ENDNOTES

1 I use the term 'actor' to designate the autonomous entities that play an important role in the making of architecture. They can include individuals (an architect, an engineer, a contractor, etc.), collectives (the public, the nation, etc.); visual representations (a plan, a drawing, a scale model, budget figures, etc.) or non-figurative representations (the Welsh nation, the Welsh spirit, the procurement system, etc.). On the term 'actor' see Latour 1993.

Introduction

By employing modern epistemologies we have found ourselves with pitiful contingencies on one side and necessary laws on the other – without, of course being able to conceptualise their relations’ (Latour 1993). This divides the world into two sets: one of causes and the other of effects; one of architecture (understood as form, size, location, disposition and materiality) and the other of society (that causes buildings to vary, flourish or perish). This epistemology views architecture as an engineering technology and an objective frame on one side yet, on the other, comprehends it through many subjective perceptions, experiences and symbolic interpretations. How can we circumvent the boundaries between the abstraction called ‘technology’ and the abstraction called ‘symbolism’, between ‘subject’ and ‘object’, between ‘nature’ and ‘culture’? How can we stop drawing boundaries between architectural technologies and architectural humanities, between materiality and meaning? How can we prevent this divide from continuing to blind architectural theory? How can we avoid the common simplifications of architectural theory that replace the specific (the architectural practice, the design, the processes, the objects) with the general (social factors, class divisions, gender, politics and ethnicity)? This book will address such a challenging series of ‘how’ questions.

RETHINKING BIFURCATIONS

If you wish to follow the mainstreams of architectural theory, one possible interpretation of the Cardiff Opera House controversy would have engaged in a semantic analysis to reveal the hidden symbolic meaning behind the building (Chapter 1). Architectural theory lends itself to semiotics; buildings are interpreted in terms of language of signs; they are analyzed in terms of symbolic meanings (Jencks 1980, 2004, Kaika 2010). Architectural artefacts and buildings are static objects, made of brute and technical matter. They are available 'out there', a field apart from powerful perceiving subjects who can actively inspect, interpret and explain their meaning.
This modernist opposition between subject and object seems to have paralyzed architectural theory. It leads to an impasse in which the theory of representation is trapped in the metaphysics of essence that causes buildings to be defined by rigid classifications, applied after the architectural event. I argue for a non-representational way of tackling buildings (Chapter 1). Here, we open buildings to the experience, to the course of events that make and consume architecture. Buildings become interpretable objects. They make themselves detectable through a continuous elaboration of procedures that put architectural meaning through to the test through trials, debates and controversies. This way of looking at buildings as events move the irrelevance of the old distinction between intrinsic materiality on one hand, and aesthetic or 'symbolic' meaning, on the other, between buildings as static freeze frames, and buildings as moving projects.

If you still wish to stay with the mainstream of architectural theory, another possible interpretation of the Cardiff Bay building would be to use external factors (social, economic, political) as a source of explaining its success or failure (Chapter 2). Commonly, architectural theory either takes society (its factors and influences) as a source of explaining architecture. Else, architecture is a mechanism for exercising control and shaping the social. In the first case, buildings mirror societal change and reflect economic factors, broader macrocosmic organization and cultural frameworks. In the second case, buildings are instruments that are imbued with the power to transform society and to affect social practices. In both instances, what is kept is the bifurcation between the big constructs of architecture' and 'society'.

Drawing inspiration from the social sciences, architectural theorists assumed that their major task was to identify and characterize the possible relationships between technology, science and art on the one hand, and the society, on the other. They presumed that they are all stabilized, defined and determined entities. Architectural challenging but thorny avenues of the critical theory. Yet, to depart from the divide of the society as a separate domain or context in which architecture can be framed, 'Society' designates neither a mono-spherical container (as, for instance, Durkheim need an alternative understanding in which, 'soci ET is an adjective that points to a Latour 2005). It can only be gained if we follow the processes and the associations of this understanding of the social is inspired by the field of Science and of grappling the phenomena of architecture in the making. 'Science studies'? your effort to extract architecture from all possible connections with the rest - economy, to question in a series of empirical inquiries that do not strive to isolate architecture entanglements, as a cosmology.

It would be logical to assume that the reason we take inspiration from STS is because architecture is a science or technology only. No. This was the mistake that STS scholars initially made in the 1990s. To explain the city, the architectural objects or urban change, STS scholars adopted a social constructivist perspective that treated them as scientific objects. When they used STS tools to tackle design and urban planning, they simply assumed that a building was a modernist object and that the city was a technological artefact (Albar and Bijker 1997, Hommels 2005). Yet, to transport STS into new fields we do not simply identify the scientific and technological aspects of urban and architectural phenomena, or follow how scientific and technological networks tangle with the urban ones. What we borrow is the method of inquiry that has allowed STS studies to successfully get out of the artificial dichotomies of nature/culture, subject/object and technologies/ humanities. That is, the method of Actor-Network Theory that relies on painstaking ethnography.

