kept asking me throughout the duration of the course; thrilled by the change but always feeling insecure straddling the stable boundaries of technology and humanities. I will discuss the specificity of the teaching philosophy that controversy studies imply.

MAPPING CONTROVERSIES AS A TEACHING PHILOSOPHY IN ARCHITECTURE

Developed initially by the French sociologist Bruno Latour and applied across a variety of disciplines, Mapping Controversies offers a new way of inquiry in social sciences based on Actor-Network-Theory. As a teaching philosophy, it is used largely in the fields of Sociology, Political Sciences, and Engineering Studies, primarily in French-speaking universities across Europe. Only recently was the teaching method introduced in English-speaking universities with Manchester (Architecture) pioneering this field along with Oxford (Geography) and MIT (Science Studies).[2] Drawing on controversy mapping theory and previous teaching experience in *École des Mines*, I started the course Mapping Controversies in Architecture in 2008/2009.[3] I asked my students to use their advanced design skills to draw, map and visualize not an object (typically a building or a site) but a controversy, that is, a complex ecology of connections of an architectural, cultural, economical and political nature. This implied a very different inquiry in the cosmic nature of buildings, which made the students ask more and more interesting questions.

Two Types of Inquiry

Donald Schön's (1983) concept of 'reflection-in-action' revolutionized design anthropology in the 1980s and founded a new epistemology of practice that stands the question of professional knowledge on its head by taking as its point of departure the competence and artistry already embedded in skilful practice. This type of studio-based reflexivity is followed in many architectural schools today and is commonly privileged by the professional schools of many research universities.

If reflection-in-action stands against the scientific, linear way of knowing, what kind of inquiry could complement the systematic way of knowing about architecture? I will argue that architects need to engage with a pragmatist type of architectural inquiry that is a situation-based, distributed way of learning about architecture and its various entanglements rather than one that relies on a stable stock of systematic, scientific knowledge. Mapping Controversies in Architecture was introduced to the curriculum as a pragmatist, self-exemplifying mode of engaging with architecture. As opposed to the reflective studio-based learning of what it means to design, it implies an out-of-the-studio way of learning *about* design, which is simultaneously an out-of-the-auditorium mode of questioning the multifarious connections of architecture, society, economics, culture and politics. Some results from this educational experiment are discussed below.

Let us follow Petra (a student) and Quist (the coach) in their attempt to design a building. The example is taken from Schön's *Educating the Reflective Practitioner*

(1987). As they discuss the project they also sketch different buildings: a reflective mode of designing. This reciprocally reflective dialogue of coach and student happens in the studio. Their design process traces a web of projected moves and discovered consequences and implications, sometimes leading to a reconstruction of the initial coherence – a reflective conversation with the materials of the situation. We follow Petra and Quist's conversation with materials and shapes. Drawing and talking, Schön informs us, are parallel ways of designing and together make up what he calls the 'language of designing' (Schön 1987). Petra is stuck. She has tried to place the shape of the building into the contours of the land but the shape does not fit into the slope. Quist criticizes her framing of the problem and he repositions it as follows: 'You should begin with a discipline, even if it is arbitrary … you can always break it open' (Schön 1983: 83). In the media of sketch and spatial-action language, he represents the site, draws and redraws different options and simultaneously evaluates the consequences of every move on the sketch.

Each move has implications that bind later moves and each of them can potentially create problems that need to be described and solved, sketched and resketched. Quist designs 'by spinning out a web of moves, consequences, implications, appreciations, and further moves' – that is how Schön defines what it means to design (Schön 1987: 57). Both Petra and Quist engage in a reflective conversation with the situation. Each move is a local experiment that contributes to the global experiment of reframing the problem. It is a reflective process: 'As Quist reflects on the unexpected consequences and implications of his moves, he listens to the situation's back talk, forming new appreciations, which guide his further moves' (Schön 1987: 57). Design progresses as Quist reframes the problems posed by Petra and engages in a reflective conversation with the situation and the implications of the new design moves.

Here is another type of inquiry. It is 2006 and we are in the midst of a controversy surrounding the proposed expansion of London's Heathrow Airport. Robert, Aisha, Joe and Sophie delve into the press clippings and Internet image galleries to try and unravel all the traces this controversy has left in the digital sphere. They explore the archives of Heathrow developments, governmental papers, news reports covering the community and activists' protests, images and videos. They are my architecture students and I am not a coach in the studio but a lecturer in humanities.

