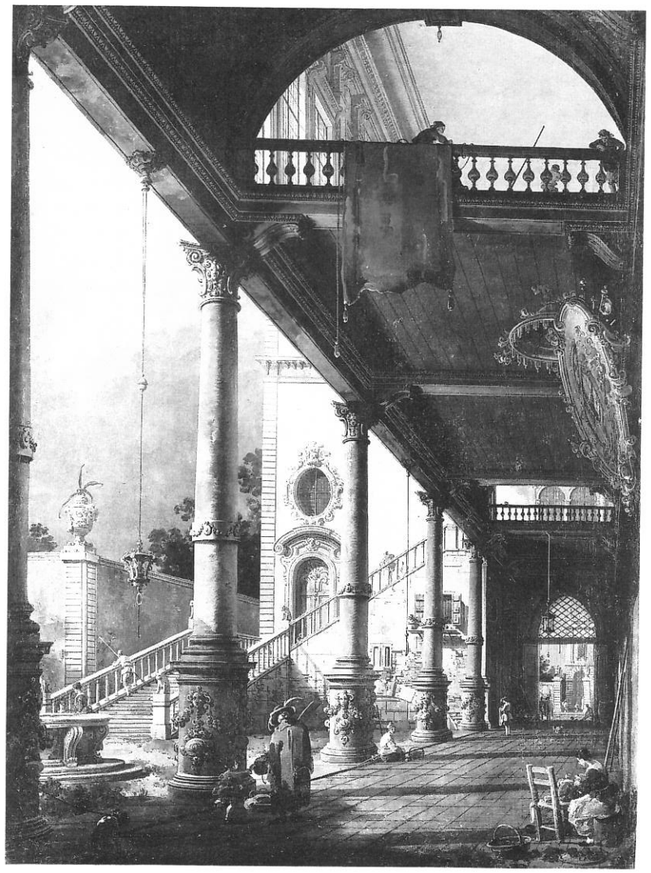


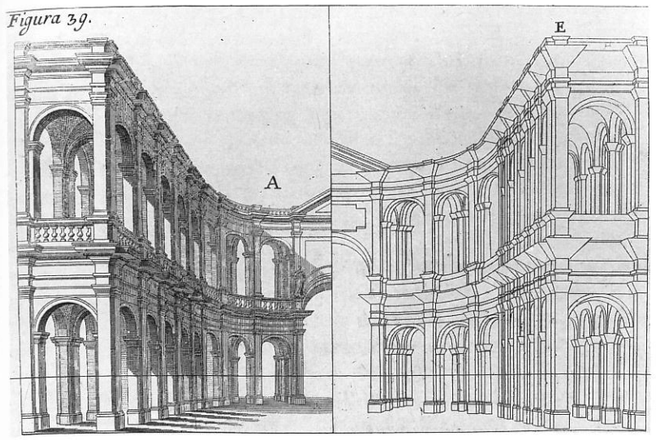
282. Antonio Canaletto, *Architectural Capriccio with Loggia and Palace*, 1765, Venice, Accademia.

283. Bernardo Bellotto, *Self-Portrait in an Architectural Setting*, *c.*1765, Warsaw, National Museum.

based on a rigorous scrutiny of the actual scenes—something we will discuss further when we look at his possible use of instrumental techniques—but they are also based on a knowing measure of optical contrivance. This contrivance, like that of Saenredam, relies upon a complex compound of the physical characteristics of the actual scene, the geometry of perspective construction and an instinct as to what will achieve the desired effects in the actual picture. Not infrequently different paintings of the same set of buildings use slightly different relative orientations for the individual elements, as well as altering the viewpoint or angle.

The splendid sets of views looking in either direction up and down the Thames from the terrace of Somerset House show his artful contrivance at work (pls. 279–81).[210] It is well known that he has multiplied the number of the spires of the city churches—perhaps he found, as many photographers have cause to know, that a distant effect which is striking on the spot looks unimpressive when reduced by perspective rule within the smaller compass of a representation, and he decided that the effect of the towers needed amplification in the actual painting. But the contrivance goes further than such additive procedures. In the different painted and drawn versions he has manipulated the geometry of the terrace with respect to viewing height and angle, sometimes in a pronounced manner. Some of the foreground forms do respond to some extent to the changed viewpoint, but there is no consistent revision of the relationship between foreground and background features either with respect to parallax or their orientation to the picture plane. It is just possible that Canaletto based this bending of visual rule on a conscious awareness of the new kinds of optical-perceptual theories which we will encounter most prominently in France, but I think it is more likely that it is based on the traditional perspectivist's manipulation of rule for pictorial effect in given circumstances.

