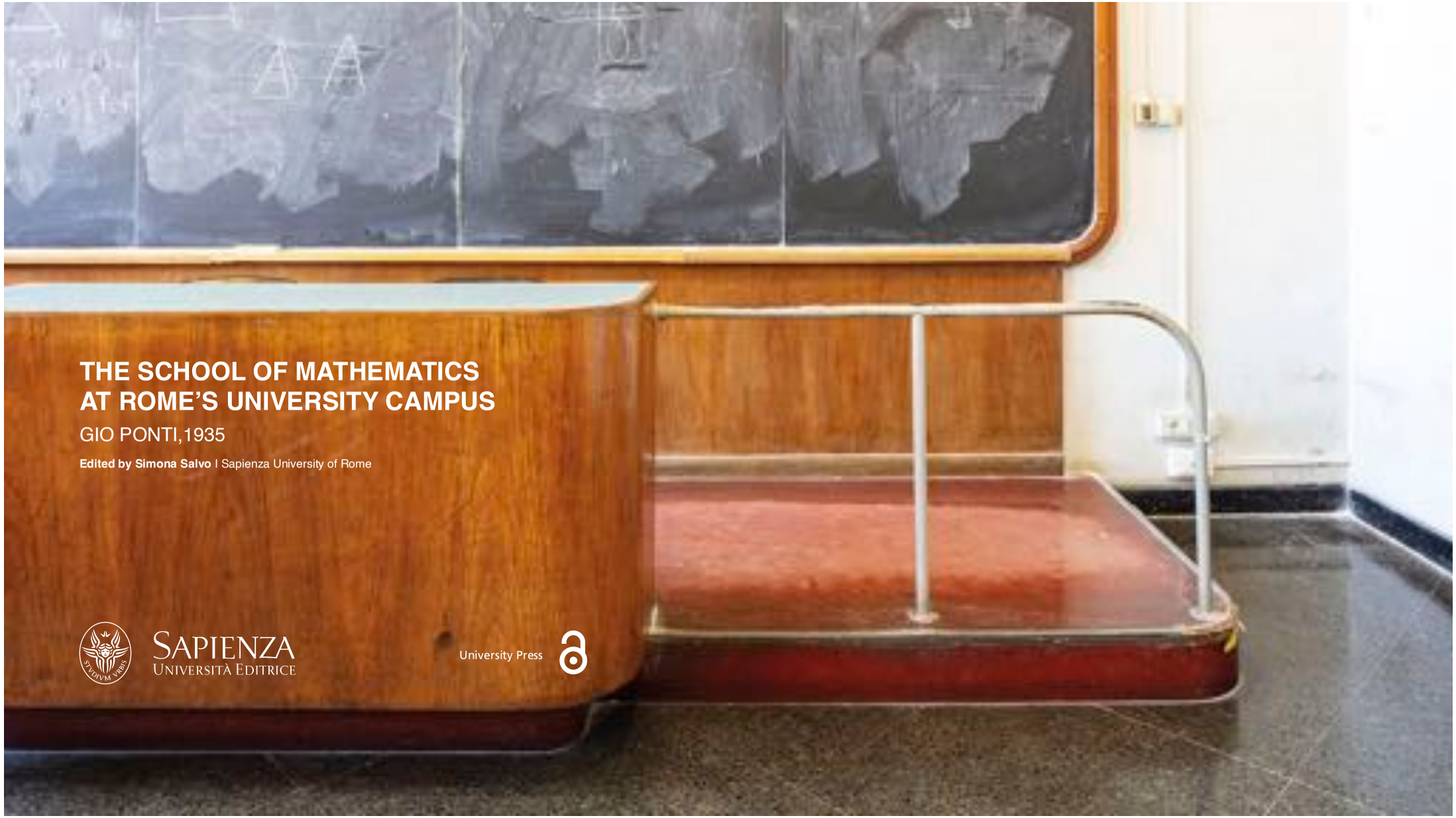

THE SCHOOL OF MATHEMATICS AT ROME'S UNIVERSITY CAMPUS

GIO PONTI,1935

Edited by Simona Salvo | Sapienza University of Rome

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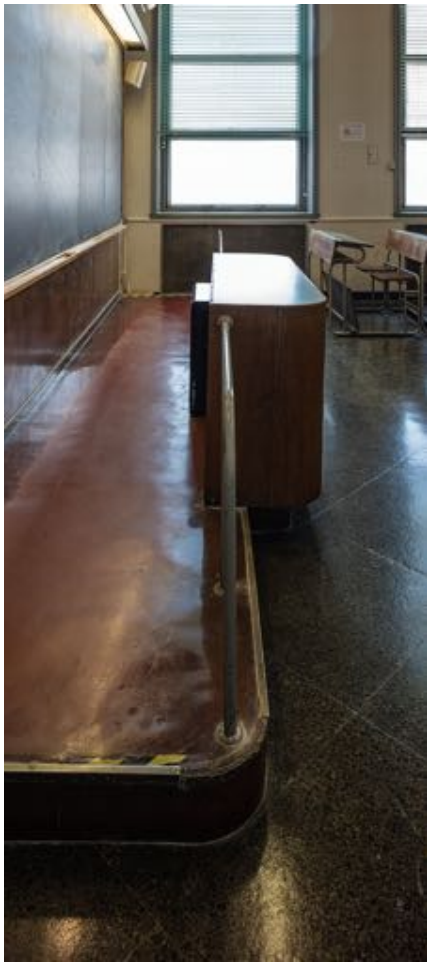

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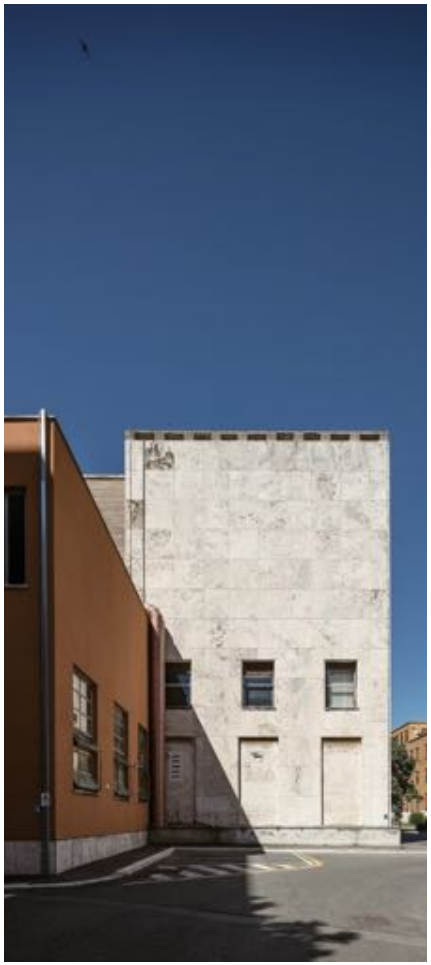

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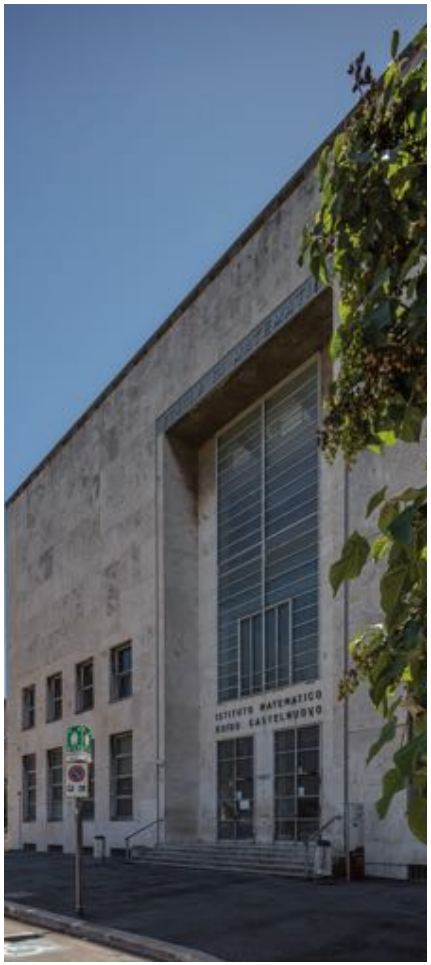

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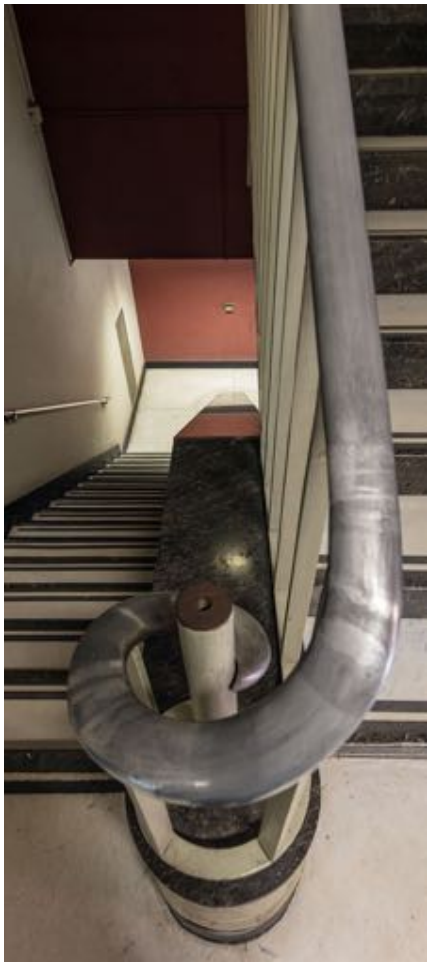

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FOREWORDS

Antonella Polimeni
Rector of Sapienza University of Rome

The three-year research project on the School of Mathematics building on Sapienza Main Campus is the result of a strong collaboration between scientific institutes and Sapienza departments. It is not the first time that this building has attracted the attention of scholars, architecture historians and specialists. It is, however, the first time that an interdisciplinary working group has dedicated energy, time, and scientific expertise to integrate the study of the building's history with a structural survey, analysis of materiality and evaluation of its current state.

