

# Tools, which tools?: The changings of architects

Gill Matthewson  
Monash University

## **Abstract**

*In the call for papers for this conference, the origin of the word 'technology' in the Greek word "tekhnē" is detailed. Translated as meaning "art" or "craft", we are reminded that conceiving and making are inextricably linked; a dependency that suggests that "tekhnē" lies at the core of architectural practice.*

*The paper considers practice through a popular textbook (*The Architect in Practice*) that was first published in 1952 and is now in its 11<sup>th</sup> revised and updated edition. The book is not intended to focus on the skills of design, but on all the multiple other skills the authors deem necessary to be a 'successful' and 'efficient' architect. Should there be any doubt, the introduction exhorts the reader specifically to lay aside the tools of design/drawing in order to concentrate on the valuable lessons contained in the book. The tools that need to be set aside to allow for this concentration change across the editions, loosely but belatedly following technological changes in the tools of the profession over the more than six decades since the book was first published. From "tee-square, colours and brushes" to "CAD equipment and thick felt pens", the listing of these tools also tell a story of changing practices and conceptions of what an architect is and does. The paper discusses the implications these changes have for the connection between conceiving and making in architecture.*

Sixty-five years ago, in 1952, an architect (William Norman Bruce George) and a quantity surveyor (Arthur James Willis) published a textbook entitled *The Architect in Practice* offering guidance and advice to budding architects. Willis (the first named author, born 1895) had by this date already written a number of books about quantity surveying, at least two of which bear his name and are still in print.<sup>1</sup> George was twenty years Willis's junior, and wrote two other books: *British Heritage* in 1976 and *World Architecture* in 1981.<sup>2</sup> In 1958, George also established an architectural firm George, Trew & Dunn, specialising in hospitals in the UK.<sup>3</sup> His most notable work was the design of the Royal Military Chapel in Birdcage Walk, London after it was predominantly destroyed by a V1 bomb during World War Two.<sup>4</sup> Built on the existing ground plan, George (usually credited with the design) framed the surviving

Lombardo-Byzantine inspired gold-mosaicked apse (by George Edmund Street in 1879)<sup>5</sup> with a structure of white Pentelic marble and Portland stone. The clearly modernist design was thought to be influenced by Alva Aalto, whose work George had admired whilst on a study tour that included Finland when a student.<sup>6</sup>

*The Architect in Practice*, like other Willis books, is still in print – albeit under new authorship, revised and updated – and now in its eleventh edition (2016). The current authors claim that the book has been a leading textbook since the first edition and, although written for the UK, has been used worldwide for educating architects.<sup>7</sup> All Australasian schools of architecture, except one, have copies, ranging from two to seven editions. Notwithstanding the UK focus, the book also presents a detailed picture of an architect in practice in Australasia.

The book is not about the skills of design, but on all the multiple other skills the authors deem necessary to be a ‘successful’ and ‘efficient’ practicing architect. Should there be any doubt, the final sentence in the first paragraph of the introduction advises the reader to lay aside the tools of design/drawing in order to concentrate on the valuable lessons contained in the book. What needs setting aside to allow for this concentration changes across the editions more or less following technological changes in the tools of architecture since 1952 and trace a kind of history over that time. They also trace the meaning of those tools because tools are more than their utility, they represent different ways of thinking about architects and architecture. This paper discusses this list of tools, its different manifestations across the eleven editions, and the implications the changes have for the connection between conceiving and making in architecture.

## **1952**

In the 1950s, when the first edition was published, architecture in the UK was dominated by small private practices, although with a sizeable portion of RIBA membership working for local governments.<sup>8</sup> Andrew Saint describes a changing profession in the UK in the 1950s and 60s moving from the ideal of the architect as a gentleman plying the profession in a small practice, towards the architect as a managerial or entrepreneurial architect in larger practices. While Willis and George aimed their book at those planning to become private practitioners, one chapter covers the prospect of dealing with large commissions from public authorities common at the time.<sup>9</sup> Saint cites the RIBA as promoting the idea of the efficient/managerial architect towards the end of the decade,<sup>10</sup> but Willis and George already had the making of the efficient architect as their target in 1952.

