

Book Reviews

Firearms and Fortifications: military architecture and siege warfare in sixteenth-century Siena

SIMON PEPPER & NICHOLAS ADAMS, 1986

Chicago, University of Chicago Press

xxiv + 246 pp., 87 illus., £19.95

ISBN 0 226 00535 6

In this book, two architectural historians study in detail the defensive fortifications of Siena and of the strongholds of her territory in the mid-sixteenth century, and the campaigns that tested and eventually overcame those defences. These campaigns are an episode of particular interest in sixteenth-century Italian history, marking as they do the loss of independence of one of the greatest and most turbulent of the independent Italian republics of the Middle Ages, and its incorporation into the new Tuscan state ruled by the Medici dukes.

It was the construction of a fortress, the 'Spanish citadel', on the outskirts of Siena by the city's 'protector', Charles V, that precipitated the rising in 1552 which brought Siena into conflict with the Emperor. Sieneese protests that their objections to their city being dominated by a fortress manned by Spanish troops did not imply any disloyalty to their Imperial ally were rejected. Soon Siena found herself, with the help of the French, eager to gain such a strategically important foothold in central Italy, preparing to meet the attacks of the Imperial troops and of the forces of the Imperial client, Duke Cosimo de' Medici.

Examining the modifications and additions the Sieneese had made to their mediaeval fortifications after an earlier attack on the city in 1526 had revealed dangerous weaknesses in her defences, and the rapidly-constructed additional works the Sieneese threw up to meet the assaults of the Imperial and Florentine forces, Pepper and Adams stress how misleading studying military architecture through the eyes of the treatise writers of the sixteenth century can be. They question the assertion that military and civilian architecture had become two distinct specialisations by the mid-sixteenth century, showing that 'civilian' architects, military commanders, artillery experts, and even princes (the plans for the Spanish citadel were given final approval by Charles V himself), had a hand in the design and construction of fortifications. They show how 'temporary' earthworks, strengthened with timber posts and struts, that could be thrown up in a matter of days, were regarded as serious obstacles by field commanders, and could play a vital role in overall defensive strategy. Rapidly-constructed temporary fortifications of this nature, occasionally, if time permitted, strengthened with masonry in places, could, if positioned along supply routes, or forming part of a system of mutually supporting fortifications, seriously harass enemy troops, hinder the establishment of an effective blockade, and delay, if not render impossible, an all-out assault on the main target by the attacking forces. They could not sustain artillery bombardment for any length of time, but this was not such a serious disadvantage as might appear, for artillery played a less dominating role in the siege warfare of the age

than the elegantly lethal plans of angle bastions and lines of fire which seem to epitomise this period of military history have tempted historians to believe. Using the extensive reports on the campaign available in the Medici archives in Florence, Pepper and Adams show how rarely it was possible to make full use of the firepower theoretically available to a besieging force: the difficulties of transporting cumbersome bombards across hilly country, especially in bad weather, of getting the right ammunition for them, in sufficient amounts (a greater problem for the pieces firing iron balls, which had to be custom-made, than for those firing stone balls), of finding skilled gunners in sufficient numbers, all conspiring to reduce the firepower available to commanders. It might take only one day's bombardment to capture a temporary fortification, but it could take several days to get the artillery into position in the first place, and commanders had to calculate the risks of damaging the pieces and using up limited ammunition on minor places. The authors also argue that the bastions constructed for Siena by Baldassarre Peruzzi, though not conforming to the classic low-profile, gun platform bastion supposedly the best adapted to meet the challenge of artillery, were logical solutions to the particular problems posed by the sites they were designed to protect.

