Edited by
Stephen Emmitt

Architectural Technology

Research & Practice

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Chartered Institute of
Architectural Technologists

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Contents

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Foreword

As Vice President for Education and Chair of the CIAT Research Group it gives me great pleasure to support the first ever publication to specifically address the area of research, and in particular its relationship with practice, in the discipline of architectural technology. *Architectural Technology: Research and Practice* is not only groundbreaking because it is the first book of its kind, but also because it provides at long last one of the accepted foundations needed to underpin the emerging academic discipline, namely a recognised research base. The architectural technology discipline is well established at degree level and taught in many UK universities with counterparts around Europe. Architectural technology programmes are subject to a comprehensive accreditation programme run by CIAT, but the concept of academic disciplines requires a subject to be researched as well as taught. Differentiating a significant body of research that can also be identified as relevant to architectural technology is therefore an essential part of this process.

Research manifests itself within academic disciplines in many ways, from empirical research activities to applied research, mostly aimed at supporting the profession. In the case of architectural technology much empirical and applied research conducted in other allied fields is already there and can be directly applicable. However, establishing a body of research specifically applicable to architectural technology that is being conducted and promoted on a significant scale has yet to be fully established. This book takes a momentous step in that direction.

Recognising that the relative youth of the discipline requires that systems and networks need to be established where no existing procedures or formal structures exist, the Chartered Institute of Architectural Technologists (CIAT), as the professional body having always supported practice based research in particular, has responded with its recently re-established Research Group taking on the endorsement to 'promote the development of research applied to the education and practice of architectural technology' (http://www.ciat.org.uk/). The CIAT Research Group aims to focus on four distinct areas:

- Developing and defining architectural technology research.
- Encouraging, promoting and disseminating research.
- Building and encouraging knowledge exchange between practice, research and education.
- Promoting architectural technology as an academic discipline.

In aiming to address the interaction between research and practice in the field of architectural technology this book demonstrates the significance of research to those involved in architectural technology, and above all stimulates further research and debate. In doing so it also achieves its primary aim of highlighting the richness and potential of the subject area. With contributions from architects and architectural technologists, the passion for the subject is evident throughout the collection of chapters and case studies covering a number of different yet highly relevant themes. As the editor, Stephen Emmitt suggests, 'the underlying message is that architectural technology is not just a profession; it is a way of thinking and a way of acting'.

CIAT, in supporting this publication, is aware of the need for books such as this to sustain the process of research informed practice, as an aid for both students and those practising within the discipline of architectural technology.

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Vice President for Education,
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Introduction

Architectural technology as a discipline and as a knowledge domain has evolved rapidly in the UK since the early 1990s, and in doing so it has started to (re)establish the synergy between building design, technology and community as we strive for a more sustainable and stimulating built environment. The role of the architectural technologist, both the official role promoted in the UK by the Chartered Institute of Architectural Technologists (CIAT) and that adopted by others, such as architects, engineers and surveyors operating in the field, continues to evolve, shaped and reshaped by the time in which we live and the technologies to hand. The challenge for building designers is constantly to evaluate and question: why we build; what we build, how we build; and when we build. It is only through such soul searching that we are able to advance our understanding and create a more responsive built environment. In order to advance our understanding we need to consult a wide range of knowledge, which will be derived from research and reflection on practice.

Developments in architectural technology

Building design and technology have a very special relationship, since without the technologies to realise the built form architecture would exist only in our minds. The relationship between building technology and design can be traced back to the Enlightenment and the Industrial Revolution, periods when advances in technology and science were seen as the way forward, and times of solid faith in progress. Architects needed a thorough knowledge of scientific matters (applied mechanics and materials properties) as part of their education and daily practice. However, it was the engineers who took up the technical advances and new ideas in building the quickest. Cast iron, concrete, steel and glass gave engineers opportunities to build great structures, sometimes working alongside architects, sometimes with contractors.

As technologies multiplied in number and complexity the building profession started to fragment. Increases in building activity brought about social and

structural changes (Bowley, 1960). Surveying, structural engineering and design activities were separated with the development of the professional institutions. The Institute of Civil Engineers was formed in 1818, the Institute of British Architects in 1834 and the Surveyors' Institute in 1868. One of the peculiarities of fragmentation in the UK construction sector has been the architects' gradual retreat from technical issues to concentrate on design, a characteristic found in the majority of educational programmes and in practice (Cole and Cooper, 1988). This has created a void between the design and construction phases, which has gradually been filled by architectural technicians and constructing architects (Emmitt, 2002; Barrett, 2011). It is the growth of a new discipline, architectural technology, and development of the profession (architectural technologists and technicians) that span the boundaries between design and production.