The book begins with a rather elaborate series of pages. First, are the inspiration, the Dedication, and an epigraph – all on a single page.<sup>11</sup> These have a similar message concerning the very wide range of roles an architect must fulfil: artist, administrator, and even lawyer. The preface that follows is a quasi-Socratic dialogue reiterating the complexities of roles and describing the difficulty of conveying these in a book, but insisting that they will succeed. In the introduction, the authors advise that in order to concentrate on the valuable lessons contained in the book:

Let the reader therefore leave his drawing-table, forget his tee-square, his colours and his brushes, take off his smock and settle down to his desk (or arm-chair) to study an aspect of his work which he may find requires some self-discipline but is nevertheless essential to make him an efficient architect.<sup>12</sup>

The tools to be laid aside are all design/drawing tools and the book is clear that these skills are not sufficient to be an architect and especially not enough to be a successful one. It may be through drawing that architecture is conceived, represented and eventually made, but it is through the lessons of the book that drawings become built architecture and the designer an architect. Accordingly, the introduction begins with the lines:

Ability to design and skill in draughtmanship will not alone make an architect. The purpose of this book is to present to architectural students, and perhaps the less experienced practitioners, some indication of the practice and procedure with which they must be acquainted if they are to follow their profession with success.<sup>13</sup>

The tension between the architect's role as primarily concerned with the art and aesthetics of architecture and as deeply involved with technical and building matters is as old as the profession (and continues to rumble).<sup>14</sup> This paper is interested in the tools listed and what they tell us about this shifting tension.

### **The tools**

The tee-square is a classic symbol of an architect and in some form have been used in the designing of buildings since classical times. It, with the drawing-table, is a tool for the many kinds of drawings that architects and architecture students undertake, from perspectives to construction drawings to free-hand sketches. The items next in the list, 'colours and brushes,' refer to the traditional media of gouache, water-colour washes and inks that were used to enhance and clarify drawings, and to present a proposed project. All these items would have been familiar to architecture students one hundred years previously, albeit in their article

training in an office rather than schools. The last item on the list is a smock and is perhaps the most curious item on the list for contemporary architects and architecture students.

Smocks, in practical terms, protected clothes from staining by the by-products of the crafting involved in design and drawing: ink, graphite, charcoal, colour materials, and perhaps the bloodstains from slips with scalpels when scratching out incorrectly placed lines. In other words, it makes the crafting involved in the production of the drawings of architecture explicit. But the wearing of a smock was also, and perhaps more importantly, symbolic – a claim to artistic status and identity that was part and parcel of the Beaux-Arts tradition under which George had studied at the Liverpool School of Architecture in the 1930s. Under the directorship of Charles Reilly, the school developed a strong atelier system which emphasised the art of drawing and an aesthetic rather than technical approach to architectural education.<sup>15</sup> Although Reilly retired the year that George began (1933), the Beaux Arts methodology and philosophy dominated in most schools of architecture in the UK until at least the Second World War.

A photograph of a studio in the Liverpool school in 1930 shows the students wearing a variety of over-garments or smocks.<sup>16</sup> However, a contemporary of George's, Joseph Esherick, studying in the "firmly-committed Beaux-Arts" school of architecture at the University of Pennsylvania describes wearing a blue smock during his education, much more of a uniform than those on display in the Liverpool photograph. Similarly, at Cornell University in the 1920s, the smock was a uniform; moreover, each year class wore a different coloured one.<sup>17</sup> Both schools did not permit first-year students to wear this uniform. Esherick details a ritual involving first-year students fighting for the right to wear the architect's smock by removing it from a second-year student – by force.<sup>18</sup> Esherick considered these de-smocking fights to be "muddy, aimless, and harmless battles," more a ritual conducted between gentlemen than thugs. Indeed, such fights were not only allowed but encouraged at the university because they were thought to "develop manliness and courage."<sup>19</sup> While architecture schools might continue to have rites of passage (such as all-nighters and crits),<sup>20</sup> this kind of pugilistic ritual has not survived.

Regardless of colour or pattern, rituals or pragmatics, the smock was symbolic of being an architecture student in the Beaux-Arts tradition. Fashion sociologist Joanne Entwistle maintains that clothing represents an important connection between individual identity and social belonging which is "signalled and reproduced through shared tastes and dress styles: one's whole embodied appearance signals membership."<sup>21</sup> Smocks made this identification strong for architecture students. Certainly, for Willis and George at the time of their writing the

first book, the smock represented the architecture student as art-architect that they insisted needed the help of their book to become successful by being efficient.