The multi-disciplinary approach of the authors, their blending of architectural and military history, is at its most successful in their fascinating account of the siege of Montalcino in 1553. While a much more important military action, the siege of Siena, by comparison, is less clearly described, but perhaps only because the operation itself, involving various diversionary actions, was more diffuse, and the story consequently is that much more difficult to tell. On the whole, the plentiful political documentation is used well to throw light on why and how fortifications were built, and how well they fulfilled their purposes. Only occasionally does a false note betray a lack of familiarity with political history (the description of Pitigliano as an 'independent feud', rather than fief, for example), but such lapses are rare and unimportant.

Throughout the book, the many illustrations are an integral part of the exposition. Not one is superfluous. Though the reproductions of the sixteenth century paintings and plans are sometimes too dark for the necessary detail to be clearly distinguishable, some of the most important are complemented by diagrams by Simon Pepper. His plans, maps, axonometric drawings of bastions, and simple illustrations of the tools of the trade, be that trade earthwork construction or the use of artillery, are of an exemplary clarity and one of the best features of the book.

CHRISTINE SHAW, *Westfield College, London.*

L'Architecture du Fer. France: XIXe Siecle

BERTRAND LEMOINE, 1986

Paris, Champ Vallon

326 pp., illust., £35

ISBN 2 903528 71 3

In this book, Lemoine gives a comprehensive account of the use of iron, in nineteenth century France, not only in architecture, as the title suggests, but also in engineering structures of every kind. He shows that once the material was available at a non prohibitive cost, around mid-century, engineers and rationalist architects began to experiment with it and used it extensively. During this period, iron was apparently

accepted more in France than in Britain, where it was falling out of favour amongst architects and critics.

The book is divided into three sections. The first is a review of all the constructive elements and systems using iron, beginning with a brief discussion on their international development, followed by a description of their application in France. Of special interest, the author relates also the steps involved in the process of erecting a structure and some of the ensuing problems that had to be considered. Iron, being a new building material, meant that the structure often had to be innovative, that the great number of pieces (12,000 for the Eiffel Tower) implied a multitude of drawings, and that the workforce be organised in an assembly shop as well as on a building site. With this short study, Lemoine provides some enlightening glimpses into the nineteenth century building world but omits some important considerations such as the problem of fire hazard to which iron was subjected when left exposed, and which certainly concerned builders. Lemoine fails also to mention building legislation which restricted the use of iron for external walls.

The second part is a description of the building types in the development of which iron played an essential rôle. Lemoine introduces each type by relating the French situation to an international one, but again briefly and only as far as secondary sources allowed. This is to be expected, however, considering the problems of availability. This section, which constitutes the core of the book, is filled with a myriad of French examples, some executed, some not, thus demonstrating the variations on a basic type, and the extent to which iron was used. The originality of design and the boldness of expression are emphasised and shown in structures such as train stations, market halls and some spectacular churches. It is not clear, though, how each type evolved and for this reason, it might have been worthwhile, even at the expense of some of the examples, to discuss the technical, and perhaps the stylistic, development of the building types, and why these changes were needed.

The last part deals with architectural theory and the debate that took place amongst architects on the legitimate use of iron. Although iron appealed especially to the Rationalist architects for its constructive aesthetics, Lemoine shows that the Eclecticists or Classicists also found a justification for its use. He illustrates this point by examining on the one hand the writings of Viollet-le-Duc, who referred to the skeletal nature of Gothic architecture as a model for his theories, and on the other, the Halles de Paris by Baltard. Lemoine discusses also the notion of a new style generated by the use of a new material, as represented in the theories of Boileau. The author goes on to explain that the debate was actually short-lived, and how the lower cost of iron, the popularisation of technical knowledge and the Eiffel Tower accounted for the universal acceptance of the material by the end of the century. This final section brings some insight into the understanding of nineteenth century architectural ideology in relation to iron but it lacks the mastery of the subject found throughout the rest of the book. The general attitude of architects towards the use of iron and the distinction between the various schools of thought remain somehow unclear. It must be remembered, however, that the situation itself was not always well defined, and this is exemplified by the fact that Baltard, the Classicist, received the Rationalists' approval for his Halles, while Boileau, more inclined in the tradition of the Rationalists, was heavily criticised by Viollet-le-Duc.

