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THOMAS HARRISON AND "THE STRUCTURAL DEPARTMENT OF THE ART"

Moira Rudolf

The work of Thomas Harrison of Chester (1744-1829) is remarkable for a concern with the quality of masonry. He shared with C.R.Cockerell a fascination with the power of stone. It was a theme which the latter returned to repeatedly in his Royal Academy lectures of 1842-56; at the same time admiring Harrison as a pioneer of the Greek Revival who, like George Dance the younger, fully understood the constructive nature of the Classical language. Cockerell's diaries contain various complimentary remarks:

> "Harrison is undoubtedly the noblest genius in arch. we have had —in external arch. chiefly";[1]
>
> "His merit is in external arch. — as masonry chiefly",[2]

and, on visiting Chester Castle in 1823:

> "it is in the great intelligence of the masonry that Harrison's merit lies'.[3]

Cockerell was admiring particularly the use of monoliths in the portico (begun 1791) (Fig. 1), the massive blocks of stone employed throughout, especially in the portico and the Propylaeum (1811-*c*1815) and the constructive nature of the architecture; all these being distinguishing features of Harrison's style.

In Cockerell's Royal Academy lectures of 1842 he declared the use of large and costly stones to be "the primary qualification of good architecture" and a feature of ancient buildings.[4] He later argued that magnitude of materials was important for great public works and criticised most contemporary practice:

> "the noble material which nature furnished us we degrade by our petty contrivances of art, and we make a merit of enfeebling those fine blocks, which if left alone would convey ideas of energy and beauty. What does this all point at but that the builder has outgrown the architect and that while we reproduce old things in antiquated scale he has prepared his materials for a more enterprising and gigantic style than we are capable of inventing. he points at the large and noble block, lying in the Quarry or even in his yard —which we proceed to subdivide into what we are pleased to call architectural proportions. When the quarries of Pentellicus had displayed the magnitude of their materials the architects Ictinus and Mnesicles took the utmost advantage of them and corresponding with the prowess of the mechanic and quarryman they excited that admiration by their employment of them in the marble ceiling of the Propylaea which Pausanias 550 years after described as 'the most admirable work that had been made up to the present time, as well for the enormous length of the stones, as for the beauty of their order and Execution'. 10 marble beams 19.3 in the clear sustained the Eastern ceiling. 14 of 18.9 in the Hall, and others of more in dimension."[5]

Cockerell recognised that even modest buildings could be improved by large, carefully selected stones. In his diary of 1821 he had noted:

"Saw a lodge near Shrewsbury not bad . . . Little porch & being three arches in stone looked exceeding well. They had no impost & were of a simple kind . . . according to the material, the ornament should be calculated . . . the beauty of a fine stone . . . requires little ornament if the stones are laid in good proportion."[6]

In 1849 this was echoed by Ruskin who in his Lamp of Power argued that the architect with limited resources should choose his approach first:

"and if he choose size, let him abandon decoration; for unless they are concentrated, and numerous enough to make their concentration conspicuous, all his ornaments together will not be worth one huge stone".[7]

At the same time Ruskin advised against concealing masonry as

"there is a very noble character always to be obtained by the opposition of large stones to divide masonry, as by shafts and columns of one piece, of massy lintels and architraves".[8]

Cockerell attributed the grandeur of Classical temples to the size of stones employed and observed that it was difficult to persuade a person looking at the Parthenon drawn to the same scale as St Paul's, London, or St Peter's, Rome, that the former was comparatively small.[9] He also cited Aristotle's opinion that the effect of architecture arose from magnitude and order:

"and what he means by magnitude is certainly not alone from magnitude of the whole, but magnitude also of the parts".[10]

Cockerell appreciated that using large stones on even a modest building would give it great weight and consequence:

"At Shrewsbury remarked the house of a mason, London side of the bridge. Looks exceeding well in large blocks 3 to 4′ square."[11]

He mentioned Vitruvius's *Tenth Book of Architecture* dedicated to large stones and machines to transport them and observed that Solomon, in the *Third Book of Kings,* used massive stones for his buildings.[12]

Harrison would certainly have been aware of Vitruvius and would have known of the Biblical precedent for large stones: in July 1796 at the Chambers sale he bought copies of *L'Architecture de Vitruve,* (1684), and of John Wood the elder of Bath's *The Origin of Building: or, the Plagiarisms of the Heathen Detected,* (1741),[13] a quasi-philosophical work in which Wood argues that Classical architecture had been revealed to the Jews and incorporated in the Temple at Jerusalem. Harrison's appreciation of large stones is clearly illustrated in an extract from his own papers, dated about 1818[14] and recorded in Cockerell's diary:

"Mr Harrison on the Trajan Column says. Though it is now more than 40 years since I measured and examined Trajan's Column, yet it has been strongly impressed on my mind ever since that this Roman work, independent of the sculpture that surrounds the shaft is one of the finest pieces of masonry existing — This impression arose from the extraordinary magnitude of the blocks of white marble of which it is composed and the amazing precision with which they are worked and set in the building."[15]

At Chester Castle Harrison used massive components to create an effect of impressiveness through the magnitude of masonry and the apparent expense of materials. He later explained:

"the grandeur and magnificence of the Trajan and Antonine columns and the obelisks of Rome arise principally from the stupendous masses

of valuable materials. Had they been of smaller and baser materials, the admiration would cease. This is seen in the county hall at Chester. (Fig. 1) Portico of 12 columns: 22′ high and 3′1″ in diameter each in a single stone, all strangers measure and fathom them, enquire their height and weight, how brought and raised. Had they been of several stones this would not have happened."[16]

This was a constant preoccupation in his architecture, expressed ultimately in the Lord Hill Column, Shrewsbury (1814-16)[17] and the Anglesey Column, Llanfair (1816-17). Although the immediate forerunner to these was William Wilkins' Nelson Pillar, Dublin, of 1808-09, Harrison's columns were, he confessed, an attempt to regain something of the Roman grandeur. Both are almost works of engineering. He noted:

> "The column erected at Shrewsbury in honour of Lord Hill is 15′ in diameter at the plinth, the height of the shaft and capital is 91.7 and the whole altitude including the statue 130′. The height of the basement is 13.6 [and] its greatest angular extent 48′. It is built of a stone of a fine quality and colour from a fine quarry six miles distant, the stones are mostly of large dimensions, some of those in the basement weight 10 tons."[18]

He pointed out that the shaft of the Lord Hill Column would contain 163 stones:

> "Which are few compared with other columns: the monument of London is about the same diameter, but the shaft from its construction must consist of some thousands. . . . I suppose it [the Lord Hill Column] will be the largest Doric column ever erected and I hope the best constructed of any built since those of Trajan and Antonine".[19]

This, like the columns of Chester Castle, was an attempt to impress or to set a record.

There was no real English precedent for Harrison's use of finely jointed large blocks of stone though it may have been encouraged by a knowledge of Sandby who, in his sixth Royal Academy lecture, defined magnificence as greatness of size rather than a profusion of splendid or valuable things[20] and like Cockerell after him praised this quality in ancient buildings:

> "When shall we see buildings in this country capable of giving the correct impression of the Magnificence of the Parthenon, the simple grandeur of the Temples of Paestum . . . the awful and terrific grandeur of those at Segesta, Selinute, and Agrigentum, particularly the Temple of Jupiter, which in its perfect state must have been the admiration of every beholder? The columns of this immense building . . . exceeding 40′ in circumference, and each flute almost 2′ in its concavity presents a cradle of repose to the traveller, wearied with wanderings over the frightful ruins of that stupendous pile."[21]

Cockerell observed that Wren had intended a giant order for St Paul's but could not obtain sufficiently large scantlings.[22] George Dance the younger had introduced an interest in the bare stone surfaces of antiquity but Cockerell attributed the reintroduction of massive stones to Rennie and Smirke, especially praising the latter, in 1842 writing

> "if we compare our execution of works in the present day with that which prevailed when he commenced his Eminent and leading practice we shall be fully sensible of our obligations to his example"[23]

and ten years later, echoing Harrison's own remarks on the Lord Hill Column,

> "Since the days of Trajan or Hadrian, no such stones have been used as

have been recently employed at the British Museum, where 800 stones from 5 to 9 tons weight form the front."[24]

The giant Doric columns of Smirke's Covent Garden Theatre completed in 1809 were similarly novel. They had a diameter of 5′6″ and were said at the time to be exceeded only on the Acropolis and at St Peter's, Rome.[25]

The credit should at least have been shared by Harrison. The beams carrying the stone coffers of the Chester Castle Propylaeum weighed four or five tons,[26] the great monoliths of the Shire Hall portico 10 tons each[27] (Fig. 1). Some of the stones in the base of the Lord Hill Column weighed 10 tons and certain of those in the Anglesey Column a comparable amount (Fig. 2). In the latter Harrison carefully followed antique precedent; the steps forming the stylobate are of considerable height with the ascent to the column by lower subsidiary steps, a feature noticed by Cockerell in ancient temples and remarked in his second lecture of 1852.[28] The average dimensions of stones used in the rusticated dry arches of Harrison's Grosvenor Bridge, Chester (built 1827-33) are gigantic: some 5′6″ by 18″ high by 18″ deep.