The wearing of smocks in the professional workforce mid-century is less clear. In fact, Saint recalls an architect causing great amusement when he wore a smock at the drawing board in the London county council's architects' department in 1957 – just five years after Willis and George's publication.<sup>22</sup> There are, of course, always clichés that arise around the clothing of a particular profession: bankers wear pin-stripe suits and doctors white coats. Mid-century architects were often associated with bow ties and the wearing of them was the cliché for architects of the time (allegedly, the bowtie prevented a drawing being smeared by a standard tie). New York architect Peter Eisenman still continues this aesthetic, and blogs on the internet argue that it is a clear signifier of an architect of a certain generation.<sup>23</sup> It is, of course, the contemporary cliché that architects wear black.<sup>24</sup>

The architecture profession has its roots in the so-called 'gentlemanly' professions which evolved in the nineteenth century. Indeed, architecture schools in the early twentieth century considered their objective was the production of gentlemen.<sup>25</sup> The professions, and the gentlemen who worked in them, were employed in work that did not involve 'sweat' or dirt, they could and did wear white, hence the term white-collar work. According to Karen McNeill, most American architects at the turn of the century "wore suits that were typical of any other white-collar professional."<sup>26</sup> Entwistle discusses the nature of the suit and acknowledges its complex and nuanced meanings, but argues that the suit signals formal and conservative<sup>27</sup> – ideal for an aspiring profession. Smocks as protection for that clothing somewhat belies the cleanliness of that professional aspiration, or at least the public face of the profession.

But, in the 1950s, the smock in practice was not necessarily the romantic pre-war Beaux-Arts smock with its signature pleating. In a photograph of the Queensland firm of Hayes and Scott used for their Christmas card in 1959, the seven men of the firm are posed at their drawing boards, four of whom are wearing what might be better described as dust or lab coats.<sup>28</sup> Particularly if white, this kind of 'smock' can also be seen as a symbol of the serious *work* of drawing and so the serious work of architecture – work that involves specialist equipment and the knowledge to wield it. In 1965, Massimo Vignelli, co-founder of the Unimark International design company, tapped into this seriousness when he insisted that all their designers worldwide wear what he calls 'white smocks'.<sup>29</sup> For him, the 'white smock' (which is a white lab coat in the photograph of Vignelli that accompanies his declaration) denoted professional – he explicitly mentions the architect and the doctor – at a time when graphic design was less established as a profession than either architecture or medicine. It was also, in his view, a

“great equaliser, stressing objectivity over subjectivity,” a key element in the firm’s philosophy. However, in 1970, employees revolted – for them the white smock/coat symbolised corporate power, technocrats and a formality at odds with the kind of rule-breaking design thinking that characterised Unimark, and so blue jeans took over. The various student revolts in architecture schools in the late 1960s and early 1970s, including in Australasia and the UK,<sup>30</sup> would also have put paid to such formal wear. Certainly, no photographs of students during the 1960s and 1970s I have found show smocks – like at Unimark International, casualwear and jeans became universal.

And so perhaps the most curious part of the inclusion of the smock in Willis and George’s list was the number of years and editions it remained.

### **1970**

It is not until the fourth edition published in 1970, that there is any revision to the text. Another author, or more precisely, collaborator is added to the credits: Christopher J Willis, son of the first author and also a quantity surveyor. The opening paragraph of the introduction modifies the list of design tools that must be laid aside in order to attend to the book: “colours and brushes” have been swapped for “set-square and scales.”<sup>31</sup> For the authors, the architecture student of 1970 no longer dealt so much in the colour washes of nearly twenty years previously. In Neil Bingham’s survey of architectural drawings of the twentieth century, he identifies moves in the 1960s towards representations of architecture through photo-collage and applied colour in the form of shapes of adhesive sheets like Letraset.<sup>32</sup> He argues that these moves reflected the revolutionary ideas of the times and critiques around modernism. That said, many of the images included by Bingham for the period still utilise colour-brush-work, with the addition of felt-tip pins, crayons and oil-pastels.

Willis and George’s nomination of set-squares and scales in the stead of colours and brushes appears to be more backward-looking. These are the tools of the kind of straight geometric drawings favoured by post-war reconstruction modernism rather than a critique of it. The smock also remains on the list, a seemingly odd and dated vestige of romantic version of an architect as a particular kind of artist. Despite the seeming irrelevance of the smock in whatever form, the fifth (1974) and sixth (1981) editions of the book kept the list unaltered (by 1981, Willis was 86 and George 66).