A team of more than twenty-five researchers, scholars, students, consultants and experts has worked continuously – uninterrupted even by the pandemic – joining forces to afford a transdisciplinary glance at this impressive work of architecture.

The School of Mathematics is a masterpiece of the early 1930s by Gio Ponti, who is today regarded as a master of Italian Modernism. Although World War II bombings shattered the coloured stained-glass window that once adorned the balanced and harmonious white travertine façade, the building remains a striking and significant piece of architecture. Although it underwent a series of transformations over the years before its historical and artistic relevance was recognised, it can still be appreciated and admired for its magnificent expressivity. Its uniqueness derives from its complexity, such as is often found in Italian monuments of all ages: a rare synthesis of urban design, architecture, art, industrial design, historical archives and – perhaps the first of its kind – scientific production in the field of mathematics.

This illustrated report is a synopsis of the extensive technical research documents produced by the research team for each step of the work. It is also a premise for the conservation management plan proposed at the end of the full report. As in any area of science, knowledge is at the basis of future action: we need to understand today how to take care of the historical buildings of our campus tomorrow – buildings recognised worldwide as architectural and historical monuments.

We are very grateful to The Getty Foundation for its support for this initiative, which in turn depends on our researchers' expertise and commitment. We fully recognise the importance of drawing the interest of international specialists in architectural conservation to this specific building, one of Gio Ponti's most significant masterpieces of which Sapienza's community is proud.

This research project thus occupies a special place in the process of recognition of an Italian master builder, as well as in the context of the conservation of modern architecture. The care and preservation of our campus, and many other urban ensembles built in Rome during the first half of the 20th century, are part of this wider framework.

The management, upkeep, and conservation of a university campus and even more so of Sapienza's "Città Universitaria" must achieve a balance between a range of needs, from functionality to the expression of the academic community's cultural identity, while meeting safety requirements and satisfying the ever-growing demand for technological upgrading, in terms of energy efficiency and standards of communication. Today, we know that every step taken in transforming the campus buildings – particularly the School of Mathematics – deserves a cautious approach based on the awareness of their value and a thorough survey of their current condition. However, we are also confident that Sapienza can count on all the necessary expertise, skills, tools and staff needed to trigger an ethical approach, capable of responding to a variety of demands and offering advanced and solid solutions.

We herein bring together the conclusions of the work developed by the interdisciplinary working group that has collaborated on this report, with a commitment to further research this topic. The aim is to highlight that knowledge should precede and support every transformation, especially in advanced cultures that should rely on the lessons of the past to build the future.

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Isabeau Birindelli
Director of the School of Mathematics

Mathematical buildings, building mathematics- For many centuries Mathematics was a branch of Philosophy and at some point, it became an instrument to be used by physicists, engineers, and other scientists. Not until the XX century did it acquire an autonomy, a status of independent science. It is difficult to pin the precise moment when this happened. The fact that mathematics is a branch of science and not just a useful tool for science and engineer is by no means a foregone conclusion.

For example Luigi Cremona, a great mathematician with an essential role in the reform of the universities in the end of the XIX century, was called to the University of Rome in 1873, where he founded the "Royal School of Engineers" by unifying it with the "mathematical section" of the Faculty of Sciences, which would have been the primitive nucleus of the Istituto Matematico, later named after Guido Castelnuovo, hosted in the "Scuola di Matematica" by Gio Ponti. Until 1920, even in Göttingen, that had been the university of Gauss, and which appointed the greatest mathematicians of the world like David Hilbert and Felix Klein, there was no Department or Institute of Mathematic, as the mathematicians were members of the Philosophical Faculty. In 1926 Courant and Klein, not only created the Mathematisches Institut but, maybe for the first time in history, endeavoured to obtain a building dedicated to mathematics. However, for the construction of the Mathematisches Institut in Göttingen, Courant had to ask for funding from the Rockefeller Foundation.

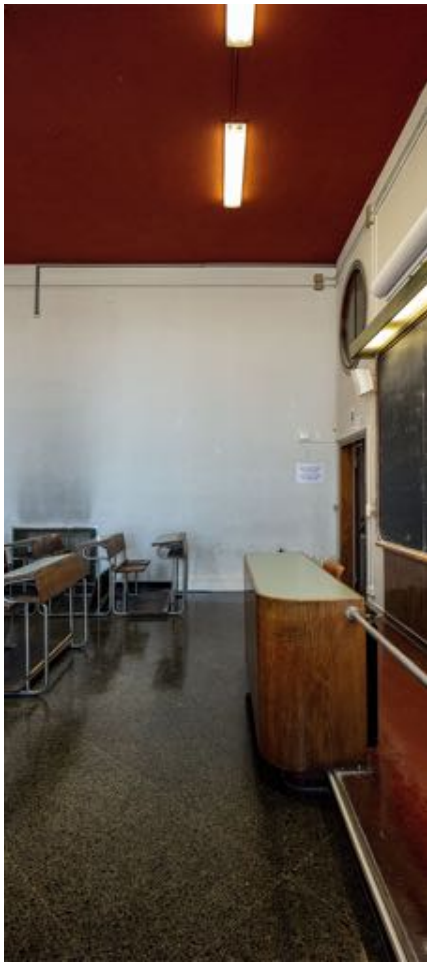
The endorsement allowed not only the construction of the building but the appointment of many mathematicians. This made Gottingen the dream come true. According to those who lived there in that period, nothing before or after could be compared to that golden period. As it is well known, within a few years this miracle was destroyed by the Nazis since most of the great mathematicians there were Jews. Nonetheless, in the meantime, this incredible success led to the foundation of other "Mathematics Institutes" in Europe, as in the case of the Institut Henri Poincaré (1928) in Paris also funded by the Rockefeller Foundation.
Of course, another important pole for mathematics in Europe was the School of Rome that included Guido Castelnuovo and Tullio Levi Civita, to mention two names among many. In the vision of the new campus, the idea of dedicating to mathematics a whole building, located in a key point of the città universitaria, was the proof of an incredible foresight, considering that Italy, at the time, was dominated by the philosophical views of Giovanni Gentile, who thought that natural sciences and mathematics were second order subjects since they had no universal value and had their importance only on a professional level.

Considering that when the Scuola di Matematica was planned, there only existed two buildings dedicated to Mathematical Institutes in Europe, in Göttingen and in Paris, it is important to consider how these had been shaped. The building in Gottingen was designed by Werner Seidel but under strict control of the mathematician Neugebauer. Neugebauer insisted on the importance of the presence of a great library where mathematicians could study and find the necessary references. This was also true for the Institut Poincaré that had a very rich library having inherited the part of the Sorbonne library dedicated to mathematics funded by Darboux and Appell.

The great novelty of the Scuola di Matematica by Gio Ponti consists in the fact that the architect prevails on the mathematicians. Nonetheless, also in Rome, Ponti dedicated a great part of the building to the library around which the entire building is conceived.

Another similarity is in the fact that the library has inherited a great part of the books of the library of the Royal School of Engineers, in particular its historical collection which included about 2500 works published between 1482 and 1830. The most valuable editions are those between the XV and XVIII centuries: nine incunabula, 140 XVI century, and precious editions of the XVII and XVIII centuries.
In conclusion, as Head of the Mathematics Department "Guido Castelnuovo", I wish to emphasise that, albeit the terrible laws against jews had destroyed most mathematical schools in Europe, and had wiped out the Scuola di Roma, Sapienza's Mathematical Institute has somehow recovered after the Second World War. The Department now includes more than 80 professors and researchers, many visiting scholars, it publishes the journal "Rendiconti di Matematica" and organises regularly international conferences and colloquia. The professors of the department teach in the whole of Sapienza and are invited in the most prestigious universities and research institutes. The department is usually the first or second mathematical department in Italy in the international ranking, such as QR ranking or Shanghai ranking.

I deeply believe that the beauty of the building where our research in mathematics takes place has contributed to its success. I therefore rejoice in the fact that the Getty foundation has financed this important research, which is hopefully the first step to maintain the beauty of Ponti's building without destroying its original aim: giving a beautiful home to mathematics and mathematicians.



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Carlo Bianchini
Director of the Department of History,
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The School of Mathematics in the Città Universitaria
There are moments in life in which what has always been impossible suddenly becomes possible. Generally referring to the lives of human beings, this remark can occasionally fit also the life of a building like the School of Mathematics by Giò Ponti in the Città Universitaria of Sapienza University of Rome.
It would not be appropriate (and far too long) describing here in detail the evolution of such a masterpiece of rational architecture also because these pieces of information would be found in other sections of this paper. Nevertheless, I would like to explain how and at what level the mentioned impossible is turning into possible.

After the end of World War 2, for many decades, the whole compound of the Città Universitaria has undergone a sort of cultural and political rebound. Any reference or symbol to the fascist era that had designed and implemented the campus' project must be either obliterated through overwriting or removed or consciously ignored. This unspoken directive, while on one side has determined "re-arrangements" (as in the case of Sironi's fresco in the Aula Magna), on the other has somehow demoted the value of many buildings inside the Città Universitaria. This cultural (and in some cases even ideological) program appears now clear and even reasonable at a certain extent: the buildings had to be regarded as buildings. In other words, they had to lose their symbolic and cultural reference to fascism and become physical containers of educational and research functions. The 60's, 70's and most of the 80's of last century represent the "golden age" of this way of re-thinking the Città Universitaria.