We borrow this method to explore phenomena that are an exception for sociological theory, although tackled by some anthropologists: the non-stabilized states of technical/social, natural/social, aesthetic/social, etc. Before we explain the design of the Cardiff Opera House in terms of the static categories of class, elitism, politics and avant-garde aesthetics, we can slow down our inquiry into the controversy. We forget the divides, and we follow, document and map the controversy as it unfolded. By so doing, we mobilize both humanities and technologies. We follow the actors, their statements, their own interpretations of the world, and the networks that they trace. We can track these heterogeneous entities by following their gradient of stabilization and we can account for the unstable state of the social, the technical, the natural and the aesthetic. If we can follow, account and visually map the controversy dynamics, we can describe what happens in these extreme situations of volatility that are so rarely investigated. Situations in which the networks have neither the complete status of an object nor of a subject. New and different forms of objectivity and subjectivity emerge.

Nothing is static. The redistributions are to be made (Chapter 3). The story of process, of design in the making is, by the same token, a story of the making of the social.

MAPPING PROCESSES

The topic of controversies is not new in architecture. Yet, the slow inquiry into design processes allows us to question some myths in architectural theory: how is it still possible that we can attribute buildings to a single architect’s name? Can we say that Jorn Utzon designed the Sydney Opera House? We cannot explain a work of architecture by referring to the sphere of politics or society only; nor is it to be attributed to a single personality only. Architecture appears to be an impersonal process over the course of which a building is composed; it is made of the many different pieces brought by the different actors connected or not with the one that signs as an ‘author’ (Chapter 4). Design progresses by many detours, each of
them modifying the initial design vision and aim of the project; it is composite and collective. Questioning whether it is the "individual architect" or "society as whole" that should be blamed or praised for the success or failure of a particular project is wrong. This question is to be replaced by a programme of inquiry — Mapping Controversies — a slow and painstaking inquiry that would allow tracing the meanders of the collective action of architecture.

The methodological and conceptual roots of the Mapping Controversies approach stem from the discipline of STS. The importance of studying controversies has been recognized by STS scholars since the 1970s. It has become an important methodological tool that gains insight into key processes, which usually remain invisible within the sciences. The methodological assumption underpinning the study of scientific controversies is that one learns something about the underlying dynamics of science and technology and their relations with wider society. Following a controversy as it unfolds allows the normally hidden social dimensions of science to unravel and makes them more explicit (Pinch and Leuenberger 2006, Callon et al. 2001). Thus, controversies are seen as integral to many features of scientific and technological practice and dissemination. Latour and Woolgar (1979) indicated how controversies could be analyzed in terms of whether certain modalities are added to or subtracted from scientific statements, making them more or less fact-like.


According to the ANT approach (Venturini 2010), controversies involve all kind of actors. In controversy studies, the analyst should not constrain the observation to any single theory or methodology; the phenomenon should be observed from researcher's own assumptions. The purpose of the cartography is not to teach how to observe their collective existences.

Using this method, we will follow recent and past architectural controversies that will lead us to different parts of the world. The danger is that when we talk different urban cultures, we tend to describe local treatments of the universal. Too transport networks and city authorities. Culture is taken as a variable that is relative avoid simplistic culturalistic comparisons. Mapping the debates that buildings surround the recent parliament in Cardiff (Chapter 1), we will revisit other well-(Chapter 4); or the recently re-opened case of the Eiffel Tower in Paris (Chapter 5).

We can even track the rhythm of a controversy that unfolds as I write: the London 2012 Olympic Stadium design (Chapter 6). In all of these cases, we do not need to embrace culturalistic discourses of urban differences. Instead, we account for what is specific to these buildings. That is, we treat them as pertinent ethnographic objects and the urban as describable and accountable. Culture will assume an ontological quality (Houdart 2007), not merely an attribute.

Initially developed as a research method, Mapping Controversies has been translated into architectural education (Chapter 5). The comparison is drawn between the reflective enquiry (recalling a particular example from Donald Schon) and the Mapping Controversies self-exemplifying mode of enquiry. By following a group of students on their way to map the controversy surrounding Heathrow airport, parallels are drawn with Schon's approach (1983, 1987). In doing so, I illustrate how this type of social science inquiry, concerning the complexity of design as opposed to the mere technical mapping of reality, is useful to designers. I argue for the importance of realistic approaches in design education.

