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The Garden of Bifurcating Paths. Towards a Multi-Sited Ecological Approach to Design

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Abstract
Architectural projects have conventionally been conceived as a linear progression from conception to completion, from site to site, and through an idealised timeline, whereby progression goes from stage to stage. However, recent ethnographic accounts of architectural practices, informed by Science and Technology Studies (STS) and Actor-Network Theory (ANT) have shown that design develops differently: often through multiple irregular and bifurcating paths. This article argues that a building-in-the-making, in particular during the construction stage (rarely explored in the design studies literature), develops not through a linear project logic but along a contingent and branching trajectory, as it twists and turns through a complex ecology of actors (developers, city planners, clients, contractors, engineers, etc.) according to 'matters of concern.' A multi-sited ethnographic approach based on 'ecologies of practice' will allow us to account for the varying sets of experiences and ontologies that can be witnessed as a building concept is shaped during design development and construction. This will be illustrated by shadowing Carol, an architect from OMA, during the design development and construction stages of the Factory project in Manchester, UK, where we will witness how design does not progress along a linear path, but rather bifurcates, shifts and aligns in a dynamic way.

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Introduction

From the outside, buildings seem to appear in our cities magically, as if in a 'double-click.' But how do they appear? Through what kind of path, what ecology of actors, do buildings emerge? What sort of logic does the building-in-the-making take? Does it happen progressively, following a dotted line from stage to stage, as we often read in historical accounts; or, does it follow a meandering trajectory, one which takes many unexpected detours? If there is no dotted line or pre-determined sequence of stages, how can we follow this trajectory? How can we witness the sets of experiences that accumulate along its journey? Will we have to submit to its complexity? Forever lost in this garden of bifurcating paths?[1]

Often in architectural theory, we leap over this complexity, the meandering trajectories, of a building-in-the-making; we pass too quickly from the design to the completed building. Yet, if we get closer and follow its movements slowly, we are able to treat architectural projects in another way. Building from the recent ethnographic studies of architecture, inspired by Science and Technology Studies (STS) and its offspring Actor-Network Theory (Yaneva 2017, 2009a, 2009b; Loukissas 2012; Houdart, Minato 2009; Yaneva, Latour 2017), this paper argues that in order to witness the bifurcating, shifting and aligning movements of a building-in-the-making it is necessary to follow its trajectory as it visits various kinds of sites, with different concerns and practices, and thus beyond the conventional sites of design. Adopting a 'multi-sited' approach allows us to trace the building as it encounters other kinds of practices and actors, and to witness processes – to open up more 'black boxes' (Latour 1999) – that have rarely been explored in previous accounts of architectural projects. But in order to do so we need to prepare ourselves to navigate through a complex ecology full of unexpected voices and actors. After first getting a better understanding of what a trajectory is, and what our journey will entail, in contrast to the idea of a 'project,' we will then equip ourselves with our tool for thinking, what Isabelle Stengers calls an 'ecology of practices' (2005; 2010), which will help us as we follow a series of brief snapshots of the trajectory of Factory, an ongoing project in Manchester,

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1 - This is in reference to the infinitely folded labyrinth in Jorge Luis Borges' short story *El jardín de senderos que se bifurcan,* which was originally published in 1941 and was translated into English as *The Garden of Forking Paths* (1962 [1956]).

UK, as it weaves through a portion of its ecology of actors.

Designed by the Office for Metropolitan Architecture (OMA), the future building of Factory will be a 'flexible' art and cultural building situated in the city centre of Manchester; it was initiated in late 2015 and is slated to be completed in 2020. As an £111 million project, £78 million of which funded directly through the Arts Council of England, the building-to-be aims to be a future icon of Manchester and Northern England; and situated at the heart of the 'Northern Powerhouse' scheme announced by the UK government in 2014, to develop a cultural counterweight to London, the project carries a lot of pressure, and as a result, has attained a lot of attention. The trajectory of Factory, as it moves through the design development and construction stages, will illustrate for us the movements of the trajectory, and allow us to think about how we can begin to witness the sets of experiences that emerge throughout its incremental emergence (Fig. 1).

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Fig. 1 - Rendering – Factory, OMA (courtesy of OMA).