Most of Harrison's works have a strong sense of construction emphasised by their trabeated system, especially evident in engineering-type structures such as the Northgate, Chester (1808-10) and the Hill and Angelsey columns. This was again rare in English neo-Classical architecture and was much more common in France. There Laugier had made a plea for structural integrity in his *Essai sur l'Architecture* (1753, revised 1755) in which he had stated the only permissible elements of a building to be the essential members of the primitive hut: columns, beams, pediments and simple walls.[29]

Laugier urged architects to apply the orders, previously considered as decorative features, with the same constructional truth as the components of the hut.[30] Engaged columns, though not ideal, were a permissible licence and were to be engaged as little as possible so as to retain that sense of being a necessary part of the structure.[31] In his view an architect only overloaded his work with decoration if he was not gifted enough to make it simple.[32] Harrison, like Soane and Smirke, would have been fully aware of Laugier. At Chester Castle, in agreement with Laugier's rules, he emphasised the closing function of the wall rather than its plasticity;[33] where there were no columns he used rustication. The inner end columns of the Shire Hall portico (Fig. 1), those of the Portico Library, Manchester (1802-06) and the Northgate, Chester are engaged only about one quarter and give the impression of being freestanding; a feature of which Laugier would have approved.[34] At the Shire Hall portico and the Northgate Harrison enlarged the mutules of the cornice, spacing them so widely that they give the appearance of beam ends supporting the overhang; this was probably inspired by Laugier and is found also in Lewis Wyatt's Octagon Lodge of 1806 at Heaton Hall, Manchester. Laugier would not have approved of Harrison's liking for niches or the giant order,[35] or for the Doric order which he had objected to on the grounds of its "meagre and poor" capital, harsh entablature, square mouldings and dangerous appearance of its overhanging cornice.[36] He would probably, however, have liked Harrison's streamlined, simple and elegant Ionic order,[37] the way in which he related buildings to their spatial settings and his concern for visual effect.[38]

Harrison's use of monoliths was an unusual though not unique feature: Carr used them at Tabley (Oaklands) Hall, Cheshire in 1760-70; Lewis Wyatt surrounded his Octagon Lodge (1806) at Heaton Hall with eight Tuscan monoliths and framed the door with monolithic architraves.[39] Harrison used them wherever possible; all 84 columns at Chester Castle are monoliths,[40] (Fig. 1) and these are distinguishing features of his houses, first used at Kennet House, Clackmannanshire in 1793-94 and from then throughout his career, reaching especial extravagance at Woodbank (*c.*1812) where their number must

Fig. 1. Thomas Harrison, the portico of the Shire Hall, Chester, begun 1791 (Conway Library).

have made the modest house very expensive to build.

Where he was unable to use single stones, either because of financial constraints or because of a shortage of sufficiently large scantlings, Harrison constructed his columns of as few stones as possible, generally three as at the Liverpool Lyceum,[41] of 1800-03 and the Portico Library, Manchester. Presumably if more or suitable stone had been available these would have been monoliths. As well as having a better appearance this was good building practice. In 1888 Gwilt observed:

> "When large columns are obtained in a single block, their effect, from that circumstance alone is very striking; but as this is not very often to be accomplished, the next point is to have as few and as small joints as possible; and the different stones, moreover, ought to be selected with the view, as much as possible, of concealing the joints, by having the blocks as much of the same colour as possible."[42]

At Chester Castle Harrison used extraordinary lintel/keystones so finely jointed that they give the impression of being carved out of a single stone (Fig. 3) and of great structural strength. A variation on this idea occurred at Broomhall, Fife (*c*1795-1799) (Fig. 4) where the lintels over the basement windows are one block, carved to look like several. Cockerell later remarked that this was characteristic of the builder or good craftsman,[43] but the precedent here was probably John Carr of York's Huthwaite Hall of 1748. It is interesting that Carr was trained in the quarries as Harrison may have been.