Given the prominence of the *vedutisti* in eighteenth-century Venice, it is not surprising to find that perspective played an increasing role in the Venetian Academy, which was founded in 1650.[211] Antonio Visentini, a perspectival illusionist who

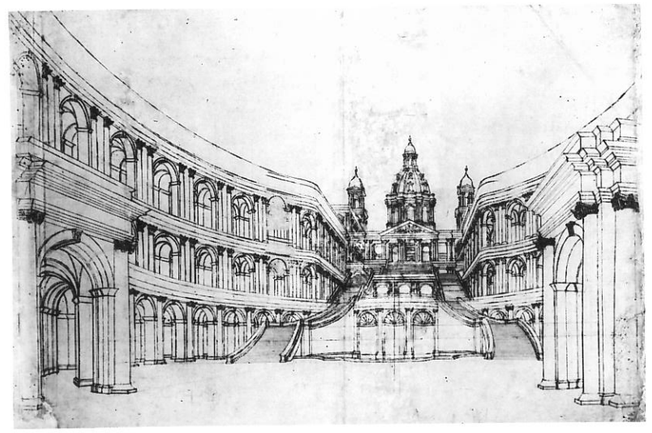


284. Illusionistic stage design from Pozzo's *Perspectiva*.

collaborated with Tiepolo and made prints after Canaletto—and painted *vedute* in his own right—became President of the Academy in 1761 and held the chair of 'architectural perspective'. In 1767 a new Professor was appointed, Giovanni Francesco Costa, who wrote a treatise on the *Elementi di prospettiva*.[212] Between 1772 and 1778 Visentini returned to his old post. And in 1790, the son of Tiepolo's favourite architectural painter, Mengozzi-Colonna, was appointed to teach perspective. Canaletto, perhaps rather belatedly, was elected to the Academy in 1763, and two years later presented his reception-piece (pl. 282).[213] In this academic context, it is significant that the presented painting is one of his imaginative *capriccios*, showing his powers in 'uniting art and nature' in the Algarotti manner, rather than one of his more realistic *vedute*. In any event, it is one of the most overtly 'scenographic' of all Canaletto's paintings and one of his most dogmatically perspectival, with its strong diagonal accents.

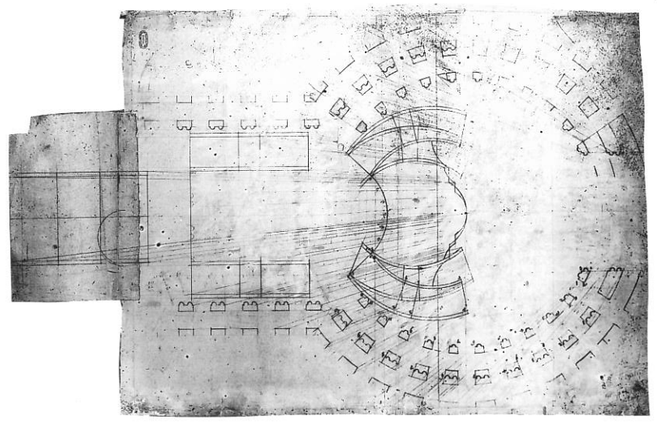
The way in which mere 'view painters' felt constrained to inflate the intellectual pretensions of their art in an academic context can be seen most spectacularly in the career of Bernardo Bellotto, Canaletto's nephew and most considerable pupil.[214] The central feature of Bellotto's practice was the painting of splendidly effective *vedute*, particularly in Dresden, where he spent some of the most productive years of his career. However, when he wished to present his own image to the world, he did so in a grandly theatrical manner (pl. 283).[215] The context which makes sense of this extraordinary picture is the founding of the Dresden Academy of Fine Arts in 1764, and Bellotto's appointment as tutor in perspective. Bellotto himself parades in the foreground as a Venetian grandee. Behind him opens a vista into an invented courtyard of most splendid kind, rendered in striking perspective, and displaying brilliant effects of cast shadows. One source of visual inspiration for the architecture appears to have been a theatrical design by Pozzo (pl. 284), a source which reflects the kind of perspective tradition in which Bellotto wished himself to be viewed. If we should remain in any doubt about the intellectual claims he is making, the handbill pasted on the column at the right quotes the famous dictum from Horace's *Ars Poetica*: '*pictoribus atque poetis quidlibet audendi semper fuit potestas*' ('painters and poets always have an equal right in daring').[216]

There is a group of drawings by Bellotto for such imaginary architecture which supports his claims to be taken seriously as an intellectual artist. They consist of grand architectural structures fully worked out in plan and elevation, which are projected element-by-element onto the flat plane of the perspective rendering (pls. 285–6). As Pozzo had done on occasion, Bellotto has placed the intersecting plane within the depicted structure, and some forms are thus projected 'backwards' onto the plane.[217] This procedure has the practical advantage that it avoids some of the compression of lines if a single plane is



285. Bernardo Bellotto, *Architectural Study of Imaginary Architecture with Curved Arcades and Church*, *c.*1765, Warsaw, National Museum, Rys. Pol. 2070.