2 - See Asimow's (1962) ***Introduction to Design*** for a theoretical justification of this chronological stage-by-stage design process, which he refers to as 'horizontal.'

Projects versus Trajectories

Architectural projects are conventionally conceived through an idealised linear timeline that progresses along a straight path, from A to B, from conception in the architect's studio to a completed building. In the professional guides for architectural students, the project is defined as a continuous process divided into distinct stages (Chappell, Willis 2005). This sequential design process, where each sequence or stage is characterised by a specific type of activity and types of problems, as Peter Rowe (1987) points out, is the paradigm for contemporary planning procedures.[2] This is evident if we look at the current RIBA Plan of Work, which is used by architects to help them plan and organise their projects in the UK; the Plan of Work outlines 8 stages with clear step-by-step directions, from 'strategic definition' to 'use.' For some, this notion of 'project' is useful because it provides the messy circumstantial nature of design a clear outline (Allen 2000). For others, it has been used to frame the problem-solving decision-making practices of designers. Michael Brawne (1992) refers to it as a 'sequential' process, applying Karl Popper's theory of falsification to the situation of design, where "the design process and its immediate outcome can be roughly equated with the tentative solution, the tentative theory step, in the move from P1 [Problem 1] to P2 [Problem 2]" (1992, p. 72). The designer's course of action is guided procedurally. Similarly, Peter Rowe (1987) has offered another procedural account of design, which he calls 'episodic.' In this case, the activity of design is a means of inquiry: a structured relationship between a situation and a normative position, where prescriptive guidelines provide direction. In these cases, 'progress' is grounded in a teleological framework, imagined through detached abstract ideals of temporality, where a continuous line moves toward an 'end.'

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The problem with these procedural notions of a project is that they provide scaffolding for the idea of a 'double-click' invention in architecture, which obfuscates and neglects the twists, turns, and uncertainty involved in an architectural project. They are formulated from a distance, and are ultimately abstract idealisations, not borne from the actual experiences of design. If we pay close attention to design practices, another temporality emerges; there is no longer

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a linear, chronological and continuous movement from stage to stage.[3] In lieu of this idea of linearity of an architectural project, we can turn to philosopher Étienne Souriau's distinction between project and trajectory, which he applied to artistic practices, but we can see it applies equally to architecture:

I dismiss the project, which is to say, that which in ourselves sketches the work in a sort of thrust and throws it ahead of us, so to speak, in order to find it once more at the moment of its accomplishment. For in speaking thus, we eliminate, in a different way, every experience felt in the course of the making from among the givens of the question. We fail to recognize the very important experience of the work's progressive advancement toward its concrete existence over the course of the journey that leads there (p. 231).

Internal to the idea of the project is the action of *projection*, of throwing one's expectations or the project's potential into the future, only to see them realised. The project's future waits *in potentia* indicating that a building is simply the realisation of potentials that had already existed. This ignores the course of, what we, following Souriau, call the trajectory, where "there occur many absolutely innovative acts, many concrete proposals, suddenly improvised in response to the momentary problematic of each stage" (Souriau 2015, p. 231). The trajectory places an emphasis on the different kinds of experience that emerge throughout the development of a building, the thousands of moves, decisions, conflicts, actors, twists and turns that are required for the building to move. Following the trajectory of a building will require us to pay attention to these 'intervals,' to everything that happens in between, in specific moments and sites, and to the experiences that constitute detours and bifurcations. This gives the architectural project as it moves from site to site, from practice to practice, in different worlds and forms, more density, a thickness. We begin to see many more types of beings, ontologies, temporalities, and spatialities populate its path.
But how do we witness a chain of experiences that grow alongside the trajectory of a building-in-the-making? How can we 'recollect the trajectory' (Yaneva 2009a) of the building *as it moves* through discrete moments and sites? Following a project through

3 - However, in the recent RIBA Plan of Work (2017), the meandering trajectorial nature of architectural projects is hinted at as the Plan of Work allows for some flexibility in planning.