For many years the unrecognised work-horses of architectural practices, assistants, architectural technicians and architectural technologists, have been at the centre of many a successful business, forming the link between conceptual design and production and helping to translate design intent into physical reality. However, the assistants, technicians and technologists have had to endure a territory devoid of status, where career progression and standing were traditionally well below that of their design orientated colleagues. Writing in the later half of the 19th century the architect and critic John T. Emmett (1880) made a particular point of highlighting the plight of the architect's assistant. He claimed that assistants were by far the most important members of the architectural profession, essential to the smooth running of their superior's office, but largely unseen and certainly unrecognised. Emmett went on to urge architects' assistants to form an association or institute, in partnership with the tradesmen and workmen, which would lead to 'perfectly instructed, practical, artistic craftsmen', and who would become masters of their own destiny in a 'joyful and dignified career'. His words were not heeded, and it took almost 80 years before the institute advocated by Emmett was formed, not by the assistants, but by the Royal Institute of British Architects (RIBA).

The formation of a profession

The RIBA Oxford conference of 1958 proposed the abolition of pupillage and part-time courses for architects, and with it the formal creation of the architectural technician discipline. This essentially created a two-tier system, those responsible for controlling design (architects) and those with practical skills (the architectural technicians). To reinforce the distinction the technicians were given lessons in 'design appreciation' rather than studio-based design projects (Crinson and Lubbock, 1994). Of course, the two-tier system was already in place in the majority of professional offices, but now it had been officially recognised, thus setting the scene for the events to follow.

In 1962 the RIBA's report *The Architect and His Office* identified the need for an institution (other than the RIBA) that technicians could join to ensure maintenance of standards for education and training (RIBA, 1962). Technical design skills were identified as a missing component of architectural practice and the report urged the diversification of architectural education so that this

shortcoming could be addressed, suggesting that architects who chose to specialise in technology (rather than design), the 'architechnologists', should still be allowed to join the Institute (RIBA, 1962). The report acknowledged that technicians were needed in architects' offices to raise productivity and standards of service, for which they would require education and training in the preparation of production information and technical administration; 'design' was specifically excluded from the technologist's training. The Society of Architectural and Associated Technicians (SAAT) was formed in 1965 and inaugurated as an Associated Society of the RIBA under Byelaw 75 of the RIBA's charter in 1969 (SAAT, 1984). SAAT did not encompass all technicians (estimated by SAAT at 20 000–25 000); many belonged to other societies, as reflected in its membership of 5300 in December 1983.

The constructive link

SAAT published an influential report in 1984, *Architectural Technology: The Constructive Link*, which drew on existing literature to develop a view of construction for the 1980s and beyond, highlighting the future direction for SAAT and its members. The book was important in helping to establish a sense of identity for architectural technicians since it helped to identify the technicians' role as complementary to that of the architect. The book was also important in highlighting the link between conceptual design and the realization of a physical artefact. As a construct and metaphor, the constructive link lies at the very heart of architectural technology.

In 1986 the SAAT was rebranded as the British Institute of Architectural Technicians (BIAT) and again in 1994 to the British Institute of Architectural Technologists. Although the acronym remained the same, BIAT took a significant step forward with the subtle change from 'technicians' to 'technologists' in the title, reflecting the growing stature of the discipline. With the change of name and the promotion of degree-level qualifications for its members, BIAT had started to redress the issue of status. The Institute's Innovation and Research Committee was established in 1996 and a small number of research events were organised in the following years. The Institute was granted a royal charter in 2005 and once again the name changed, this time to the Chartered Institute of Architectural Technologists (CIAT). Around this time the undergraduate programmes were maturing and design was becoming increasingly prevalent – present in the conceptual design of buildings and the conceptual design of building components and joints. With the change of status came the promotion of postgraduate degrees in architectural technology and with it an increased focus on the value of research.

Researching the constructive link

Since its birth in 1965 the architectural technology profession in the UK has evolved into a distinctly separate discipline from architecture. The profession has started to increase its leverage in the marketplace and with increased

attention to the (thermal) performance of buildings, collaborative working and the role of building information modeling (see, for example, Harty, 2012) the profession is well positioned to make a significant contribution to the realisation of creative and functional buildings. However, without a sound theoretical and evidence based foundation it is unlikely that the architectural technology discipline will be afforded the credibility it deserves. It follows that the profession must embrace research and start to develop a distinct body of knowledge that adds value to the sponsors and users of buildings and to society as a whole.

The unquestioning faith in science and technology that dominated earlier times has given way to increased scepticism and caution, represented in the constant questioning of professionals. It is research – the gradual contribution to the development of a unique body of knowledge – that shapes a profession and underpins the values and competences of its members. This knowledge resource also helps others working alongside architectural technologists to understand others' roles and relationships.

CIAT's Research Group

It is almost 30 years since the publication of *Architectural Technology: The Constructive Link* (SAAT, 1984). During this period much research has been published that falls under the umbrella of 'architectural technology', although very little of this has been funded or conducted by the professional bodies representing architectural technologists. Relying on other professional institutions to stimulate research may be an economically prudent approach, but without a solid knowledge base the profession is open to criticism and questions of legitimacy. How, for example, can architectural technology claim to be a profession if there is very little research underpinning its knowledge domain? How can the members of CIAT respond to the challenges we face in the built environment, other than from an informed position?