Mapping Controversies in Architecture grasps architecture as simultaneously technical and social. The originality of the Mapping Controversies approach lies in its capacity to deeply modify what is meant by 'process'. It allows us to transform the understanding of a building (planning, drawing, designing, fabricating, inhabiting) as successive phases involving successive trades. Instead of portraying how a building 'occupies' a niche inside a society, or 'corresponds' to certain economic or cultural needs, or 'reflects' national symbols and zeitgeist, we follow the 'process philosophy' pioneered by Alfred N. Whitehead (1978). The method allows us to grasp the capacity of buildings and design projects to elaborate their times and spaces, and even societies of interested parties, around themselves. Following controversies unfolding in time and space, does for buildings and design projects what Henri Bergson (1911) has done for the philosophy of process.

The mapping refers to the 'art of describing' architectural objects, processes and practices. The accounts included here trace the complexity of phenomena without replacing the specific with general. Mapping Controversies provides us with inventive narrative techniques to gain access to the particular and grasp the unique. We can offer an adequate description on the basis of the series of situations accounted, according to the actors' dynamics and the spaces and times they generate. To describe, we need to use all of the possible equipment and media: pen, diary, tape recorder, film, statistics, digital tools and new software. Equipped with these, our accounts 'deploy' architectural objects as networks instead of either merely describing them ethnographically or unveiling the hidden meanings behind them. Action is not merely related to a particular agent or explained by enduring historical structures and urban systems. To 'deploy' means to meticulously account for the performances of the entire collectives of humans and non-humans. The recent developments in computational design (Chapter 6) can greatly enrich the descriptive techniques of social sciences.

Mapping Controversies produces infra-reflexive descriptions of architectural objects, practices and processes. We can generate accounts that will deliberately circumvent any meta-reflexivity (Latour 1988). Accounts that keep the freshness
of architectural experiences and the roughness of the controversies actors' language far from the reach of the prevailing meta-reflexive critical frameworks of interpretation. Accounts that will visually and narratively trace different architectural processes without referring to entities outside of them. Accounts that are self-exemplifying and that can amplify the diversity of the urban and the architectural, instead of reducing them to sets of homogenous abstractions, to types or closed categories.

In a domain that has a consumer's view of philosophy of design, it is immensely important to have a theory with greater intimacy and a more productive posture. I hope that this book will offer architects an entry into a work of theory. It is as far from the celebratory reminiscences of so many books on architecture, as it is from the superficial ways in which 'theory' is used to add philosophical decors to technological feats.

PART I

RETHINKING BIFURCATIONS
Chapter 4
Controversies in Architecture

Controversies are seen as integral to many features of architecture practice, of design and use. The word ‘controversy’ is the best way to describe the many issues with which administrators, architects, urban researchers and citizens have to deal with on an everyday basis. The list of design issues is endless as are the various and constantly changing patterns of urban and political uncertainties. It is, in a way, the very success of architectural design that has triggered this massive backlash. The first reason to focus on architectural controversies is the rarity of contemporary social or political issues that do not contain a part of urban expertise. Second, these are the issues which impact upon the public because of their very complexity.

THE SYDNEY OPERA HOUSE: REVISITED

Let us revisit an old textbook controversy – the Sydney Opera House. Who made this building possible? Jørn Utzon? Arup? The Labour Government? Australian taxpayers? To tackle the question of ‘who’ we usually isolate the technological virtuosity of the concept from local politics. But why do we do this? How can we possibly distil Sydney’s ambition to get a landmark building from the street protests against Utzon’s resignation, from the architect’s strong ego, from the compromise engineering solutions devised by Ove Arup’s company? Can we still simply say that Utzon designed the Opera House in Sydney?

It was indeed Jørn Utzon who was awarded the first premium in 1957 after an international competition organized by the Sydney Opera House Executive Committee (SOHEC). The competition attracted the best talents in the world. Much of the interest in Utzon’s building focused on the dramatic form of the roof, which was supposed to be made up of a series of quarter shells: ‘when the audience pressed forward to examine Utzon’s design in an exhibition display, it was obvious that nobody had even seen anything like that before. Many people felt the minute they looked at it that here was something transcendental’ (Yeomans 1968: 27).
Surprisingly, when Utzon was preparing his competition entry he took no
engineering advice. It was difficult to visit the site and so he studied the qualities of
the promontory from photographs and postcards while drawing the first sketches.
He even ignored the competition rules: 'he placed the two theatres side by side
(...) the other entries placed the theatres end to end' (Murray 2004: 7). Utzon's
compilation entry failed to include the required perspective drawings and showed
only enlarged sketches. His design also exceeded the limits of the site.