The result of this long and troubled period crossing the '68 and the so-called Years of Lead, has been a substantial loss of any reference to the original architectural value of the original buildings that paved the way to incoherent, uncontrolled and sometimes damaging interventions either for adaptation or extension reasons. These wounds can be easily appreciated just walking around the Città Universitaria and looking at the flourishing emergency stairways around the Aschieri's (Chemistry) and Pagano's (Physics) buildings or the unapparent destruction of Capponi's (Botany) masterpiece.

In the same period in which most of these "adaptations" were performed, the seed for a change was starting to sprout. The strong, sound and original Italian way to restoration of architecture was in fact growing fast and in a short while was able to provide a consistent theoretical and operational approach not only for ancient buildings but also for "modern" ones. The term "restoration of modern architecture" born around the end of the 90's intended to embrace in fact a special category of buildings being on one side the product of the modernist culture, on the other artefacts built using the "new" steel and concrete technology.

Even if an increasing number of researchers and scholars have chosen rationalist buildings for studies in the last three decades, this cultural/operational preparation was not enough though to determine effective changes on the buildings of the Città Universitaria. The actual situation was in fact very tangled: on one hand the responsibilities were too spread among different offices not so inclined to share information, on the other there was not enough coordination between the inputs of the University Governance and the technical implementation of activities.

This phenomenon was not necessarily a responsibility of the different actors involved in the process but more the result of the many (sometimes contradictory) changes that have affected the Italian university structure at least in the last 20 years and especially after the 2010 reform that has strictly separated the academic functions from the managing ones.

For these reasons, when supporting prof. Simona Salvo in the application of the project for the "Keeping It Modern" initiative, I was pretty sure that many of the foreseen results would certainly display "on paper" the consistency and value of the method applied to the School of Mathematics but have very little chance to come out of the drawer were they would have been stowed.
On the contrary, while writing this presentation at the end of the project, I must acknowledge that "impossible is turning into possible" if not even to "probable".

Once hardly to even conceive, the status of monument of the Città Universitaria compound and of its buildings is now to be considered commonplace both for Sapienza community and its Governance. Such so, that we do find in the Governance board a Deputy Rector for the Patrimonio Architettonico (Architectural Heritage). This new approach has also influenced the "intervention/managing workflow" actually establishing a strict coordination between the technical structure of Sapienza (Area Gestione Edilizia – AGE) and the Deputy Rector and his supporting group of experts. The sensation is like as everything was ready for rearrangement, accomplishing a process that has been growing for decades. The School of Mathematics project funded by the Getty Foundation has been for sure one significant driver for this movement to begin.

In this framework many projects are starting and others are about to start but the School of Mathematics' one is definitely the first of the list. The Getty Foundation funding has in fact worked in this case as a trigger: on one side it has demonstrated the feasibility of the knowledge/assessment workflow needed to deal with modern monuments; on the other, thanks to the Conservation Management Plan, it has outlined a clear and sound framework for appropriately considering the different issues coming from the living body of the building.

But, more than all the remarks presented so far, one "detail" must be considered as the more outstanding result of this complex project: Sapienza has decided to invest more than 1 Mln € for further investigations and first interventions: what a best result for the School of Mathematics, Gio Ponti, 1935 Project?

I.
RESEARCH AS A MEANS OF CONSERVATION

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MAKING SCIENTIFIC RESEARCH POSSIBLE. THE GETTY FOUNDATION FUNDING AWARD AND THE "KEEPING IT MODERN" PROGRAM

Simona Salvo

We only have our civilization to save our civilization.
Gio Ponti, 1940

As part of the 2018 "Keeping It Modern" program the Getty Foundation of Los Angeles funded a two-year research project on the School of Mathematics at Sapienza University in Rome. The grant was an unprecedented opportunity to perform interdisciplinary research on the building and identify the guidelines for its conservation over a period of time. The scientific and cultural support provided by the philanthropic North American institution, together with its generous economic incentive, made the cross-disciplinary and multiscalar investigation possible, quite apart from other contingent situations, placing this research and case study within the international scenario of the conservation of modern architecture.

The results of this research are probably neither groundbreaking in terms of historical discoveries – no unexpected document or historical drawing was discovered in the archives – nor did it identify dramatic vulnerabilities or damages to the building, peculiarly resilient given its almost 90 years of intense working life. Instead, the research has highlighted the little attention paid so far to this building (and to the entire University campus), treated pragmatically and considered only for the possibilities it offers for transformation, adaptation and development, rather than for its historical, artistic, and cultural importance. Conservation, preservation, and respect for this and other buildings on campus are undoubtedly a goal for the academic community, but remain wishful thinking without producing any substantial progress because they clash with the ever-growing requirements of intensive use and functional adaptation.

Figure 1 - The professor's lounge, now 'Aula Ponti', partially restored after interventions in 2011-2013 (© Sardo 2021)

As a result, apart from the scientific achievements and in-depth data collected during this research, the study was an opportunity to measure the discrepancy between the historical and artistic importance of the building and the interest rate incurred by public institutions on the sums borrowed for its conservation- including the University, the Municipality of Rome and the Ministry of Culture; the discrepancy also reflects the distance between the propensity to support the mere use of this building instead of its preservation and conservation, in view of its best and complete fruition.

Rome's University campus is not an isolated case. This kind of treatment is also reserved for other modernist urban ensembles in the Capital, namely the E42 district (now EUR) and the former 'Foro Mussolini' (now 'Foro Italico'), that play a crucial functional role within the city, but are also heritage sites in the full sense of the word. Yet, in the case of the University campus, it is a burning issue for us academics. The goal of researchers and scholars- especially those who perceive the historical value and architectural qualities of the university buildings and are willing to perform scientific research to preserve them- clashes with the mission of public and governmental institutions which has been based, at least till now, on a free, pragmatic, and uninformed approach. Hopefully the data gathered by this research will trigger a change, leading to a better future and optimal collaboration at all levels in order to conserve, preserve and enhance our common heritage.

Scholars in the field of architectural conservation, especially those based at Sapienza University, have always shown enormous interest in the School of Mathematics. This research continues, develops, and broadens a previous study triggered in 2010 by the Director of the Mathematics Department, Vincenzo Nesi, in support of limited interventions on the building based on historical data[1]. At the time, the objective was to gather scientific data with a view to reorganizing the building's interior and provide the best possible use of spaces whose architectural significance had become indecipherable due not only to continuous adjustments and transformations over a period of time, but also to the accumulation of files of documents and other furnishings everywhere in the lobbies and corridors. Archival research, surveys, and specific studies were performed between 2011 and 2013; the skylight above the library reading hall was waterproofed, the roof underwent general maintenance, and the layout of the corridors, offices and other spaces were rearranged, first and foremost the so-called "professors' lobby", which had been radically altered in the Fifties[2].

The link between research / knowledge / appreciation / intervention in that early experimental project heralded a conscious and respectful approach to the building, sensitive not only to a reinterpretation of its original condition, but also to a critical assessment of the alterations to Ponti's design. It is worth emphasizing that this early initiative, respectful of the building's architectural quality, was prompted by the academic faculty. Professors, scholars, and students who spent every day of their working life in the building, were able to perceive and understand its value perfectly. Surprisingly enough, decades earlier the Department of Mathematics had established a special commission for the décor of its headquarters, an initiative that no other Sapienza department has undertaken, until now. At that time, the authorial value of the project for the building to Gio Ponti certainly had less influence on the daring initiative to rationalize and reduce the office spaces in order to revive the monument.

The focus on the School of Mathematics undoubtedly increased thanks to that initiative; it highlighted new important cultural initiatives, e.g., the international conference held at Sapienza University marking the 80th anniversary of its foundation (Azzaro, 2017, 2018, 2019). During the conference, specifically on the evening of November 24, 2017, the lost stained glass window designed by Ponti and made by Fontana Arte in 1935 for the main façade of the building, was re-created by projecting its image on the current blank window[3]. This should be considered a pivotal event along the path to reappropriate and preserve the building: a performance that moved the audience, thus emphasizing the power of art and culture[4].

This is the viewpoint with which we look to the future, exploiting the long wave of fame lately regained by Ponti; we are fortified by the data collected in the past two years of research on the School of Mathematics, and hope that- in Ponti's words- *our civilization will save our civilization.*

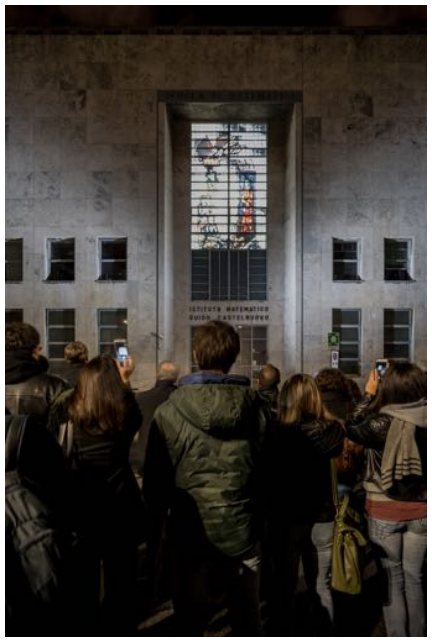


Figure 2 - The re-creation of Ponti's stained glass window obtained by projecting the original image on the current window (© Lanzetta 2017)

RESEARCH ON THE SCHOOL OF MATHEMATICS AT THE TIME OF GIO PONTI'S REVIVAL

Simona Salvo

A first spotlight had been shined on Ponti's works two decades earlier when the Pirelli Tower was restored in Milan, sparking interest in the master's artistic and architectural production, especially during the post-war years. Its conservation between 2002 and 2004 was undoubtedly a turning point in the re-evaluation process, not only because it was aesthetically and technically innovative, but also because it triggered many historical findings. Above all, that experience reaffirmed the strong cultural link that critical assessment establishes between architectural history and the scientific analysis of the built fabric, in view of its appreciation and conservation. The unprecedented opportunity of working 'with an open heart' and dismantling a stretch of the building's curtain wall envelope piece by piece, was a crucial step in order to motivate and support the decision-making process, and consequently the material conservation of the curtain wall. This opportunity once again proved that direct, scientific and hands-on knowledge is vital to initiate a process of disclosure and appreciation of cultural properties, and establish a positive cycle.