Fortunately there are initiatives underway to help build a body of research.

BIAT's Innovation and Research Committee was instrumental in raising the profile of research within the profession. This committee was replaced by the CIAT's Research Group in 2010. The aim was to concentrate on the value of research to the profession and stimulate a number of projects to support this aim. One of the Research Group's initiatives was to look at how research informs the practice of architectural technology and vice versa. The outcome of that exercise was recognition of the need to set out what constituted 'research' in architectural technology, which in turn led to this book.

Research networks

There are many research networks that deal with specific issues concerning aspects of building design and construction, but two are particularly pertinent to the development of a research culture within architectural technology. These are the Detail Design in Architecture (DDiA) conferences and the International

Congress of Architectural Technology (ICAT). Detail Design in Architecture was established in 1996 in the UK with the aim of bringing together knowledge and developing our understanding of architectural detailing with an environmentally sustainable agenda. This conference network has been supported by BIAT, CIAT and the RIBA, with conferences held in the UK and The Netherlands, and more recently Turkey (2012) and Taiwan (2013). The International Congress of Architectural Technology was established in 2008 by individuals involved in educating architectural technologists. This European network has adopted a wider remit, questioning the role and scope of architectural technology (and architectural technologists), helping to explore the interfaces between practice, education and research.

Agenda

This book addresses the interplay between research and practice in the field of architectural technology. The aim is to demonstrate the significance and importance of research to those involved in architectural technology. The objective is to stimulate further research and debate within the subject area, and hence contribute to the development of the field. The purpose is not to tell readers how to conduct research, although some practical guidance is provided, but to highlight the richness and potential of the subject area. Taking our cue from the constructive link, the argument in this book is for research to underpin the link between design and production and between education and practice.

The book comprises a mix of chapters and case studies, bringing together a number of different themes under one set of covers. Together, the contributions provide a number of insights into the world of research as seen from the perspective of those working within the architectural technology field, comprising practitioners, academics and students. The underlying message is that architectural technology is not just a profession; it is a way of thinking and a way of acting. This is underlined by contributions from architects and architectural technologists passionate about architectural technology as a field of knowledge. Contributions range from the theoretical and polemic to the pragmatic and applied, further helping to demonstrate the richness of the field. There is a clear and deliberate bias towards environmental sustainability within the book, which reflects concern for our natural and built environment.

Architectural technology is the realisation of architecture through the application of building science: essentially a mode of action forming the constructive link between the abstract and the physical. It is a mode of action reliant on evidence derived from research and practice. Whether research and practice should be about reinforcing the status quo or about challenging our beliefs and accepted way of doing things will depend on the context, but both extremes are needed to expand our understanding. This book can only deal with a few aspects of architectural technology, essentially a glimpse into an exciting world of possibilities and opportunities.

Further reading

For a comprehensive overview of architectural technology see *Architectural Technology* (second edition) by Stephen Emmitt (Wiley-Blackwell, 2012).

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Chapter One
Theory and Architectural Technology

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Why theory, what has theory got to do with architectural technology and why worry about it? One answer suggests that it needs a differentiating design theory to reinforce its position as the primary technical design authority in the modern construction industry. In saying that, however, it also raises a whole host of further questions such as what is technical design, what position is being referred to exactly and why a differentiating design theory? This chapter is placed at the beginning of the book because it poses some of the principal questions that need to be addressed as the subject of architectural technology develops into a mature academic and professional discipline. Considering architectural technology historically in terms of alternative theories, through theories of technology and also by means of complementary design theories, allows the reader to reflect on architectural technology in its many expressions, be they historical, physical or even metaphysical. In addition, simply establishing and documenting its existence, confirming a theoretical and historical foundation to the discipline, permits continuing deliberation and development, providing a focused context for further relevant research.

Introduction

Why do we need a theoretical approach to architectural technology? Firstly, to answer this question we need to have some understanding of what we mean by theory. *The Concise Oxford Dictionary* offers three enticing descriptions:

- the sphere of abstract knowledge or speculative thought,
- exposition of the principles of a science, etc.,
- collection of propositions to illustrate principles of a subject.

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While the last two can have a significant role to play in many aspects of architectural technology, particularly those related to building physics and architecture generally, it is primarily the first, speculative thought, that gives us the catch-all definition we require, namely theory as ideas as opposed to practice and theory as thinking rather than doing. Most practising technologists, however, will know intuitively that all doing is preceded by thinking and sometimes very long and hard thinking. Calling it theory (e.g. this is all very well in theory but how will it work in practice?) simply gives us a framework and space to structure our thoughts.