286. Bernardo Bellotto, *Plan of Curved Arcades and Church, with Projective Lines*, *c.*1765, Warsaw, National Museum, Rys. Pol. 2071 r.



placed near the apex of the visual pyramid in the normal manner. This variation, however, does not reduce the fundamental affinity of his approach to the long-winded procedures of perspective by intersection first described by Piero della Francesca three centuries previously. Nothing could better illustrate the continuity of geometrical optics in Italian painting. But, sadly, Bellotto's generation also represents the last great flowering of the perspectival tradition in the country which had given it birth.

BRITAIN, BELATEDLY

Any perceptive and well-informed continental observer of the visual arts in Britain in the first half of the eighteenth century—even a confirmed Anglophile like Algarotti—could not help but notice the imbalance between Britain's contributions on an international scale to the sciences and her minor place in the international spectrum of the fine arts. Architecture was the only major exception to this rule. Algarotti was ready to couple the name of Inigo Jones with that of the great Palladio. Jones's stage sets had provided the only really distinguished episode in perspectival design by a native artist before 1700.[218] It is symptomatic that the British translation of Pozzo's treatise was dedicated to the architectural triumvirate, Wren, Hawksmoor and Vanbrugh.[219] By Algarotti's time, however, there were signs that the artistic, intellectual and social foundations were being laid for new achievements in the arts of painting and sculpture. The new climate is nicely captured in Algarotti's dedication of his *An Essay on Painting* to 'the Society Instituted in London for Painting, Arts, Manufactures, Commerce':

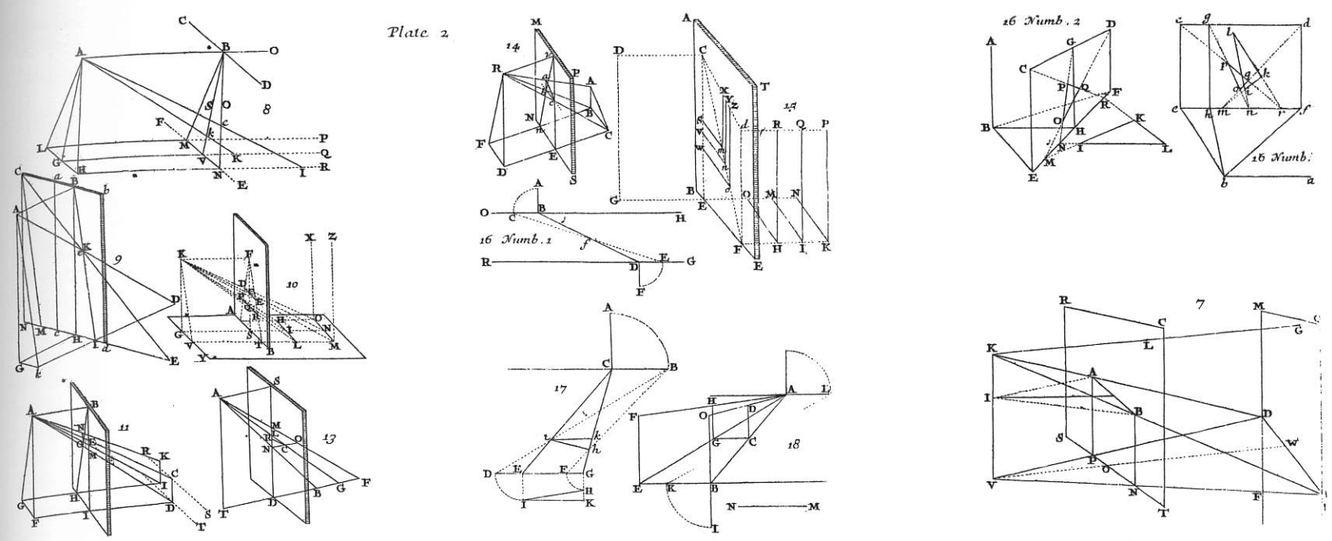
> the English nation claims the superiority . . . in the world of Science . . . Painting indeed has but recently engaged the attention of the English so far as to inspire them with a design of contending with the Italians, for those honours of which the latter have long boasted an exclusive possession. The design is nevertheless becoming formidable, in being promoted by a society. . . , instituted by free people, and composed of the choicest public spirits of their age and country, who, while they generously encourage the best artists, excite emulation in others, by exhibiting the works of all to public view, therein appealing, even for their own judgement, to that of a learned, ingenious and subtle nation.[220]

Algarotti thus precisely acknowledges the two factors behind the great surge in perspectival theory and practice in eighteenth-century Britain: the high level accomplishment in the exact sciences; and the birth of the art institutions and academies. There is no doubt that the mathematicians were in the lead. Two considerable treatises on perspective were published during the second decade by Ditton and Taylor, well in advance of any perspectival painting of comparable sophistication, and almost fifty years before the specifically artistic treatise of Joshua Kirby. However, once perspectival mathematics was absorbed into the context of the new academies, it took vigorous hold and resulted in a series of notable publications by Kirby, Fournier, Highmore, Malton, Edwards and a succession of less prominent authors. In terms of artistic practice, this surge was reflected in the impressive rise of topographical draughtsmanship and in the work of one painter of real genius, J.M.W. Turner.