### **1992**

It is not until the seventh edition in 1992 that Willis and George retire as authors and with this change comes a complete rewrite. Although the intervening editions had updated and added

where necessary, the format and much of the text of the book remained, in the main, that of the 1952 edition. The rewrite is under the first authorship of David Chappell (an architect, who has maintained this role in all following editions) and Christopher Willis (the former collaborator on the previous three editions). With this seventh edition, the material of the book is completely re-structured into new chapters, which are grouped into parts, and each chapter consists of numbered sections and sub-sections. This is a clear move away from the discursive prose of Willis and George to a more reference-text format, rendered easily accessible through the intense numbering of sections and sub-sections. Although they continue to urge the architecture student reader to lay aside design tools and settle into an armchair to study the lessons of the book, the book is now less of an armchair-read and more obviously a 'dip in, dip out' source of information.

In the re-writing, some of the anachronistic aspects of the book, which were well overdue for revision, have been addressed. It is not until this edition that the language of the book acknowledges that architecture students and architects might not just be men nearly two decades after women began to enter schools of architecture in large numbers in the 1970s. To do this, the text shifts to the plural of architects/readers to avoid the singular pronoun.<sup>33</sup> And the list of design tools is also updated:

Let the readers therefore leave their drawing board, forget their tee-squares, set squares and scales, move away from their CAD equipment and settle down to their desk or armchair to study an aspect of their work which they may find requires some self-discipline but is nevertheless essential to make them efficient architects.<sup>34</sup>

The drawing-table is replaced by the drawing board. Finally, the smock has been dropped and in its stead are computers. In casting off the smock, its historical, symbolic and pragmatic associations have been discarded. Being an architecture student might still involve serious work and mess but, with more relaxed dress codes in general, there was less formal wear (like white shirts) that needed protecting. The symbolism of the smock denoting the architect-artist was perhaps also a romantic redundancy. Except, the wearing of black, a colour associated with contemporary rather than nineteenth century artists, more likely supplanted it.<sup>35</sup>

The wearing of black is not restricted to the education environment and therefore constitutes a more intensely embodied indicator of architectural identity. Garry Stevens maintains that becoming an architect, unlike with other professions, requires not just *knowing* something (such as drawing or design or even the multiple roles the book details) but *being* something.<sup>36</sup>

This, he argues, is due to a particularly high level of indeterminacy or uncertainty hovering around the identity of architects because of prevailing ideas of genius, individual innate talent and creativity. This makes the ‘knowing’ for architects far more uncertain than, for example, the ‘knowing’ of doctors and consequently places a higher emphasis on ‘being.’ An architect’s ‘being’ is classically and inextricably entwined with creativity, which is why the connection to artistic skills like design and drawing persists.<sup>37</sup>

## **2000s**

In the eighth edition of the book in 2000, the second author (Christopher Willis) has been replaced by a third member (and third generation) of the Willis family – Andrew, yet another quantity surveyor.<sup>38</sup> The tools of design are refined to include just the drawing board and CAD equipment, omitting the tee-squares, set-squares and scales. This reflects the fast uptake of computers into architecture over the 1990s. While CAD was taught in some schools of architecture beginning in the early 1980s, it became increasingly compulsory during the nineties.<sup>39</sup>

For the ninth edition in 2005, the preface and introduction material is collapsed together to form a new preface; there is no longer an introduction to the book.<sup>40</sup> It is in the preface now that the reader is asked to lay aside the tools of design.

In the eleventh (and latest) edition in 2016, there is a new co-author (Michael Dunn has replaced Willis breaking the connection of the book with the Willis family). The major change is the dropping of the drawing board as the signifier of the many kinds of drawing architects produce. Readers are now asked to “move away from their CAD equipment, lay aside their thick felt pens...”<sup>41</sup> For Chappell and Dunn, thick pens stand in for a loose kind of drawing that contrasts with the precision that computer-aided design tools can deliver. The specification of thick pens is slightly unusual; architect blogger Steve Ramos describes how most architects use pens rather than pencils, and lists five essential tools for an architect. Felt-tip pens came in at number two (after a thick skin!), but he precisely details the need for a variety of pens that can execute a wide variety of line thicknesses.<sup>42</sup>