In fact, the history and restoration of the Pirelli Tower is directly linked to our research on the School of Mathematics, not only because it involves two of Gio Ponti's most important works, but because that first experience led to the cultural recovery of his works in Italy and abroad. In April 2002, the Pirelli Tower- with its wounded and mutilated façades and structure due to a dramatic accident- captured international attention. It was then that the final decision was taken to preserve the original curtain wall. A meticulous study had revealed the extraordinary historical and technological importance of these façades, thus helping to critically understand the "object" and provide scientific data for the decision-making process. The urgent and politically relevant project was followed by a very broad national and international public: but the stakes were obvious, and the historical value of the façades was undeniable at that point.

Scientific knowledge, appreciation, urgency, and a certain pragmatism magically merged and evolved into a virtuous experience. The work performed thanks to the very courageous choice to preserve the original metal and glass curtain walls- a completely new and untested intervention- involved an exciting, pioneering experience that welded traditional Italian restoration theory to ultra-modern construction technology.
Apart from the many intriguing aspects of that work- ranging from a strict analysis of the residual efficiency of a late Fifties curtain wall system to the very difficult and unprecedented regeneration process of the metal frame of the building envelope (Salvo, 2007, Salvo 2014)- the project highlighted Ponti's magnificent and ingenious architecture, encouraging both specialists and the public to focus on the figure and work of a master of Italian architecture, who had so far been underestimated as an industrial designer.

Notwithstanding this renewed attention towards Ponti's production, the works he did in the Thirties were still on the backburner and, of all the projects he designed during the years of the fascist Regime (1922-1943), the School of Mathematics was the least considered, despite the fact it was a high point in Ponti's production: it was his first non-residential building, his first important, publicly commissioned project, his first important commission in Rome, his first work for the Regime, his first construction in a newly-built urban context, and his first professional opportunity after the end of his partnership with Emilio Lancia, which took place in a certain cultural context; this development allowed Ponti to occupy a nationally and internation-

Figure 3 a,b - The Pirelli building in Milan in 1960, and after restoration work (© Paolo Monti, BEIC Milan; © Salvo 2006)

ally acknowledged role. The project was undoubtedly a turning point in the career of the forty-four year old Ponti.

Despite the fact that historiography (and public opinion based on historiography) has not considered them in the same way, the Roman School of Mathematics and the Tower in Milan are equally representative of his architectural poetics, notwithstanding the fact they are considered in an antithetical position within the current critical interpretation of Ponti's work. The School of Mathematics has been protected by law since 1989, while the Pirelli Tower has never had monumental protection; the former belongs to an apparently specific historical period, while the latter is part of an architectural era that is still under-explored; the former is largely ignored by specialists and by the public and has been subject to multiple alterations, while the latter is considered an icon of the Sixties. And yet, the two buildings express just one idea of artistic creativity, namely Ponti's architectural concept developed in XX century Italian culture.

Rome's School of Mathematics has remained one of Ponti's least considered works and certainly the least studied, until this research5. This fact testifies to the complicated historical-critical positioning of Ponti's early works, probably due to his unclear cultural role during the years of the Regime and his ambiguous relationship with the fascist commission. Although this situation has constantly evolved, and his work is today superlatively appreciated and considered a cult, his projects in the Thirties and Forties, especially the public commissions he received from the fascist Regime, continue to be underestimated and sometimes ignored, leaving the critical issue unsolved. The decades during which the Duce held sway over the fate of the country- the so-called 'Ventennio'- have represented a "hard rock" for Italian architectural historiography, which has long been influenced by a political and ideological interpretation of the architectural production of that period.

Moreover, except for several studies based on the visual analysis of the building and a rather repetitive bibliography, this architectural work has been set aside due to a rather "Milan-centric" historiography of Ponti, as well as by Ponti himself, who rarely mentioned his Roman projects[6].

Ponti and his artistic production have certainly gained a key role within the powerful current, ongoing cultural process that has sparked broader interest in the man and his artistic and architectural works, as well as his cultural role in XX century Italian culture. Lately, attention for his work has grown exponentially, accompanied by a flourishing series of cultural initiatives celebrating his profile as a refined artist and multifaceted intellectual, and his extraordinary skills as an architect, urban planner, writer, artist, etc.

Appreciated for his intellectual versatility and his open, optimistic and dialogic nature, Ponti lived through the XX century and made himself an interpreter of his age by imbuing his works with an all-Italian creativity. Contemporary culture inevitably tends to mirror itself in his dialogic nature, the search undertaken by a generation that gave its best by investing in ingenuity and creativity in the years after World War II. Consideration of Ponti's work and its critique was pushed to a point that was ostensibly the exact opposite to previous architectural historiography. The harsh criticism of the late Seventies opposed to his nature and his works, especially those of the Thirties, seems to have been put aside7. In fact, previous critical positions have been truly revised only recently; this is due to the wider chronological gap that separates today's scholars from the years of the dictatorship, allowing for a more detached and objective judgment. Monographic research currently underway on some of Ponti's most important works- and naturally this research on the School of Mathematics- represents an indispensable scientific and philological reference to which critical judgment should be anchored, within the ongoing historiographical re-evaluation process.

Ponti's exuberant revival in the last decade is documented in many exhibitions8, books, studies, and initiatives of all kinds, including an initial conservative attitude towards his works9; they are therefore to be considered a cultural phenomenon of our times, a sort of 'revival' that has also triggered a broader and deeper understanding of Ponti's production and, perhaps, also of its 'survival'.

When we applied for funding to The Getty Foundation in Los Angeles in 2018, the 'Ponti revival' had already begun in earnest, indicating that it was time to focus on his other works, even the more uncomfortable ones. The Getty Foundation's interest in Ponti's building in Rome is, one way or another, probably related to the conservation work on the tower in Milan; it is also inspired by a cultural objective: to shed light on an architectural episode that can be considered a pivotal moment in Ponti's entire career.

Today, historians of architecture consider Gio Ponti and his works as a very important subject; they have focused on the many different considerations inspired by the Master's exuberant nature. Ponti and the arts, Ponti and design, Ponti and architecture, Ponti and the city10, Ponti the demiurge who, nevertheless, continues to elude a focused definition and a comprehensive and final historical-critical interpretation: Ponti artist, Ponti designer, Ponti architect, Ponti urban planner, but also poet, writer, publicist, theorist, and practitioner. We are therefore idealizing this figure, perhaps attributing responsibilities and merits that Ponti deserved only in part, shifting the axis of critical consideration to an extreme that is the opposite of what it was two decades ago.

The materiality of most of Ponti's buildings have not yet been analyzed, and may be therefore considered 'unexplored'. On the contrary, those built in the Thirties have fallen even further behind the others, especially the ones commissioned by the fascist Regime, such as the School of Mathematics.

This research has therefore made the most of the experience accrued with the Pirelli Tower, placing material data at the center of the scientific-analytical interpretation. Notwithstanding the very different conditions of the two projects- an urgent intervention due to a dramatic accident in Milan, and a study to draft a conservation plan in Rome- both share the same theoretical and methodological approach based on a cross-disciplinary value assessment directly applied to the materiality of the building. In both cases, the urge for a conservative approach stems from the scientific awareness of the complexity and beauty of these artifacts, considered not only to be two of Gio Ponti's most beautiful works, but also historical documents, precious architectural pieces of Italian modernism produced in the first half of the XX century and the expression par excellence of the culture of that age.

This is why the focus of our work is the School of Mathematics- not Gio Ponti.

The current condition of the building, compromised but also enriched by its 85 years of intense life, history and memory, offers us the measure of times gone by; it forces us to hold onto the truth of constructed reality, to avoid clichés and the inaccuracies of remote interpretation and, as far as possible, to stop projecting contemporary cultural on memories of the past. Of course, this research is nourished by the critique and interpretation of Ponti since his death, but it primarily deals with construction; it takes note of the original physical consistency of the artifact, and its current condition, with all the possible limitations, given the fact that our understanding is far from absolute.

All in all, the greatest assumption acquired through this research is how much has not yet been understood of this- albeit 'recent'- building, and how much knowledge and material substance we have lost and will never be able to recover. For instance, it is certainly impossible to retrieve the 'original color' and original urban environment around the building, once metaphysically isolated and dominant in the context of the University campus.

We believe that research and knowledge about our past are the greatest means we have to encourage appreciation and awareness of the values at stake, for us as scholars and for anyone interested in this subject.

Figure 4 - Entrance lobby to the front building (© Sardo 2021)

This new experience has opened avenues of scientific and cultural interest that are worthy of being investigated further.

The achievement of a cross-cultural research to scientifically assess the importance of the building, beyond its authorial recognition- i.e. not only as one of Ponti's creations- is one of the objectives of this study. In redefining Ponti's profile as an architect it is therefore of primary importance to consider specific aspects tackled during the study. Ponti's project for the School of Mathematics provides clear evidence of the architect's genius, but it also bears witness to the expertise of many engineers, architects, clients, entrepreneurs, craftsmen, workers, artists, and technicians, etc., who contributed to shaping a cultural mosaic that allowed the "Ponti phenomenon" to take place.