Therefore a theoretical approach is already tied to many aspects of the practice of architectural technology but is particularly closely related to its existence as an academic discipline and how we take the subject forward in a controlled and managed way. In academic language, architectural technology is a vocational subject, meaning it is intended to lead on to practice as a professional. This is different to more academic disciplines where there is no closely related occupation. However, even vocational subjects need to be established as having strong academic principles or they exist merely as training programmes. Architectural technology now functions as both a professional discipline and also as an academic discipline and, as with most vocational subjects, these two aspects are very closely aligned (Wienand, 2011a). Although it may be possible to exist as a professional discipline without academic support, architectural technology is now predominately a degree level entry profession. It is taught as an academic subject throughout the UK and is supported by significant areas of research, all hallmarks of an established academic discipline. That is quite an achievement for a discipline of such comparative youth, and the next requirement is to bring what is a wide ranging research base into some form of recognisable arrangement.

This observation leads nicely on to the next set of questions, namely: why research, what is it aiming for, what exactly is architectural technology research, what for that matter is architectural technology? These questions can continue with: is architectural technology just detailing or is it technical design in architecture or perhaps much more than that, and what exactly are architectural technologists?

Leaving the research questions to others for now, we still have to ask: what is technology, what is theory, and therefore what is architectural technology; and what about theories of technology? All of these questions are fundamental to understanding the discipline of architectural technology and theorising allows us to consider these questions and many more in an attempt to provide a stable academic foundation for this exciting and immensely rewarding discipline.

Why we need theories

The concept of theory comes in many forms, from the everyday good idea to the verifiable scientific theory that takes on the mantel of 'fact' until proven conclusively otherwise, using scientific method. What they are all about, however, is ideas, and that is precisely why we need theories. Theorising can just be about ideas, making us think and see things in a different way, leading potentially to new innovative ideas. Essentially, though, it is about providing a structure to our

thinking and a framework for our conclusions. For the discipline of architectural technology, viewed from either the academic or professional perspective, theories also allow us to use that framework to give some meaning to the past, the present and, in particular, the future. By taking that open and variable philosophical interpretation of what we mean by theory, we can use the simple form of 'ideas'. In this abstract or speculative sense, the strength of ideas comes from their very nature and therefore, as concepts, they are there to be considered in depth rather than any notion of being deemed factual.

Why exactly does architectural technology need theory? It could be argued (a theory) that it does not actually need theory and exists quite satisfactorily in its present form. That view suggests that it is a constant task based profession, that once mastered remains static for all time, which is clearly not true. The reality, as we all know, is that keeping abreast of change is a vital function of the practising architectural technologist, which leads us to two further questions: how does theory help us master change and, more fundamentally (we keep coming back to this), what exactly is architectural technology? The rest of this chapter attempts to confront this dilemma by using the concept of theorising to provide routes to the answers. For example, understanding how the discipline has got to the position where it exists today will help to provide some insight into what exactly it is. A deeper theoretical understanding of what architectural technology actually is may also help us to understand and grasp the present, predict the future and maybe also allow us to define that future.

Historical perspectives – learning from the past

The claim that theory can help us to understand how we got to where we are and therefore to understand who we are comes with the study of architectural history, and in particular the aspects of architectural theory that place philosophical thinking in distinct historic periods. It is recognised that the constantly evolving world of construction is not a smooth flow from one new idea to another but that just as with biological evolution it moves in a haphazard way, responding to whatever external influences are at play at any one time.

While architectural technology as a professional discipline has much in common with many allied vocational disciplines, such as civil and architectural engineering, building and quantity surveying, service and environmental engineering, it is probably closer to mainstream architecture than any other, especially when viewed from the perspective of the layperson. It can be argued that a study of the shared history of the two disciplines is where the subtle but real differences emerge that allow architectural technology to assume a separate and distinct identity. Both professions will see a significant heritage in the concept of the Master Builder that was so important to the buildings of the Middle Ages, or probably more accurately defined as the Gothic period of the 12th to 14th centuries. The comprehensive role of on-site designer, manager, builder and engineer that was the Master Builder would be entirely familiar to both modern day architects and architectural technologists. The collaboration with fellow craftsman, stonemasons and carpenters in the creation of buildings based on