Alongside these geometrical and pictorial stands of perspective, there also ran the sophisticated British discussions of perception in the wake of John Locke. These came to result in sustained questioning of the relationship between seeing and knowing—between sensations, senses and intellect—in a way that possessed clear implications for the visual premises on which perspective painting was founded. I am leaving aside this theme for the moment—it will appear in its own right in Chapter V—since even those British theorists who did acknowledge the problems in the eighteenth century allowed the edifice of perspectival illusion to stand largely unscathed when they presented the 'rules' to artists.

In British perspective theory, the name of Brook Taylor has achieved a position of dominance not rivalled by that of one writer in any other country. His enormous reputation has tended to obscure the fact that he was not the first author of an accomplished book on perspective in England. That honour falls to his fellow Newtonian, Humphry Ditton, who in 1712 published his *A Treatise of Perspective, Demonstrative and Practical*.[221] Ditton does not now enjoy the reputation of being one of Newton's foremost disciples, but the great man regarded him sufficiently highly to support his appointment as Master of the New Mathematical School in Christ's Hospital. His book is devoted to 'projection' rather than 'appearance', making the same kind of distinction as Barbaro and other authors had earlier laid down.[222] His exposition is accordingly geometrical in nature, setting up the basic propositions in a neatly-conceived series of three-dimensional and flat diagrams reminiscent of Guidobaldo and Stevin (pls. 287—8). By international standards, Ditton is not an innovator, but the composition of his treatise is an act of some note in the British context.

Within three years of its publication, Ditton's work had been overshadowed by that of Brook Taylor. The reason is not so much that Taylor's treatise was a dramatic improvement on his predecessor's, but that his greater intellectual distinction lent it a special lustre. He is said to have been an accomplished amateur painter in his own right and was one of the co-authors with Newton of an unpublished treatise on music.[223] Amongst his purely scientific works, his *Methodus incrementorum directa et inversa* won the respect of the international mathematical community.[224] The first edition of his *Linear Perspective*, published in 1715, is little more than a geometricial booklet—forty-two pages long—and although the second edition of 1719, *The New Principles of Linear Perspective*, is provided with additional demonstrations of a 'more ornamental' kind, (pl. 289), it remains a highly condensed and mathematical work.[225] This terseness results from his desire to illustrate only the general principles rather than the variety of their applications. Thus, for example, he makes 'no difference between the Plane of the Horizon, and any other plane what-

