Achievement in architecture is frequently the outcome of an undisclosed mutual intimacy. Wright and Mueller had such a relationship and from it emerged four significant buildings.

Frank Lloyd Wright and Paul Mueller: the architect and his builder of choice

Andrew Saint

In recent years there has been mounting curiosity about how architects and engineers work with one another to make buildings. Studies of such collaborations have their present use for furthering technique and efficiency in construction. As a historical exercise, one might view the tendency as part of a broader, revisionist trend – an overdue project for setting the record straight, and releasing architecture from the velvet manacles of art history. Acquaintance with the making of any sizeable building soon teaches that the Vasarian concept of *disegno* – of a creative process anterior to and set apart from construction – suits only a minority of architecture's modes and moments. As an explanation even of the more imaginative paths that lead from the blank sheet to the occupied building, it is intellectually reductive, humanly ungenerous, and actually untruthful.

On anyone who tries to shift the perspective, however, it soon dawns that the designing and making of buildings is inherently unstable. Clients, social relations, economic systems, building types and sizes, topographies and technologies are among the variables. The greatest of all is the human relationship itself. Every creative professional works in a special way; in every creative team the balance of power is different. Sometimes the critical relationship is twofold: between (for example) architect and engineer, or architect and builder. Often it is more complex. To understand the form of early iron buildings, for example, one needs to know something of what passed between designer, fabricator and erector – roles sometimes shared by the same person or firm, sometimes distinct. To understand large modern buildings, further specialists must be drawn into the picture, along with the manner in which the construction was managed.

Against this backdrop of instability and complexity, one thing that can be done is to home in on instances of fertile relationships neglected by proponents of the *disegno* school of criticism, see where they lead and try in that way to trace some of the currents in the ebb and flow between architecture, construction and technology. The following is a sample of such an investigation, from the draft of a book I am in the

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1 Architect and engineer: jointly overcoming 'difficulty after difficulty in the field'
a Frank Lloyd Wright in the 1930s
b Paul Mueller in about 1904

process of writing, *Architect and Engineer – A Study in Sibling Rivalry*.

That title is premised on the belief that the history of architecture is littered with passionate instances of the binary relationship. Whether the better model for that relationship is one of sibling rivalry or marital accommodation ('Till death do us part', Ove Arup pledged the architects when he received the RIBA's Gold Medal) hardly matters. The point is that achievement in architecture is regularly the outcome of an undisclosed mutual intimacy. The relationship described below, between Frank Lloyd Wright and Paul Mueller, was of just that intimate but private nature, so often needed if work is to be well – and, for that matter, beautifully – done.

The reader will be aware that family roles are seldom as they seem, nor is any couple quite self-contained. How should we define Mueller's role: as Wright's engineer, builder or construction manager? If his role does not seem to be one that we might view today as specifically that of a structural engineer, it should be pointed out that modern ideas about how engineers work creatively with architects only began to become fixed from the 1930s onwards. Was it just competence, coincidence and loyalty that led him to build four of the most crucial buildings in Wright's career? Or did his particular gifts extend and mature Wright's exceptional capacities? There are no simple answers. But telling a fairly familiar story with Mueller cast as a protagonist rather than a bit-part player may afford some insights.

Mueller's early progress

It is exciting to him to rescue ideas, to participate in creation. And together we overcame difficulty after difficulty in the field, where an architect's education is never finished.

(Wright, 1945: 144)

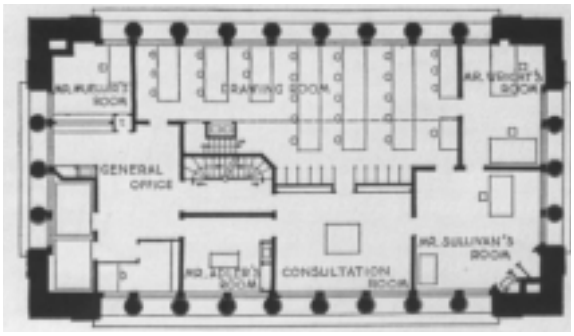
With these words Frank Lloyd Wright *[1a]* summed up not only his personal debt to Paul Mueller *[1b]* but the Faustian pact often concluded between engineers and avant-garde architects since the start of the twentieth century. Time and again, engineers have 'rescued ideas' in exchange for a share in the adrenalin-rush of architectural creativity.

It is as Wright's builder of choice for several of his most celebrated projects from 1904 onwards that Paul F. P. Mueller (1864–1934) is now remembered. But he had done much before then. Mueller was one of those proficient Germans who were the making of the American Mid-West. He belongs to the growing ranks of Europeans and Americans who from the 1830s onwards received a grounding in architecture and structural design at technical schools (Pfammatter, 2000). Though this 'polytechnical' pattern of education embraced both architecture and engineering, it leant more towards the latter, because the demand for engineers was everywhere greater than for architects. Many graduates of polytechnics, technical high schools and the like became consultant or government engineers. But as technical training expanded after 1870, many young men with some academic grounding in the design of structures went into contracting instead, or hovered between professional and commercial status.

Mueller was a case in point. He arrived in Chicago in 1881 aged 17, having attended what he called 'the government school of mining and civil engineering in the Saar Basin' and passed a polytechnic entry examination (Kaufmann, 1989: 62). He began by working with a variety of architects, engineers and iron and steel companies, amassing expertise in the new style of big building. The 1880s is familiar as the critical decade when the tall building in Chicago got drastically taller, developed its own look and language, and traded in its wrought-iron frame for one of steel. Who was responsible for all this is a source of never-ending fascination. Older versions of the story highlight the great Chicago architectural firms of these years: Jenney and Mundie, Burnham and Root, Adler and Sullivan and so on. A recent account lays more stress on a string of small, fast, incremental changes in technology, on the diversity of specialist skills involved, and on the entrepreneurial behaviour and capacity of the steel fabricators (Misa, 1995). In his first Chicago years, Mueller was in the thick of these multi-disciplinary developments. 'I went to work here with various architects and draftsmen; was engaged by the Aetna Iron Company; Clark, Raffner & Company, and S. S. Wetner, engineers; also superintended the erection of steel structures', he tells us (Kaufmann, 1989: 42).