Lemoine is clearly an authority on French iron architecture and has published other works on particular aspects of the subject. Besides being an historian, he is also trained as an engineer and an architect; a valuable combination for understanding and

explaining structures, and dealing with construction history in general. His text is informative, well documented and superbly illustrated throughout with contemporary photographs, working drawings and construction details, although it would have been helpful to have references in the text to the plates. It shows the wealth of primary sources on iron construction still in existence in France, and the author's thorough knowledge of them. An appendix to the text contains valuable information on the thirteen principal iron construction businesses.

The book, however, is disappointing in two respects. First, it would have been useful to discuss the respective rôles of the architect, engineer and manufacturer who were characteristically involved in the nineteenth century building projects in which industrial materials were used. Was the architect credited for the design of a building, such as Labrouste was for the Bibliothèque Sainte-Geneviève, the actual designer of its iron structure, or was an engineering contractor been called in as a consultant? The answer to such a question would help us understand the irreversible impact that iron had on the building professions and on the relationships between them. Secondly, because of the thematic approach that Lemoine has adopted, with the emphasis on the building types, it is difficult to trace the architectural progression of the use of iron, and therefore to deduce some distinct conclusions.

In spite of these points of criticism, this book is a well-rounded study and can be considered to be the most comprehensive account on French iron structures to have been published so far. It is especially a good reference book, and certainly an excellent introduction to the history of construction in France.

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Landmarks in American Civil Engineering

DANIEL L. SCHODEK, 1987
Cambridge Mass., MIT Press
384 pp, illust., £44.95
ISBN 0 262 99256 X

This is a large and immediately inviting book, generously laid out and liberally illustrated. The unusual shape and arresting cover may give the impression that this is just another coffee-table book. It isn't. Coffee-table books need coloured pictures in the 1980s and here there are none. What is more, anyone dipping at random into the text will find it scholarly, very readable and pleasantly free from mannerism. The second impression may be that this is a serious and comprehensive history of the development of civil engineering in USA. It is certainly serious and far-ranging but not comprehensive. Why not?

The flyleaf and the preface explain. The book is made up of a set of quite detailed accounts of some 100 projects designated by the American Society of Civil Engineers as National Historic Civil Engineering Landmarks. Hence the title.

One of the rules for designation is that at least part of the landmark must remain. This may explain why, for instance, James Finley's pioneering work on the suspension bridge gets only six lines of text and the development of high-rise framed buildings—surely one of America's great engineering contributions—is only represented by the 16 storey Ingalls Building in reinforced concrete. Does none of Finley and Templeman's

Essex Merrimac bridge survive and isn't there any early iron or steel framed building still with us which merits designation?

Given the constraints within which the Author was working it would be hard to improve on the planning of the book. There is a general introduction on engineering history and good specialised introductions to each of the fourteen subject chapters (roads, canals, bridges, power systems, buildings, etc.). These sectional introductions relate the landmark projects to the more general developments in the same field and to work in other countries. There are notes on the personalities involved and on the social significance of the landmarks as well as their technical details. There is also a bibliography and an index and there are maps.

As one might expect the chapters vary considerably in length with more than eighty pages describing twenty-two designated bridges and only seven pages on airports. To those not wholly familiar with the American Scene some of the 'landmarks' are stunning. The 92 metre high Kinzua railway viaduct would almost justify a trip to the States on its own. The present steel structure dates from 1900 but replaced an even more slender iron one of 1882. Then there is the 'Saltash-type' Smithfield Bridge of 1884 in Pittsburgh, the Watervliet Arsenal of 1859 in cast and wrought iron and many others, apart from the better known Bollman and Fink trusses and the famous George Washington and Brooklyn Bridges. The details of the building of the Brooklyn Bridge with old photographs and engravings are particularly fascinating.