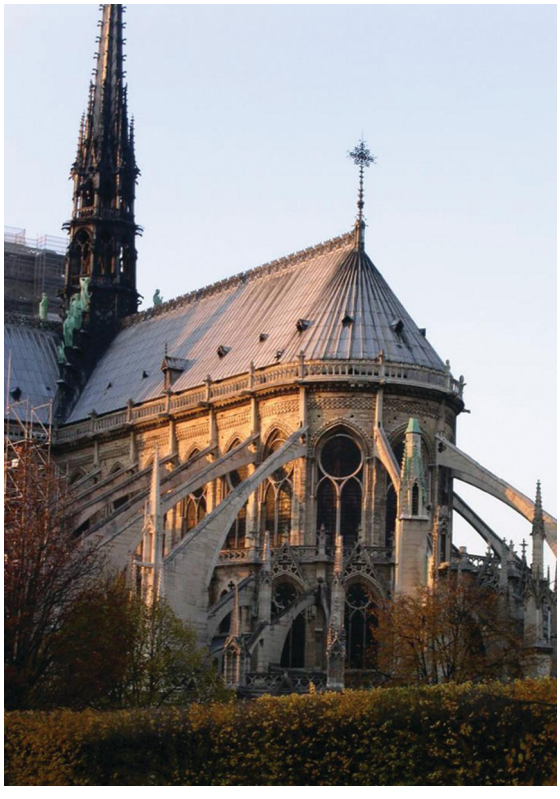

Figure 1.1 Notre Dame de Paris, illustrating the technical mastery, the depth of understanding and the pure technical design genius of the flying buttress.

verbal communication and full-scale layout in the field would also be instantly recognisable (Barrow, 2004). Historical texts that celebrate the triumphs of the Gothic era tend to focus on the architectural features that made it all possible and in particular the architectural legacy it provided for the history of Western architecture (see Figure 1.1). Few, however, really celebrate the technical mastery, the depth of understanding and the pure technical design genius required.

The great Gothic epoch was only possible because the Master Builders were the ultimate technical designers before all else as the seminal work, *Architectural Technology up to the Scientific Revolution* (Mark, 1993) makes abundantly clear. Therefore, by taking a slightly different perspective, it is possible to theorise with some authority that the current professional discipline of architectural technology has very firm roots in the Middle Ages and we could be tempted to go even further back. However, by taking this particular moment in history and assuming a common heritage we can also then trace a lineage that supports but equally differentiates architectural technology from architecture.

It does not take long to move from the Middle Ages into the Renaissance (14th to 17th centuries), which witnessed a separation of the architectural design process from on-site technical design of construction and as such triggered an

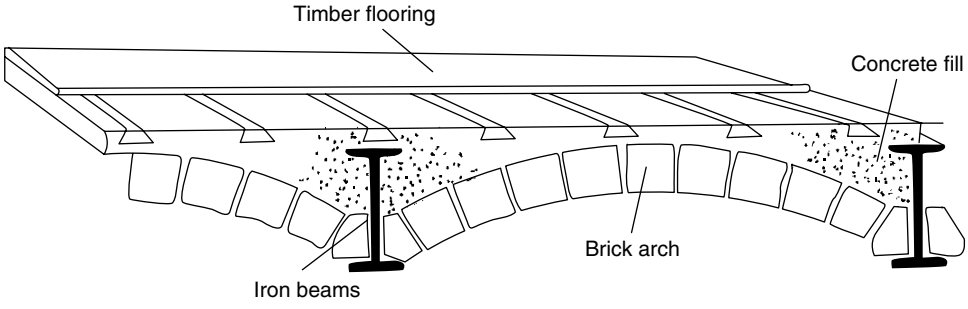

Figure 1.2 The Jack Arch of the Industrial Revolution, illustrating the fusion of the 'new' materials in wrought iron beams with the traditional brick arch providing larger spans of fire resistant suspended floors.

elevation of artistic and architectural design, leading eventually to the now familiar role of the modern architect. Other major developments followed as a consequence, such as the need to produce discrete depictions of their concepts; in other words, drawings. The complex philosophy of communication through drawing is interesting and continues to evolve today as new drawing tools and methods become available. The separation that came about in response to the need to impart specific construction information to builders as opposed to a drawing that depicted the final appearance of the building was another factor that helped to define a division between technical and representational illustration. Indeed, it is no surprise that two Renaissance architects, Brunelleschi and Alberti (Edgerton, 2009), are credited with the clear formulation of perspective drawing, a magnificent method for providing a three-dimensional appearance that from a technical standpoint has little use because, as it is 'not to scale', it is not possible to transfer dimensions. Again these historical observations can be used to support a theory that this division of drawing styles helped to precipitate another divergence between the two professions, with technical drawing traditionally the realm of the architectural draughtsperson having a clear lineage all the way to building information modelling (BIM) and an artist inspired façadism with the concept that creativity can exist universally (Wienand, 2011a).

While the architecture of the Middle Ages relied on and celebrated the impact of building technology and technical design on the final built form, the Renaissance delivered major advances in architecture that were not related directly to technology, with some notable exceptions. It was not until the Industrial Revolution that building technology took another major evolutionary surge forward, although this time probably under the command of the engineering profession. The technologies unwrapped during this period allowed the creation of many more wonderful architectural achievements and can also in theory be linked directly to current building design, where much cutting edge architectural design can be claimed to be 'technology enabled' (see Figure 1.2).