They learn about the nature of dissent, they identify the actors, they stare at a complex timeline of the controversy that incorporates all of the actors and they follow the different events. Images and YouTube material inform us about the key actors and we can literally hear their voices: 'Voices from the remembrance service for the victims of climate change on the taxiway at Nottingham East Midlands Airport held by the Baptist minister, Reverend Malcolm Carroll, held on 24 September 2006'; 'Voices of protest from the 14–21 August annual climate change camp held at Sipson. Over 2,000 people attended'; 'Voices of protests from 21 March when Plane Stupid activists do a banner drop near Edinburgh Airport'. And we can extend that list.

Robert, Aisha, Joe and Sophie immerse themselves in complex datasets that allow them to reflect not only on the design of the third runway and the sixth terminal

to Heathrow Airport but on all those issues design is related to. How will the new terminal affect climate change? How many surrounding homes will the expanded airport destroy? How will the new design affect the residents of Sipson? Will the campaigns against Heathrow's expansion change any of the design plans? As my students collect the data on the controversy and try to analyze and visualize it, they actively engage in a type of pragmatist inquiry called mapping the controversy. They trace the actors' trajectories; draw their diagrams of relations and the timeline of the controversy while collecting the data. They do not simply deal with the sketch and the design coach but interact with a much vaster and heterogeneous assembly of actors: the Mayor of London, Boris Johnson; greenhouse gas emissions and nitrous oxide levels; Greenpeace and its celebrity supporters such as Emma Thompson and Alastair McGowan; environmental impacts; residents' health concerns; the activist group, Plane Stupid; environmental, aviation and welfare groups; air companies such as Co-op Travel, British Airways and the British Airports Authority. All become part of the complex ecology of the proposed airport expansion.

When dealing with all of these actors, Joe and his team do not learn what design is; they learn about *what design does* – what kind of effects it can trigger, how it can affect the observer, divide communities and provoke disagreements; they immerse themselves into the many consequences of design practice and gain an awareness of its various implications. So, if Joe, Robert, Aisha and Sophie were asked to design a new terminal, especially after the controversial fame of the recent Terminal 5, would they still stay in the studio? Would they remain absorbed in a meditative dialogue with the sketch, staring at a model and 'engaging in a dialogue with materials and shapes', trying to solve the paradoxes of design? No, they would rather plunge into the design world outside the studio and face its complex ontology.

What kind of inquiry is this and how does it differ from Schön's studio type of reflection-in-action (Schön 1985)? Does it still require designers to engage in a meditative process of communicating with materials and shapes in search of good airport design? No. Is it inspired by critical theory and does it engage in a meta-reflexive analysis that explains design by situating it as much as possible into reflexive frameworks? No. Neither of these approaches can describe the Mapping Controversies exercise in which Joe and his friends engage. It is neither a purely reflective nor a meta-reflexive inquiry.

Compared to the studio reflection-in-action that deals with the uncertainty of design, taken in the specific materiality of cognition, the mapping is a self-exemplifying type of inquiry that deals with the consequences of the manoeuvres of all actors involved in situations of uncertainty, their implications, their changing positions and opinions. As Joe and his team search among the piles of articles in the library and navigate databases and image galleries on the Internet, they witness a web of moves composed of all of the actors' stances involved in the controversy. This exercise is not about designing a building and trying to fit it into a slot but about weighing up the impacts a building could have and evaluating the consequences of design and its implications. The mapping does not advance by a subsequent reframing of the problem or by the sketching and resketching of

different options and possible scenarios; it progresses by following all extending webs and multiplying their proliferation through the inquiry. In the first case, Petra and Quist try to understand what their building will look like and how to design it in a better way by solving all the problems of site, scale, materials and shapes. In the second case, Joe and his team try to comprehend the consequences of design and the web of shifting positions within the controversy.

You could argue that the two types of inquiry are not comparable at all. One occurs in the US during the 1980s and the other in the UK in 2009. One involves a student and coach; the other is a group learning environment with a lecturer; one refers to a situation of learning *to* design; the other implies situations of learning *about* design; one could be quickly called 'design practice'; the other 'design theory'; one will take its inspiration from technology; the other from humanities. And if we were to continue the list of comparisons we will get deeper into the dualism of technology and aesthetics, architecture and society, theory and practice. Sceptical of the rationalism that distinguishes art from science, the Mapping Controversies method attempts to endorse and cultivate a specific attention to the performativity of design through teaching.

I refer to Schön's study in order to shed light on the differences between a bidirectional reflective inquiry and the self-exemplifying multidirectional type of inquiry implied by Mapping Controversies. In the former, the designer and the result of his design are affecting one another in a situation that renders both directions into a relation of cause and effect, where every design move 'bends back on' and affects the entity instigating the action. There are many ways of comparing the design reflexivity of Petra and Quist described by Schön with what typically happens today in a studio practice. Whatever differences we can establish, Schön's types of reflectivity can still be found today in architectural schools.