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the design development and construction stages, a completely different scenography is witnessed: a trajectory that moves much further, into more foreign territories, where we encounter voices, beings and experiences that are usually excluded from accounts of architectural projects. More black boxes open up; more sets of experiences are witnessed. Closely following the trajectory of a building-in-the-making requires, as Albena Yaneva (2017) points out, that we adopt a multi-sited strategy, whereby we can adequately witness the building as it twists with rhetoric, is translated into various forms, bifurcates with decisions and concerns, shifts in negotiations, and speeds up in moments of alignment, and slows down in moments of oscillation. Akin to what anthropologist George E. Marcus calls a 'mobile ethnography,' where the ethnographer follows 'unexpected trajectories in tracing a cultural formation across and within multiple sites of activity' (1995, p. 96; see also Czarniawska 2007, 2004; Hannerz 2003), this will allow us to trace an object as it moves through various sites, associations and connections. What happens when we begin to observe architectural projects in this way? The idealised linear project begins to twist, to turn back on itself, to bifurcate, shift, and align, as the trajectory moves through the complex ecology of actors that gathers around it.

What happens when we begin to observe architectural projects in this way?

The Necessary Tools for Following a Trajectory

However, before we begin following the trajectory through an ecology of actors, we need to prepare ourselves, to have the appropriate equipment for this situation. We can turn to those who have already begun clearing the path: the growing body of ethnographic accounts of architectural practices. While the experiences of architecture and built form have historically provided a vehicle for anthropologists to understand a cultural group from within (Buchli 2013), there has also emerged, within the last 30 years, an 'architectural anthropology' (Stenders 2017), where ethnography has provided a set of tools through which architectural practices can be understood from within. Through these studies of architectural practices, two general conclusions emerge: a re-orientation away from the products of architecture – buildings and contexts – toward the processural nature of design practices, and

away from the ideal producer of architecture – the solitary architect-artist – toward the collaborative or collective nature of design. An emphasis is placed on interaction, collective work, and the variety of co-participants as well as the practices, processes, and experiences involved in the making of a building.

The first ethnographic accounts studied various aspects of the architectural profession and design practices, rather than just the cultural import of the build form, from the more sociological and quantitative studies of architectural firms (Blau 1976) to Donald Schön's study of the 'reflection-in-action' of studio practices (1987), and Dana Cuff's seminal ethnography *Architecture: The Story of Practice* (1992). Cuff's work offers an account of the everyday aspect of several architectural practices in California in the 1980s, covering the relationship between the profession, academic institutions, and the design studio. In her account, she describes how buildings emerge in a project through collective and collaborative processes of social negotiation; there are not simply architects, but clients, bankers, engineers, civic groups, and corporate executives that co-operate in the architectural project. For her, architectural practices occur 'through complex interactions among interested parties, from which the documents for a future building emerge' (1992, p. 4). The fundamental argument is that the culture of design practice is socially constructed through a series of customary actions that "weave webs of meaning among a group of participants" (1992, p. 5). In order to grasp the cultural or social dimension of architecture, to understand how a building forms along a project, she argues, we need to extract the patterns of interpretation and the ritual behaviours of architects as they go about their daily professional lives and as they meet others who participate in the project.

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But, there has been a shift within the last 20 years in anthropological accounts of architecture away from the sociological and social constructivist accounts that were in vogue in the 1980s toward an emphasis on the philosophy of pragmatism of the early 20th century (e.g. William James and John Dewey), the more recent literature in Science and Technology Studies (STS), and the principles of what Bruno Latour has outlined as a 'symmetric anthropology' (Latour 1993; for an account related to architecture see: Yaneva 2017). As

a result, these more recent ethnographies describe design practices as distributed across a growing number of actors and voices – human and nonhuman – that make a difference in design. There is no *a priori* ontological distribution of beings; every being that makes a difference in the situated design practice is placed equally onto a 'plane of immanence,' from which hitherto unforeseeable possibilities are able to be witnessed. Therefore, other manners of world-making are allowed to appear.