Working with Adler and Sullivan

Soon Mueller was moving into the circles of Chicago's more cultured architects. The sequence of events is a trifle confused, but he may have been with J. L. Silsbee for a short while before being hired by Dankmar Adler, probably in 1886. There after six weeks he was made



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office foreman at the age of just 22.[1] 'I was first engaged as engineer', he wrote, 'and then afterwards I was put in charge of the office' (Kaufmann, 1989: 43). This, according to Wright's not entirely reliable autobiography, was where the two met. It draws a fond sketch of Mueller, all beard and guttural accent, exercising a restless, youthful authority over the staff. Wright himself, having come up to Chicago 'as a young engineer looking for work', had joined Silsbee for most of 1887 before moving over to Adler and Sullivan (Wright, 1945: 62, 87–8). In a plan of the Adler and Sullivan office atop the Auditorium Building published in 1890, just four private rooms are indicated: those of Adler and Mueller at one end of the office, Sullivan and Wright at the other *[2]*. As Adler was to Sullivan, so to an extent, in less equal, formal or continuous circumstances, Mueller was to be to Wright.

Dankmar Adler has often been overshadowed by the brilliance of his partner Louis Sullivan and their assistant Wright, though both went out of their way to praise him. Nowadays, his great gifts are better recognized.[2] Like Mueller, Adler was German-born. Many of Adler and Sullivan's most prestigious commissions in the Mid-West came from enlightened German or German-Jewish patronage. It was also to the German-speaking nations that Adler looked in the first place for architectural and technical inspiration. Usually he is designated as an engineer

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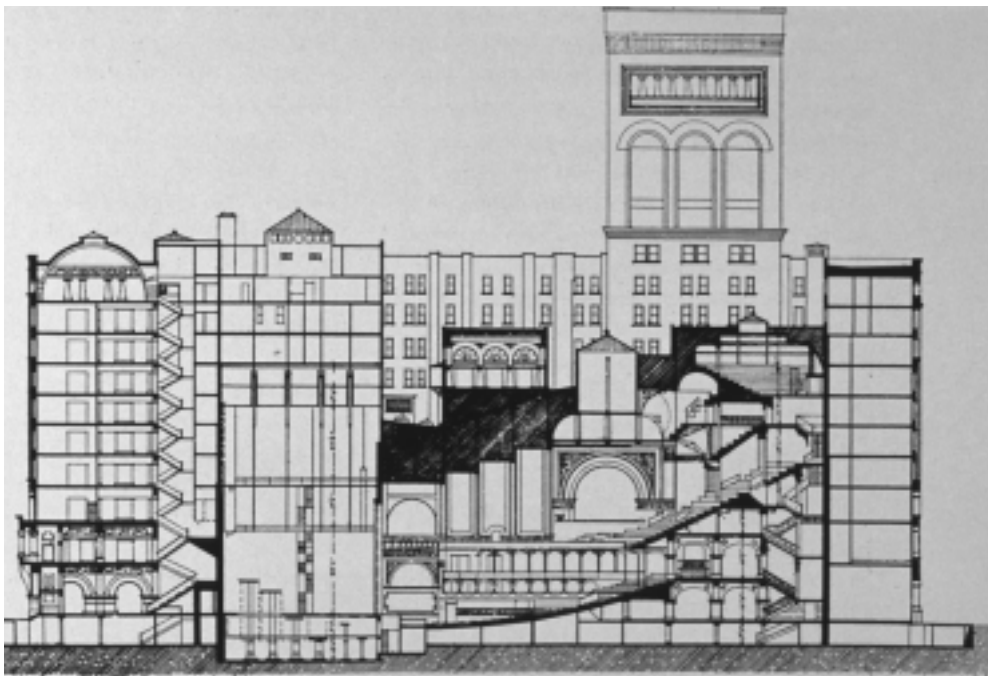

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2 The office of Adler and Sullivan in the tower of the Auditorium Building

3 Men of the Topographical Division of the Federal Army's Engineering Corps before Yorktown, May 1862. Dankmar Adler served with this division, later merged into the federal Corps of Engineers

4 The job that made Adler and Sullivan famous and Mueller's first and heaviest responsibility in the office. The Chicago Auditorium of 1887-89
a Exterior view
b Section

or architect-engineer, so as to distinguish his role from that of Sullivan, the consummate architect-decorator. That tallies with Adler's own testimony of the 1890s: 'Of late years, owing to the preeminence in the artistic field of my partner Mr Sullivan, I have devoted my efforts to the study and solution of the engineering problems which are so important ... in the design of modern buildings' (Twombly, 1986: 97). Adler had emigrated too young to share Mueller's start in German technical training. But he had served in the Civil War with the infant Topographical Division of the US Corps of Engineers *[3]*. War begets improvization and experiment in construction, and the subsequent leap forward in American civil construction surely owed much to the toughness and audacity acquired in that grim conflict by Adler, Jenney, Sooy Smith (the great Chicago foundations expert) and many others.