## **Drawings and tools and architects and image**

It is drawings as representations of what might become architecture (be they symbolised by the drawing board, tee-square, colours, felt pens, or CAD equipment) that the authors over the years both privilege and try to tempt their reader away from with the promise of success. They, like others, assume drawings to be key to the education of an architect.<sup>43</sup> Esherick



concludes his reminiscences of his Beaux-Arts education with the declaration “and we did learn to draw.”<sup>44</sup>

Bingham argues that the rapid ascent of CAD in the last decade of the century meant that the “architect simply had a new drawing tool.”<sup>45</sup> However, while computers and the ever-developing software that they run might be at one level be seen as simply a new tool, they have also disrupted (and continue to disrupt) some very old patterns in becoming an architect.<sup>46</sup> In 2000, Dana Cuff observed that the near universal acceptance of computers into architecture schools and offices had disturbed the customary understanding that fresh graduates would still need extensive training before they could actually contribute to the office.<sup>47</sup> Universities teach students the very latest CAD and graphics software – or students train themselves in order to produce compelling images for their portfolios. This expertise can make them very valuable to firms – sometimes more valuable than older, experienced architects.

In a statistical study of the Australian Census, I reported a high number of older men leaving the architectural workforce in Australia between the 2006 and 2011 Censuses.<sup>48</sup> More recently, the 2016 Census shows a dramatic loss of men who were in their fifties in 2011.<sup>49</sup> These are architects who know how to run a project, how a building is put together, the ins and outs of the construction industry and the legislation that controls it – in fact, precisely all the matters that the book details for the education of its readers. If this knowledge is no longer sufficient to keep those who have it in architecture and there is a greater need for very particular drawing/computer skills, then the premise of the book is seriously destabilised.

By laying aside the tools and symbols of all kinds of drawing and design, the authors of the book ask architecture students to step for a moment outside of the design world and enter the world of practice; a practice that is assumed to be the private practitioner.<sup>50</sup> These are traditional concepts of an architect and do not acknowledge that architecture as a profession has been and is continuing to undergo continuous change and severe disruption. Many architects work in large firms,<sup>51</sup> and the digital revolution is having a major impact. Writing in the late 1990s, Garry Stevens warned that computers in architecture were both producing an underclass of CAD operators and threatening the occupational integrity of architecture.<sup>52</sup> Computers both expand and contract the scope of architects; they permit the total construction and crafting of a building in digital form from every nook and cranny to cityscape revealing every gnarly detail and spatial potential. But the very sophistication of the tools that enable such digital crafting can also lead to the fracturing of what it means to be an architect because each

software tool requires a degree of specialist knowledge reaching well beyond that required by the tools of the mid-twentieth century.

If the conceiving and making of architecture is bound to its tools of representation through drawing, then architecture will continue to be disrupted by the fast-developing tools presented by the digital revolution. This has unknown and tough implications for the education of architects and any book directed towards practice. Just as the smock stayed for too long on the list of items the budding architect needs to temporarily put aside, the ideas of practice that the book detail will always be behind the cutting edge.

---

<sup>1</sup> Initially sole authored but currently: Sandra Lee, William Trench and Andrew Willis, *Willis's Elements of Quantity Surveying*, 12<sup>th</sup> ed. (Chichester: Wiley-Blackwell, 2014) first published in 1935; Allan Ashworth, Keith Hogg and Catherine Higgs, *Willis' Practice and Procedure for the Quantity Surveyor*, 13<sup>th</sup> ed. (Chichester: Wiley-Blackwell, 2013) first published in 1951.

<sup>2</sup> W.N.B. George, *British Heritage: In Colour* (Poole, Dorset: Blandford Press, 1976); and W.N.B. George, *World Architecture (colour)* (Poole, Dorset: Blandford Press, 1981).

<sup>3</sup> 'William Norman Bruce George,' *Dictionary of Scottish Architects*, accessed January 15, 2018, [http://www.scottisharchitects.org.uk/architect\\_full.php?id=403813](http://www.scottisharchitects.org.uk/architect_full.php?id=403813)

<sup>4</sup> 'Bruce George, Architect – Obituary,' *The Daily Telegraph*, March 20, 2016 <http://www.telegraph.co.uk/obituaries/2016/03/20/bruce-george-architect---obituary/>

<sup>5</sup> 'The Royal Military Chapel, The Guards' Chapel, Wellington Barracks, Birdcage Walk,' *Churches Together in Westminster*, accessed <http://ctiw.london/2012/guards-chapel/>

<sup>6</sup> 'Bruce George, Special Obituary,' *Old Farnhamians' Association*, March 7, 2016, accessed January 15, 2018, [http://www.farnhamians.org/ofa/Obit\\_BruceGeorge.htm](http://www.farnhamians.org/ofa/Obit_BruceGeorge.htm)

<sup>7</sup> David Chappell and Michael Dunn, *The Architect in Practice*, 11th ed. (Chichester: Wiley-Blackwell, 2016), xiv.