It is always possible to find some doubts or faults with a book like this. For instance, does the statement that the crescent trusses of the Union Station in St Louis were the longest in the world when built in 1894 refer to the clear span or the overall width of the train shed? If the span then the 43 metres at St Louis was easily exceeded by the 65 metre crescent trusses at New Street Birmingham of about 40 years earlier; a small sketch section and plan would have been helpful here. In the main introduction one is left wondering whether the author has really mastered the relationship of the Ecole Polytechnique and the Ecole des Ponts et Chaussées. These are just examples but the question of drawings and sketches goes deeper.

On almost all the landmark projects some sketches or simple drawings would have been helpful. One would happily have sacrificed some of the open spaces in the layout for little uncluttered line drawings of the type the Italians do so well. It is a myth that one can convey technical information by photographs alone. What is more, although some of the photographs are excellent, others are just dingy. Surely someone could have found a better photograph for the only illustration of the Wheeling Bridge, while to waste a whole page on a dark and seemingly irrelevant photograph of blasting at Elephant Butte Dam seems unduly extravagant.

This subject of illustration leads me to question who the book was written for. Was it for education, or as a guide book for historical engineering visitors, or for presentations (promotional or as a reward) or just to enhance the image of the profession? It could be used for all of these. The book has made me wish to make a long trip through the States, with it as my guide and to have time to meditate on why some projects have become landmarks and some not. My only advice to anyone else tempted to do this is that, unless you are travelling first class, the book should be taken as hand luggage; otherwise it will use up about 11% of your 20 kg luggage allowance.

Although I may seem slightly critical of some aspects of this book, I can only say in conclusion that I will treasure my copy and fight anyone who might try to take it from

me. There should be a copy in every public library and I would expect anyone interested in civil or structural engineering history to wish to own a copy.

R. J. M. SUTHERLAND, *London*.

William Le Baron Jenney: a pioneer of modern architecture

THEODORE TURAK, 1986

Ann Arbor, Michigan, UMI Research Press

XVI+374 pp., illust., £60

ISBN 0 8357 1734 8

Authors of biographies are generally prone to make exaggerated claims for the merits and achievements of the person they have chosen to write about. Not so Theodore Turak: as a counter to the tendency to canonise William Le Baron Jenney as a key figure in late nineteenth century architecture he immediately establishes a more realistic view. "It must be admitted", he remarks in his opening pages, "that Jenney was not one of the towering figures of his time although his name was well known in architectural circles". Such a deflating overture may not sound very promising to the uninitiated but those who persevere will find that Jenney's career, here laid out in full for the first time, was far more diverse and intriguing than is generally supposed.

The unusual position that Professor Turak finds himself in, that of diminishing Jenney's reputation, arises from the way that career has previously been presented. Amongst the historians of the 1930s who helped map out the ancestry of the modern movement Jenney was held in high esteem, primarily as the begetter of that branch of rational functionalism known as the Chicago School. Trained more as an engineer than as an architect, he was honoured by them in much the same way as Brunel and the Stephenson were honoured by the first generation of British modernists. Five or so of his commercial and office buildings were cited for the way in which they made an architectural virtue of their constructional necessities, principally of course the Home Insurance Building (1884-5), generally regarded as the first consistent skeletal frame office building. For architectural purity Sigfried Giedion recommended the Second Leiter Building (1889) even more highly; in his eyes it was the most obvious precursor of Mies van der Rohe's commercial skyscrapers. Jenney's status as the founder of a school was also based on the role his office played in training architects of a younger generation: Daniel Burnham, Louis Sullivan, William Holabird and Martin Roche all spent some time with him.