The Auditorium Building

Mueller's time in the Adler and Sullivan office coincided with all that firm's most famous buildings. A lengthy witness statement of 1925, published some years ago by Edgar Kaufmann Jr, is our main source for this stage of his career. In it Mueller selects for mention the firm's theatres, including the Deutsches Stadt Theater, Milwaukee; the Pueblo Opera House; and the Schiller Theater in Chicago (Kaufmann, 1989: 43). The layout, structure and acoustics of these projects, which typically threw hotels, offices and shops in with the theatres as a means of sustaining them economically, were very much Adler's province and remind us that Mueller was Adler's man. For an engineer, such mixed structures were in every way more challenging and adventurous than the regular frames of the skyscrapers in St Louis and Buffalo that are the primary image of the Adler and Sullivan practice today.

Foremost among the theatres was the enormous Auditorium Building *[4a and b]*. This was the job that made Adler and Sullivan famous. The Auditorium was Mueller's first and weightiest responsibility within the office, as well as the subject of his witness statement, written over thirty-five years after the building's construction. Adler had been constrained to take many risks, many of them forced on him by changes insisted upon during construction by the Auditorium management (Twombly, 1986: 167–8, 178–82). They had not all paid off. Settlement took place, and in 1925 triggered a lawsuit in which Mueller was called as a witness.

The resulting memorandum ought to be revered as a historic text of construction management. In rare and rich detail, the manifold interests and responsibilities which Adler and Mueller had to co-ordinate are laid out. Here is an antidote to the individualist ideal of architecture. Angus, Lichter, Marburg, Neiman, North, Sooy Smith, Strobel, Wright, the Carnegie Steel Company, the Keystone Bridge Company, the Snead Ironworks Company – Mueller explains in meticulous detail the role of these and other parties not just in the erection but in the evolving design of the Auditorium (Kaufmann, 1989: 42–62). Yet Adler and he manifestly believed that their structural-managerial duties also comprised the making of cultural and physical conditions wherein Sullivan (and perhaps his assistant Wright) could be creative. The Auditorium was not about 'rescuing ideas'; here the plan, structure, services and acoustics came first. It was about furnishing a framework that the art-architects would then clothe, refine and enrich.

A precise grasp of detail

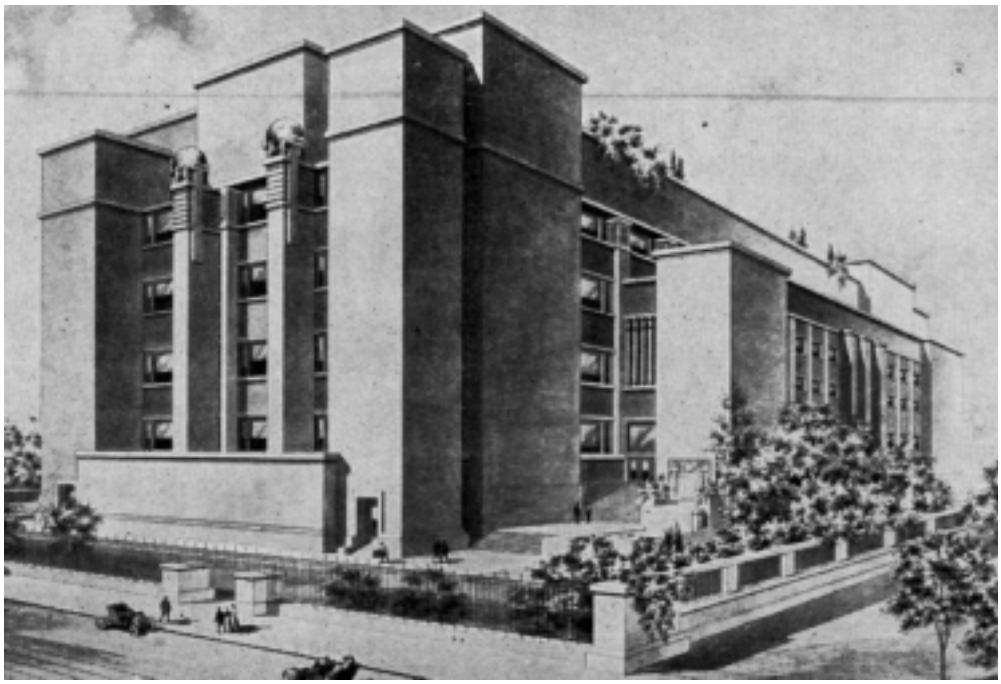
Looking back, Mueller felt there had been too much consultation over the Auditorium. 'I am sorry to say that Adler & Sullivan were so solicitous of the opinions of others', he said, having in mind the well-known Boston architect William R. Ware who, having been brought in by the management, insisted that two extra storeys be added to the tower after its foundations were already in (Twombly, 1986: 166–7; Kaufmann, 1989: 48).

Though the testimony says little about Mueller's exact part in the process, it shows that he was in the thick of it: 'I knew at one time I spent six weeks at Mr Adler's house, and every night we would go over the matters that came up during the day, and he would check it up in his own house before he would tell us to go ahead' (Kaufmann, 1989: 45). His precise grasp of technical detail long after the event stands in contrast with Wright's loose, romanticized memory of past projects and struggles. This complement of temperaments was to be useful.