Moreover, designers take a variety of other data into account when designing: they do not engage in solitary coach-and-student problem-solving with the help of a sketch. The dialogue with sketches and shapes is complemented by an intense search of data, design precedents, image retrieval, actors' statements, archival materials, government papers and data about the architects in charge. These new sources of design inspiration would imply a different mode of communication with materials and shapes, a different type of cognitive practice. The thinking about what they are doing while they are doing it makes the *drawing* design practitioners reflective, while the mapping designers are rather *surfing practitioners*. You might object to this as a rash comparison and say, 'but many professionals today rely on browsing large amounts of data at the beginning of every inquiry'. What is it that makes the *surfing* Joe a design practitioner? If design happens by surfing and drawing, how can designers find their way within these various datasets – the digital masses of data on their computers and the heaps of drawings, paper cut-outs and physical models in the studios? How does this type of hybrid inquiry, with tracing paper and screen pixels, travel and generate a new type of design practice?

To answer these questions we will leave Petra and Quist for a while, arguing over the sketch and reframing design problems, and focus on the mapping venture that Joe and his colleagues are about to undertake. Why do they deal with controversies

rather than simply with buildings and shapes? How does the engagement with controversy analysis and mapping lead us to a different epistemology of practice? What are its implications for design education?

What Does it Mean to Map a Controversy?

The students follow and map different controversies by focusing on the dynamic debates surrounding particular buildings or projects ranging from local UK controversies such as Robin Hood Gardens in Sheffield; BBC Broadcasting House, Chelsea Barracks and Arcelor Mittal in London; Birmingham Central Library; the Dunes of Scotland Golf Resort, to overseas projects with importance for the international design community such as Expo 2010 in Shanghai; Nu River Dam in China; Okhta Tower in St Petersburg; the CCTV in Beijing; and the Park 51 mosque project near Grand Zero. Controversy, I explained to them, does not refer particularly to media debates, scandals, rumours surrounding design plans, uncertain architectural knowledge, buildings-in-progress, tentative technologies or building innovation. Instead, controversy points to the series of uncertainties that a design project, a building, an urban plan or a construction process undergoes; a situation of disagreement among different actors over a design issue. It is a synonym of 'architecture in the making'. Mapping Controversies means 'analyzing controversies' and covers the research that enables us to describe the successive stages in the production of architectural knowledge and artefacts, buildings and urban plans. It also refers to a variety of new representational techniques and tools that describe the stages of controversies.

Students are invited to follow, document and map (analyze and visualize) a controversy surrounding a particular building or design artefact. This may involve a master plan, a design proposal, an urban network, a technological or material innovation, or otherwise it may take the form of controversial statements or declarations. The instructions and definitions given are:

1. To follow requires being able to trace the dynamics of the controversy in time: the actors (individuals, groups or institutions), their arguments, the different positions and how they change and progress over time, the spaces in which they develop, the many ways of closing and reopening the debates, the extent of public involvement and participation in the process.
2. To document the controversy requires the collection of a variety of materials. Compile a research dossier that includes press clippings, images, interviews with architects, clients and investors, public bodies, concerned citizens and users. Include materials and extracts from the literature related to other buildings of similar type. Seek information from governmental papers and archives. Examine and compile architectural plans, drawings and diagrams.
3. To map (analyze and visualize) means to present the chronological development of a dispute surrounding a building, a design project, a master plan but also to represent it with visuals. To capture the dynamics, visualize the timeline, the chronology of the controversies, the weight of

the different actors. Provide a visualization of how the actors' positions disperse or converge and how a personal position might change the whole configuration of arguments, and the timing and spacing of these arguments. To map denotes being able to visualize and analyze an argumentative space – a space shaped by disagreements and tensions, triggered by the controversial architectural object.