One way we can differentiate these two strands of architectural anthropology is to look at the tools they wield, to see how they will help us move through this complex ecology that grows around design. Instead of cutting through the complexity with Occam's Razor, in search of clear patterns, structures, or matters of fact, the more recent ethnographic accounts of architectural practices utilise another tool for thinking, what Isabelle Stengers refers to as an 'ecology of practice' (2005; 2010) An 'ecologies of practice' based approach, combined with STS and ANT, affords ethnographic accounts the capacity to witness the full and varied experiences of architectural practices as worlds replete with varied ontologies, active beings, compossible worlds, and processes of becoming. They heed how practices emerge immanently, from within a distributed network of humans and nonhumans, upholding the ontological dignity of everything that matters, and makes a difference, in design practices (Yaneva 2017, 2009a, 2009b; Loukissas 2012; Houdart, Minato 2009). As Yaneva explains, "[t]o view architecture as an 'ecology of practice' means to redefine the complicated forms of association between all its beings: habits, skills, buildings, sites, city regulations, designer's equipment, clients, institutions, models, images, urban visions and landscapes" (2017, p. 33). An ecology of practice thus does not impose *in advance* a priori categories or transcendent principles that determine what matters for architectural experience, but allows us to see "a versatile and multi-sided reality that does not precede the mundane process of design making but is rather shaped *within* these practices" (Yaneva 2017, p. 33). While social constructivist accounts explore how meaning in architectural practices emerge through human interaction,[4] relying on discursive analyses, they are nevertheless founded upon and informed by

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4 - While Cuff does refer to 'graphic talk,' the importance of graphic dialogue in conversations between architects and clients, this graphic talk is still explained through social structures that determine their meaning.

a social infrastructure that sits behind the scenes, an 'ecology of practice' takes into account how the varied ontologies of design are *performed* across aggregates of various kinds of beings: models, visuals, computer software, pixels, PowerPoint presentations, non-verbal language, gestures, documents. It *shifts our attention* to other kinds of questions that keep us in the 'here and now' of design practices. Equipped with an 'ecology of practices' tool-kit, the ethnographer studies the experiences of architectural practices as something that happens through and with its formatted setting, full of actors, both human and nonhuman. There are two fundamental aspects of an 'ecology of practices' that help slow us down: our objects of study are both relational and constrained. It is relational, on the one hand, because nothing outside or prior to the practice determines what matters within the practice; everything that matters matters *within* the situation studied. There is an internal 'relative coherence' that links all of the active and folded beings, who, when unfolded, may carry us to other places and times that nevertheless matter in the situation (Stengers 2010, p. 34). And, on the other hand, the ecologies involve a mutual interaction that is not 'harmonious' but constrained through what Stengers refers to as 'reciprocal capture' (2010, p. 36). Each being within the set of interacting practices rely on one another, symbiotically, in order to continue to exist; there is no transcendent determinant – like in the structure-agency scenario – but a moment of 'indetermination' where we cannot determine who or what acts, or who or what is acted upon. Instead, we must pay attention to the event, of what happens 'here and now.' Yaneva (2009a), for instance, in her ethnography of OMA, witnesses how designers as they work with foam models, renderings, and images emerge as designers through the act of designing; there is a symmetrical co-production of the reality of design and the designers themselves. The events of making in architectural practices cannot be reduced or traced back linearly to the set of conditions or causes that precede the act. With an 'ecology of practices,' we have to move slowly, event to event, moment to moment, and pay attention to the surprises and signs that we encounter as we travel. Without Occam's Razor in hand, we are able to avoid bifurcating experience through what Alfred North

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Whitehead diagnoses, in modern epistemology, the 'bifurcation of nature' (1938), and thus we avoid shaving away experience into purified matters of fact, the categories of critical thought, or the lived experiences of phenomenology. Instead, we remain "faithful to what is given in experience" without discriminating in advance, and faithful to the overflowing of experiences that a trajectory of design affords.
And yet, while we may be properly equipped to pay attention to what is around us, to avoid being completely lost in the infinite folds of this bifurcating garden, we need a guide, like in any unknown territory, to lead us through the meandering paths of the trajectory. Let's meet our guide.

A Guided Tour Through the Bifurcating Paths of Factory (Fig 2)
Sitting in a busy café at the Granada Studios, in Manchester, UK, the future site for Factory, I am meeting our guide for the first time, who has just returned from a series of meetings she has had with Places Matter, a UK-based organisation that often acts as a design review panel for large architectural developments. Carol is one of the lead architects from OMA work-

Fig. 2 - Factory, OMA – Building Site in Manchester (May 2017).

ing on the ongoing Factory project. Following Carol through a number of interviews, I will shadow her to the various sites that she visits with the design, where she encounters the various actors and concerns that make a difference for Factory. This will allow us to witness the complex design ecology and its bifurcating paths that gather around the building-in-the-making as it meanders through the design development and construction stage, and as the building incrementally gains reality through its travels.