Harrison used many different masons and contractors throughout his career though the uniformity of his masonry suggests that it is something in which he took a close interest. Two surviving documents of 1791, the "Observations" and "Directions" on Chester Castle,[44] bear this out and indicate his concern for the appearance and construction of the building as well as his knowledge of the selection and handling of stone. In the "Observations" he wrote

> "There should nothing appear in the Execution that may shew any

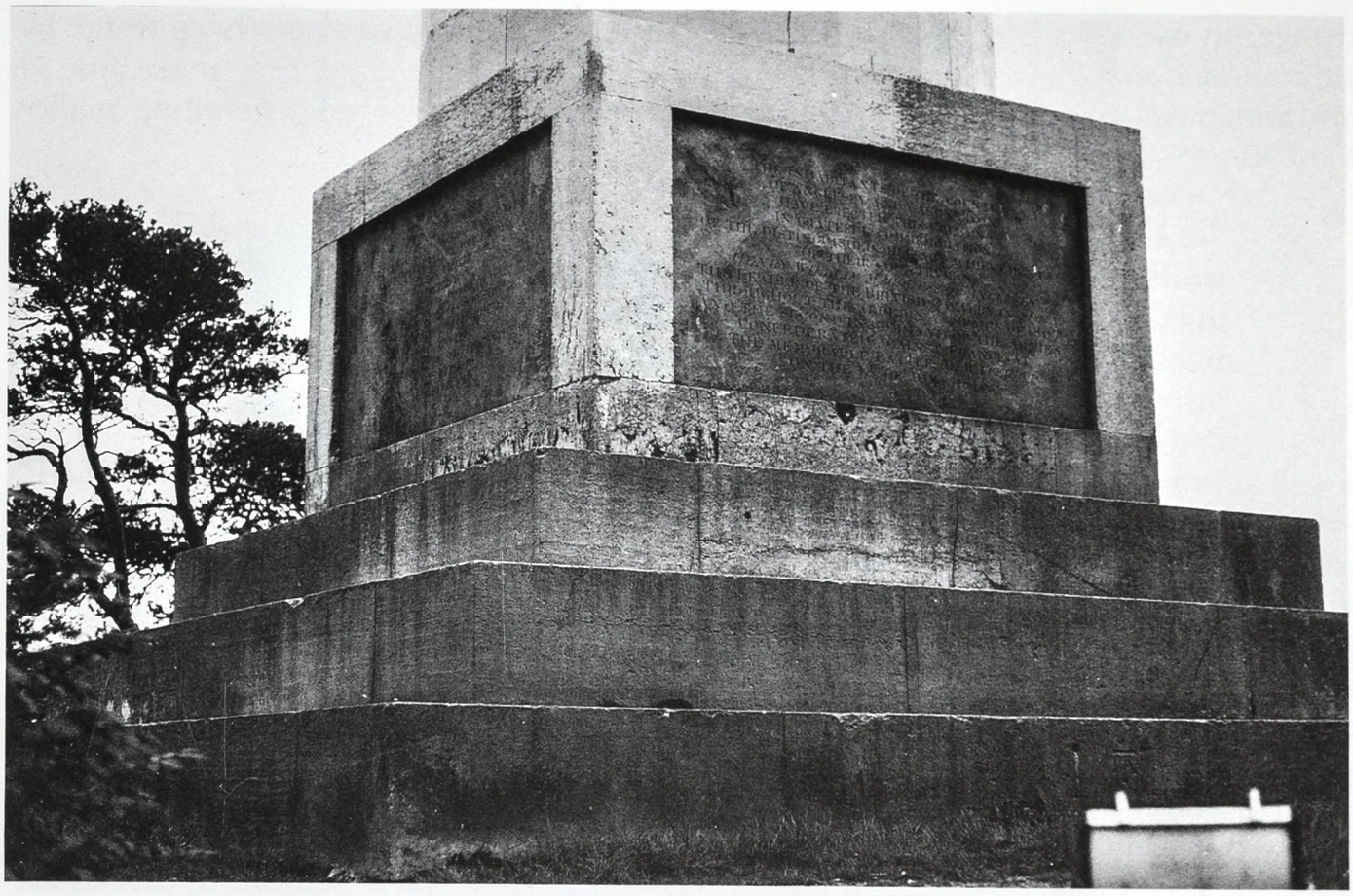

Fig. 2. Thomas Harrison, detail of the base of the Anglesey column, Llanfair, 1816-17 (Conway Library).