In their attempt to map the Heathrow controversy, Joe and his colleagues returned to the library and spent many hours browsing the Internet. Firstly, they started following the dynamics of the controversy: the actors, their arguments, the different positions and how they change over time. Secondly, they documented the controversy by collecting a variety of materials and compiling a research dossier composed of press clippings, images, and interviews with architects, clients, investors, public bodies, concerned citizens and users. To this they added materials and extracts from the secondary literature related to other buildings of a similar type. They looked for information from governmental papers and examined architectural plans, drawings and diagrams. The third and the most challenging step, was to analyze and visualize – to *present* the chronological development of disputes surrounding the airport expansion design plans and also to *represent* it with visuals; to capture the dynamics, visualize the timeline, the chronology of the controversies and the weight of different actors' positions. Employing digital media, the students created interactive chronologies that displayed primary events based on media representation and which informed the website visitor who were the actors that were most connected with a particular event. The diagrams permitted an overall visual depiction of chronological events and grasped the relationships of the heterogeneous actors involved in the controversy in a more intuitive and user-friendly way. They made videos and used materials available on YouTube, as well as podcasts that were accessible through iTunes. They provided visualizations of how the actors' positions disperse or converge, and how a personal position might change the whole configuration of arguments and the spacing and timing of these arguments. There are semantic web-crawling tools appearing online which can connect with data sources. Employing complex linguistic and referential algorithms, they dig out articles, reports and official websites connected with particular topics by noting interconnectivity between websites, terminology and keywords (Venturini 2011). The creative use of semantic web tools and architectural design skills led them to produce innovative visuals to *trace* the dynamics of the controversy and its changing argumentative spaces.

The students have no definitions to learn and no strict recipes to follow; they describe what they see meaning that they must be attentive to the details to find a unique account of a given situation. There are two reasons that this is experimental. Firstly, because students need to restrain themselves from explaining design with a single theory or viewpoint, for instance, the political factors or the ecological crisis that would give a particular shape to airport design. Secondly, they observe the controversy not through a singular design viewpoint or through the narrow glasses of the sketch (as Petra and Quist would

do in their studio). Joe and his colleagues put different hats on their heads when trying to unpack what such a design project means. They follow it from as many viewpoints as possible: the village inhabitants, the land occupants, the aviation companies, the pollution, the planners and the designers, the celebrities, the airport authorities, the carbon dioxide emissions and so forth. They listen more to the voices of the actors than to their own presumptions. They put the quick and easy explanatory schemes of design critics and theorists aside. Instead, Joe, Aisha, Sophie and Robert listen to what actors, protest demonstrations and the resistance of materials say and forget (even for a while) all presumptions of what this controversy might be about.

Using new objects of research and new techniques of representation means that Joe, Aisha, Sophie and Robert do not simply tell a story about a possible/impossible new terminal design at Heathrow. They also tackle the classic question of representing the subjects of design whose composition is always variable. The mapping refers to the variety of tools that describe the consecutive steps in the production of architectural knowledge, focusing on visual representations of the stakeholders, linking their various interests and tracing their development through time. There are many digital technologies that students can employ and I encouraged them to choose freely from what we provide and also what they find under their own initiative. The software used to embed these actors into a representational space ranges from basic web tools, such as web page editors Flash and Java, to 3D visual software in accordance with the content that the students are dealing with. All in all, the design students have successfully created novel modes of visually incorporating controversy studies suited to a digital format.

The results were presented in websites in which the design controversy and its moves are described. We stipulated that each project website had the following items:

Homepage
The simplest part of a website should include the title of the controversy and a list of chapters and authors. Each site should use a different format based on the particularities of the issue being explored.

Presentation of the extent of dissent
Dissent is a key feature of a controversy (Figure 5.4). A multiplicity of dissent is one of the first things that a viewer should find on a Mapping Controversy website. It is important to note that this is precisely what is missing from other websites on controversies where you may find a large list of links and information. However, there is no relative weighting of the importance of the actors and their concerns. Nor are there clear and coherent associative connections between the various actors. The idea behind Mapping Controversies is that you know how to organize the data in such a manner that these elements are clearly visible and navigable on the website.
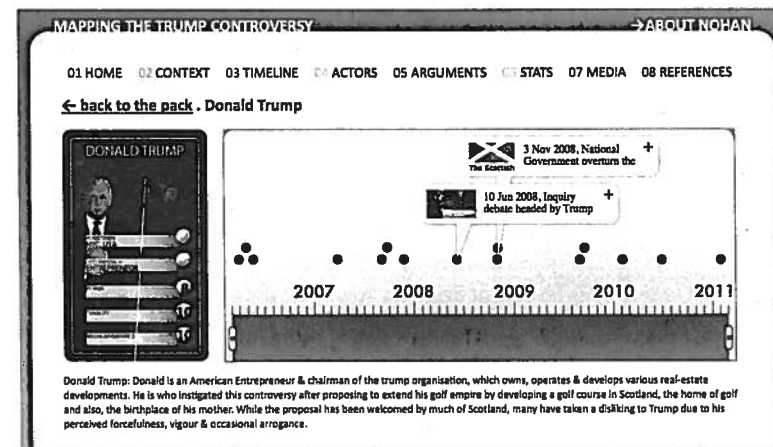
5.4   Example of students' website, presenting the controversy surrounding Donald Trump's proposed golf course at Menie Dunes in Aberdeenshire; copyright – MSA.