This cultural, historical, and human mosaic requires careful analysis and evaluation and should be considered part of the hermeneutic process that will hopefully lead to a correct historicisation and appreciation of the building and, indirectly, to its protection and conservation.

We have invested more than two years of collective work in this cross-disciplinary research, exchanging points of view and information, but the building- its material truthfulness- has always been our focus and we have never ignored the 'human factor'. Appreciation, or misappreciation, embodies what the building currently means to society and individuals; it measures their respect and understanding, or their disrespect for, and sometimes even their rejection of this architecture, today, yesterday, and possibly tomorrow. Therefore, we have always tried to frame the School of Mathematics within the imagery of the students, the academics, the administrative staff, and the public in general, as we consider them the true stakeholders of our work.

On the other hand, in the words of Cesare Brandi11, we have always concentrated on the building's "physical subsistence" and this has led us to new interpretations. By adopting an interdisciplinary approach, comparing the construction with archival documentation- drawings and projects as well as technical and administrative records- we have begun to understand what the design drawings alone do not say, but also what mere observation of the artifact cannot reveal. Again, in Brandi's words, we have aimed at the philological interpretation of the form and the scientific analysis of matter, in order to operate a fully cognizant recognition of value.

The ultimate goal of our research has been to raise awareness of the values at stake, first of all in its 'inhabitants', academics, and students in Mathematics, and then Sapienza university as a whole, including the staff of the Technical Office responsible for the maintenance of the buildings, and of course Rome's residents and its national and international tourists. The focus has been to show that this admirable building may be enjoyed not only from a functional point of view, but also for its extraordinary architectural effects

Figure 5 - The School of Mathematics during the pandemic (© Sardo 2021)

GIO PONTI (MILAN 1891-1979)

Giovanni - called "Gio" - was born in Milan on November 18, 1891, son of Enrico Ponti and Giovanna Rigone. After completing his classical studies he enrolled in Milan's Royal Higher Technical Institute and graduated as a "Civil Architect" at Milan's Polytechnic in 1919, despite his much stronger passion for painting. The opportunity to visit the Palladian villas during World War I sparked his fascination for classical architecture, and prompted him to start a new architecture magazine called "Domus" in 1928, as well as entertain close contacts with the 'Novecento' artistic movement founded by Margherita Sarfatti and supported by Mario Sironi and Giovanni Muzio. After an intense apprenticeship in industrial design, to which he dedicated much of his life, Ponti began to collaborate with important firms that produce household objects; from 1923 to 1933 he was the artistic director of the Richard-Ginori company. This collaboration gave rise to a renewed production of very successful ceramic objects, proposed during international decorative arts exhibitions, the first of which was held in Monza in 1923. At the Paris Exhibition in 1925, Ponti was awarded the Grand Prix for porcelains.

At the end of Twenties he began to collaborate with the Venini glass factory in Murano, and in 1932 became creative director together with Pietro Chiesa of the Fontana Arte company, one of the main producers of artistic glass in Italy, a sector that was gaining momentum during that period. Starting in the Thirties glass windows played an important decorative role in Ponti's works, including in the School of Mathematics, and testifies to his tendency to merge all artistic expressions in a Gesamtkunstwerk. At this stage his interest in architecture was imbued with close connections to the manufacturing production.

In 1926, he began working with Emilio Lancia, obtaining commissions for many projects, mainly residential buildings mostly located in Milan. These domus or typical houses of the high-ranking Milanese bourgeoisie are the focus of Ponti's architectural research before the war, embodying the idea of dwelling as a means of aesthetic, social, and cultural expression through architecture. This early "Ponti idiom" developed between 1927 and 1933, merging painting with Milanese neoclassical architecture, thus defined a new architectural language strongly influenced by classical tradition linked to Vitruvius, Palladio and Serlio, and was renamed 'Novecento'. Villa Bouilhet, the "typical houses" and projects by the atelier "Il Labirinto", proposed a new idea of Italian design to Milanese clients. In the pages of "Domus", Ponti promoted a vision of architecture based on classical language, but ideated using advanced construction techniques and materials - such as concrete, steel, glass, and rubber - in search of an Italian way to modernity.

Ponti's popularity was at its peak at the end of the Thirties, when dictatorship became even stronger in Italy (1922 - 1943). He initially shared the Regime's initiatives by first joining the Fascist Union of Architects in 1933, and then in 1936 the Commission for the "Littoriali di Architettura", a national competition showcasing the best design achievements of young Italian architects. He participated and indirectly contributed to shaping fascist ideology, but kept his political distance from the Regime by adopting an independent architectural language marked by classical themes, defined as "Mediterranean" by Edoardo Persico (Persico 1934a); in fact he withdrew from the architectural controversy between traditionalists and rationalists.

In 1921 he married Giulia Vimercati, from a well-known Milanese family, who gave him four children: Lisa, Giovanna, Letizia, and later Giulio. In 1927 he completed his first house in Milan, in via Randaccio.

After breaking with Emilio Lancia in 1932, Ponti accepted public clients and began to design service buildings. The task to design the School of Mathematics arrived in 1932 from Marcello Piacentini - indirectly from Mussolini - and kept him busy for three years, together with a myriad of other commitments, probably due to Ponti's official enrolment in the National Fascist Party that same year. During that period, Ponti began to work with Eugenio Soncini and Antonio Fornaroli with whom he designed and built other typical houses and public buildings. Among these, Ponti alone designed the project for the "Liviano", the Faculty of Letters at the University of Padua, having been commissioned by the Rector who also entrusted him with the decoration of the main entrance to the Rector's Office. His artistic contributions are clearly visible not only in Padua, where he worked with Massimo Campigli on the huge fresco at the entrance of the "Liviano", but also in Rome where he constantly tried to sell the idea of merging art and architecture to clients, such as the government and the Vatican.

In 1930 Ponti joined the IV Biennale in Monza, becoming a member of its steering committee; he directed the Milanese edition in 1933 which became a "Triennale" from that year on. This prestigious role probably won him the "Mussolini Prize" (1934) for his contribution to Italy's production of manufacturing art as a result of the convergence between art and industry. But the most important commission Ponti received was in 1936, offered by a leading figure in Italian industry, Guido Donegani, who entrusted him, Fornaroli, and Soncini, with the prestigious project for the new Milanese headquarters of the Montecatini company, considered an example of functional efficiency and formal elegance.

During that period Ponti's activities branched out into various fields. Between 1941 and 1947 – when he distanced himself from "Domus" - which he was to direct almost uninterruptedly until his death in 1979 - he focused on "Stile," another magazine about architecture, industrial design, and artistic culture. He also designed costumes for the Teatro alla Scala in Milan and in 1936 became tenured professor of Interior Design at the Politecnico di Milano, maintaining this position until he retired in 1961.

Ponti trusted completely in progress and firmly believed that the future can only be better than the past. He was spontaneously open to any form of artistic collaboration, and was interactive by nature, promoting true cultural osmosis: the pages of "Domus" and "Stile" clearly serve as a venue where intellectuals could meet to exchange ideas. He stands out not only for his artistic and architectural production, but also for the extensive cultural activity he engaged in with extraordinary dedication and coherently with industrial development in Italy. Such qualities originate in his strong artistic sensibility, his outstanding intellectual skills, and a profound religious faith that marked his everyday life, together with proverbial optimism, freedom from partisanship and sectarianism, and absence of prejudices.

At the end of World War II he threw himself into the reconstruction of the country, with a theoretical, practical, and social commitment illustrated in Verso la casa esatta, written with Adalberto Libera and Giuseppe Vaccaro.

In 1952 he founded a new office with Antonio Fornaroli and Alberto Rosselli, his son-in-law. In 1954 Ponti invented the "Compasso d'oro" award for Italian Design and fine-tuned his theory of the "finite form", described in Amate l'Architettura (1957), a key element in all his projects. In 1957 he began to produce the "Superleggera" chair for Cassina, and in 1954-1960 he designed and built the Pirelli tower in Milan, considered his XX century masterpiece. His projects in the late Fifties are currently considered icons of Italian modernism.

Thanks to the powerful dissemination of his works in "Domus", this period brought new fame to the architect, also in the international arena. Between the Sixties and Seventies he designed buildings in Holland, China, Pakistan, Iran, Japan, and North and South America. In Caracas he built Villa Planchart and Villa Arreaza, considered iconic Italian villas, thanks to the collaboration of several artists, such as Fausto Melotti, Pietro Fornasetti, and Damiano Chiesa. Designing churches and cloisters was another chance to focus on the importance of holy spaces and further develop the trend towards the dematerialization of architecture, e.g., in the Milanese churches of San Francesco d'Assisi al Fopponino (1964), San Carlo Borromeo (1967) and the convent of Bonmoschetto (1959). The ability to imbue architecture with spirituality became evident in the Cathedral in Taranto (1970).

Ponti died on September 16, 1979 in his Milanese house in via Dezza which also hosted his offices and the editorial staff of "Domus" on the ground floor. He left behind a huge number of projects and achievements, bearing witness to his status as one of the most important architects of the XX century.

Figure 6 - Padua, Palazzo del Liviano, mural painting by Gio Ponti and Massimo Campigli. Gio Ponti explains the project to the Rector Carlo Anti (© Cortesi 2019)

CROSS-DISCIPLINARY RESEARCH METHODOLOGY: SIX INVESTIGATION TASKS

Simona Salvo

The best hours dedicated to this building are those that have seen us think about it, and the building is (and will be) what always brings us together.