The first time that Utzon visited the site was six months after it was announced
that he had won the competition. Too late to correct the mistakes made with the
first sketches! Thus, starting from a number of sketches drawn far from the site
that never consulted with engineers to assess its viability, Utzon was gradually
led to make a detour in his initial design intentions. He had to collaborate with
the engineers from Arup – the company that SOHEC commissioned to work with
Utzon. Created in 1946 by the Dane, Ove Arup, the firm had built up a reputation
of providing structural engineering advice to the architectural profession. The detour
to the competences of Arup, this step aside, followed by many other steps aside,
was difficult for an 'I want' architect like Utzon to make. Let us follow how these
deviations from his initial design reconfigured the overall concept for the Sydney
Opera House.

The design of the beams posed a big technological challenge. Utzon's early
drawings showed the concourse supported by a number of columns. Arup
suggested that the job could be done by a single span and was keen to investigate
a novel form of beam design that 'would reflect the architect's desire to express
honestly the characteristics of the materials used. 'Let the structure speak for
itself,' Utzon would often say. The design should be bold, simple, on an impressive
scale and combine sculptural quality with a clear expression of the forces acting
upon it' (Murray 2004: 25). At the ends of the beams the most effective section
was considered to be a T-shape and at the centre it was a U-shape. Arup integrated both
shapes to create a sculptural and efficient form that Utzon accepted enthusiastically
as 'Ove's invention.'

Equally challenging was determining the shape of the roof shells. During the first
years of planning, a double-roof made of two membranes of concrete separated
by beams was the structural system decided upon. After numerous discussions
still not decided. Working hard on various geometries for the roof, Arup also tried
tests and double-roof plan was forgotten. The precise shape of the shell was
to find theoretical solutions for the forces in the roof. Two different structural
the roof structure. They equally spent years investigating the magnitude and distribution of wind forces on
due to gravity loading. To accurately calculate these Arup made another detour: a
available technology was advanced enough to construct the shells according to
were then a relatively new development that Arup engineers were only learning
the Opera House's roofs, beams and other technological challenges. Thanks to this
detour, Arup's use of computer technology to aid design gave them the ability to
offer solutions to the technological challenges. Yet, none of the solutions provided
was good enough for Utzon. Numerous speculations were made on how much
the structure would deflect in strong winds; how much the consequent vibration
would shorten the life of the building and whether it would cause panes of glass to
crack and alarm any audience inside the theatres.

In 1958, pleased with shells drawn as parabolas, Utzon wrote back to Arup:
'Many thanks for the beautiful "shells" ... We are all thrilled with them. They
are much better than the competition project' (Murray 2004: 29). By the end of
1961, further tests and calculation led to an agreement that the roofs were to be
elliptical paraboloids. This system of paraboloids was as close as Arup could get to
modelling Utzon's free floating shapes. The engineers also suggested closing the
end of the shells, but Utzon did not like either the resulting internal appearances
or the method of closure. Arup also suggested triangular plates meeting at the
apex rather than continuous shells. To get Utzon's poetic shapes to stand up, the
engineers separated the three sets of shells from each other to form separate
structures—this rationalized it and changed the initial idea of Utzon's design. The
engineers accepted that 'it was their job to make the architect's concepts work'
and were entirely committed to doing so. To stand up, each roof vault was to be
formed of two rows of concrete ribs rising up from the podium; every rib would
need an individual shape if the roof vaults ultimately produced were to be elliptical
paraboloids. Utzon plumped for the ribbed structure (versus an arched original
scheme in steel and concrete) saying that: 'I don't care what it costs, I don't care
what scandal it causes, I don't care how long it takes; but that's what I want' (Murray
2004: 34). After further engineering tests and discussions with administrators,
it was decided to abandon the elliptical paraboloids for a spherical shape as a regular
geometric form out of which the various chunks could be lifted and put together
to provide a satisfactory shape for the roof vaults.

The change in shape from parabolic to spherical caused the press to comment.
Utzon tried to play down the significance of the changes. 'The silhouette hasn't
altered' he told the Sydney Morning Herald (Murray 2004: 36). However, the change
in the building profile was radical; the smoothly-curved shells of the competition
entry had been exchanged for the upright arches of the actual spherical solution.
Thanks to the detours to Ove Arup and then to computer technologies, Utzon's
initial sketches, quickly drawn after the postcards, changed considerably. So too
did his design intentions.

It was very difficult for the engineers to realize the architect's idea without any
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only adapted the shape of the building and size of the structural members. Such
only adapted the shape of the building and size of the structural members. Such
and use of new technology, the engineers joined the design process at an earlier
stage. Rather than realizing the architect’s idea, handing over finished designs
and imposing a solution, the engineers became part of the design team and their
mobilization of new technologies led to novel design solutions.