We have briefly examined distinct historical periods where the impact of technology on the ensuing architecture is markedly different. The Middle Ages was very much constrained and controlled by technical limitations, the Renaissance

and beyond saw architectural exuberance unhindered by technical shortcomings and now we have technology essentially driving architectural innovation. Any theoretical exploration of the role of technology in architecture must also examine the role of architectural technology on building and therefore whether it is the 'technology to build' or the 'technology of building'. The answer is clearly both, depending on the circumstances, and is also potentially related directly to the role of an architectural technologist, but the relationship is also a lot more complicated as historic developments illustrate.

In the concluding chapter to his historically significant and remarkably inclusive work, *Construction into Design*, covering the period from the beginnings of the Industrial Revolution to the latter stages of the 20th century, James Strike (1991) contrasts external drivers on the introduction of architectural technologies such as fashion and war with the spirit of innovation and the potential for failure. He summarises these relationships as involving changing viewpoints, the nature of change and evolutionary themes and in so doing illustrates the apparently capricious world that governs the adoption of new technologies. In discussing changing viewpoints he points to differing views on the value of technology such as 'one generation reacting against its predecessor' or straightforward disagreements over the value of industrial technology in the production of architecture – an issue we still struggle with today when using state of the art technology to produce retro-styled buildings. The next point, closely related to changing viewpoints, is recognising in the nature of change that humans are slow and unpredictable when it comes to accepting the value of things new. Here Strike demonstrates this with the considerable time lags between the inventions of cast iron (Abraham Darby with smelting iron in 1709) and concrete (Joseph Aspdin with Portland cement in 1794) and their eventual use in building, let alone enthusiastic adoption. He also points to a discernable pattern in suggesting that: 'the story line for each material or technique is never identical, but the recurring stages often include: inception of the idea, testing of prototypes, trial use, failure, gestation on the shelf, reinvention, retrial, success through the construction of a seminal building, adoption, misuse, rejection due to failure or a change of fashion, introduction of legislation to control its use, gradual improvement of the material or technique, and finally general acceptance' (Strike, 1991).

Design projects that buck this trend are rare and Norman Foster's Willis Faber Dumas Headquarters in Ipswich (1975) is an example of the pure genius or luck required to succeed when challenging the current technical boundaries. Foster (2007), speaking about the project noted that he himself had written, 'But we don't have the time, and we don't have the immediate expertise at a technical level.' Perhaps the genius here is recognising limitations and rising to the challenge, fully aware of the risks. Returning to Strike's final topic, evolutionary themes, we enter the more predictable world of material and component developments; the scientific and research supported development of reinforced concrete or steel frame buildings for instance, following the earlier themes, but the high precision prefabrication of components is another significant factor, the Pilkington glass spider (planar system; see http://www.pilkington.com/) connector of Foster's building being a prime example.

Historical study allows us to examine previous scenarios with the advantage of hindsight and although normally written in authoritative styles, there is usually sufficient space to permit some degree of theorising of what might have been concluded to provide some otherwise unforeseen answers. A very noticeable omission so far in this historical overview is the exceedingly important impact of the Modern movement of the 20th century, on technology and architecture and by association also the building and design professions. An interesting example surrounds the comments and thoughts of Charles-Édouard Jeanneret, Le Corbusier, possibly the most influential architect of the period, who stated that 'Architecture is not building. Architecture is that cast of synthetical thought in response to which the multiple elements of architecture are led synchronically to express a purpose. And as this synthetical purpose is absolutely disinterested, having for object neither to make durable, nor to build rapidly, nor to keep warm, nor to promote sanitation, nor to standardize the domestic usefulness of the house, I would say, since it is above any utilitarian objective, it is an elevated purpose. Its objective is to bring us benefits of a different nature from those of material usefulness; its aim is to transport us to an inspired state and thus bring us enjoyment' (Le Corbusier, 1929). Corbusier's architectural theory does something very important and unforeseen here in that it helps to illustrate what could be a defining feature of architectural technology, namely the pursuit of that *utilitarian objective* (see Figure 1.3).

The great advantage of architectural theory in this instance is that it does not have to be verifiable or even particularly sensible, primarily it has to be inspirational and a motivating force for the individual architect or, as described earlier, a collection of propositions to illustrate principles of a subject. In a similar vein, a theoretical notion could assert here that while all aim to design buildings, architects aim to produce great architecture, engineers to produce sound structures and architectural technologists to produce high performance buildings, in that utilitarian form.

An interesting proposition from another of the 20th century's most prominent architects, Frank Lloyd Wright (1901), also illustrates the very subjective nature of some architectural theory when he lambasts the Renaissance, suggesting 'It is the setting sun which we mistake for dawn.' He stated that 'with the beginning of the sixteenth century, the malady of architecture is visible. It becomes classic art in a miserable manner; from being indigenous, it becomes Greek and Roman; from being true and modern, it becomes pseudo-classic. It is this decadence which we call the Renaissance' (cited in Braham and Hale, 2007).