The changes which have affected architecture in recent years, plus the broadening of research on how the classic Chicago buildings of the 1880s and 1890s were developed, have tended to modify Jenney's earlier reputation. The debate over the claims made for the Home Insurance Building, which first flared up in the differing reports made at the time of its demolition in 1931, still has not been fully settled; but now that the skeletal frame has lost some of its glamour the hunt for its pedigree seems less enthralling. If, as Colin Rowe first argued in 1956, the formal austerity of the early Chicago skyscrapers owed less to architectural impulses than to "their being no more than the rationalisation of business requirements", then naturally the frame takes on a less heroic meaning. Likewise as more is learnt about client requirements, and about those who called the tunes such as the developers Peter and Shepherd Brooks and the

construction agent Own Aldis, so the earlier view of Jenney's influence seems less tenable.

Professor Turak goes half way in accommodating these revisionary interpretations. Despite the subtitle that he adopts—*A pioneer of modern architecture*—he refrains from the sport of tracing Jenney's influence amongst those that followed him; and, as his introductory remarks imply, he is also loathe to press the claims for Jenney's importance within his own lifetime. Such caution is admirably honest but its effect is rather numbing, especially since Professor Turak seems equally reluctant to amplify the social context in which Jenney practised. Even the liveliest moments, such as the account of how Jenney secured the Home Insurance commission and kept his grip on it, lose some of their effect for want of a full explanatory background.

The legitimate reason for not tarrying too long in one spot is that like all biographies this one must hurry on. In doing so it devotes as much space to Jenney the domestic and church architect as to Jenney of the proto-skyscraper. This broad sweep suggest one further reason for the book's diffident tone. Apart from his work for the West Chicago Park Commissioners and his contribution to the development of Riverside Illinois, there is not much else that he produced that might not have come from any competent midwestern practice. In one or two instances the claims for his non-commercial buildings are pressed quite hard. In the case of the Congregational Church at Manistee Michigan (1887) because of its galleries hanging from powerful laminated trusses, and the proposal that its floor should have a steel structure; and the Horticultural Building at the World's Columbian Exposition (1893) because it was just about as inventive as the architectural guidelines for the fair would allow. Yet these buildings, and others even more so, seem to have a tentative quality which largely vanishes where his office blocks are concerned. Perhaps the truth is that Jenney worked best under the thumb of a speculative developer, and that his ability to do so was really his pioneering contribution.

ROBERT THORNE, *HBMC London Division*.

The Art in Structural Design—an introduction and sourcebook

ALAN HOLGATE, 1986

Oxford, Oxford University Press

xvii+338 pp. illust., bibl., £35, paperback £15

ISBN 0 19 856167 9

The Great Engineers—the art of British engineers 1837-1987

DEREK WALKER, 1987

London, Academy Editions

288 pp., illust., £35

ISBN 0 85670 917 4

Any approach to the history of engineering design is conditioned by a person's perception of the process in their own time. It is nowadays an all-too-common perception that structural design is a wholly determinate process using equations of statics and strength of materials which, decade by decade, are getting more and more accurate and gradually replacing the subjective, and hence fallable, skills of the designer.

Alan Holgate's book has one aim—to open the eyes of the reader, especially the student of civil or structural engineering, to an alternative view that structural calculations are not the only, or even the main influence on the final design of buildings and bridges.

Nearly half of the book is devoted indirectly to the architect's influence on building design. Seven chapters deal with architectural aesthetics, criticism, history and philosophy and with the nature of the architect's job and relationship with the engineer. The remaining 13 chapters cover three main areas—the technical and financial planning of construction projects, the philosophy of the design process and the aesthetics and criticism of structural form.

The book is copiously illustrated with photographs and line drawings, although these latter are often too 'soft-focus' to carry the points they are meant to convey. For engineering students the wealth of images drawn from the history of buildings and structures will be unusual but likely to open their minds to the rewards of looking into our past.

As the subtitle of the book indicates, it is both an introduction and a sourcebook. Several appendices give teachers and students ideas and sources of material for projects to undertake as well as over 300 useful references.

With many engineers wanting to rekindle the idea that engineering design is an art, this book appears at an appropriate moment. However, a number of shortcomings should not be overlooked.