Gio Ponti to Valtolina, Dell'Orto, Fornaroli, Rosselli, Nervi and Danusso, during the construction of the Pirelli Tower in 1958

The trans-disciplinary team that developed this research has been organized into six task groups, the same that structured the research proposal presented in 2018 to The Getty Foundation when applying for funding. The tasks are: historical-critical research; survey and representation of the current state; analysis of materials and construction techniques; study of the load-bearing structure, geotechnical features, and static and dynamic behavior; analysis of installations and evaluation of its energy performance; investigation of the building's functional organization and current use; final assessment regarding its cultural value and state of conservation. All six disciplinary areas have been coordinated by the same number of scholars and permanent staff working at Sapienza University, who are somehow related to the field of the conservation of modern architecture[12].

The scope was to investigate the building from an interdisciplinary perspective and obtain physical and figurative scientific data so as to take stock of its current condition. These six core activities structure the Italian architectural conservation methodology and apply to any artifact, not specifically to modern buildings.

Technical coordination and logistic support were carried out by the Project Manager Carlo Bianchini and by the former and current Directors of the Mathematics Department, namely Riccardo Salvati Manni (2017-2018) and Isabeau Birindelli (2018-today). Unfortunately, interaction with the Research Plan Consultant, originally an employee of Sapienza's Technical Office, was not successful, in terms of availability and helpful reactions. This is not only significant, but also a distinguishing feature of the perpetual approach by the management of campus buildings. Rather than surprising, it is disappointing, as the continuous request made by architecture scholars and researchers to investigate, survey, and study the campus buildings, has always been pared-down, notwithstanding the support and contribution they could offer.

Task Group 1 fulfilled the crucial assignment of inputting historical and archival data to the research performed by other task groups, and of course redefining a critical outline of the design and construction of the building. Scholars have systematically searched, documented, analyzed, and catalogued all available archival documentation- written, iconographic, photographic,

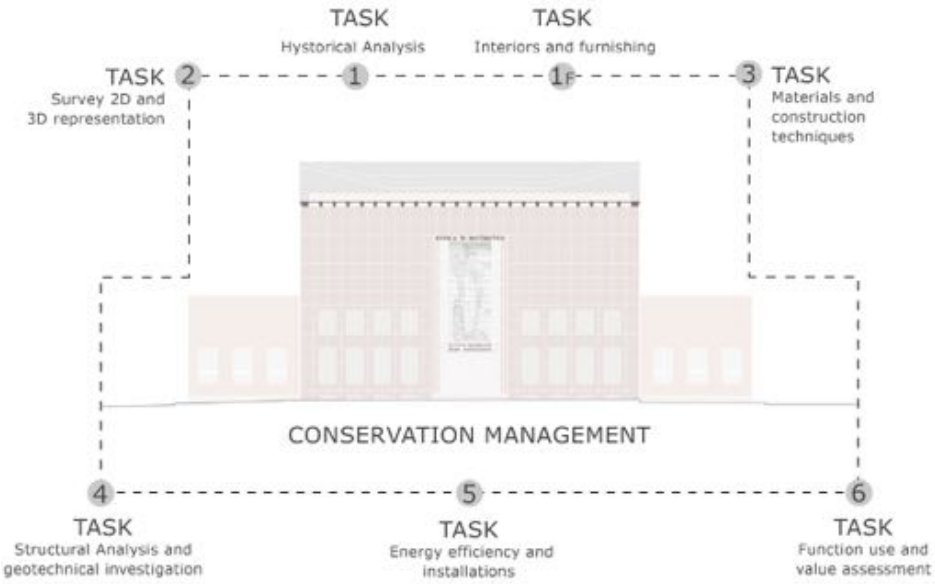


Figure 5 - Organization of interdisciplinary research methodology (© Salvo 2018)

Figure 6 - Group work during a preliminary on-site inspection of the building in preparation for the research proposal regarding the Keeping It Modern 2018 award (© Salvo 2018)

Figure 7 - Launch of the research on Gio Ponti's School of Mathematics at Rome's University campus awarded in 2018 by The Getty Foundation within the "Keeping It Modern" Program in the presence of Sapienza University Rector Eugenio Gaudio and scientific coordinator Simona Salvo; the ceremony took place in the library reading hall on April 11, 2019 (© Marandola 2019)

Figure 8 a/c - Snapshots of research activity and on-site inspections (© Salvo 2018)

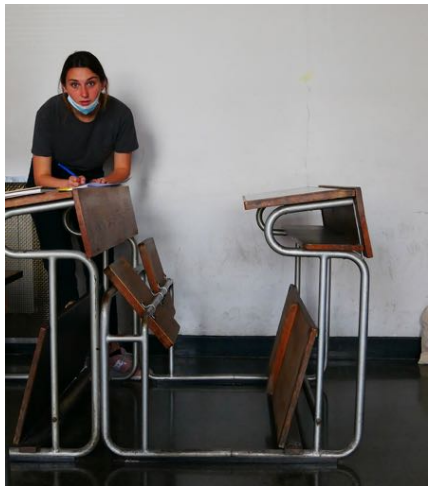


Figure 9 a/e - Research activity and on-site inspections performed as a team (© Salvo 2018 and 2020)

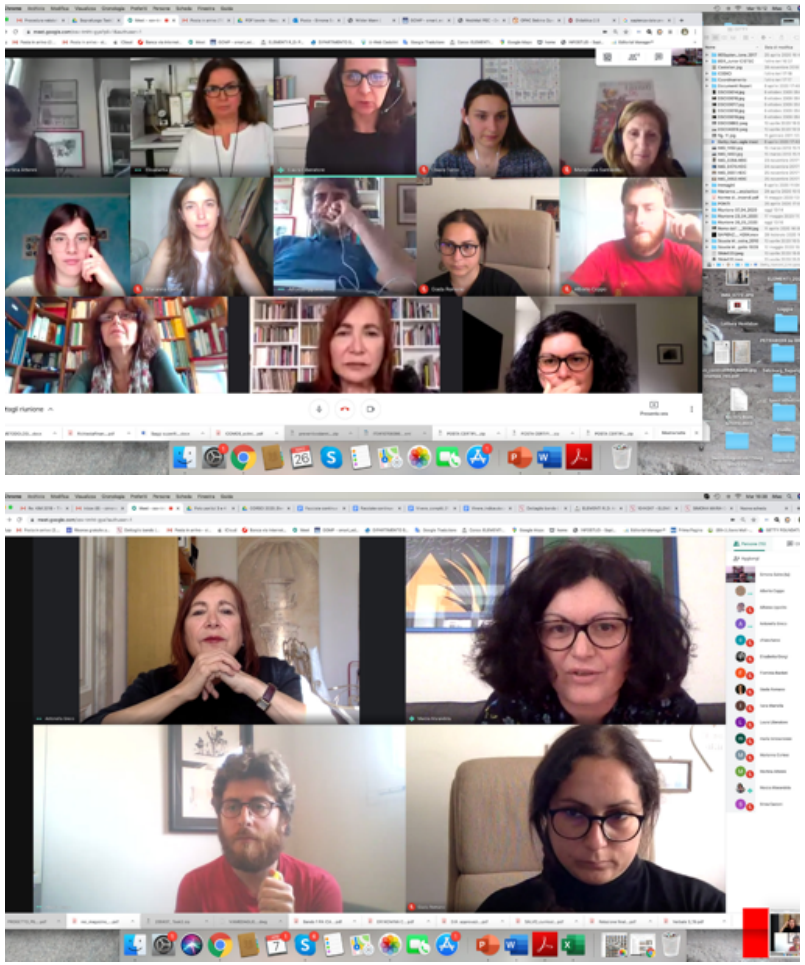


Figure 10 a/b - Research activity in March 2020 shifted from direct investigation to discussion while in lockdown at home due to the pandemic; discussions continued online until summer 2020 (© Salvo 2019 and 2020)

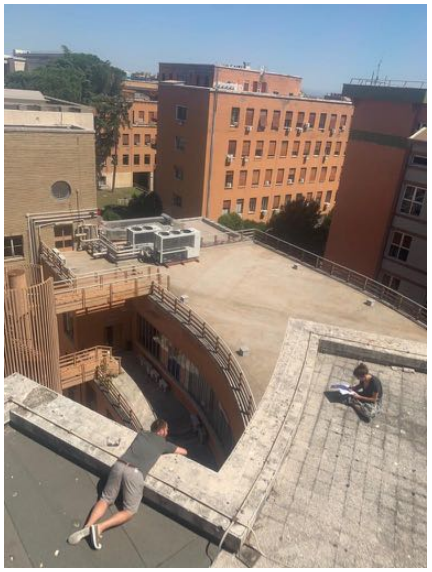


Figure 11 a/b - The last on-site and geotechnical investigations took place in July and August 2020, when pandemic restrictions were somewhat reduced (© Salvo 2020)

Figure 12 - Exploration of the whole building, even its remote corners, was performed during the summer of 2020 in total solitude due to the absence of students and faculty members (© Salvo 2020)

Figure 13 - The photographic campaign by Nicolò Sardo performed between summer 2020 and summer 2021, without students and faculty members (© Salvo 2020)

Figure 14 - Inspection of the fixed and movable furniture required specific expertise (© Salvo 2021)

Figure 15 - The very last surveys in view of the final report. from the start, the 'guardian angel' of our investigative activity (and the building's maintenance) was the caretaker Paolo Mariani (left, in the photograph on the right) who lives on the premises with his family in the porter's house designed by Gio Ponti (© Salvo 2021)

etc.- starting with the Historical Archive of Sapienza University housing the most extensive and interesting documents about the building. Many other archives have been also researched, with interesting results. They include: the Gio Ponti Archives, Milan (written and photographic archive); the State Central Archive; the Capitoline Historical Archive; the Triennale di Milano Historical Archive; the Historical Archive of the Commerce Chamber of Rome; Marcello Piacentini's Archive in Florence; the current archive of the Department of Mathematics at Sapienza University.