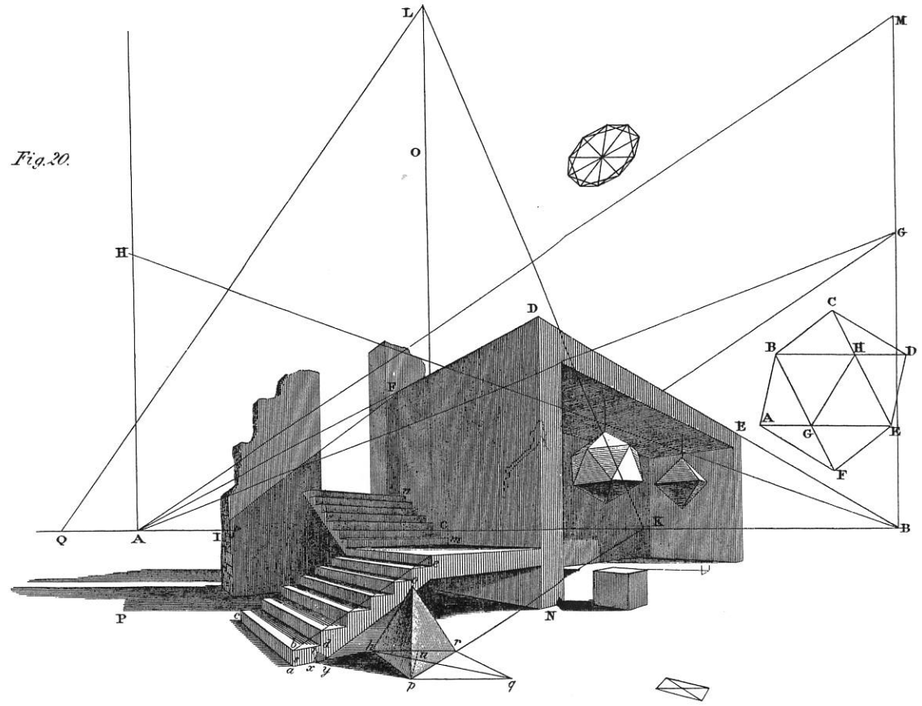


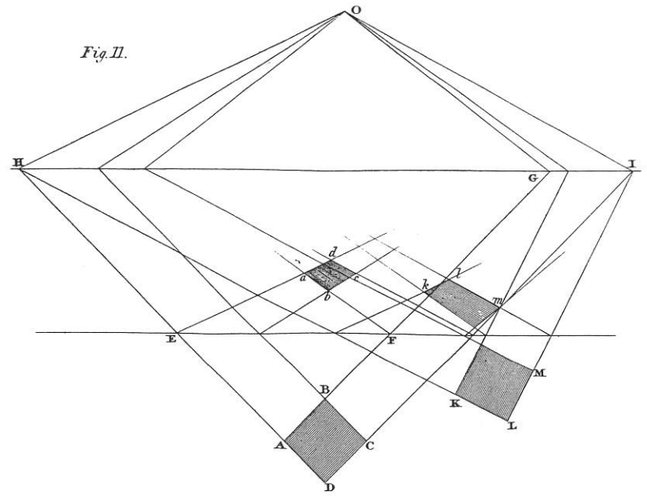
287. Demonstrations of the principles of perspective projection on to the picture plane, from Humphry Ditton's *A Treatise on Perspective*, London, 1712.

288. Demonstrations of the perspective projection of a triangle from Ditton's *A Treatise on Perspective*.

Procedure as in Guidobaldo del Monte, pl. 172.

289. Perspective composition of geometrical bodies and architectural elements, from Brook Taylor's *New Principles of Linear Perspective*, 2nd edn., London, 1719.





290. Perspectival projection of a series of points to give the projection of a given form from Taylor's *New Principles*, 1719.

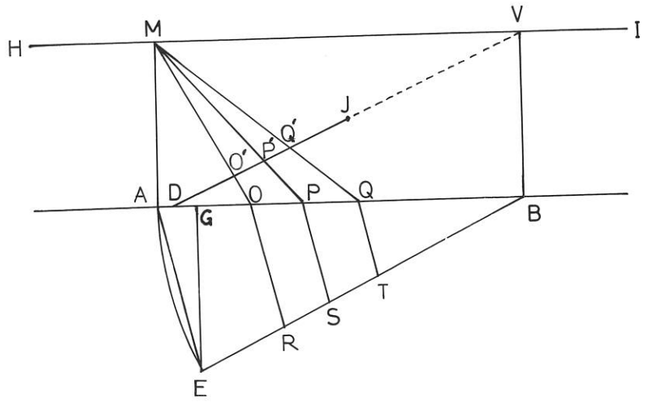
E.g. to project corner A of the square ABCD, for an observer at O: extend DA to E and H; extend AB to F and G; join H and G to O; draw a line from E parallel to OH; draw a line from F parallel to OG. Where the lines intersect is A, in projection.

291. Principles of perspective projection by the 'measure point' method for scaled divisions on a line given orientation.

E—observer
EG—viewing distance from base of picture plane AB
DJ—given line in projection, extended to 'vanishing point' V

Drop the perpendicular from V to B and join B to E (all projected lines which meet at 'vanishing point' V will be parallel on the ground plan to EB). With compasses centred on B, draw EA; erect a perpendicular from A to M (M is the vanishing point for all lines parallel on the ground plan to EA, and is termed the 'measure point'). To divide DJ at scaled intervals equivalent to O, P, Q as measured along the base of the picture plane: join O, P and Q to the 'measure point' M; where OM, PM and QM intersect DJ will be the required divisions O′, P′ and Q′.

Note: The angle BAE = BEA. RO, SP and TQ are parallel to AE. Thus BRO = BEA = BOR = BAE etc. DOM and DO′ O etc. are equivalent to the angles BRO, BOR etc. in projection. Thus DO′O is an isosceles triangle in projection.



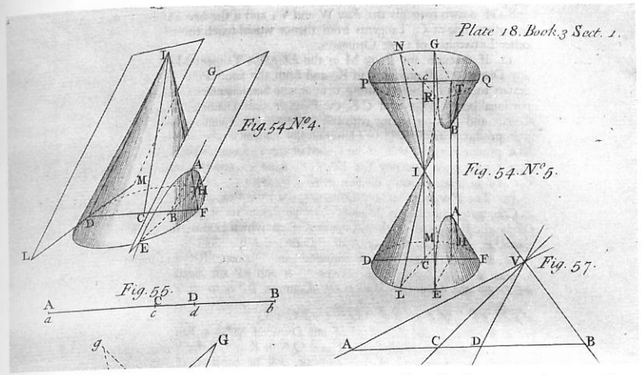
soever; for since planes, as planes, are alike in Geometry, it must be proper to consider them as so, leaving the artist himself to apply them to particular Cases'.[226]

Taylor acknowledges that his geometrical procedures belong to the 'executive' rather than the 'inventive' ('poetic') aspect of art, but warns the painter that if he finds it necessary to bend the geometrical rules in particular circumstances, his original invention must be at fault, not the rules.