When I begin to explain the aim of my research to Carol, that I would like to follow the trajectory of Factory, to get a sense of its complexity, to map out the ecology of participants involved, and to see how the trajectory moves, surprising me, she laughs: "your guess is as good as mine!"[5] Already confused and intimated by the complexity that had unfolded when I had worked on the planning documents, this is not reassuring: I now realise that even the actors are mesmerised by the complexity. Disconcerted, I remind myself to slow down, to not get ahead of myself – and the trajectory! – and thus to not confuse the trajectory for the project. This is a sure way to get lost in the thick flora of the ecology. Over the next few interviews with Carol, as I follow her to several sites through the interviews, it becomes increasingly clear that there is no clear, pre-ordained path to take, that there are many unexpected twists, detours, delays and actors that appear unexpectedly along her journey. As she tells me in the same meeting, while there are many 'milestones' that are agreed upon in advance to mark the journey, they hardly ever map onto the trajectory; often, there are delays, extensions and reversals that emerge due to specific concerns that arise.[6] Noting this down, I realise that there can be no map for this risky territory that changes without notice, and that it is much safer, in the spirit of shadowing (Czarniawska 2007), to follow my guide, to remain a few steps behind her; and to keep in mind the tenets of pragmatism that warn us not to project connections in advance, to avoid all attempts at *salto mortales* (James 1912), and that knowledge is also a trajectory that one must follow intermediary by intermediary, bit by bit.

Following Carol through the design development and construction 'stage' for Factory[7] takes us to very

5 - Interview with Carol Patterson, Manchester, 28 September 2017.

6 - Interview with Carol Patterson, Manchester, 28 September 2017.

7 - This stage is formally referred to as Stage 3 in the logic of the project. This procedural way of following a project through consecutive and continuous stages is used by the practitioners for very pragmatic reasons; while this logic does not adequately map onto the experiences of the trajectory of a building-in-the-making, it is still sometimes necessary to use this language when discussing architectural projects.

different locales where we encounter various kinds of expertise, technologies, equations, models, planning documents, budgets, notebooks, spatialities and temporalities. As Carol tells me, a lot happens during this moment: there is "filling in a lot of information, and you're also editing [a lot] out."[8] To get an overview of the differing voices encountered, let's quickly follow Carol to several meetings. In early September 2017, we find ourselves with a group of representatives from Historic England, a public body often involved in large-scale architectural developments, representing the history of the built environment in England, and in this case, the rich history of Factory's site; a lot of which the designers found out during design development.[9] Here, we come across the historically-listed warehouses, the viaduct arches, the historic canals that run underneath the site, The Beatles, the sets of Coronation Street, and the world's first passenger railway station. Folded within each of these actors is a set of parameters and constraints that are required to be integrated in design. Still in early September, we move onto another meeting, with Deloitte, discussing the progress of the project, the budget and costs. And then, travel to The Netherlands, to have a design meeting with Level Acoustics, the acoustic engineers, to test some ideas with them because there have been changes to the structural materials that arose from a meeting a few days prior with Laing O'Rourke, the contractors. The following week, it's back to Manchester, to meet with BlueCharcoal, a theatre design consultancy, to discuss concerns regarding the layout, access to stages and theatres, the placement of toilets and facilities. And in the afternoon, a series of 'Gateway Interviews' with UK government officials to discuss the progress of the design, whether they have 'ticked all the necessary boxes' or not. As the design continues to travel through these various meetings the inputs, disagreements and agreements, concerns, issues, actors, forms, and materials continue to pile up, thicken the plot, and are integrated into the trajectory of the building. The ecology of the project continues to grow around the trajectory, but also *shift*, as new concerns arise and new actors have to be integrated and enrolled into the building.

With each travel to different sites, as I follow Carol, it is increasingly clear that the progress of a building

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8 - Interview with Carol Patterson, Manchester, 18 July 2017.

9 - Patterson, C. (June 2017). ***Manchester Architect's Symposium: Factory.***

does not follow a linear project, with consecutive steps and stages, but that the trajectory is attracted to, and twists around, what Bruno Latour calls 'matters of concern' (2004); every meeting is a gathering of participants around a particular set of concerns that *matter* and are ultimately *material* concerns. These concerns act like vectors for the trajectory, or points of bifurcation around which the complex ecology gathers, shifts, and aligns as the concerns arise and achieve closure. To acquire a good idea of how these movements along a trajectory occur, let's zoom into two examples.