Presentation of context
The third element concerns the type of contextual knowledge required to take part in the debate. On the web we are often bombarded with masses of data and we are not equipped with the means to extrapolate any significant knowledge. For this reason, a Mapping Controversies website should strive to provide some sort of context. This may seem difficult as a result of the fact that context itself is often contested but it can nevertheless be done through a careful and pragmatic presentation.

A multiform documentation
In a school of journalism, the following are regular activities: site visiting, picture-taking, reading papers, compiling a bibliography and conducting interviews. Architects often engage in some of these activities as part of studio projects. They are equally important for the students' Mapping Controversies websites where, for example, they can transcribe interviews, post photos or perhaps make a film. It is important to carry out this fieldwork because while much information can be found on the web, the Internet does not, of course, include absolutely everything. Limiting oneself exclusively to digital technology can mean that important information is left out and a project will suffer as a result.

Many technical tools invented in order to navigate and gather masses of statistical data have now completely changed their function; they navigate through masses of information which remain accessible at the elementary level rather than at the macroscopic level. The web has extraordinarily renewed all of the techniques which are dependent on information technology.

Statistical analysis

With each successive layer, and the added complexity they imply, it becomes paramount to create a mapping or cartography of the many positions involved in the controversy with the help of statistical tools. This is what is referred to as 'second-degree objectivity' (Venturini 2010) – the novel modes we have of accessing extraordinarily large amounts of data.

As the web has expanded, it has not only multiplied the sources and quantity of accessible data but has also stimulated a proliferation of creativity in terms of the many cartographic and quantitative tools and crawlers which allow for visualizing, or revisualizing, that same mass of data. It is now quite possible and relatively easy for a student to map the relative authority of key figures in a dispute. It is important to note that current web technology permits us to make a cartography of opinions with the very same tools, honed in years of scientometrics, which have been used for analyzing scientific facts.
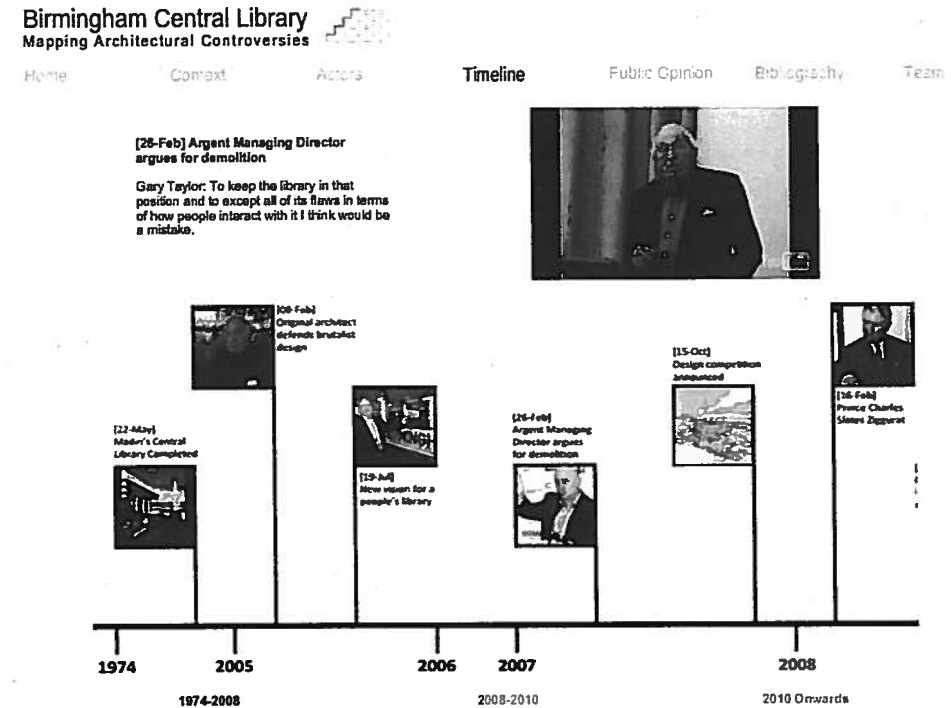
Chronology integrated with documentation

The sixth element that is always visible on project websites is an interactive chronology (Figure 5.5). This looks like a simple feature but is nevertheless a very elaborate tool. A chronological timeline can be used to map and gather masses of information obtained through the work of the reporters. The students can be very creative in their ways of visualizing the time of the controversy, its flight and its different speeds.