After Adler and Sullivan, Mueller joined a big building firm, the Probst Construction Company, as 'secretary and consulting engineer' (Kaufmann, 1989: 43). In that capacity he supervised many of the structures built for the Chicago World's Fair of 1893, before becoming an independent contractor-builder in 1897. He erected large buildings of all sorts, including churches, but seemingly not the independent houses of the kind which made up the staple of Frank Lloyd Wright's earliest practice, started in 1893. Small houses at that time seldom offered technical challenges or paid well, so they did not much interest enterprising construction firms. Adler and Sullivan themselves had also not troubled much with houses in their heyday, though they often designed them as a favour to clients which indeed is how Wright got his start in that line. So until his practice outgrew its suburban scope, there was no reason for Mueller and him to work together. Then, the picking-up of old threads amounted to a shift from the in-house fellowship of Adler and Sullivan to a version of the same thing in the field, and from the challenge of steel in big buildings to that of reinforced concrete in middling ones. Institutional and temperamental factors of many kinds meant that there would be far less balance and continuity in the 'partnership' between Wright and Mueller than there had been between Adler and Sullivan. Nevertheless partnership of a kind it appears to have been.

Larkin: conservative construction

The renewal of the link is bound up with projects for Wright's enduring early clients, the Martin brothers. As far as we know, Wright and Mueller's first collaboration was the celebrated Larkin



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5 A masonry building with steel-framed interior. Larkin Administration Building, Buffalo. Frank Lloyd Wright, architect, Paul Mueller, builder, 1904–06, since demolished
a Perspective from the Wasmuth folio, 1911
b Interior, showing steel beams (right-hand top)

Administration Building, Buffalo, started in 1904. Though littered with innovations in planning and servicing, the Larkin Building [5a and b] was conservative in structure. Darwin D. Martin's brief insisted upon 'absolutely fire-proof construction' (Quinan, 1989: 129). But what one might imagine to have been concrete was in fact 'of masonry material – brick and stone' (Wright, 1945: 136), supplemented for the spans by the well-embedded steel with which architect and builder were familiar. As yet neither Wright nor Mueller appears to have known that much about the techniques of reinforced concrete. Then spreading fast throughout the Mid-West, these as yet were thought of as appropriate chiefly for cheap buildings (Hildebrand, 1974; Banham, 1986). There was plenty of money for Larkin, so the economy of concrete did not need to be invoked.

After ten years of largely domestic practice, Wright was always willing to be bold but still had much to learn about construction. At the very start of his career, he had spent almost a year working on and off for the architect-engineer Allan Conover in Madison, before enrolling for two semesters in Conover's engineering course at the University of Wisconsin. At that stage the formal side, he admitted, 'meant nothing so much to him as a vague sort of emotional distress, a sickening sense of fear' (Wright, 1945: 54). In Adler and Sullivan's office he must have picked up all that he needed about commercial steel structures, no doubt in part via Mueller.

What about concrete? Both in Europe and the United States, the early advances in reinforced concrete were made by companies operating on a patenting and licensing system. Not until the patents began to expire, from about 1905 onwards, were independent architects and engineers able to make headway in this field. Only then did Wright begin to do interesting things in a technique which, like so many twentieth-century architects, he was soon to laud as the key to modern construction.

E–Z Polish: conversion to concrete

Like others, Wright had been tinkering with ideas for designing in concrete, conceived just as a poured and moulded mass and probably not taken into technical detail, since at least the 'Monolithic Bank' project of 1901 (Riley, 1994: 123). The trademark overhangs of his early houses had always been managed in timber, which small American builders understood. Not until 1904, the date of the 'plant house' at the Darwin D. Martin House, Buffalo, do we hear in a letter from Wright to his client about reinforced-concrete beams (Pfeiffer, 1987b: 13). There immediately follows the first of Wright's buildings to be constructed with a reinforced-concrete frame. This was the E–Z Polish Factory between Chicago and Oak Park, built by Mueller for W. E. Martin [6]. Its lower storeys were put up in 1905–06 while Larkin

6

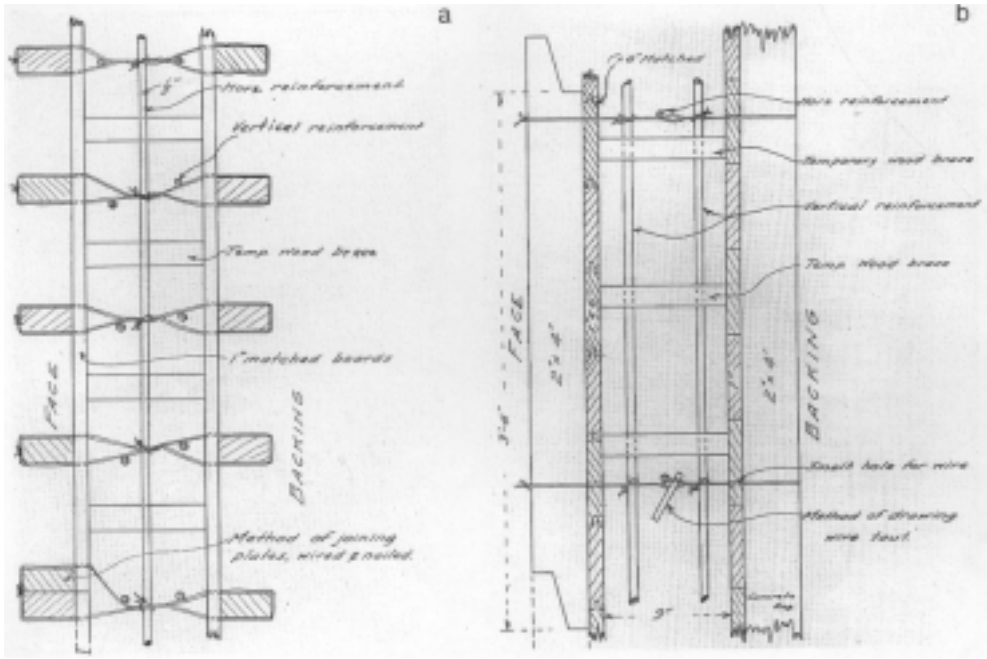
7a

was under construction, the rest being added later. Delays on the original portion caused a violent row between W. E. Martin and Wright. 'Mr Mueller is ground between the obstreperous millstones and smiles and smiles, attributing no preponderance of blame to either party, amiable and well-poised gentleman that he is', wrote Darwin D. Martin of this collision between his brother and his architect (Gill, 1987: 161). Saintliness was a needful virtue for Wright's collaborators.