Ditton and Taylor both provide succinct accounts of various ways of projecting points, lines, planes (pl. 290) and bodies in a series of geometrical demonstrations. Taylor, more importantly, also gives a new method which was to become a particular characteristic of British perspective technique, namely the use of what was later called 'measure (or 'measuring') points' (pl. 291). These points, produced by striking off a distance on the horizon from the vanishing point of any given line equal to the distance of that point to the eye, permit the division of the projected line into lengths of any required size, as measured along the base of the intersection or picture plane. The geometrical basis of the measure points can be quite simply demonstrated, although Taylor himself does not deign to do so. The British mathematician does not appear to have been the inventor of the technique—it makes a brief appearance in Ozanam's *La Perspective théorique et pratique* in 1700—but the subsequent expansions and commentaries on his treatise were responsible for establishing it as a uniquely economical way of controlling the precise dimensions of the division of any projected line, whatever its angle.[227] As such, it proved notably useful to achitectural draughtsmen, particularly those concerned with the precise rendering in perspective of projected buildings for the client's approval. We will see that Turner was acquainted with the technique of measure points.

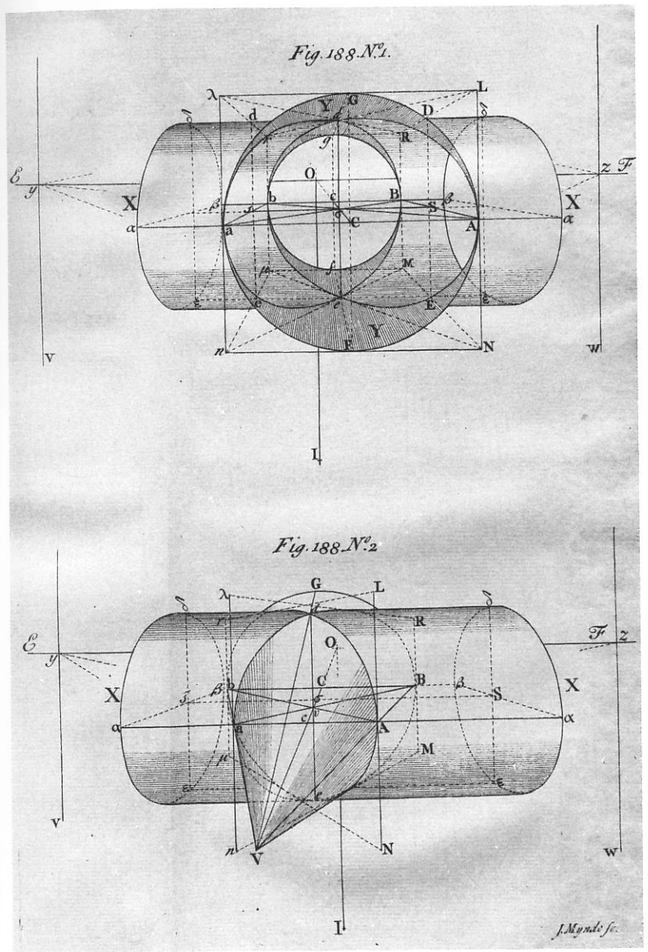
Taylor also deals with the 'inverse problem', that is to say the determination of the original properties of a set-up known only in projection. This concern is more mathematical than practical, and is typical of the theoretical tone of his work. Cast in the form of a geometrical treatise, with axioms, lemmas, theorems etc., his book would have been forbidding for contemporary artists. It is not surprising to find John Bernouilli condeming it as abstruse and unintelligible for painters.[228] What is remarkable is that such a 'difficult' book should have become the foundation for artistic perspective in Britain for two centuries. This success was probably not so much a result of the book being widely read in itself—though it did run to five editions—but rather due to the dozens of books by followers which aspired to translate the principles of Brook Taylor into a practice intelligible to artists. Such a translation was more or less openly invited by Taylor himself. In the century following its first appearance, there were at least eight publications which declared in their titles that they intended to present 'easy' or 'practical' versions of Taylor's revered method.[229] To this list must be added the many treatises which were openly or covertly dependent on Taylor's principles.