<sup>8</sup> Andrew Saint, *The Image of the Architect* (New Haven and London: Yale University Press, 1983), 142.

<sup>9</sup> Arthur J Willis and W.N.B. George, *The Architect in Practice*, 1<sup>st</sup> ed. (London: Crosby Lockwood & Son Ltd, 1952), xi.

<sup>10</sup> Saint, *The Image of an Architect*, 147.

<sup>11</sup> Willis and George, *The Architect in Practice*, 1<sup>st</sup> ed., v.

<sup>12</sup> Willis and George, *The Architect in Practice*, 1<sup>st</sup> ed., xi.

<sup>13</sup> Willis and George, *The Architect in Practice*, 1<sup>st</sup> ed., xi.

<sup>14</sup> Saint, *The Image of an Architect*, 61; Dana Cuff, 'Introduction: Architecture's Double-Bind,' in C. Greig Crysler, Stephen Cairns and Hilde Heynen (eds.) *The SAGE Handbook of Architectural Theory* (London: SAGE Publications, 2012).

<sup>15</sup> Andrew Saint, *Architect and Engineer: A study in sibling rivalry* (London and New Haven: Yale University Press, 2007), 466.

<sup>16</sup> Saint, *Architect and Engineer*, 466.

<sup>17</sup> 'Vari-Colored Smocks Donned by Architects,' *The Cornell Daily Sun* XLIV, no. 69 (December 15, 1923), <http://cdsun.library.cornell.edu/cgi-bin/cornell?a=d&d=CDS19231215&dliv=userclipping&cliparea=1.1%2C704%2C567%2C653%2C757&factor=4&e=-----en-20--1--txt-txIN----->

<sup>18</sup> Joseph Esherick, 'Architectural Education in the Thirties and Seventies: A Personal View,' in Spiro Kostof (ed.), *The Architect: Chapters in a History of the Profession*, revised ed. (Los Angeles: University of California Press, 2000), 248.

<sup>19</sup> 1914 university text cited in George E. Thomas and David B. Brownlee, *Building America's First University: An Historical and Architectural Guide to the University of Pennsylvania* (Philadelphia: University of Pennsylvania Press, 2000), 19.

<sup>20</sup> Dana Cuff, *Architecture: The Story of Practice* (Cambridge, MA: MIT Press, 1991), 118.

<sup>21</sup> J. Entwistle and A. Rocamora, 'The Field of Fashion Materialized: A Study of London Fashion Week,' *Sociology - The Journal of the British Sociological Association*, 40, 4 (2006), 743.