E–Z Polish was a decent, disciplined 'daylight factory', to use Reyner Banham's term, but it is absurd to label it 'precocious', as Frampton has done in an impressionistic essay on Wright's technology (Riley, 1994: 60). It had a brick-faced front over a concrete frame of which we know little, since it was demolished without proper record. Probably Wright and Mueller had to work it out in tandem with one of the specialist concrete firms. At the least, it was something to learn from.

Unity Temple: concrete revealed

Concrete came into fuller play with their next collaboration: Unity Temple, Oak Park of 1906-08, a building now covered in an excellent monograph from which much of the information in the next few paragraphs is derived (Siry, 1996). It is striking indeed that Wright's first important achievement in concrete should have been a church *[7a]*. That a mail-order office in a dim neighbourhood of Buffalo could look smarter than a church in the chic suburb of Oak Park shows how far proprieties were in flux at the start of the twentieth century. The reason was money. Just as Larkin was extravagant, so Unity Temple had to be cheap; Pastor Johonnot and his trustees had only $45,000 to spend. That was why, perhaps after a brief flirtation with brick, concrete was proposed and agreed upon. There was nothing absolutely new about that; the European history of cheap churches in mass concrete with a render goes right back to the 1830s.[3] The rationale for the



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6 E–Z Polish Factory, West Carroll Street, Chicago. Frank Lloyd Wright, architect. The lowest two storeys were built by Paul Mueller in 1905-06, the rest being added later. Since demolished

7 Unity Temple, Oak Park. Frank Lloyd Wright, architect, Paul Mueller, builder, 1906–08
a Exterior of the church showing the concrete with creeper grown to mitigate the dour surfaces
b Plan (left) and section (right) showing formwork and reinforcement for walls

technique was always economy, not innovation for its own sake. No one supposed concrete could wear as well or look as good as masonry, least of all in northern climates.

Once (early in 1906) concrete had been decided upon, Wright was talking to Mueller. When bids were called for, Mueller's proved much the lowest. Wright's version of events is 'can-do': 'Paul Mueller comes to the rescue, reads the scheme like easy print. Will build it for only a little over their appropriation – and does it. Takes it easily along for nearly a year but he does it. Doesn't lose much on it in the end' (Wright, 1945: 143). The truth is less beautiful. There appears to have been hesitation and much to-ing and fro-ing over Unity Temple; and Mueller's company declared bankruptcy a year after its completion.[4]

Such at this date was Wright's apprenticeship with concrete, and his commitment to enclosure and solidity in this class of building, that a structural frame seems never to have been proposed for Unity Temple. In the collaborators' eyes, the key to saving money through the use of concrete lay in the standardizing of formwork and simplifying of profiles. They looked upon reinforcement as a new extra tool for deploying beams boldly and economically, not as a means for systematic construction of whole buildings. So at first not only the foundation walls but also those of the superstructure were to be of thick mass concrete. Only the spanning members and planes were reinforced, the calculations and estimates being put out by Mueller to a specialist engineer. Until the 1930s, Wright was by and large to stick to this 'prairie' philosophy of horizontalism for reinforced-concrete forms. 'First among them is the slab – next the cantilever – then the splay', he pronounced in his lectures on materials of 1927 (Gutheim, 1975: 141).

Just before pouring, however, it was decided lightly to reinforce the church's wall-cores – at $4000 extra cost. This puzzling variation appears to relate to Wright and Mueller's lucubrations over the concrete surfaces. Aware of the unsightliness of normal concrete mixes, Wright at first wanted to line the inside of the formwork with a mortar of cement and red granite aggregate before the concrete for the wall-cores was poured. Duly polished once the forms had been removed, this outer lining would have become the smart surface of the building. But after alternative sample panels were made up, he changed his mind. Instead, the walls were all cast in one, with gravel aggregate of a lighter colour and smaller size all through, and reinforcement added to the core *[7b]*.

Unity Temple was among the first ambitious works of architecture to make a show of concrete. Though by this date high-class European architects like Perret and Wagner were using it liberally for their structures, they still fought shy of exposing it. But so flagrant and suburban a display of raw walling was hardly a manifesto for honest appearances. It was more like a hopeful substitute for what could not be afforded, 'the finished result in texture and effect being not unlike a coarse granite', as Wright remarked (Siry, 1996: 146), echoing a plea common at the time to excuse the choice of exposed concrete. That was in 1908. Much though he valued its versatility, his later practice suggests that Wright never shared the European infatuation with the external appearance of concrete, unless tamed and manipulated into artistic blocks. 'Aesthetically' (he wrote of concrete in 1928) 'it has neither song nor story ... it is supine, and sets as the fool, whose matrix receives it, wills' (Gutheim, 1975: 205-8). Unity Temple was a courageous feat of design, but Wright never repeated its surface texture. He was well aware that it would have looked better with a different facing.

From constructor to slave-driver

The dissolution and reconstitution of Mueller's building company after 1910 appears to have freed him to devote himself to special projects. Notable among these was the supervision of the two greatest experimental commissions of Wright's early-middle period, Midway Gardens (1914) and the Imperial Hotel in Tokyo (1919–22). Concrete was fundamental to both these lost masterpieces. But it was not deployed in the conventional ways which chroniclers of twentieth-century structures have come to expect.