> weakness, or give the least hopes of Escape, for a Design however well adapted to the purpose, will signify little unless the work be executed accordingly.. A wall or building may appear very well externally and support its own weight, till the mortar is dry, and yet the stone may be very ill squared and worked upon the Beds and Joints, but should a breach be attempted in such a wall from within, where it is lined with Brick or Rough Stone, though the greatest caution had been taken in filling it with mortar or running it solid with proper grout,[45] yet till the binding quality of the Lime has taken place, which is always some years first, the Backing or Brick wall may be easily penetrated, and an Ashlar, which perhaps only touches the others at the outer Edges, easily removed, but should the stone have been properly squared and set in no more mortar than is necessary, and ashlar which might be attempted to be moved would be so bound and fixed by the surrounding ones, that it would be impossible to remove it, but by a great force, or working through the solid stone".[46]

Harrison recommended that as the working of the stone was of such importance, the mason's work should be regularly inspected to prevent carelessness:

> "and any stone that is found ill done should not be measured or paid for till the man who did it has made it right".[47]

He had noticed a much greater waste of stone than necessary and suggested that this could be prevented by sending daily dimensions of the stone required to the quarry and having it cut to approximate size there; any stones exceeding the dimensions should have something deducted for waste while damaged ones should be paid for accordingly or rejected.[48] Another error was to use stone of too large a bed when it was both cheaper and

stronger to use a smaller bed and fill the remaining space with brick or cheap stone. In addition he noted that, contrary to common belief, adding less rather than more lime to sand and gravel made a stronger mortar or grout; too much destroyed the binding quality of the lime.[49]

He stated the duties of the superintendant to be

> "to know and to send to the different quarries the dimensions of such stones as are wanted, and to examine and measure them when brought to the ground, to direct and see the cutting and working that they be wrought square and true, and used with the least waste for those purposes for which they may be most proper; also to see them set true and straight in the walls".

as well as to see that the walls were properly mortared and grouted.[50] In the "Directions" he further emphasised the importance of care in cutting the stone and ensuring that there were no hollow joints;[51] this would guard against water getting into the depressions, freezing and forcing the stone apart.[52] Furthermore, the stone should be placed on its natural bed, as in the quarry, so that it would withstand the effects of corrosion and lamination; any damaged but usable stone should be put in parts of the building not visible. He recommended that the joints in the upper and lower courses break over each other by at least 10 or 12″ and that timber binders be placed in the walls at regular intervals; again good building practice.[53]

Harrison required all visible joints of the rustication at Chester Castle (Fig. 3) to be as regular as possible. In working it the masons were not to weaken the stone by driving the tool in deeply and all sharp projections or blemishes were to be hammered off.[54] He attached a diagram to the "Directions" showing the "improper method" of rustication with gaping joints, irregularly cut stones and stones not tapered towards the top; the "proper method" shows very fine joints and stones of regular sizes with profiles which taper slightly upwards.[55]

Harrison's concern for precision was a constant one; even his modest masonry houses use large stones of even sizes, in regular courses, with the joints as fine as possible. The mortar is generally barely visible as at Woodbank and is always used sparingly. At the Hill and Anglesey columns it appears not to be there at all. A contemporary noted approvingly of Chester Castle

> "The columns, mouldings and plain ashler are worked and set with a precision which could not be exceeded even in marble."[56]

This feature was more common in ancient architecture and more common abroad than in England. Cockerell, citing Francesco Colonna's *Hypnerotomachia Poliphili* (published Venice, 1499) noted his description of a magnificent pyramid in which

> "the masonry without cement so joined that a needle cannot be introduced anywhere"

showed "his exact observation of Grecian monuments".[57]

In France Claude Perrault (1613-88) had published his *Ordonnance des Cinq Espèces de Colonnes selon la Méthode des Anciens* (1684) in which he introduced a theory of positive and arbitrary beauty in architecture. Positive beauty was based on the quality of materials, precision and neatness of execution, on size, magnificence and symmetry. Arbitrary beauty was to be found in proportional relationships, form and shape.[58] Although Harrison was almost certainly inspired by ancient architecture he would have known of Perrault's works expecially the celebrated east facade of the Louvre (1667-*c*1674), designed in conjunction with Le Vau and Le Brun, which he no doubt saw in 1776.[59]