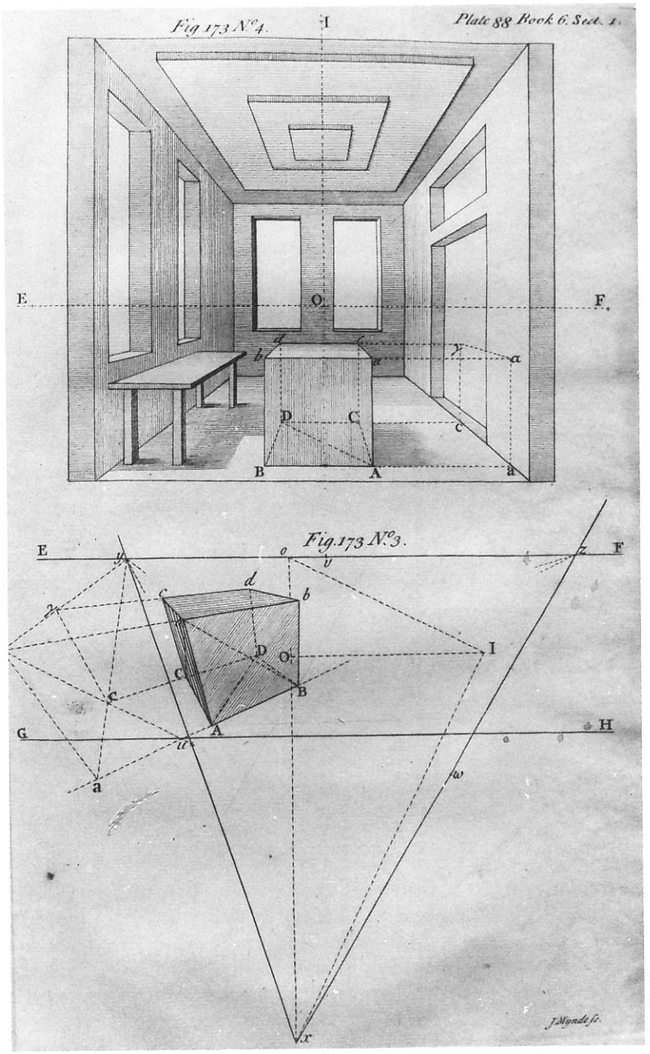
Taylor's book also played an important role in the continuing strand of projective geometry which runs from Desargues to Poncelet in the nineteenth century. The most substantial



292. Studies of conic sections, from John Hamilton's *Stereography or a Compleat Body of Perspective*, London, 1738.

293. Studies of the planes of intersection of curved forms, from Hamilton's *Stereography*.





294. Demonstration of perspective projection of an interior and inclined cube from Hamilton's *Stereography*.

mathematical adoption and amplification of his ideas occurred in John Hamilton's *Stereography or a Compleat Body of Perspective* in 1738.[230] This is a mammoth book of 400 pages which elaborates a wide range of mathematical procedures. He points out that the painter should be concerned to cultivate the knowing 'art of seeing' rather than relying upon the superficial 'sense of seeing', and he therefore emphasises that even the most practised hand and eye can 'do nothing perfectly well' without the guidance of stereography.[231] However, for the most part Hamilton deals with mathematical issues which move considerably beyond the painter's ken. The statement in his preface that 'Stereography . . . appears to have a much

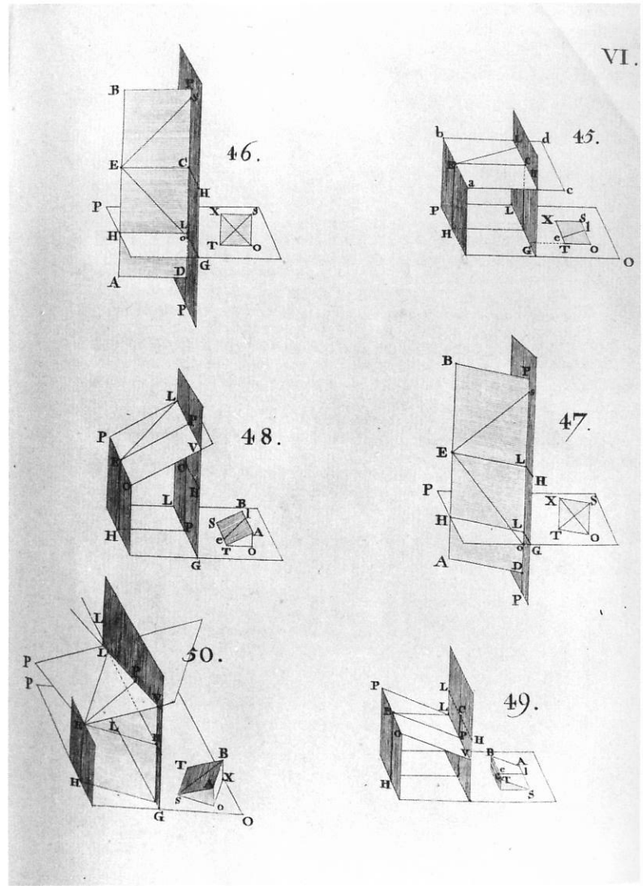
295. William Hogarth, *Perspectival Absurdities*, from J. Kirby's, *Dr. Brook Taylor's Method of Perspective Made Easy in both Theory and Practice*, Ipswich, 1754.