One element that the architect usually decides on in such projects is the
dimension of the building. In this particular case, the difficult geometry and the scale
of secondary stresses and temperature movements prevented the architect from
supplying the outlines. It was Arup who made the calculations and provided 350
detailed drawings. Utzon expressed serious concerns about the fusion of roles and
claimed that it appeared as though Arup were doing the architecture as well as
the engineering. He often stated: “Only I, am sure, can visualize the final
picture of the Opera House.” All consultants, all contractors, every craftsman should
in a way, understand this in order to enable us, together, to achieve the perfect
building” (Murray 2004: 49). At the same time, Ove Arup fulsomely praised the
architect claiming that: “He is a brilliant designer – one of the best, and probably
the best of any I have come across in my long experience of working with architects –
and he has a remarkable ability quickly to understand the essence of other technical
disciplines as they impinge on his architectural conception” (Murray 2004: 45). The
architect had to accept, little by little, that a project of such complexity required
design and construction to be totally integrated. The traditional division
between architecture and engineering, inherited from the nineteenth century,
had to be overcome. Meandering on the way to the long dreamt Opera House in
Sydney, Utzon had to consider the complexity of engineering decisions and the
challenges of new technologies at use.

It becomes impossible to say any longer that Utzon created this novel roof. The
realization of the roof required the ground-breaking use of computer technologies
and teamwork between architects, engineers and consultants; that is, it was a work of
‘total architecture.’ There were risks and promises in diverting from Utzon’s intention
to realize the design according to his initial sketches. The promise was so powerful:
Utzon hoped to go back to his initial aim but believed that he would be stronger
when equipped with engineering solutions and new computer technologies that
produced exact calculations and allowed for numerous construction drawings to
developed on time. Helped by the computers, the engineers also promised to
become more successful in responding to the design challenges. Helped by the
risked being unable to go back to the initial design intention since the design was
Utzon and his practice.

These deviations from Utzon’s intended linear path actually made the project
much more complex and composite. Responding to the technological challenges
frontiers of building science. The design progressed by derivations, which led
trajectory towards the final aim – the Opera House as envisioned by Utzon. The
ambiguity of the composite design action remained until the end of this project:

Utzon mobilized Arup for the realization of his design intentions; Ove Arup made
Utzon engage in a series of detours for the sake of new technological innovations. At
the end of the process Utzon was replaced by a team of architects who completed
the building. Yet, he was the one who recognized more than anyone else the
importance of these detours to Arup’s engineering technologies and expertise;
otherwise it would never have been completed (Murray 2004: 136). So, throughout
the course of the project the relationship between architect and engineer was
entirely redefined. None of these professionals could exist as solitary experts, as
isolated consultants in a project of such scale and technological uncertainties.
Instead of playing a game of superiority – asking whether the engineer is superior
the architect or whether the architect is more important – they reconciled the
tensions stemming from rigid professional divides. As a result, design appears as
a collective venture that integrates architecture, engineering, cost consultancy,
urban and product design all within one studio; design action – collective and
composite.

The detour to Arup was also important to enable the architect to keep up to
speed with the construction process of one of the most complex building projects
in the world. The architect often wanted to change small things as if the concrete
structure was a medieval masonry. Denmark’s strong craft tradition and smaller
scale projects allowed Utzon to work like this. His office was very small and bright
architects worked for him, but most of them were inexperienced. He needed
time to achieve detailed perfection and he always wanted to change things;
nothing was ever finalized but each change was viewed as an improvement. It
became impossible for Utzon to fulfills this extremely complex project with his
small team of architects and the craft ways of working that they employed before
this commission. To complete the drawings on time Utzon needed 30 architects
but he had only 9–12 architects in his office, all of whom were experiencing
their first major building project. Utzon needed another important detour to the
expertise of Arup. This is also something that made the design action look even
more composite. Because of the different times that architects and engineers
were moving and the different rhythms they followed, they could hardly be
regarded as a team. They remained visible as two distinct professional groups
who were always in disagreement rather than being in a harmonious working
relationship. In 1964, the architect was not supplying the drawings needed for
the construction to continue to schedule. Arup could not understand why Utzon’s
working methods meant that they could not be supplied with drawings. It was
meeting the clear that Utzon was not able to anticipate hiring adequate extra staff to meet the
needs of this gigantic project.