To achieve the fine joining of the Lord Hill Column Harrison used cramps of brass

Fig. 3. Thomas Harrison, detail of the entrance to the gaol at Chester Castle (Conway Library).

or copper, each 3″ long and weighing 1lb, secured with lead for every stone.[60] This again illustrated his understanding of construction and was unusual. Copper, although expensive, was the best material as it was very tenacious and could be set in damp mortar without fear of corrosion whereas ungalvanised iron would oxidize, expand and split the stones.[61] Lead was used presumably because it would not be adversely affected by exposure to air and water and would unite with the brass or copper to give great strength.[62] It is not known to what extent Harrison used copper cramps on his other buildings as few specifications have survived, but the finely jointed ashlar and condition of his masonry suggest that it was fairly common practice for him. It is interesting that in his brick built Watergate House, Chester of 1820, which incorporated very little masonry, the specification stated

> "the whole of the Masons work to be well cramped and bedded with sufficient beds to the whole of it".[63]

There were, however, other ways of securing the courses: stones were usually bonded by placing them in such a way that no joint fell immediately above or below another;[64] a practice scrupulously observed in Harrison's buildings. The stability of ashlar masonry is generally independent of the mortar's adhesion and bed dowel joggles were often used to prevent the courses sliding through lateral pressure.[65] Stones were said to be "joggled together" when a projection was cut on one stone to fit into a corresponding hole on another, but since this practice was both labour intensive and wasteful,[66] it is unlikely that Harrison used it. In the "Directions" for Chester Castle he referred to the stones being

> "set solid and true in the walls, upon their own beds, with as little mortar and pinning as possible".[67]

This implies that, rather than "joggling" the stones together, he preferred to get the cutting, setting and bonding of the stone as precise as possible; the "pinning" was

probably carried out with hard pieces of stone or metal secured by lead which worked in a similar way to cramps.[68]

Excellence and magnitude of masonry seem to have been appreciated by only a handful of architects, in particular John Dobson of Newcastle, all of whose Classical houses are characterised by finely jointed masonry and large, precisely set blocks of ashlar. It is interesting that there is a connection between Smirke and Dobson, and Smirke and Cockerell whose importance in this respect has been stressed. Cockerell spent 1809 in Smirke's office;[69] when Dobson was in London he became friendly with Smirke's father, the artist Robert Smirke, who tried to persuade him to remain in the capital.[70] Dobson's eldest daughter subsequently married Sydney Smirke.[71]

Again the engineering aspect is important. Smirke, like Harrison and Dobson, had engineering and constructive ability though he pioneered several modern structural techniques,[72] whereas Harrison adhered mainly to traditional building practice; his buildings are well constructed and give the appearance of strength. One critic of Smirke, anticipating what Blomfield was later to say of Harrison,[73] declared that he was

> "pre-eminent in construction: in this respect he has not his superior in the united kingdom".[74]

Although Harrison cannot be linked with Smirke or Dobson, the common denominator is a knowledge of engineering and construction. Harrison's background, together with his training and the years 1769-1776 spent in Rome,[75] qualified him well and encouraged his interest in huge stones set with minute precision.