With so much space devoted to architectural matters, the book is rather unbalanced. There should have been more space devoted to other influences on building design such as detail design, the use of proprietary building components and systems and the speed and method of construction. There are many examples from construction history which could have illustrated these points. Likewise the sections on the nature and philosophy of structural engineering and design are sketchy in comparison to those on architectural philosophy and design. Finally, it is to be regretted that the excellent job of reviewing the existing literature of the subject was not augmented by more of the author's own ideas, for instance on the application of criticism and aesthetics of structural form to the historical development of buildings and bridges.

As with any book which tries to break down accepted views, this one has had its problems. The curious balance and overall structure of the book and the rather awkward flow from chapter to chapter suggest that the original manuscript was much larger and publisher's pressure removed the less marketable sections. Even so several booksellers have shelved the book under architecture rather than engineering saying "engineers don't like this sort of stuff".

It might have been hoped that some of the gaps in Holgate's book would be filled by a book entitled *The Great Engineers—the art of British engineers 1837–1987*. This book forms part of the celebration of the 150th anniversary of the Royal College of Art in London and was sponsored by Balfour Beatty, British Steel and Plessey. It consists of some 21 essays by a number of eminent persons concerned with the construction industry, the Royal College, the history of engineering and the electronics industry. The book is lavishly illustrated by over 400 illustrations of which half are in colour.

More than half of the essays and illustrations are directly concerned with various aspects of construction history. The essays vary in their approach; some discuss individual buildings, such as the Crystal Palace, the Sydney Opera House and the Hong Kong and Shanghai Bank; others deal with individual engineers, such as Bazalgette and Owen Williams; others follow a historical narrative, such as develop-

ments in engineering drawing, the use of materials in structures and oil-rig design, and 'The Grim Tale of the Channel Tunnel'; and some deal with more general matters such as the life-style of Victorian engineers, the construction achievements of the railway engineers, 'Construction as a Prime Export' and several more personal views about the relationship between the architectural and engineering professions.

Despite the wealth of good illustrations and the strength of most of the individual essays, the book is both difficult and often extremely annoying to read. The root of this would appear to lie in the basic idea behind the book, and indeed the exhibition which it accompanied. It is entirely unclear for whom it was intended. The book's subtitle, *The Art of British Engineers 1837–1987*, suggests that it would deal with the skills and achievements of eminent British Engineers in all fields of engineering and throughout the specified period; yet it does not do this—it concentrates overwhelmingly on the construction industry with but a token contribution concerning electronics and nothing on other fields of engineering. This selection perhaps reflects the interests of the three, seemingly arbitrarily united sponsoring companies. Also, the period between 1880 and 1970 is, with one exception, virtually ignored.

As a coffee table book, *The Great Engineers* will certainly appeal to the practising engineer or architect, especially if they are stimulated by a wealth of images and not too bothered if these do not serve to illustrate the points being made in the text, and are prepared to overlook the many typographical errors.

The book could, however, have been more coherent and sharply focused. It could have served as a celebration of the educational activities of the Royal College as they have touched the engineering and design professions. As it stands, virtually the only mention of the College concerns its part in 'The Strange Case of the Duke of Wellington's Funeral Car', in which the College comes off none too well—the funeral car, designed by several of the College staff, was so massive it stuck in the mud during the procession.

The book could also have sought to inspire the young at a time when the best students are not entering the engineering design professions. Yet the choice of subjects and mixture of degrees of factual detail, is bewildering and there are few clear messages about the challenges and attractions of engineering and design, either in the past or the future. Likewise the historian would have been better served by more essays presenting well-referenced historical argument or debate. As they stand the bibliography and the biographies at the end of the book are both arbitrary and idiosyncratic in their selections—another reflection of the sponsors' interests.

Both books are welcome additions to the small library devoted to the history and philosophy of engineering. That they have each fallen short of the standards achieved in similar studies of science is a reflection of the youth of the subjects and should encourage other authors and publishers to make their contributions.