List of actors

The seventh element is a presentation of the actors in a controversy (Figure 5.6 and 5.7). When searching on Google for information concerning a disputed fact, a person does not seek an endless stream of unorganized data but a manner of discovering who the main actors are and how they are gathered. A controversy can be visualized in the form of an assembly or forum in which the perspective of the issue alters according to your position. To create this effect, even simple colour-coding works well towards aligning the interests of various groups together. Once a controversy has been mapped the same website can be used as an interactive forum to continue and animate the debate.

A website may be developed in such a manner that it not only presents information but also produces it with data automatically read or streamed into the website for further exploration of the issue. It is now possible to access data depicting the phenomena themselves in addition to their abstract descriptions in static written form. Video resources allow witnessing the 'dispute' rather than merely presenting abstract concepts and terminology. The empirical tradition is deeply revolutionized by the possibility of having direct access to the data; empiricism itself is being renewed.

5.5   Example of interactive timeline controversy surrounding the Birmingham Central Library; copyright – MSA.

Students can even choose to transform the website visitor into a *producer* of fresh data because they can be given the possibility of intervening in the dispute. More and more websites allow for virtual experiments that replace abstract notions with visual access. The use of virtual labs allows becoming a virtual witness and developing the basic competency and skills needed to enter into the debate.

Digital technologies can be mobilized to *simulate* the different versions that actors have of the same dispute. The students look at some of the innovations present on the web and consult the resources section of the course website (http://www.mappingcontroversies.co.uk/) to get access to a selection of tools relevant for design education; a larger collection of resources is available at http://www.demoscience.org (resources).

To summarize, it is important to see a website as a 'gathering' or assemblage of information derived from papers, reports, images, recorded interviews and videos (Venturini 2011). The key point for evaluation is whether or not controversy websites utilize digital web technology to its full extent. The students should overcome the tendency to reproduce data in a static book form and push towards dynamic presentation and visual novelty. Incorporating all of the new digital tools

S.6   Actors' diagram of the London 2012 Olympic Stadium controversy; copyright – M5A.

Candy Brothers....are one of the main developers who own the site along with Qatari Diar. They bought the site for a record fee from Ministry of Defence

5.7   Actors diagram of the controversy surrounding the potential development of the site of the former Chelsea Barracks, London; copyright – MSA.

at our fingertips and capitalizing on new forms of visual architecture are the key factors for effective controversy mappings in the future. Architecture students find that it is also a great challenge to use all of the advanced design skills that they have acquired to produce original visualizations (with AutoCAD animations, videos and so on) and use them in the websites. They equally make use of the digital technologies and the huge amounts of available web resources to better visualize the complex nature of buildings and their changing cosmologies.

The aim of the website presentations is not to unveil some general structure of social and political factors concealed behind the phenomena. Their only purpose is to provide the most detailed description of the phenomena as seen by their protagonists. As Latour says, 'If your description needs an explanation, it's not a good description' (Latour 2004c: 67). The visuals used by architects do not simply describe, but also deploy the phenomenon. In the first step (following the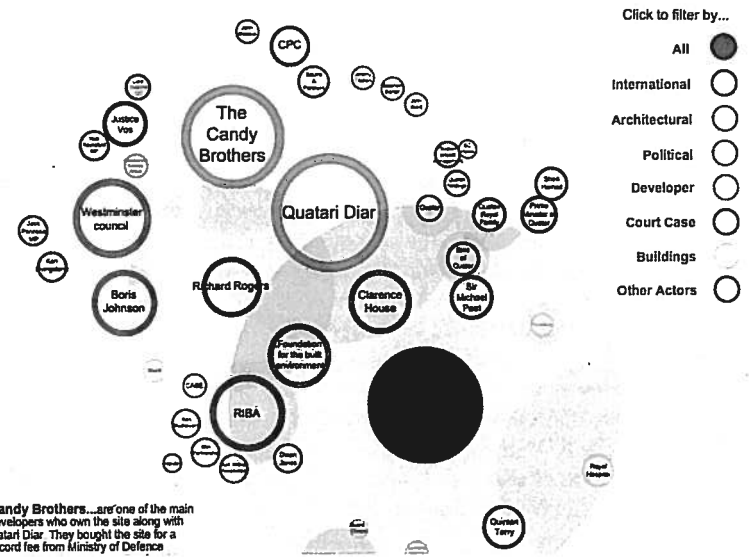 controversy) and the second step of the inquiry (documenting the controversy) students only observe and describe what they see and find, thus putting aside any social theory, any meta-reflexive frameworks, that would explain particular courses of actions or the specific nature of actors. Then, in the third step of mapping, they deploy with design virtuosity the ontological charade they find when studying a controversy on the move.