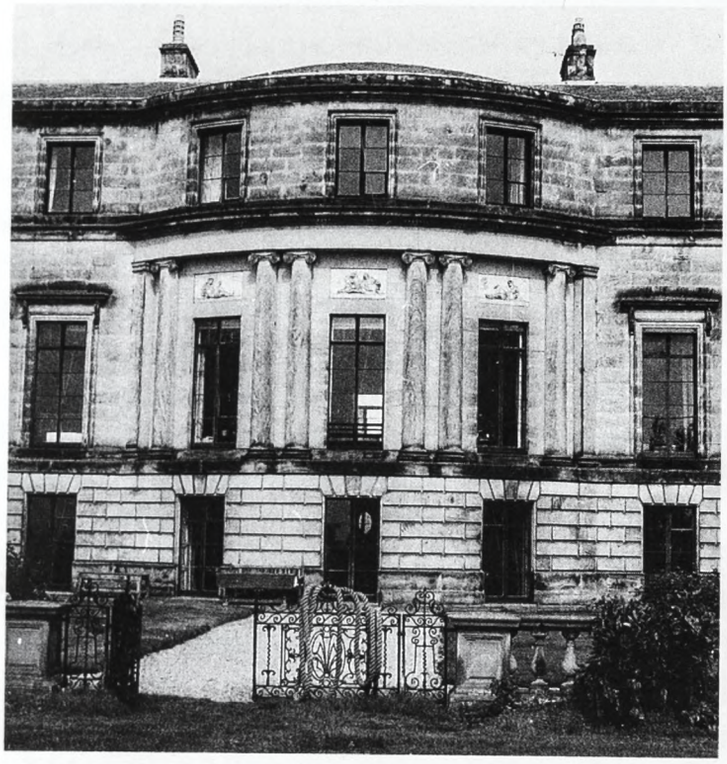

Fig. 4. Thomas Harrison, detail of the south front bow of Broomhall, Fife, 1796-99 (Conway Library).

ACKNOWLEDGEMENTS

I would like to thank Mr John Newman, and the staff of all the libraries and institutions listed below, and also my dear friend Dr Kevin Dalton for conversation and comments.

Abbreviations: B.A.L.: British Architectural Library; C.C.R.O.: Chester City Record Office; C.I.A.: Courtauld Institute of Art; C.R.O.: Cheshire Record Office; L.C.R.O.: Liverpool City Record Office; N.M.R.: National Monuments Record; R.A.L.: Royal Academy Library; R.C.A.M.: Royal Commission on Ancient Monuments; S.L.H.L.: Shrewsbury Local History Library.

NOTES

1. B.A.L., Diary of C.R.Cockerell, hereafter referred to as "Cockerell", March 4, 1828.
2. *Ibid.,*November 9, 1823.
3. *Ibid.*
4. R.A.L., 29F, drafts of Cockerell's R.A. lectures, 1842-43, hereafter referred to as "R.A. lectures"; MIS/CO1, 1st lecture, 1842, inserted before p.31; MIS/CO2, 2nd lecture, 1842, 2. Cockerell's lectures reported in *Builder* (and *Anthenaeum*), 1843-56.
5. R.A.L., 29F, R.A. lectures; MIS/CO3, 3rd lecture, 1842, 5: partly quoted in Watkin, 1974, 110-111.
6. B.A.L., Cockerell, July 28, 1821, 60.
7. Ruskin, *Seven Lamps of Architecture,* first pub. 1849, Everyman ed. (n.d.), 74.
8. *Ibid.*, 81.
9. *Builder,* XI, 1853, 55, 2nd R.A. lecture, January 13, 1853.
10. R.A.L., 29F, R.A. lectures; MIS/CO3, 3rd lecture, 1842, 7.
11. B.A.L., Cockerell, July 28, 1821, 60.
12. R.A.L., 29F, R.A. lectures; MIS/CO8, January 12, 1843, unpag.; for mention of massive stones in Bible see First (commonly called Third) Book of Kings, 1 Kings, 5, v.17; 1, Kings 6, vv. 2, 8, 9, 10, 12.
13. David Watkin, *Sale Catalogues of Libraries of Eminent Persons,* iv, Architects, 1972, 114-15; lots 129 and 135.
14. B.A.L., Cockerell, 1822. "Mr. Harrison's papers confided to me by Mr. Burton." Extract follows passage dated July 1818.
15. *Ibid.*
16. *Ibid.*, March 21, 1822.
17. Harrison should be credited with the work; see M.A. Rudolf Ockrim, "The Life and Work of Thomas Harrison of Chester, 1744-1829", Ph.D., University of London, 1988, 292-93.
18. B.A.L., Cockerell, March 21, 1822.
19. *Ibid.*
20. Sandby, 6th R.A. lecture, 11-12, cited by Pierre Du Prey, *The Architectural Education of Sir John Soane,* published thesis, 1977, 53.
21. Sandby, *ibid.*, 213.
22. *Builder* X 1852, 4th lecture, n.d., 102; taken from S. Wren, *Parentalia,* 1750, 287.
23. R.A.L. 29F, R.A. lectures, MIS/CO3, 3rd lecture, 1842, 6.
24. *Builder* X, 1852, 4th lecture, n.d., 102; *Builder,* VIII, 1850, 1st lecture, January 3, 1850, 14.
25. J.M. Crook, *The Greek Revival,* 1972, 117.
26. J. Hemingway, *History of the City of Chester,* 11, 1831, 178.
27. *Builder* XI, 1853, 55, 2nd lecture, January 13, 1853.
28. *Builder* X, 1852, 2nd lecture, January 15, 1852, 67.
29. Laugier, *Essai sur l'Architecture,* 1753, revised and translated 1755, 10.
30. Laugier, 1755, xvii, cited by W. Hermann, *Laugier and Eighteenth Century French Theory,* 1962, 20-21.
31. Laugier, 1755, 16.
32. Laugier, 1753, 62ff.
33. *Ibid.*, 65.
34. Laugier, 1755, 16.
35. Laugier, 1753, 13, 52, 45.
36. *Ibid.*, 79ff.
37. e.g., as at Portico Library, Liverpool Lyceum (1800-03), and many houses/public works; *ibid.*, 95ff.
38. *Ibid.*, 227.
39. J.M. Robinson, *The Wyatts, An Architectural Dynasty,* 1979, 153-54.
40. Hemingway, *Chester,* II, 178.
41. L.C.R.O., 027 LYC/5, Lyceum Articles, March 19, 1801, 4 specify that columns were to be of best Toxteth stone, each to consist of three pieces.
42. J. Gwilt, ed. Papworth, *Encyclopaedia of Architecture,* 1888, 584.
43. R.A.L., 29F, R.A. lectures, MIS/CO3, 3rd lecture, 1842, 3.
44. C.R.O., QAB 1/8, "Miscellaneous Correspondence and papers on rebuilding the gaol [begun 1788] and county hall", contains "Some Observations upon the Execution and Manner of conducting the works of the New Gaol by T. Harrison Architect", and "Some further Directions necessary to be