Besides the study of archive sources, bibliographic and iconographic documentation has also been collected and catalogued, especially the material produced by famous Italian photographers, such as Giacomelli, Vasari, Cartoni, Alinari, the Istituto Luce, Oscar Savio, Gabriele Basilico, as well as the images in the Bibliotheca Hertziana photographic archive. A detailed catalogue of all the collected and systematized material was made available to other task groups, thus establishing a multifaceted, contextual, historical interpretation of the building's history.

Task Group 1F, instead, investigated the original design of the building's interior, specifically the fixed and mobile furniture, lighting equipment, and finishings and fixtures, closely connected to the original design of the building, to its use, and to the almost 90 years of research and teaching activities that have taken place in the building. This study produced an accurate survey of the rooms and halls still furnished with original artifacts; it highlighted their transformation, current conditions, and corresponding causes for degradation and loss. An accurate documentation of original, authentic, and dated artifacts was also included in this report. Fixed and movable furniture, including doors, has been surveyed and catalogued according to the year of production of each artifact, and the origin of its design.

As a matter of fact, not all fixed pieces of furniture date back to the original phase, i.e., to 1935, for example the many doors added in the late Forties and Fifties to rearrange the interior spaces; however, they should not be considered lesser in value or 'non-authentic' for this reason. The list identifies every piece of furniture as either still in place, moved or lost, indicating (where possible) the date of its movement or elimination. In parallel, Ponti's work in the Thirties as an interior and furniture designer has been examined and assessed, especially his design work for the University of Padua, and other projects in Milan.

Continuous comparison between Ponti's original design drawings and the actual condition of the building, as well as interaction between one scientific research area and another, led to extreme accuracy in the verification of the information. The aim was to accurately identify which were the authentic parts and which the additions, thus reducing inaccuracies and providing a well-based interpretation of the building's current state. It was then possible to proceed with two- and three-dimensional graphic reconstructions (2D, 3D) of the various phases, from the design of the building to its current state. The intent was not merely to achieve philological accuracy, but to inform the critical process with scientific data, capable of steering conservation policies. Thus, many questions emerged in addition to those that remained unresolved after analyzing the historical documentation and observing the artifact.

The survey of the building was performed by Task Group 2 using laser scanner technology; this provided a numerical model of the artifact known as a 'points cloud'. The procedure allowed the research group to acquire an enormous amount of data and develop a very realistic 'digital twin' of the building. On the one hand digital 2D and 3D representations on various scales proved to be graphically useful to document, compare, and verify the results of the interdisciplinary analyses performed by each group on specific architectural elements, such as windows, fixtures, skylights,

Figure 16 a/b - Collection of microscopic samples for laboratory analyses performed by Task Group 3 (© Pandolfi 2021)

balustrades, cornices, etc., and provide an overall integrated interpretation of the built organism. On the other hand, the survey has been constantly verified by directly observing the building, which turned out to be much more complex, multifaceted and 'irregular' than its appearance would suggest.

Task Group 4 instead focused on identifying the building's structure and performing geotechnical tests on its foundation soil, comparing the results with the cross-reading of archival documentation and direct observation of the artifact. Hypotheses about the design and construction of the load-bearing structures were developed to accurately interpret all the documents, again mediated by direct observation. Dedicated direct surveys and non-destructive investigations, such as rebar locator testing were also implemented on the structural layout in order to achieve the final 3D models of the original load-bearing system, and any further additions and extensions. The 3D structural models of the building also allowed us to assess its static conditions and possible reactions in time, also in consideration of seismic hazard.

Administrative permission to carry out geotechnical on-site tests by performing boreholes within the University campus in proximity of the School of Mathematics was correctly requested and permitted. The investigation took place in August 2020 and– as already stated – was paradoxically facilitated by the pandemic, because the absence of public on the premises simplified the entire operation.

After performing a site response analysis, the geotechnical investigation highlighted possible amplifications of seismic action due to the characteristics of the foundation soil. The results of on-site geotechnical tests were mapped on a cross section of the building and its surroundings and have contributed to a greater understanding of the very rugged terrain on which the campus was built; this terrain is at the origin of many of the structural problems affecting the buildings on campus, even today.

This research activity constantly interacted with the other groups. More specifically, Task Groups 1 and 6 provided historical documentation; Task Group 2 acquired data regarding the architectural layout of the building, using and integrating it with structural details; Task Groups 3 and 5 gathered data that was useful to better comprehend the building materials and techniques, the way in which its spaces were used, and corresponding dead and live loads.

A more precise hypothesis regarding identification of the structural system was therefore possible; nevertheless, not being able to carry out destructive tests undoubtedly hindered the assessment of its vulnerability regarding gravity and earthquake loads. Foundations and structures- also considered as integral parts of the building's architectural features- underwent several variations both during the design and construction phases, mainly due to the uncertain properties of the foundation soil. Therefore, at the time of the design process (1932-1935), the issue was not to achieve a bold reinforced concrete structure with big span beams- as proposed by contemporary propaganda- but to offer a balanced, reliable solution to Ponti's architectural design, including by adopting very modern construction solutions with verified static and dynamic loads.

Task Group 5 investigated the building's equipment, installations and energy efficiency measures. Since its construction, the building has been equipped with very innovative installations and plant systems: the heating, electrical, and lighting systems. The forced and natural air ventilation systems allowing Ponti to design environments without traditional windows turned out to be a key element when investigating and measuring the microclimate of spaces with large windows. The combination of natural and forced ventilation installed in 1935 allowed Ponti to design halls without traditional openings, as in the library, but also to regulate the microclimate in rooms with big windows (e.g., the drawing halls in the curved wings).

However, current environmental comfort standards dictated that it was necessary to carry out microclimatic measurements in different seasons, also with a view to reorganizing the building's functions and uses.

Energy efficiency of the installations turned out to be pivotal in the evaluation of the residual functionality of the building, in relation to the activities, users, and objects sensitive to microclimatic variations, such as the library's collection of ancient books. In addition to the historical investigation (the old boiler still survives!), Task Group 5 measured the energy efficiency of the building's interior, because internal comfort and energy control are key to supporting the building's current use. The investigation was organized in separate phases. Phase 1 (fact-finding investigation) consisted in identifying and analyzing the building's existing systems, and defining and studying the materials and construction techniques used for the envelope. This task was carried out synergistically with other tasks, especially Tasks 1 and 6. Phase 2 (indoor air quality measurements) was completed by implementing survey and seasonal measurements in most offices, halls, rooms, and classrooms in order to evaluate the internal air quality based on a customized protocol developed in other departments. Finally, data collection was merged into an energy model to complete the Energy Performance Certificate.

While completion of the microclimatic monitoring phase enabled a preliminary assessment of the building's energy class, the analysis of primary energy consumption made it possible to assess the amount of heating and lighting energy needed for the building's uses, with the percentage incidence of renewable sources on total primary energy consumption. At the end of the diagnostic investigations and implementation of the energy model, Task Group 5 elaborated an energy diagnosis and hypothesis regarding energy efficiency improvement, in view of the conservation management plan.

Fire security plans were instead investigated by the Scientific Coordinator since this aspect was a key element of the entire research. This issue required extra work and research, not envisaged by the research program and budget. Fire protection stairs and accessibility retrofits- added in the late Eighties when the University campus buildings were still considered only for their use rather than for their historical significance - are certainly a hot topic as they have spoiled the very harmonious, calibrated space designed by Ponti. Notwithstanding, the three fire escape stairs built in the courtyard in 1985-1989 are still necessary to comply to fire safety regulations of school buildings, dating to 198513. The clash between conservation of the building and the requirements related to its daily use, have coagulated around this topic and its functional reorganization.

Sapienza's intention to deliver a new fire prevention plan in order to redesign- or remove- the fire escape stairs in the courtyard, has been enthusiastically welcomed by the research group. You may well imagine that this decision had opened new perspectives on the future of the building and its re-consideration as an important historical and artistic architecture. Moreover, this was a chance to collaborate with the campus' Management Office and input into the planning of the future transformation of the building based on a scientific value assessment. It was a chance to finally implement an effort involving accurate historical data mapping, detection of authentic parts, and identification of any decay processes and their causes. Unfortunately, an administrative deadlock has stopped the initiative: the next months will tell if this collaboration will come to fruition.

Task Group 6 investigated the current functionality of the building, in close connection with the results of the other task groups, especially Task Group1, 1F, and 5. This is why we developed 3D models of the historical phases of the building, from its current state (2021) in 1935, and established the precise date of construction for every artifact. This was also part of an integrated chronology of events, containing information and data from all tasks; the aim was to obtain a complete, diachronic picture of the building's layout, in close reference to direct or indirect data sources.

Information about the solidity, use, functions, presence and 'untold' story of the building- thanks to personal memories, unconventional sources, and interviews- has been closely combined with the information produced by the other task groups and has finally produced an accurate value assessment of the building, based on the identification and dating of each part in order to highlight areas of maximum /minimum authenticity, and corresponding transformability. The objective was to not only understand how life in the building has changed, from its origin to the present day, and the reasons why these transformations have taken place, but also outline the current demands by the academic community which have changed so radically over the years. Although the 'historical' use of the building as the 'School of Mathematics' has remained unaltered, research and teaching activities have indeed changed a great deal over the years, due not only to the evolution of academic research and teaching at Sapienza and in the field of mathematical studies, but also in relation to systems regulations, security regulations, and an exponential growth in the number of students and teachers. The integrated chronology of 86 years of life, reconstructed not only by tracing data and news in the archives of the Department of Mathematics, but also by relying on the memory of those who have 'lived' and worked in the building for years, provides a complex and diachronic picture of the reasons why so many transformations were implemented.