Every controversy sets a trail that makes us reconsider what a building is and how many elements it is made of. Mapping Controversies allows students to follow this process and rethink the nature of buildings. Its techniques hinge on the idea that 'things' generate contested spaces in which an artefact is produced following a plethora of material and subjective considerations (Harman 2002, Latour and Weibel 2005). Buildings are 'things' as they appear as the result of a protracted process involving multiple concerns. In the diagrams of the mapped controversies, the students present the variable ontology of all kinds of actors enrolled: activists, groups and single architects, aviation companies and wind resistance, farmers and celebrities, house owners and drawings. And because the protagonists in a controversy are so heterogeneous (materials, experts, politicians, clients, architects, technicians, and concerned lay people) in the process of mapping them students learn about the hybrid nature of the issues at stake. The questions to be tackled in an architectural debate, to their surprise, are far from being of aesthetic and technical nature only; they range from political and ethical concerns through to mechanical engineering and environmental politics.

Mapping Controversies allows students to display the design and the social in a very dynamic way. The actors never appear alone, in isolated bubbles or structures, but always in a network. A building is seen through these mappings as an animated collection of criss-crossing trajectories of unstable definitions and expertise. Rather than merely adding external concerns to objective entities, this advocates a new perspective to buildings where humanities and technologies, design and theory join synergies. And yes, it ends up as both humanities and technology by redefining them and justifying the need to tackle them together.

Following controversies also prevents students from falling into the trap of reductionism – reducing and explaining the protest against the Heathrow Airport runway with the political climate, cultural changes or social factors. These are easy frameworks of explanation. Students account for as much as those lines as they can without reducing the building specificity, or in fact any design matter, to one type of factor only. They account for the complexity of design venture and the underlying social, political and cultural dimensions of the process of design. Controversies also open 'black boxes' and allow students to get access to things and understandings that otherwise will be taken for granted. 'Before this runway controversy many people were not aware of all of the environmental effects of aircraft or of the fact that the government can forcibly purchase your house,' stated Joe with surprise at the group presentation of their controversy mapping.

This is also a good rehearsal for the profession of the designer. In a design process an architect does not simply draw in search of perfection of form, ideal geometry and aesthetics. For design work to be successful the architect should endeavour to trace the cosmogram of the users' worlds and worldviews by identifying and tracking the practices followed by various sets of actors (for example, clients, actual and future users, contractors, citizens). Engaged in mapping the controversy, students ask the questions: 'In which world do you live?' 'How is this world structured?' 'With whom and with what are you ready to

share it?' 'What do you cherish the most?' 'Who are your allies and who are your critics?' 'How does change happen in *this* world and alter entire cosmologies?' They try to understand the actors and their worldviews, what they cannot live without and what they cherish the most. Aren't these precisely the questions that a future designer should ask?

Even though some controversies never reach the intensity of open fights, the construction of a shared universe is often accompanied by the clash of conflicting worlds. That is why design controversies have the power to recompose cosmologies. Very often the proposed change in a controversy will entirely reconfigure the connections of existing actors and rearrange their worlds. It is crucial for an architect to understand the cosmology of the users for whom he is designing.

Rethinking the way we tackle buildings (with narratives and freeze frames in humanities and many technical drawings and visuals in technology) in the Mapping Controversy exercise, the students make a step towards innovating the visual vocabulary that needs to be invented to do justice to the idea of buildings as contested spaces. Through numerous animations and videos they produce descriptive accounts of buildings that contrast greatly with the older and more reluctant view of buildings as objective static objects.

Looking at the maps and the inventive use of design visuals, we can witness the students' awareness that a building, seen through a series of contested projects and users' demands, resembles a complex ecology more than it does a static object. In this experiment, buildings reveal their nature as 'things', that is, as gatherings of many conflicting demands. They cannot be reduced to what they are and what they mean as architectural theory has traditionally been argued by adding 'symbolic', 'human', 'subjective' or 'iconic' dimensions to them. These visuals (animated plans and sections, actorial diagrams) talk convincingly about the 'thingness' of architectural and urban projects. Aiming to understanding controversies in urban design and architecture, this experiment also brings theory and practice together by reconnecting and strengthening the synergies between them.

From Reflecting-in-Action Towards the Mapping of the Real

An understanding of a building as a plethora of material and subjective considerations and as the result of a protracted process involving multiple concerns, will move beyond the traditional two or three-dimensional image, reaching out to represent additional human factors, and indeed reducing the need for distinctions between subject and object. Look at the sketch of Petra: we are in a simple Euclidian space. A building that we witness in a controversy mapping is rather reminiscent of *navigation* through a controversial datascape. Rather than merely adding external concerns to objective entities, the students' visualizations make a step towards the invention of a visual vocabulary that will do justice to the idea of buildings as contested spaces.