Looking back, Wright transfigured Mueller's role at Midway Gardens *[8a]* into that of a noble slave-driver, pushing a complex project on from start to finish in four months (Wright, 1945: 159). Fast-track construction was something Mueller would have known about from his World's Fair experience in 1893. On the technical side he relied upon Clarence Seipp, a Cornell-trained engineering graduate who specialized in reinforced concrete. Seipp now came in as Mueller's junior partner to supply the in-house assistance wanting at Unity Temple, and make the calculations for the floors and columns (Kruty, 1998: 32–3).

But when *Cement Era* hailed Midway Gardens for restoring 'the good name of concrete as an architectural material' (Kruty, 1998: 33), it meant not the structure but the array of precast and incised concrete blocks and sculpture *[8b]* which graced the upper walls and balconies throughout the pleasure garden. Herein lay the artistic and technological origins of Wright's concrete-block system, commonly associated with his Californian houses of the 1920s. This novel and intricate collaboration involved Wright, the sculptors Alfonso Iannelli and Richard Bock, their mould-maker Ezio Orlandi, and, Anthony Alofsin tells us, 'a special core of workmen who had previous experience of concrete casting' for Mueller (Alofsin, 1993: 359 n68). Here again there is a continuum between artistry and technique. Wright's slave-driving rhetoric depicts his builder-engineer as a mere manager. We should not be so easily beguiled.

Mueller was evidently not clever with money, and became implicated in the finances of the loss-making Midway Gardens.[5] He was willing, so it has been said, to build almost anything for Wright, regardless of profit. Or, in the coded language of Taliesin, he was 'obedient to cause' (Kaufmann, 1989: 62, quoting Bruce Pfeiffer). At any rate, in 1919 Mueller willingly went out to Japan at the age of 55 and took on the hazards and delays of supervising the celebrated Imperial Hotel.

8a

8b

Imperial innovations

As in Midway Gardens, the core of the Imperial Hotel *[9a]* was of concrete. Here it was even less visibly alluded to, since for the cast-concrete blocks first proposed as a counterpart to the external brickwork were eventually substituted the celebrated carvings in lava (Futagawa and Pfeiffer, 1985: 18-19). Yet reinforced concrete was notoriously the Imperial's salvation, the just-completed hotel's survival of the 1923 Tokyo earthquake becoming a key publicity incident in Wright's career.

By the 1920s the choice of reinforced concrete for major structures in earthquake zones was so common as to be axiomatic. But there were many theories about how to apply it. The legend of the Imperial Hotel rests on two beliefs: that Wright designed its foundations on a new intuitive principle which he worked out himself; and that the hotel survived the earthquake outstandingly well. The first is true in part; the seismic specialist R. K. Reitherman has shown that the second is not true at all. The idea of a concrete mat 'floating' on the underlying mud lake and secured with short reinforced piles of eight-foot lengths at two-foot centres instead of deep-driven piles *[9b]* was clearly Wright's. So too was the concept of a superstructure with a low centre of gravity, broken up into separable units. In Reitherman's analysis, the 'good but not outstanding' performance of the Imperial in 1923 – no better indeed than many Tokyo buildings with deep piles – had more to do with the superstructure than with the foundations (Reitherman, 1980). Indeed the inadequacy of the foundations became a factor in the arguments that led to the hotel's eventual demolition in the 1960s.

Authorship arguments

What about the authorship of the Imperial Hotel's structure? In a quarrel with Wright, Rudolph Schindler alleged that 'the structural features which held the Imperial Hotel together were incorporated only after overcoming your strenuous resistance' (Reitherman, 1980: 46). In view of Wright's boastfulness about the building's performance, this is intriguing but may not be fair. It appears to refer to Julius Floto, who in an article he wrote not long after the earthquake identified himself as the structural engineer for the hotel. This article followed upon discussion or communication of some kind with Wright. It shows that the mysterious Floto was intimately involved in the design of both foundations and superstructure. But instead of taking Schindler's line, he explicitly attributes the hotel's success in resisting the earthquake to Wright's personal choice of foundation technique (Floto, 1924).[6]

On the superstructure, Floto is more forthcoming. Its reinforced 'mushroom' floors, posts and slabs, he says, 'were originally designed by the writer in accord with the building code of the city of Chicago'. But Wright had chafed under the ponderous safety factors: 'He tells me now that, in building, my computations were disregarded and that much lighter sections were everywhere substituted, making in effect a design which eliminated all the strength usually provided for the live loads'. Far from being alarmed, Floto retrospectively pronounces the change 'entirely logical', since the superintendence was excellent and the workmen careful (Floto, 1924: 122).

Mueller goes unmentioned in all this. But if the account Floto gives is correct, Mueller as the man on the spot in Tokyo must have brought all his experience and authority to bear in consenting to a slimming-down of the structure. The implication is that in the making of exceptional buildings, the engineer *qua* construction manager can matter as much as the engineer *qua* high-grade structural technician. Indeed in a letter to Sullivan, after ascribing the Imperial's survival to a 'principle of flexibility' throughout the design, Wright went on to acknowledge that 'Mueller's untiring attention to