Late 2016, in a large room at the Granada Studios, Carol – and us, now – are in a series of 'artist workshops' that the Manchester International Festival (MIF), the future occupiers of Factory, had organised. The designers, along with representatives of MIF, meet selected artists and directors from across the UK to discuss Factory, not the design itself, but particular material concerns related to the layout, the amount of seating, the size of the theatres, technical equipment, access to the stage and the back of house; the artists and directors, likewise, recount their experiences with similar buildings, not in abstract terms, but concretely. A consequence of the meeting is that the number of seats within the 'classical theatre' of Factory will be reduced from 1800 to 1500 seats, which may seem minimal but reverberates throughout the trajectory and results in a change of the structure of the theatre, the façade surrounding it, as well as its connection to the other parts of the building, drawing the structural engineers, MIF, the acoustic engineers, and contractors into the fold. But these changes do not stop here, the changes, once translated into design, then travel back to MIF, Carol along with them, because MIF 'has a business model that the design needs to accommodate and sometimes adjusting as the design progresses.'[10] The design changes have to be translated into another form, in terms of costs and future profits, a business model. Here we can see a particular 'ecology of practices', as the designers, artists and directors, MIF, the design, the virtual building, and the budget are relationally constrained around particular sets of 'matters of concern'; they are all tied to one another, as one moves, the other has to be accommodated, and vice versa.

10 - Interview with Carol Patterson, Manchester, 18 July 2017. 8 - Interview with Carol Patterson, Manchester, 18 July 2017.

The design changes have to be translated into another form, in terms of costs and future profits, a business model. Here we can see a particular 'ecology of practices'.

Jumping onto another winding path of Factory's trajectory, there is a gathering of actors around what Carol calls 'the number one concern': acoustics. Acoustics is 'super tricky' because "you have to make sure you're building for it",[11] or as she describes in an earlier interview, acoustics affects everything: "how you hold everything up to reach the acoustic requirements is quite tricky."[12] Due to its importance for the success of the future building, a lot of different voices with different concerns are integrated. At first, the debates with the Manchester City Council, the artist and directors, the theatre consultancies, the construction consultants, and the designers turned around the baseline -- how loud could it be, and what type of containment (to avoid noise leakage into the surrounding environment) is necessary --, but now, after this was determined, the focus shifts to whether it works or not. As a result, there is a lot of experimentation and movement between the designers (OMA), the acoustic engineers (Level Acoustics), the structural engineers (BuroHappold), and the contractors (Laing O'Rourke), as well as the materials, equations, virtual sounds, and virtual structure of the building-to-be. It is all about aligning the voices together: this type of structure with these materials at this cost will give us this acoustic quality within a threshold of 63 hertz. The designers then bring these specifications to the acoustics engineers where the designs are translated into equations, into graphical representations on computer software, and tested in their *Laboratorium voor Akoestiek*. Everything happens through software, Carol says, because the complexity of the science is too difficult to understand both for the designers and the rest of the participants in the project. There is inevitably a series of translations during this experimentation period: acoustics will transform from the designs, materials, costs, digital forms, equations, sound frequencies, to the acoustic laboratory, and back again. But of course the 'acoustic concern' does not end once this stage is complete; it haunts the entire project. As these are all virtual tests, you cannot know what kind of sound the building will achieve until it is complete, and "if you find, when you build it, the problem, you have to track back to where the problem was."[13]

Thus, we can see that while some concerns have a limited time span, others stretch throughout the entire

11 - Interview with Carol Patterson, Manchester, 28 September 2017.

12 - Interview with Carol Patterson, Manchester, 18 July 2017.