There is little doubt over the considerable impact that Frank Lloyd Wright has had on 20th century architecture yet his comments above are significantly slanted and a personal observation that needs to be described as highly subjective. An architect can therefore theorise quite freely in a philosophical sense without it necessarily affecting the quality of his or her design outputs. Architectural theory in this case is based on the blurry concept of theory that directs the subsequent design process, the concept of 'isms', schools of thought and philosophical movements that thinkers believe to be true as opposed to being provable (Wienand, 2011b). Although architectural theory is most often seen in

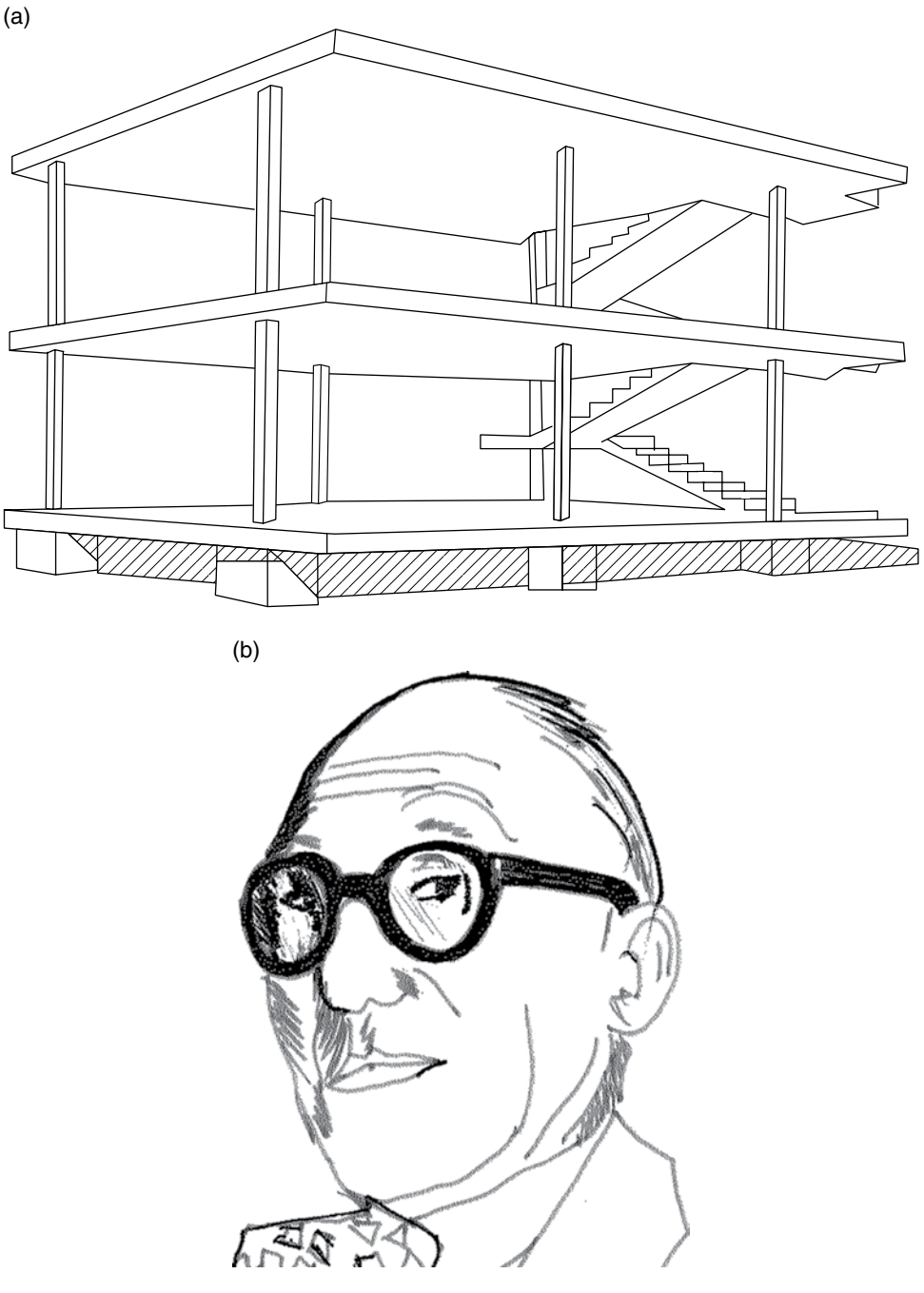

Figure 1.3 (a) The domino house by Le Corbusier – the pure simplicity of utilitarian design, approaching the aesthetic of Quaker plainness with its functionality. (b) Le Corbusier.

philosophical form – as manifestoes, historical essays, etc. – aspects of social and cultural study and the fundamental principles of proportion still require the application of scientific method. The difficulty these observations present is the inference that architectural technology as a design profession and being 'not architecture' is somehow beyond subjectivity and purely objective. However, can it be totally objective? Theoretically it can, but it certainly presents an interesting concept for further consideration and future propositions.