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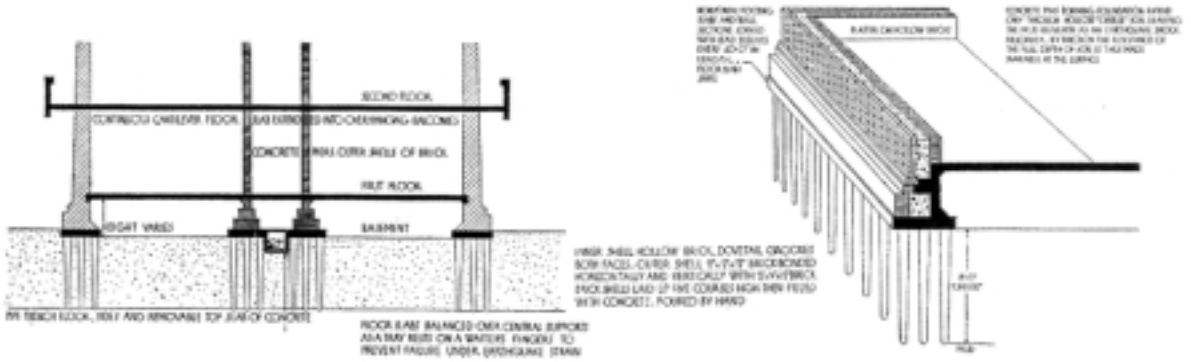

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8 Completed by fast track construction in four months: Midway Gardens. Frank Lloyd Wright, architect, Paul Mueller, builder, 1914. Since demolished
a Street frontage
b Detail of concrete sculpture

9 The climax of Wright and Mueller's collaborations. Imperial Hotel, Tokyo. Frank Lloyd Wright, architect, Paul Mueller, supervisor, 1919–22. Since demolished
a General view
b Foundation construction diagram

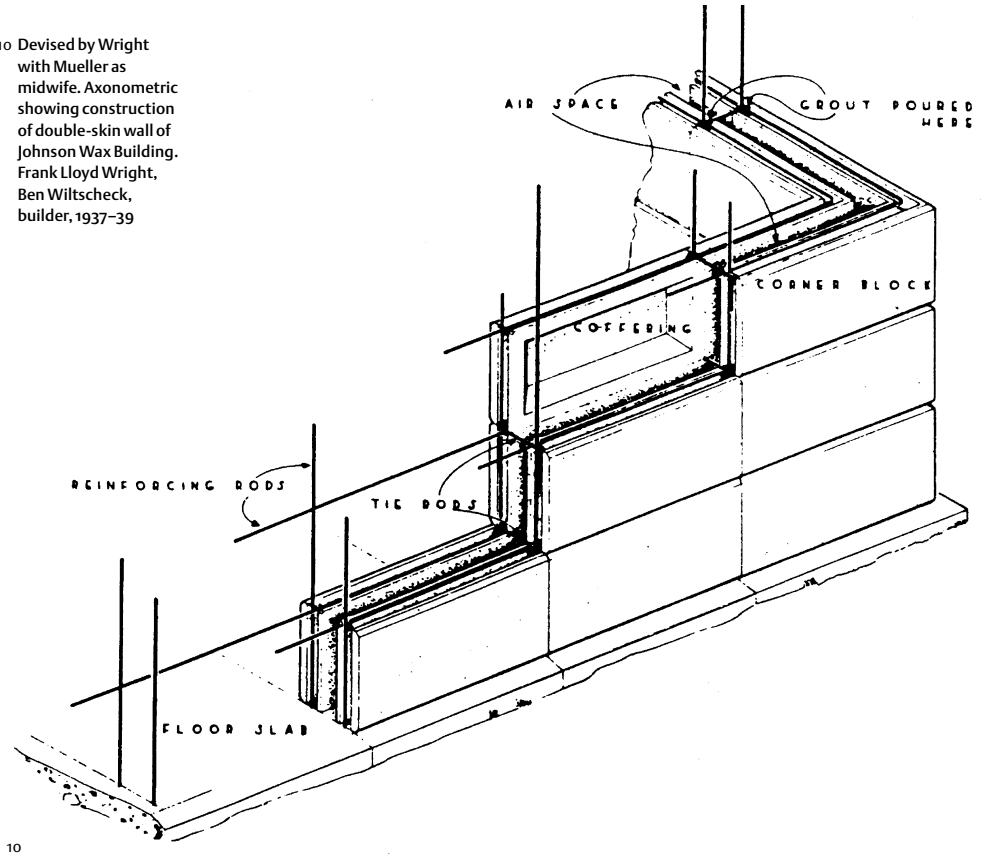
the execution of the details of this programme counted too in the final result. Nothing of any importance was put into place without his superintendence' (Pfeiffer, 1987a, 39–40).

The walls of the Imperial Hotel consisted of two leaves of brickwork, with light reinforcement in the intervening cavity, into which concrete was then poured. The upper walls were of hollow bricks, 'the whole bound together by steel reinforcing rods' (Futagawa and Pfeiffer, 1985: 26). Wright must have found this satisfactory, as he adopted a similar technique at the Johnson Wax Factory nearly twenty years later, with an added layer of cork insulation between the brickwork leaves *[10]*. Such a system also underlay the walling of Wright's much-studied concrete-block and 'textile-block' houses, of which some sixty were built from the 1920s onwards (Patterson, 1994). It derived from amalgamating the Midway Gardens experiments in concrete block with the double skin of the Imperial Hotel. Wright, not Mueller, invented these procedures. But through his patience, endurance and practical commitment to innovation, the latter had proved the midwife to their birth.

Last collaborations

The Imperial Hotel marked the climax of Paul Mueller's collaborations with Wright but not quite the end. He was to have been the contractor-manager for the great textile-block resort complex of San Marcos in the Desert, Arizona (1928–29), and stayed with Wright at the temporary desert camp at Ocatilla, working on the engineering drawings. Olgivanna Wright remembered him there as 'a kind and wonderful gentleman' who always brought presents for her children (Kaufmann, 1989: 62). Then came the Crash of 1929 and the project collapsed. Perhaps in compensation, Wright persuaded his cousin Richard Lloyd Jones to employ Mueller on Westhope, an ambitious concrete-block house of 1930–31 at Tulsa, Oklahoma – one of very few jobs that Wright was able to salvage and build during this early stage of the Depression.