Both the design enquiries of Petra and her coach and those of Joe and his colleagues deal with uncertainties. We gain valuable insights about the meaning of design in these enquiries. The designer in Schön's account is someone who deals with uncertainty, with complex, incoherent and messy situations and converts them to a determined form (here Schön follows Dewey's view of the designer); they '*construct* and impose a coherence of their own' (Schön 1987: 42). In our Mapping Controversies case, the designer is one that recognizes and completely takes into account the complexity of design by observing it then simplifying it through the production of descriptions and visualizations.

> When we observe *controversies*, we focus on the liquid side, as only in quarrels, disputes and flights, can new actors make their way to the surface of society. When we describe *controversies*, we contribute to the solidification of some portions of social magma reducing its complexity to a manageable level. Both tasks are equally important and closely connected in the practice of social cartography (*Venturini 2010: 11*).

The experiment of Mapping Controversies makes us perceive design as being concerned with the entire web of moves that are traced by the actions of design; it is about property, swarms of birds, affected nature, polluted air, the destroyed coherence of the neighbourhood, contested zoning regulations, costs, local politics, legacy and community vitality. It is much more complex indeed than simply trying to put a building on a site and adjust its scale, gradually solving design problems.

The links between architecture and society are traditionally explored in their solid states. Instead, following controversies allows us to witness the social and the architectural in a non-stabilized state where all has melted. Follow the actors in a controversy, how they agree and disagree, how they shape alliances, how they scale and rescale the spaces where they move and create spatial disjunctions. Here is where you find the social. The cartography of controversies is conceived as a toolkit to cope with the different hybridizations of actors and knowledge, as an effort to follow disputes when they cut across disciplinary boundaries. Mapping design controversies pushes the investigation of architecture students far beyond the limits of sociology and history of design towards neighbouring human sciences, technology and even the natural sciences. Questioning the new Heathrow Airport runway will lead us to question climate issues, airline politics and landowners' property rights. How can aviation companies profit better from the design? What kind of impact can a new terminal have on the environment? How will the property prices change as the construction progresses? All of these issues are not technical minutiae but important questions that lie at the core of the controversy and deserve greater attention. This realistic mode of inquiry greatly differs from the reflexive inquiry and the meta-reflexivity-based approach in design education. Through Mapping Controversies, architects learn that a building is something to be scrutinized, investigated and sought. It is not 'out there'; it is to be followed and mapped. Only through constant attention to the performativity of design can design education sustain its integrity, value and effectiveness. Developing the Mapping Controversies in Architecture approach is a way in which design education can have a future.

ENDNOTES

1   Interview of the author with David Serero, 30 May 2008.

2   The six universities teaching the course across disciplines are joint in a teaching consortium and have a website platform managed by MIT: http://www.demoscience. org.

3   The course is presented on the web-based platform Mapping Controversies in Architecture (http://www.mappingcontroversies.co.uk, or http://www.msa.ac.uk/mac). This platform is devoted to understanding urban controversies. Given the rising interest in ANT from a range of disciplines such as geography, anthropology, organization studies, planning and landscape, the platform has the potential to serve as an example of research-based teaching for these disciplines.

Chapter 6
Mapping Controversies

THE LONDON 2012 OLYMPIC STADIUM CONTROVERSY[1]

The recent expansion of design controversies is a direct result of their spread throughout the whole fabric of our existence. In 2012, London will be the centre of world attention as the host city of the 30th Summer Olympiad Games. As the date draws closer, more attention will be drawn to what is typically the architectural showcase of the Games: the athletics stadium.

How could we expect the design of such an important building not to meet resistance? A building that, once constructed, will trigger the entire transformation of East London, modify the mayoral politics in London, raise greenhouse gas emissions and nitrous oxide levels, and impact on the residents' lives and health. Indubitably, a building of such cultural importance will provoke many reactions once it is built and will draw large and varied criticism from the architectural community and the press as well as from politicians, inhabitants and visitors to the city. Architectural blogs will discuss the final design along with the legacy scenarios, while journalists will recollect the impressions of the first visitors to the venue. Numerous groups will feel concerned by its design and express reactions.

We do not need to wait until the 2012 Olympic Games to hear the critical reactions. How is this controversy to be tackled as it unfolds? Should we simply engage in the venture of explanation? What would happen instead if we were able to systematically foreground, analyze and map the changing sets of positions triggered by contested design? How can we account for the long-term consequences of controversies that surround contested urban knowledge? What does a mapping inquiry imply? How does it differ from an explanatory inquiry?

Explaining the Stadium Design

For the historians and architectural theorists who will have the chance to interview architect Peter Cook or HOK Sports (now named Populous), lingering for more than