- 
- <sup>22</sup> Andrew Saint, 'John Bancroft, Obituary,' *The Guardian*, September 20, 2011, <https://www.theguardian.com/artanddesign/2011/sep/20/john-bancroft-obituary>
- <sup>23</sup> 'Architects and Bowties,' *Architects' Wives*, October 21 2010, accessed January 31, 2018, <http://architectswives.wordpress.com/2010/10/21/architects-and-bowties/>; 'Bow Ties,' *Architangent*, September 20, 2011, accessed January 31, 2018, <http://architangent.com/2011/09/30-bow-ties/> ()
- <sup>24</sup> Cordula Rau, *Why Do Architects Wear Black?* (Wien: Springer, 2009).
- <sup>25</sup> AIA education report 1906-7 cited in Elizabeth G. Grossman & Lisa B. Reitzes, 'Caught in the Crossfire: Women and Architectural Education, 1880-1910,' in Ellen Perry Berkley & Matilda McQuaid (eds.), *Architecture, A Place for Women* (Washington & London: Smithsonian Institution Press, 1989), 29.
- <sup>26</sup> Karen McNeill, 'Julia Morgan: Gender, Architecture, and Professional Style,' *Pacific Historical Review*, 76, 2 (2007), 245.
- <sup>27</sup> Joanne Entwistle, 'Fashion and the Fleishy Body: Dress as Embodied Practice,' *Fashion Theory: The Journal of Dress, Body & Culture*, 4, 3 (2000), 328.
- <sup>28</sup> 'Christmas Card,' The Hayes and Scott Collection, University of Queensland, UQFL278, Folder B, image 0001 <https://web.library.uq.edu.au/files/1496/filename.jpg>
- <sup>29</sup> Lella Vignelli and Massimo Vignelli, *Lella Vignelli and Massimo Vignelli: Design is One* (Mulgrave, VIC: The Images Publishing Group, 2004), 28.
- <sup>30</sup> Glen Hill and Lee Stickells, 'Pig Architecture,' *Architecture AU*, June 22, 2012, <https://architectureau.com/articles/pig-architecture/>. Also Bill Mackay, 'The Counter-Culture and its Containment: The Loose Years,' in Julia Gatley and Lucy Treep (eds.), *The Auckland School: 100 Years of Architecture and Planning* (Auckland: School of Architecture and Planning, University of Auckland, 2017), 91.
- <sup>31</sup> Willis and George, *The Architect in Practice*, 4th ed. (Crosby Lockwood Staples, 1970), xiii.
- <sup>32</sup> Neil Bingham, *100 Years of Architectural Drawing: 1900–2000* (London: Laurence King Publishing, 2013), 180.
- <sup>33</sup> David Chappell and Christopher J. Willis, *The Architect in Practice*, 7th ed. (Oxford: Blackwell Scientific Publications, 1992), xix.
- <sup>34</sup> Chappell and Willis, *The Architect in Practice*, 7th ed., xix.
- <sup>35</sup> Rau, *Why Do Architects Wear Black?*
- <sup>36</sup> Garry Stevens, 'Struggle in the Studio: A Bourdivin Look at Architectural Pedagogy,' *Journal of Architectural Education*, 49, 2 (1995), 112.
- <sup>37</sup> Cuff, 'Introduction: Architecture's Double-Bind,' 385.
- <sup>38</sup> Noted in the preface, David Chappell and Andrew Willis, *The Architect in Practice*, 8th ed. (Oxford: Blackwell Science Ltd, 2000), xii.
- <sup>39</sup> Garry Stevens, 'Reflections of and Apostate CAD Teacher,' *Journal of Architectural Education*, 51, 1 (1997), 78.
- <sup>40</sup> David Chappell and Andrew Willis, *The Architect in Practice*, 9th ed. (Oxford: Blackwell Publishing, 2005), xi.
- <sup>41</sup> David Chappell and Michael Dunn, *The Architect in Practice*, 11th ed. (Chichester: Wiley-Blackwell, 2016), xiii.
- <sup>42</sup> Steve Ramos, '5 Essential Tools for an Architect,' *Buildings are Cool*, (Accessed February 2, 2018) <http://www.buildingsarecool.com/new-blog/5-essential-tools-architect>
- <sup>43</sup> Cuff, 'Introduction: Architecture's Double-Bind.'
- <sup>44</sup> Joseph Esherick, 'Architectural Education in the Thirties and Seventies,' 276.
- <sup>45</sup> Bingham, '100 Years of Architectural Drawing,' 239.
- <sup>46</sup> Cuff, *Architecture: The Story of Practice*, Chapter 4.
- <sup>47</sup> Dana Cuff, 'Epilogue: Still Practicing,' in Kostof, *The Architect*, 347.
- <sup>48</sup> Gill Matthewson, 'The Gendered Attrition of Architects in Australia,' *Architecture Research Quarterly*, 21, 2 (2017), 176.
- <sup>49</sup> Gill Matthewson, *Parlour Census Report 2001–2016: Women in Architecture in Australia* (Melbourne: Parlour Publishing, 2018), 13.
- <sup>50</sup> Chappell and Dunn, *The Architect in Practice*, xiii.
- <sup>51</sup> Dana Cuff, 'Commentary: Architecture's Undisciplined Urban Desire,' *Architectural Theory Review* 19, 1 (2014): 92–97; Sumati Ahuja, Natalia Nikolova and Stewart Clegg, 'Paradoxical Identity: The changing nature of architectural work and its relation to architects' identity,' *Journal of Professions and Organization* 4, 1 (2017): 2–19.
- <sup>52</sup> Stevens, 'Reflections of and Apostate CAD Teacher,' 78, 79.