The fact that Mueller was willing, exceptionally, to build a house suggests he too was in straits. That is confirmed by the sequel. Westhope *[11]* was not a success. An experiment in turning Wright's block system into vertical pier structures, it leaked like a sieve and was heartily disliked by its clients. Meryle



10 Devised by Wright with Mueller as midwife. Axonometric showing construction of double-skin wall of Johnson Wax Building. Frank Lloyd Wright, Ben Wiltscheck, builder, 1937–39

11 A sad end to Mueller's career as a builder. Westhope, the house at Tulsa, Oklahoma, designed by Frank Lloyd Wright for his cousin, Richard Lloyd Jones. Mueller ran out of funds to complete it and it leaked like a sieve

Secrest describes it as 'stripped-down, forbidding and almost belligerently lacking in charm' (Secrest, 1992: 371). Worse, it proved the end of Mueller's career. After delays and cost overruns, the builder whom Wright had imposed on his cousin appeared at Lloyd Jones's office in Tulsa in tears and with a lawyer. It emerged that he had diverted a large part of his advance to pay debts, and was out of funds wherewith to forward the house. Lloyd Jones humanely agreed not to prosecute. But the episode is said to have added $20,000 to the cost.

Wright turns to others

Mueller was then in his late sixties and had only a few years to live, dying in 1934. As a coda, it may be noted that his disappearance from the scene coincides closely with a change of direction for Wright and the foundation of the Taliesin Fellowship in 1932. Vincent Scully remarks that with Richard Lloyd Jones's house, 'Wright would seem to have reached an impasse in this development and to be searching for something new' (Scully, 2003: 60). As for the Fellowship, it is usually interpreted in romantic or pedagogic terms. Another way of looking at it is as Wright's regrouping of his technical comradeship in-house, as in the days of Adler and Sullivan. Now he drew his support in the main not from Mueller or Seipp or Floto but from in-house 'apprentices'. Those who had engineering skills like Mendel Glickman and Wesley Peters were specially vital to the Taliesin set-up. Peters, for instance, who had an engineering degree from MIT, was in due course to emerge as Wright's son-in-law and right-hand man.

Ideally, the smaller domestic contracts of Wright's practice from the 1930s onwards were run by Taliesin apprentices. In practice anything bigger than the smallest Usonian house still needed an outsider with exceptional skills and commitment – and not much interest in profit. John Sergeant has described how the more 'luxurious' of the Usonians were built by the itinerant Harold Turner, a Danish-born craftsman and perfectionist who had had no experience in construction before Wright entrusted him in 1936 with the Hanna House (Sergeant, 1984: 40, 62, 78, 118–9).

On a larger scale, sympathetic partnership always mattered. The success of the Johnson Wax Buildings at Racine (1936–50), for instance, owed much to Ben Wiltscheck, a university-trained architect turned builder who was a friend of the client, Herbert Johnson. This background made Wiltscheck a strategic ally of Taliesin in the negotiations between the extremes of Wright's 'organic' intuitions about structure and the rigidities of the building codes in town and state. The mushroom columns of Johnson Wax, conceived by Wright, calculated by Peters and Glickman and tested to destruction before the camera, were a typical, well-publicized triumph of imaginative genius over scepticism. It was then down

to Wiltscheck to get the building beautifully built (Lipman, 1986). Wright would have liked him to build more, 'but a bad heart forced him to decline' (Sergeant, 1984: 118). Where such a partnership with the contractor was wanting, things could go wrong. Wright's structural intuition was not always reliable. In the case of Fallingwater, subcontractors without the tried and trusted status of Mueller, Wiltscheck or Turner fought and lost a raging battle with Wright (with the apprentices caught in the crossfire) to put in the extra reinforcement they insisted was needed for the great cantilever beams of the living room. The house long suffered from the ensuing difficulties (Silman, 2001: 186–94).

Notes

1. Kaufmann (1989: 37), relying on Wright's *Autobiography* (Wright, 1945: 88) states that Mueller had been with Silsbee. This is not mentioned in Mueller's Testimony, which gives 1883 as his starting date with Adler & Sullivan (Kaufmann, 1989: 43) – apparently a mistake or a misprint for 1886.
2. See eg Charles E Gregersen, *Dankmar Adler: His Theatres and Auditoriums*, Athens (Ohio), Swallow Press & Ohio University Press, 1990.
3. William Ranger's Westley Church, Suffolk (1835–36) and F.-M. Lebrun's Protestant church at Corbarieu near Montauban (1836) are the earliest known European churches built with concrete walls. The claim in *Autobiography* (Wright, 1945: 135–6) that Unity Temple was 'the first concrete monolith in the world. That is, the first total building designed for and completed in the wooden forms into which it was poured as concrete' is hokum. That it was the first such building that might generally be agreed to be 'architecture' is nearer the mark. The first European church which might be said to make 'architecture' from its concrete construction is perhaps Plecnik's Holy Spirit Church, Vienna (1910–13).
4. Information about Mueller's bankruptcy kindly provided by Anthony Alofsin.
5. Kruty (1998: 40) reports that Mueller had borrowed money from Seipp to finish Midway Gardens and that this led to a quarrel between them.
6. Confusingly, Reitherman calls Floto 'Hoto' and assumes he was Japanese! The mistake is corrected by Richard Bennett in *AIA Journal* 70, January 1981, p6.

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