BILL ADDIS, *University of Reading*.

Towards a Social Architecture: the role of school building in post-war England

ANDREW SAINT, 1987

London and New Haven, Yale University Press

268 pp., illust., £19.95

ISBN 0 300 03830 5

Consider a local authority architect of the late 1980s unexpectedly finding himself with responsibility for a new first or middle school. Starting with a detailed schedule of accommodation as his brief and a fixed but adequate cost limit, he will have already a fair idea of the eventual nature of the finished building. He will be required to make the usual submissions at sketch plan and working drawings stages for scrutiny by the DES area architect for schools, accompanied by completed copies of ABB2; the simple, innocent looking official form which will expose inexorably and with dreadful clarity any little extravagance or imbalance between teaching and non-teaching spaces. It is unlikely that glaring transgressions will be revealed and after the ritual opening of competitive tenders the lowest will be found to correspond with estimates—naturally, since the architect will have become conversant with the established methods of cost planning. Committee approval will be granted and the contract will run an uneventful course to practical completion. The new school will be handed over more or less on time.

During the design process he will have had at his elbow, besides the Statutory Instruments, a bound set of the school Building Bulletins. Consequently, he will not be living now in constant fear of telephone calls from a perplexed head teacher complaining that the lavatory basins have been fixed at the wrong height for her small pupils; from the PE adviser that there is nowhere to store the trampoline; or from a distraught school meals supervisor that her women have walked out, having found themselves unable to prepare meals properly with the steaming oven and boiling pans installed in the wrong order. After a short lapse of time for the school to settle down he will receive an invitation to the official opening ceremony at which the chairman—or more likely, chairwoman—of the Education Committee will state formal, but apparently sincere, thanks to the architect, clerk of works, general foreman and contractor; and the interior will be on public view. The architect may well be taken aback by fulsome expressions of satisfaction by the staff and delighted astonishment by parents. His modest efforts will remain unnoticed, of course, by the architectural glossies but the local press will not be baying for his blood. Later, perhaps, he may be asked to lead a conducted tour of the school by a visiting party of earnest foreign educationists seeking enlightenment. No doubt he will reflect that on the whole things have not gone too badly, that the undertaking has cost him no more than the loss of a few hours sleep and that he has probably earned his next annual increment. He might even have made new friends.

It should have occurred to him, too, that the happy outcome of the project will have depended largely on well-tried means originating in the post-war years of heroic school building, the subject of Andrew Saint's splendid survey; when the rest of the world allowed that, here at any rate, Britannia ruled the waves. Pre-eminent in these achievements and at the heart of the author's researches stands the attractive, idealistic figure of Stirrat Johnson-Marshall, sometime deputy county architect in Hertfordshire and subsequently chief architect to the Ministry of Education. The book introduces to the reader seminal pre-1939 influences and wartime skills, leading to the remarkable

techniques adopted in Hertfordshire under his inspiring guidance between 1945 and 1948. There is a masterly, indeed entertaining, narrative of these developments and of later exploratory work by the Architects and Building Branch, set up when Johnson-Marshall joined the Ministry, through which policy was disseminated and put into effect throughout the country. With characteristic diligence Saint has brought to light the notable contributions of Johnson-Marshall's architectural colleagues; quantity surveyors, heating engineers, Black Country industrialists, manufacturers, even individual artists, many of whom shared his beliefs and some of whom might be described as his disciples.