13 - Interview with Carol Patterson, Manchester, 28 September 2017.

project, and are not limited to a specific stage. We can see that there is no innate propulsion that pushes a building along towards completion, but particular material vectors, the concerns that attract movement along a trajectory, that gathers various kinds of actors and constitute bifurcation points, moments of 'indetermination' that escape the logic of the 'project.' Through my interviews with Carol, she frequently describes these movements that characterise a trajectory as *shifting and alignment*. At important points in the progress of the trajectory, when particular 'matters of concern' gather concerned participants, there is the potential for a 'bifurcation' that necessitates *shifting*. This is can be witnessed in the series of translations that occur when the concerns and the materials talk back, when their voices need to be integrated into the design. For instance, during the experimentation with acoustics, it is not just the designers, contractors, and engineers in conversation, but the acoustics themselves, which has a noise threshold of 63 hertz that cannot be exceeded, and needs to be contained within each space of the building to avoid noise leaks, but also the structure, whose material, whether concrete or steel, has a major impact on the way the sounds behave. At each moment when concerns arise, '[they] started shifting,'[14] by which Carol means, not just the designers, but every actor involved: the structure, the steel and concrete, the acoustics, the sounds, the city council members, the acoustic engineers, and the acoustic equations. The direction of the trajectory *shifts* when a bifurcation happens, not in a foreseeable or expected moment, but when unexpected concerns arise, when unexpected voices speak up. However, with each *shift*, she explains, there is a lot more work involved in order to keep the building on the move: each shift requires an *alignment* of the many voices, actors, and participants involved in the project. During each shift, there is a process of 'waiting for all the ducks to get *aligned* to continue,' 'several things have to fall in line for [continuing] to happen.'[15] This can be illustrated, again by returning to the acoustic concern, by the fact that each one of the actors needs to be coordinated and aligned: the acoustic engineers, their equations, the virtual acoustics, the design, the structure, the designers, the structural engineers, concrete, steel, the noise leaks,

14 - Interview with Carol Patterson, Manchester, 18 July 2017.

15 - Interview with Carol Patterson, Manchester, 28 September 2017

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With each *shift* there is a lot more work involved in order to keep the building on the move: each shift requires an *alignment* of the many voices, actors, and participants involved in the project.

the 63 hertz, the contractors, as well as the city council members, MIF, their business models, and the costs. In order for a decision to be made, for the trajectory to continue, alignment is necessary, but this "requires a lot of people [to be] coordinated [...]; it's not just us [designers] making changes," there "are so many layers and so many decisions that need to get made."[16] If there is no alignment, if there is continuous shifting, the trajectory reaches a point of oscillation; the various worlds do not overlap; and there is no closure for the 'matters of concern.' There is between these two movements of shifting and alignment what Latour refers to as moments of dispersion and of integration or 'punctionalisation' (Latour 1999), of the many becoming the one, when groups of actors are folded into singular points, provisionally stabilised wholes.[17] In every decision along the trajectory, there is not a single voice, but a hundred varying voices and beings whose input and resistance is required to be integrated for the building to keep moving.

It is easy to get lost in these bifurcating paths of the garden, where we see the complex ecology of actors shift and align along the trajectory of Factory. But it is clear the abstract logic of a progress that is projected in advance through continuous and consecutive stages is not an adequate way to think of a building-in-the-making, instead we are constantly moving back and forth, zig-zagging through the flora of actors according to the 'matters of concern' that attract them. One way we can imagine the trajectory is topologically. The shifting and aligning movements of the ecology of actors involved in the trajectory are both relational and constrained, when a concern arises, when there is a bifurcation, every actor needs to move together, to be aligned in their shifts, or as Carol explains, it relates to the "complexities of how everything fits together in a way that cannot be moved."[18] The building and the participants move as a shifting, co-evolving whole through the trajectory that retains invariance through change, and in order to continue, to avoid the trajectorial threads from fraying, require closure, alignment.

Conclusion: Navigating the Garden of Bifurcating Paths

In our most recent meeting, Carol had recounted that in architecture school she was taught that "the ideas come to the architect," but as we have seen,

16 - Interview with Carol Patterson, Manchester, 28 September 2017.

17 - The idea of alignment not only relates to the closure of 'matters of concern,' to a particular movement of the trajectory, but also to the temporality of an architectural project. As Latour highlights in *We Have Never Been Modern* (1993) the idea of linear, modern time that undergirds the notion of the architectural project relies on the cohesion of elements, of 'alignment.' As he writes, '[e]ntities have to be made contemporary by moving in step and have to be replaced by other things equally well aligned if time is to become a flow' (1993: 72). Thus, it is only when all of the voices and beings are aligned that the building-in-the-making can continue to progress, to move forward in time.