To provide a more accurate picture of the dizzying increase in students and teachers during the post-war period and up to the end of the millennium, we developed a specific statistical study of attendance in the building. This has proved revealing notwithstanding the fact that these statistics do not refer only to the School of Mathematics.

During the two-year research we interviewed many 'stakeholders' involved in the past and current life of the building: Claudio Procesi, Lamberto Lamberti, and Silvana Abeasis, alumni of the Department of Mathematics who studied at the School of Mathematics in the Sixties, and then went on to work and 'live' in the building; all three have far-reaching memories of its recent history; Rosaria Del Ciello and Lucilla Vespucci, current and former directors of the library of Mathematics; Enrico Rogora, expert in the history of Italian mathematics; Vincenzo Nesi and Isabeau Birindelli, former and current directors of the Department of Mathematics; Pietro Petraroia, former director of the General Direction for Culture of the Regione Lombardia responsible for the restoration of the Pirelli Tower in Milan; Carla Onesti, curator of the Historical Archive of Sapienza University Rome; Bruno Bozzetti, former employee of the Technical Management Office of the University campus between the Eighties and Nineties; Giorgio Ciucci, Alessandra Muntoni, Fulvio Irace, historians of architecture and experts in the field; Lamberto Lambiase, geologist, expert in drilling and geognostic surveys in the University campus.

The last thirty/forty years are the most difficult to re-trace, because the habit to archive technical data has been lost, so much so that recent events are much less documented than earlier ones. The library director is in charge of the core activity of the School of Mathematics, and takes care of its most precious space, furniture, and ancient book collection. For this reason, the library directors also constantly contributed to this part of the research, especially Lucilla Vespucci, director of the library from 1983 to 2012, and the current director, Rosaria Del Ciello.

To further understand the complexity of the building we applied philological and scientific precision building a 1:50 scale wooden model of a section of the front building. Building the model meant carefully reconstructing- albeit to scale- the large triple-height library, perhaps the most complex and interesting part of the building. This was a sort of 'operational recognition' of Ponti's ability to prefigure spaces and visual sequences, and establish artistic and architectural effects that are uniquely complex, yet endowed with harmony and beauty.

The model played a specific scientific role since it is based on 2D and 3D representations from the laser scanner survey of the building, cross checked with direct survey, showing the additions and transformations made over the years; these latter parts are visible, compared to the original parts, thanks to the use of a darker kind of wood. Rather than a true 3D representation of the survey, this form of re-construction tested our scientific knowledge of the building, obliging us to deal with the existing object, and assess the weight of the countless additions, from the smallest to the most cumbersome, that took place and overlapped during the building's 85 years of life.

Figure 17 a/b - Making of the wooden model: starting construction after the preparatory phase, January 13, 2020 (© Cortesi 2020)

Figure 18 a/c - Modeling has also included furniture pieces, reproduced in scale with a 3D laser modeler, January 13, 2020 (© Cortesi 2020)

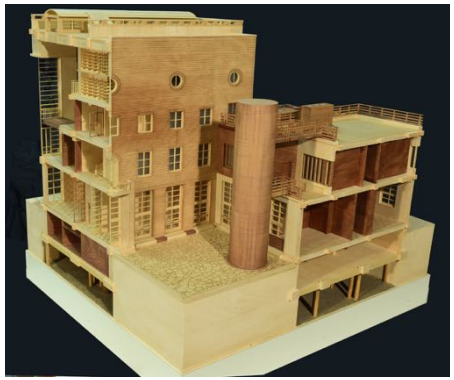
Figure 19 - The model starts taking shape, highlighting additions from original parts recurring to dark wood, January 31, 2020 (© Cortesi 2020)

Figure 20 - Details, from stone cladding to foundation poles, are represented in scale, February 11, 2020 (© Cortesi 2020)

Figure 21 - The definition of the interior starts interfering with the outer shell of the building, March 2, 2020 (© Cortesi 2020)

Figure 22 a/b - The overlapping of data, from foundations to structures, from space organization to construction techniques, from furniture to installations, required serious effort, March 2, 2020 (© Cortesi 2020)

Figure 23 a/b - Details, such as the courtyard paving and the stained glass window, have been reproduced for the final effect, March 12, 2020 (© Pontani 2020)



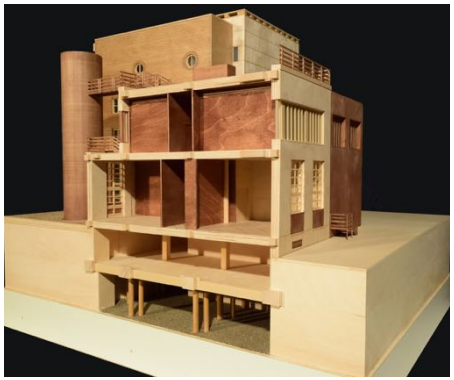


Figure 24 a/c - The completed model (© Pontani + Spaziofare 2020)

A TWO-YEAR RESEARCH AGENDA AND THE EFFECTS OF THE PANDEMIC

Simona Salvo

The last twelve months of activity were very productive, despite the difficulties and work overload imposed by the pandemic, due to the fact that any kind of progress was 'in remote' (i.e., meetings, scientific evaluation, correction of drawings, administrative reporting, recruitment, etc.). And yet, each task has productively achieved the research goals. There was also an added value: to work in the building and on its premises without the presence of people, activities, and without it being used.

This situation unveiled new aspects of the monument and allowed a much broader and unexpected idea about its future life, management, and conservation, as well as the importance of maintaining it functional, albeit by finding the best way to adjust and fine-tune it together with its dimensions.

Figure 1 - The "Aula Picone" on the ground floor of the front building, during the pandemic (© Salvo 2020)

Figure 2 - The research agenda: January 2018 - December 2021 (© Salvo 2021)

OUTCOMES, CHALLENGES, AND FUTURE RESEARCH PERSPECTIVES AS A MEANS OF CONSERVATION

Simona Salvo

There is a thin red line running through the research; it starts with Gio Ponti's project and continues to the current building, sometimes along tracks that lead far from the original input, but then bounce back, continuously soliciting further reflections, including the extreme complexity of the building's spatial layout, which is a new issue. If it is true that Ponti thought of architecture as a crystal, it is also true that his buildings are neither simple nor linear.

Comparing Ponti's greatest achievements, and analyzing the construction site of the University campus in the Thirties, as well as the technical and industrial context Ponti had to deal with, it's no wonder that the culture of that age owes so much to Ponti, but also that Ponti owes so much to that age, and to all those who directly and indirectly shaped his projects.

Merging all the data and cultural stimuli gathered during the research, a thin red line emerges combining many elements of continuity in Ponti's volcanic mind, where volumes, colors and materials took shape linking one object to another: a glass vase to the façade of a building, tableware to the handrail of a staircase, a tapestry banner to a stained glass window, and a skyscraper to a table lamp.

The research objective was not only to recognize the values at stake, but also reweave the threads of a broader discourse involving Ponti himself and his work, his philosophy, and the architectural principles underlying his architectural production: transparency, visual and spatial continuity, lightness, thinness, integration with the arts, and 'finite form'. After two years of research the results consist in greater, more accurate knowledge about the building and its history, but- as mentioned earlier- they also reveal how much ignorance still persists.

In general, it must be said that the most ambitious research goal was to stimulate awareness of the importance of this building (and indeed of other equal gems in the University campus, including the Institute of Physics by Giuseppe Pagano). The objective was to prove that the building can still admirably serve its users not only from a functional point of view, but also in cultural terms, encouraging the public, inside and outside Sapienza university, to enjoy its beauty. But once again this seems wishful thinking, even though Ponti urges us to always look positively to the future. The generous funding of this research is therefore of great encouragement, helping us acquire a better un-

Figure 1 – Students of mathematics in one of the tiered lecture halls during the rehearsal of the 2018 Christmas play (usually a comedy mocking mathematicians), a tradition of the Mathematics Department interrupted by the pandemic (© Salvo 2019)

derstanding of a modernist masterpiece- the School of Mathematics at Rome's university- and a feather in the cap of Sapienza university, to be counted among the many excellent other studies included in the 'Keeping It Modern" Program.

What remains behind is the true, efficient preservation and protection of his architectural works, many of which have been systematically altered. The Pirelli experience has shown the importance of public participation regarding cultural appreciation and conservation. In fact, scientific research is not the only wheel that turns the process of knowledge and recognition of value and beauty. Informed by the same virtuous circularity that triggered the restoration of the Pirelli Tower, research on the School of Mathematics has instilled a desire in the academic community- perhaps also the opportunity, if not the moral obligation- to recover that beauty. Unlike the Pirelli Tower, whose restoration was an institutional choice with a political background, today the future of the School of Mathematics has become a prerogative of those who live in the building and, in a crescendo, of Sapienza's governance.

We therefore intend to continue the research as a way to achieve monitoring and preventive conservation, which could keep the spotlight shining on future transformation and keep people's attention focused on the interest triggered by the building.

Some aspects of the research have therefore been reported: new investigation paths, unresolved doubts and hypotheses, cultural suggestions and, above all, extending the research to the entire campus, not only to its physical artifacts, but also socio-anthropological and cultural aspects. These ideas remain in our minds, and we truly hope we will be given a chance to develop them and, above all, implement a hands-on application.

Figure 2 - On site research work (© Salvo 2019)