What, then, of the school buildings themselves, so well illustrated by contemporary photographs, some in colour and with excellent, clearly drawn plans? In generously planted settings; ingeniously planned; sensitively detailed; environmentally and visually agreeable: a model, one would have thought, to be emulated by our hypothetical architect of today. Yet it is certain that he will not employ a derivative of CLASP, to which Andrew Saint devotes a chapter, or any of the multitude of other industrialised building systems which sprang up at the time with all kinds of official encouragement and supposedly pointing the way to the future. Our architect will be free from many of the obsessions of his predecessors. He will ignore panacea-mongers hankering after the reform of the building industry. He will not recoil in pious horror from the 'wet' trades; he might well be pleased that bricklayers and plasterers should have found employment on his site. At the same time, he will not have retreated into archaic forms and practices. His computer-designed trussed-rafter pitched roofs will be prefabricated with all the other factory-made components and hoisted effortlessly into place by up-to-date hired plant; a far cry from the primitive methods of erection illustrated and nowadays associated only with the third world. He will be very nervous about heat loss, wilful damage and maintenance.

So where did the pioneers go wrong? Saint draws no conclusions but surely it must be clear by now that the lightweight structural framing favoured at the time has proved quite unsuitable for many educational buildings. Remember that these schools were the outcome of visionary attitudes. Their designers were predisposed towards lightweight building and that was their starting point, not the real needs of education. With their ceaselessly changing planning grids, constructional grids; even bewildering tartan grids they were in search of ideal solutions of universal application. The collaboration of an independent structural engineer as devil's advocate was not sought. It went unacknowledged that, whilst a lightweight steel frame might be appropriate for the barn-like form of a sports hall, it is wholly inept for a classroom block of several storeys. Distracting noise is generated in classrooms and a high level of sound reduction is needed between them. The unchanging laws of elementary physics demand mass to separate them—something like a party wall between terrace houses; nothing else will do. This suggests a one brick-thick partition wall or its equivalent, which you might as well use structurally and your light steel frame becomes redundant. Collapse of prophetic vision of the future of school building.

During the mid-50s the architects Powell and Moya resorted to this simple principle of load-bearing cross-wall construction at Mayfield School, Putney. Mr Saint mentions that when facts and figures were disclosed they were met with disbelief at the Ministry and caused some concern among the architects. He describes the school as traditionally built; as it happens, the use of calculated brickwork broke new ground; technologically it was in advance of orthodox steel framing. For those unencumbered by ideological preconceptions here was the obvious solution for secondary school

construction. By omitting a costly steel frame funds might be freed for more teaching space, better finishings; even good quality external paving and planting. A minority shrewdly took this course; a volte-face was out of the question for the fundamentalists, now publicly committed to a future which lay in the direction of industrialised system-building, with a reformed factory-based construction industry the ultimate goal. Before long there was scarcely a school-building authority in the land not attached to one or other of the proliferating consortia: CLASP, SCOLA, METHOD, SEAC, ONWARD, MACE and so on. Self-perpetuating bureaucracies were set up to administer them. It is inconceivable that a single method should have been thought feasible to embrace satisfactorily both kindergarten and ten-form-entry comprehensive, whose only point of similarity is the description 'school'; yet, to sustain momentum sundry projects of all kinds were introduced into programmes besides all 'schools'. Sceptical client bodies were won over by promises of the hitherto-unattainable benefits of 'flexibility'—in other words, that the completed building could be dismantled at will in some undefined way and reassembled to suit changing needs; comforting to those who were not quite sure that they were getting what they really needed. Significantly, Mr Saint produces no instance of this ingredient having been put to the test. Above all, what was on offer was not old-fashioned building science but *real* science; an investment in progress.

The cue for the imaginary building programme outlined in the opening paragraph of this notice was the full-page photograph of the interior of a school of the 1980s at Yateley Newlands, Hampshire, which brings to a close the part of the book tracing school development. 'Assured, relaxed, even stylish school architecture', this concluding illustration shows a lineal descendant of that school at Putney and every feature in it exemplifies the approach of the minority who chose not to follow the path of destiny in the footsteps of the faithful. Andrew Saint does not explore this divergence and he leaves us without an historian's analysis of the reasons for the waning of the systems. Puzzled survivors and students of the period would welcome a sequel.

JACK SPEIGHT, *London*.