18 - Interview with Carol Patterson, Manchester, 18 July 2017.

albeit through brief snapshots, along the trajectory of Factory, the story of the making-of-a-building is a much broader ecology of practices, full of many other voices – both human and nonhuman – that need to be taken into account. There is no progress that moves from A to B, no straight line that goes stage-by-stage, but bifurcating paths that shift and align around particular 'matters of concern' that gather a diversity of actors. Trajectories are like strings of events, bifurcation points, through which an 'ecology of practice' allows us to trace the dynamic and simultaneous co-production of participants, groups, publics and the building-in-the-making. But how do we witness, to echo Latour and Yaneva (2017), these trajectories of the building 'on the move'?

As we have learned above, an 'ecologies of practice' approach restricts us to a 'here and now,' to neither rely on foundations or structures that are posited in advance, nor to wield Occam's razor and shave everything away to 'what really matters.' It re-orients our attention toward the shaping of a design reality that takes place *within* design practices, amongst a plurality of beings that talk back. In the recent ethnographic accounts of architectural practices that utilise an 'ecologies of practice' approach (Yaneva 2017, 2009a, 2009b; Loukissas 2012; Houdart, Minato 2009; Murphy 2004, 2005; Hagen 2017) we are able to witness the 'trajectorial nature of design' within a specific setting. Yaneva's ethnographies of the design practices of OMA are exemplary in this regard. For her, the ethnographer follows how a building incrementally gains reality as the designers gain knowledge about the building by paying attention to the 'events' of design practice, to see how, in the practice of design, there is the simultaneous co-production of the designer *with* what is being designed (Yaneva 2009a). It is by sticking to the thickness of an experience that we are able to take into account everything that matters in design practices, whether it is foam, visualisations, pixels, computers, gestures, drawings, 3D printers, laser beams, concept boards, or magic. In an ecological approach, we witness how each being equally matters and has agency in the design process, and how design zigzags across a variety of entities.

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This has also been illustrated in other 'sites' of design practice: when architects meet with the public in

presentations or in client meetings. In her ethnography of the offices of the architect Kuma Kengo, Sophie Houdart (2009), for instance, zooms into meetings between architects, engineers, and clients. Through the use of concept boards, perspective drawings, and models, Houdart illustrates how architects are able to -- 'with set designers' awareness' -- transform the space of the meeting into a 'visual medium' that affords negotiation (2009, pp. 121-122). It is the coordination of these devices, the formatting of a setting, Houdart argues, that enables the participants to also coordinate and to speak across differences. Similarly, in an ethnography of designers at Arup, Yanni Loukissas shows how computer simulations were utilised to "shape a space of alternatives with clients, collaborators, and regulators" (Loukissas 2012, p. 21); the simulations did not simply represent possible solutions, but provide conditions for differences to be articulated and for communication to occur. As with the design studio, these accounts describe the way in which design practices, whether designing or in meetings, occur *with* a variety of beings; there is a stream of experiences, a trajectory, that curves around and moves through a disparate aggregate of actors.

While these accounts describe the 'trajectorial nature of design' (Yaneva 2009a), as it zig-zags across the various beings involved in the design practice, these accounts are limited to the predictable sites of design: design studios, meetings between clients and designers, and in public presentations. They are site-specific. But as we have just seen the meandering trajectory of a building through design development and construction encounters and enrols many different kinds of actors and practices that need to be addressed. Thus we need to move out of the studio and also visit the engineer's office, the city council, the contractor's offices, the acoustic engineer's laboratory, and other sites that impinge on the trajectory of the making of a building. By adopting a multi-sited approach we are able to follow the bifurcations, shifts and alignments of the building, and to also *shift* and *align* ourselves, as ethnographers, to other worlds, to open up previously closed 'black boxes,' and to witness other kinds of ecologies of practice that participate in the building-in-the-making, but are often left unaccounted for in the ethnographies of design.

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To close, this paper argues that this type of multi-sited ethnography is necessary to develop a broader account of the pluriverse of architectural practice, and will help us piece together a kind of patchwork-map through which we can begin to witness the garden of bifurcating paths that makes up the trajectory of a building 'on the move.'

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