As the design was continually changing and the negotiations between
architects and engineers always took longer than expected, it was impossible to
have a fast-track construction: in order for the basic floor plan to be constructed
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trajectory towards the final aim – the Opera House as envisioned by Utzon. The
ambiguity of the composite design action remained until the end of this project:
SOHEC, who were undecided over their precise requirements. The technological uncertainty concerning the engineering of such a complicated design structure entailed constant changes; even when the architect was satisfied with a particular engineering solution, the Government was not because the costs increased. So the Government sought alternative advice to reassure them of the stability of the proposed structure. The delays slowed down the construction process and led to budget increases that worried the politicians: concerned communities and the Australian taxpayers began to express their fears over the design.

One can see that it is a very long path to follow a political decision to back a young architect's daring vision for a new symbol that could strengthen the image of Sydney, through to the many detours from his initial sketches and design intentions. It is hard to say that political will was incorporated into a project; that a daring vision followed a political aim; that politics and society stand apart from architecture and form a separate 'bubble'. Every single engineering solution found required precise architectural drawings. These were always delayed because the architect needed more time to refine them, review design solutions and chew over problems. In many cases the problems were solved in the designer's own mind and sketches. The detailed work still had to be carried out by others and required more time. This delayed construction, increased the budget and gradually led to the political failure of the project. Design, as the moving target it was for Utzon, was complicated by the disagreement with Arup and delays from the politicians who allocated funding: this made planning a complex business. Design does not happen as the progressive realization of a daring vision, as a flight of imagination. Many design changes were made; the numerous relocations of the building functions impacted on the design and construction programme and modified the original concept every time. The shifts and detours in design process made it impossible to express the integrity of Utzon's vision for the building. The initial idea reflected in his first sketches got translated so many times: transcribed, displaced and transported with so many transformations.

More political actors entered the story because of construction delays, notably under the two different governments who spanned the project. Concerned with architect Bill Wood to represent him and take part in all of the consultations that only employed as an administrative architect and not a designer, Utzon was never happy with his involvement.

Concerned with increasing costs, Utzon was called to a meeting by the Prime Minister and the cabinet sub-committee formed to look into the administration politics; elections were looming and the Opera House was an issue. Unable to subcontracting the work to another firm who would work in collaboration with Utzon. By 1966, the Government lost confidence in Utzon. The Minister Davis Hughes announced Utzon's resignation in Parliament on the afternoon of Tuesday 1 March 1966. Street protests and demonstrations took place in Sydney with thousands of students calling for the reinstatement of Utzon as architect of the Opera House.

Utzon's resignation provoked many discussions over the role of the architect in such projects: some thought that the separate control by consultants was detrimental to the satisfactory design and construction of the project. Equally, others thought that the architect's role should be to coordinate the work of the various consultants employed for design. When Utzon was asked to collaborate with a team headed by a Government architect, to be responsible for the planning of the design and construction programme, he refused to work in this way: 'I am at all times prepared to work with them [a team of leading architects] as your representatives, but not under them' (Murray 2004: 81, emphasis added). Eventually, Hall, Todd and Littlemore were the architects appointed to complete the job. Utzon's wish to be fully in charge of the concept and his refusal to share the responsibilities and partake in the design and construction team were detrimental in a project of such scale and complexity.

When Utzon quit the project and flew out of Sydney in April 1966, he accused Arup of failing to understand the work of an architect and for over-estimating the role of the engineers. Utzon strongly believed that no one could complete his work and that he would be called back once the new team had failed. He thought that no one could emulate the mind of the architect and copy his creation. Later, in 1967, he changed his mind and was prepared to go back to Australia and work as part of a team depending on project costs, feasibility and timing but it was too late. In 1968, Utzon again expressed enthusiasm for returning to Sydney to finish the building and stated explicitly that he would not insist on being the controlling architect if he was brought back. He was never asked to return.

The Sydney Opera House was opened on 20 October 1973 by Queen Elizabeth II. Utzon was invited to the ceremony but did not attend. Yet, he is still the main architect with whom we associate this building. In 2003, he was awarded the Pritzker prize for the design of the Sydney Opera House.

The Lines of Interpretation

From the 'I want' and 'only I can design the opera house'-architect that Utzon was at the beginning of the controversy, he was finally ready to become, after many detours, an 'I will collaborate'-designer. From declaring that 'only I have it in my mind', he became ready to share a team philosophy of making. From a vision architect he was ready to embrace the role of a professional and become concerned with design development and drawing production as important elements in the realization of the eighteenth-century genius that he considered himself to be at the beginning, always looking for his dream to come true; in moments of solitary confinement, in search for perfection, he was finally prepared to become a twentieth-century architect.
would have tremendously increased the cost. The political disagreements would have been even sharper than at the time of Utzon’s resignation.