observed in executing the mason's work at Chester Castle", (hereafter referred to as "Observations" and "Directions".

45. i.e.: fluid cement.
46. C.R.O., QAB 1/8, "Observations".
47. *Ibid.*
48. *Ibid.*
49. *Ibid.*
50. *Ibid.*
51. C.R.O., QAB 1/8, "Directions".
52. Gwilt, *Encyclopaedia,* 478-79.
53. C.R.O., QAB 1/8, "Directions".
54. *Ibid.*
55. C.R.O., QAB 1/8, QAB 2/1/103.
56. Hemingway, *Chester,* II, 178.
57. R.A.L., 29F, R.A. lectures, MIS/CO5, 5th lecture, 1842, 20.
58. R. Middleton, and D. Watkin, *Neoclassical and Nineteenth Century Architecture,* 1980, 12.
59. See Rudolf Ockrim, "Harrison" 52-53. East facade of Louvre and Ecole de Chirurgie hailed by Soane as models for imitation; Soane lectures, 167, quoted by Du Prey, *Architectural Education,* 106.
60. S.L.H.L., 1831, "Articles of Agreement for erecting a column in honour of Lord Hill at the east end of Abbey Foregate in Shrewsbury", dated October 26, 1814.
61. E. Dobson, *Rudiments of the Art of Building,* 1923, 114; Gwilt, *Encyclopaedia,* 517, 587.
62. Gwilt, *Encyclopaedia,* 515.
63. Henry Potts, Specification, Watergate House, Chester, July 26, 1820; xerox copy at C.C.R.O., Z 26/1.
64. Dobson, *Rudiments,* 39.
65. *Ibid.*
66. *Ibid.*, 114.
67. C.R.O., QAB 1/8, "Directions".
68. Dobson, Rudiments. 114.
69. H.M. Colvin, *Biographical Dictionary of British Architects,* 1978, 221.
70. *Ibid.*, 263.
71. Crook, "The Fate of Neoclassical Houses", *Country Life,* cli, 1972, 1385.
72. First British architect to use large scale load bearing foundations of lime concrete; pioneer of load bearing cast iron beams in public/domestic architecture. See Crook, "Architect of the Rectangular: a reassessment of Sir Robert Smirke", *Country Life* cxli, 1967, 846-48; Crook, "Sir Robert Smirke: a pioneer of Concrete Construction", *Transactions of the Newcomen Society,* XXXVIII, 1965-66, 5-22.
73. A. Blomfield, "Biography of Thomas Harrison', *Builder* XXI, 1863, 203: "a great man in his day; almost, if not quite, the first architectural genius in the kingdom, with a more clear apprehension of the principles of the art, and a more accurate knowledge of the structural department of it, than, perhaps, any man of his day".
74. J. Ferguson, *The Athenaeum,* 1828, 29, quoted by Crook, "Sir Robert Smirke: a pioneer", 1965-66, 5.
75. See Rudolf Ockrim, "Harrison", 29-57.