By taking this tour through architectural history we have highlighted the issue that architectural technology exists as an integral technical element in building design that either produces architecture or complements architectural design, but it also exists as a clearly defined professional discipline with a discrete and demonstrable pedigree, complete with contradictions and subsequent uncertainty. So just as with other professional occupations such as medicine, engineering and indeed architecture, the practice and products assume the same designation but describe quite distinctly different aspects; studying medicine is different to practising medicine and also quite distinct from taking medicine.

Separate disciplines have been described as being distinguishable by the way they present themselves and above all have been depicted as 'seeing things differently when they look at the same phenomena' (Del Favero, 2011). From this observation, another theoretical notion that helps to support the distinctive natures of architecture and architectural technology, and has some grounding in experience, is that when considering the 'phenomena' of architectural detailing, the two disciplines have a tendency to see things very differently; architects see the surface details that make up the architectural narrative of the building whereas architectural technologists see the technical design of joints that is mostly hidden and shapes the critical narrative around buildability.

Before moving on to the next section looking at the current situation with this slightly clearer view of architectural technology as having gained something from the past, it is clear that there are many questions still left to be answered. There are also some intriguing links to explore, such as how Corbusier's utilitarian objective could connect with the concept of buildability, a central tenet of architectural technology, or even more intriguing, as seen above, how the apparently simple concept of architectural detailing can mean very different things to different disciplines (see Figure 1.4).

The here and now

It has been suggested that a theoretical approach can help us to understand and grasp the present, predict the future and also maybe help to define that future. Having briefly considered the past, what is clear is that the discipline of architectural technology is closely linked to the evolution of technology and is, as such, constantly evolving. This poses the question, what exactly is an architectural technologist? This is difficult to answer in one sense but theoretically

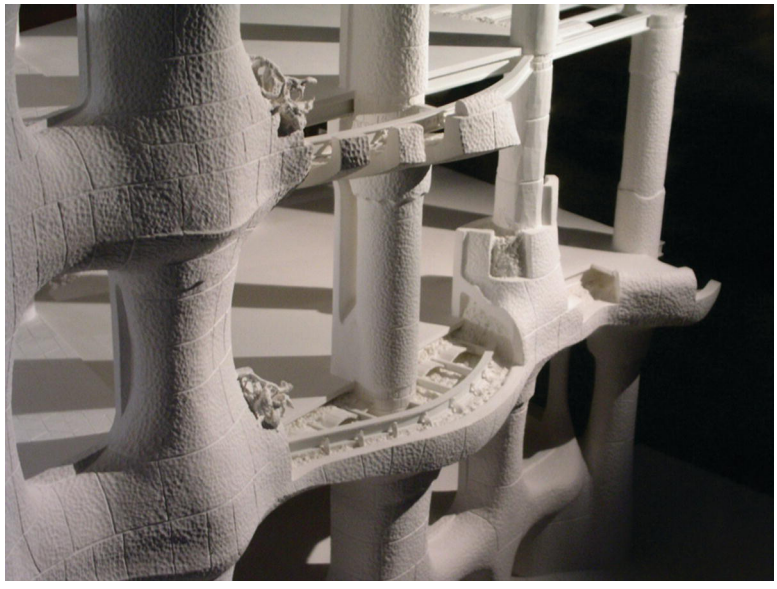

Figure 1.4 Gaudi's detail for supporting the overhanging 'rockface' of La Pedrera's main façade illustrates that for some the projecting stone is the detail yet for others it is the composite construction incorporating the steel frame and 'L' shaped stone units fused together with the concrete infill.

very exciting because the future is still to be written, and therefore anything is possible. This may seem to be an overly ambitious statement but, as noted in the opening section of this chapter, we are simply using theory as a framework and to provide space to structure our thoughts, to speculate and make propositions; there is no harm in thinking.

A reasonable start when considering a theoretical approach to the subject would be to explore any theories that already exist that may be applicable to architectural technology. In reality there are far too many to be considered fully but beyond the philosophical theories of architecture, already referred to, the theories of technology and in particular some transferable theories of design are of genuine interest.

It is useful at this point to examine some thinking around the concept of technology beyond the confines of architecture and building. A great deal of writing on the subject of technology comes in very emotive terms and some interesting theories place technology as just a tool or technology as an uncontainable force, and luckily even technology as having the capacity to save the world. The *instrumental theory of technology* suggests that technology is a tool and deemed to be neutral and 'indifferent to the ends it can be employed to achieve' (Feenberg, 1991). Unresponsive to political control, a hammer is simply used to hit things.

Substantive theory proposes that we are doomed; taking the example of the hammer it suggests that the invention of the hammer leads inexorably, for example, to somebody using it to hit another person, then sharpening the