We also witness an important shift in the engineering innovation process: the ground-breaking design concept pushed architecture to the edge of the possible and inevitably generated difficulties of timing, of technology and of cost that stretched the patience and relationships of all of the protagonists in the process. There were no ready engineering solutions to the problems; the technologies available were not adequate to solve these uncertainties and gain new knowledge about cost. Computer technologies were at the very beginning of their development for architectural purposes. For the daring design to succeed new techniques had to be developed and developed. Technological innovation needed more time.

Thus, invention had one speed of flight, slower than the organizational speed. Construction time sequenced by management constraints had a different speed of flight. There were two discrepant rhythms. On one side, the rhythm of the creative process, of a dreamer that takes too long to deliver the goods, or costs us too much money (Murray 2004: 102), who needed to retire many times to refine the concept and make it perfect. On the other side, there was the organizational rhythm of construction, cost, time, tenders and committees. These rhythms were never fine-tuned together: the rhythm of a designer perfectionist — a man for whom the quality of the end product was of greater importance than cost and time; and the rhythm of the public organizations — for whom delay in construction meant an increased budget, disappointed tax payers and loss of public trust. That is hand, there is the individual. On the other there is society and politics, with their institutions and organizations. One could say that the rhythm of design flew at a different pace to the one of politics and society.

Let us set the questions again: ‘who, in fact, designed the Sydney Opera House?’ and who is responsible for the shape that the building has today, for its iconic status, for this priceless brand? One way to tell the story is to narrate the ground-breaking design as something that happened in an isolated bubble of architecture and then of Utzon was viewed as a separate entity the architecture of this building would wholly incapable of understanding Utzon’s genius would be as erroneous as blaming and their important role of allocating and controlling public expenditure. Accusing architects should have in their armoury, would be to pass the ball to his part of the part of politics and escalate into a no-win situation.

Untangling the Lines

Yet, if we closely follow the controversy (Figure 4.1) and restrain ourselves from embracing these lines of interpretation, we will find out that there are not two
distinctive bubbles; one of the individual and one of society. There is not a powerful individual; Jorn Utzon, the architect, the dreamer, the creator, the unrecognized genius on one side with politics on the other. Follow instead, as we have, all of the actors in the controversy, both human and non-human; the roof, the competition rules, the assessors, the architect, Utzon’s office, Hall Tall and Littlemore (the architectural consortium that replaced Utzon in 1966), Ove Arup and Partners, SOHEC, the contractor, the politicians, the consultants (such as acoustics, theatre principles, electrical engineering and mechanical services), the Public Works Department, the supporting cast (Bavinton 2006). You will then be led to discover a fine mesh of moves between both sides of the court (politics and architecture).

We will find layers that multiply further. Each of them will correspond to a course of action, followed by a number of detours, each of them modifying the initial design vision and aim of the project. These layers will compose the cooperative action that designing a building implies.

Let us reiterate the questions: who designed the Sydney Opera House? Was it Utzon, or Arup, or the other architects who stepped into the job when Utzon resigned? Who is responsible for Utzon’s resignation? Who is responsible for the state of its design today? If there are so many actors who took part in it, is it its making then whose signature should be kept on the building today? The its making then whose signature should be kept on the building today? The
powerful enough on their own to change the image of Sydney. There are not
two bubbles to be drawn on our diagram, one for design and architecture and
one for politics and society, which denote two distinctive fields existing prior
to the controversy that can be opposed and juxtaposed to allow us to compare
and find connections.

Design is neither in the mind of a sole architect nor in the outer framework of
a society. It is always composite. Architecture is composite and this composition,
as seen here, is always ambiguous: it was Utzon’s masterpiece yet he did not
complete the building; many design features were different to those that Utzon
anticipated with his first project; many ideas got abandoned; the creation of
the huge over-sailing roofs was a magnificent achievement of engineering; the
completion of the project—a thorny political matter. Thus, the architect’s drawings
were transformed by other engineering drawings, helped by new technological
innovations, and continued by media pressure and political decisions. The layers
in this controversy are more difficult to follow than those of the opera house
competition in Cardiff. The detours are multiple and they modified the initial aim
shaping, in this way, a composite collective action where the artistic ego of the
architect, the engineering philosophy of Arup, the new computer technologies of
the 1960s, the shape of the shells, the political pressure from the new Labour
Government, the street demonstrations and the doubled budget should also be
taken into account. They will all become parts of a joint diagram in which
Utzon will be just one of the myriad of actors to follow (Figure 4.2). The Sydney
Opera House was the result of collective action. It was composed as a series of so
many practices, preoccupations, design difficulties, technological challenges and
different languages and actors. Architecture appears to be an impersonal process
over the course of which a building is composed; it is made of the many different
pieces brought by different actors who may or may not be connected with the
one that signs as an ‘author’.

The question ‘who is the designer?’ is not answered at the beginning of a
project when a winner is chosen out of short-listed finalists in a highly contested
international competition. After witnessing the complexity of the controversy,
we cannot simply reiterate the well-spread interpretation that the design was
mattered was his talent, his daring visions and his perfectionism. Instead, the
all of the actions are recollected. Without the forced collaboration between the
the media, the Sydney Opera House would never have been realized. Without
engineering profession would never have pushed the frontiers of architectural
achievement. Design can only succeed as a joint action!

Follow Utzon, follow the numerous solutions discussed regarding the beam
design, follow the letters written by Ove Arup to Utzon, follow the Minister for Public
Works redefining the roles of both design and coordinating architects, follow the

students protesting against his resignation, follow Peter Murray’s account of the
controversy and you will find out how difficult it is to separate the puzzle of their
actions into what pertains to the domain of architecture and engineering and what
pertains to the field of politics and societal changes in 1960s Australia. One can
understand now that it is impossible to begin from a pre-established domain that
we all call ‘architecture’ and then define another domain called ‘epoque’, ‘society’;
‘intellectual milieu’, ‘political context’ or ‘zeitgeist’ so that we can question their
possible relationships. We cannot continue to juggle these two giant balloons until
they finally pop. And you know, just as I do, that when a balloon suddenly pops it is
impossible for the air to slowly leak out, which results in a loud bang that can cause
fright. To save ourselves from this huge shock we need to understand the reason
why balloons pop the way they do. We need to understand how they are made and
what they are made of; the rubber-like materials, their elastic properties, the limits
of their stretchiness, the different techniques of filling them with air, how quickly
the latex can tear, how air seeps out of them...

Questioning whether it is ‘the individual architect’ or ‘society as whole’ that
should be blamed or praised for the success or failure of a particular project
is wrong. This question should be replaced by a programme of inquiry. It is an
empirical programme, a slow and painstaking inquiry that will allow us to follow, as
long as we can and as far as all our analytic and visual tools will allow us, the meanders
of the collective action of architecture that can mobilize elements with variable
ontology through many detours and compositions. The idea of an architecture that exists autonomously (so often taken for granted) as well as being a resource to explain contemporary architectural issues by juxtaposing them to culture, society and politics (other domains we often assume to be autonomous) is turned into an object of study that should be seriously tackled.

WHAT IS A CONTROVERSY?

Controversies, as seen here, are complex phenomena. Design controversies involve all kinds of actors. Not only are there human beings and human groups but there are also natural and technical, individuals and institutions: beams and dreamers, engineers and protesting students, politicians and roof shells.

Controversy displays the design and the social in a very dynamic way; design precedents and communities, political protests and design concerns. The actors never appear alone but in a network. The social and the cultural are to be found as architectural practices unfold, as design happens; they are not outside, far away or beyond architectural objects and processes. Following the controversy as it unfolds allows the unravelling of the normally hidden social and political dimensions of architecture.

The controversy functions as a 'hybrid forum', a space of conflict and negotiation between actors (Callon et al. 2001). Forum refers to those particular spaces in which various groups can meet and debate different issues and the technical choices that are of importance to the community. They are hybrid because the people involved and their representatives are heterogeneous: experts, politicians, clients, architects, technicians and concerned lay people. Hybrid because the questions to be tackled are of a different nature: from political and ethical concerns through to mechanical engineering and aesthetics.

Design quarrels are so interesting because they open up 'black boxes'—things and understandings that otherwise will be taken for granted. Before the Sydney Opera House controversy, many people have been aware of the complex relationships between architects and engineers, or of the technical challenges or the costs needed to construct an icon. They have taken the consequences of the ground-breaking shape as given designed by an award winning architect, Jørn Utzon.

Those among you who have tried to trace the detours in the Sydney Opera House story that I have guided you through might have used brilliant design skills to draw them. Yet, whatever mastery you use, you would never be able to cut out architecture as a domain of material activities, of aesthetic and technical challenges, that can be entirely distinguished and separated from the rest—the values of the society, the cultural habits, the local politics, the economic climate. You will naturally question how you can visualize the meanders of the architectural, the political, the technical, the social. The answer, as we shall see in Chapter 5, is to map all of their traces and entanglements.

ENDNOTES

1. ‘The black box’ theory of architectural conception accepts that all significant parts of the design process are internal and unavailable for empirical discussion; therefore design is considered to be a hermetic and undecipherable work of the brain (Boyd 1965, Akin and Weinell 1982).