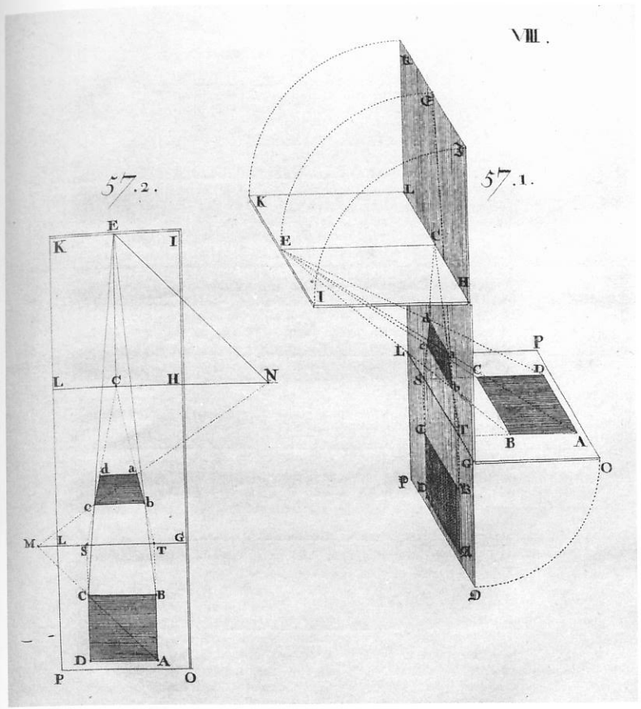
nearer affinity to Conic Sections than has hitherto been observed' gives a good indication of what is to follow (pl. 292). The writers whom he most admires are the mathematicians Brook Taylor and Philippe de la Hire, the latter of whom we will meet again in Chapter V. His discussions of the conditions under which the image of a circle appears as an ellipse, a parabola and a hyperbola, and his description of the transformation of one conic section into another, declare his allegiance to the Guidobaldo-Desargues-La Hire sucession. An accurate flavour of his approach is provided by his skilful treatment of projection onto two or more inclined planes and his studies of the planes of intersection of curved bodies (pl. 293). Such mathematical concerns in the works of Taylor and Hamilton lead discernibly towards the projective geometry of Lambert in Germany and the descriptive geometry of Monge in France.

Hamilton's concessions to painter's practice (pl. 294) do little to alleviate the daunting character of his book. Turner was acquainted with it and may have grappled with its complexities in his own rugged manner, but most artists would have naturally turned to the other kind of treatise in the Taylor succession, namely those aimed at artists within the new institutional frameworks of the academies. Of the half-a-dozen authors who wrote works in this category, Joshua Kirby and Thomas Malton provided the most respected and widely used sources of instruction and illustration.

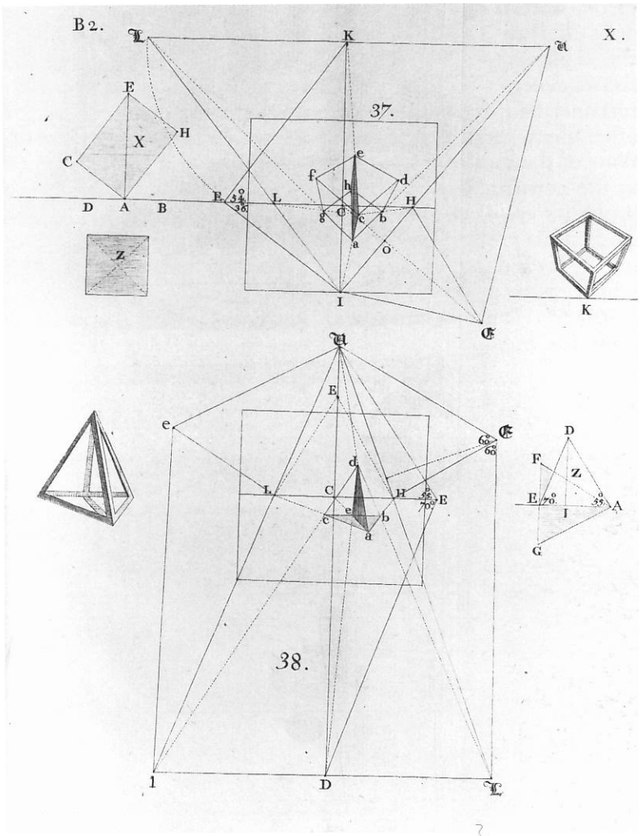
With Joshua Kirby, British perspective reaches full maturity. A topographical artist of decent if not outstanding talent, he was well connected with many of the leading painters of his day, including his fellow East Anglian, Thomas Gainsborough, and the founding genius of the British school, William Hogarth, whose ingenious satire on absurdities occasioned by ignorance of perspective provided the frontispiece for Kirby's treatise in 1754 (pl. 295).[232] Hogarth was the dedicatee of the first part of Kirby's *Dr. Brook Taylor's Method of Perspective Made easy both in Theory and Practice*, while the second part is dedicated to the 'Academy of Painting, Sculpture and Architecture in London', that is to say the St. Martin's Lane Academy, which had developed out of Hogarth's promotional activities.[233] Kirby taught perspective at the Academy, and, as the first professional teacher of the subject in

296. Demonstration of vanishing points in flat and inclined planes, from John Joshua Kirby's *Dr. Brook Taylor's Method of Perspective Made Easy*, Ipswich, 1754.



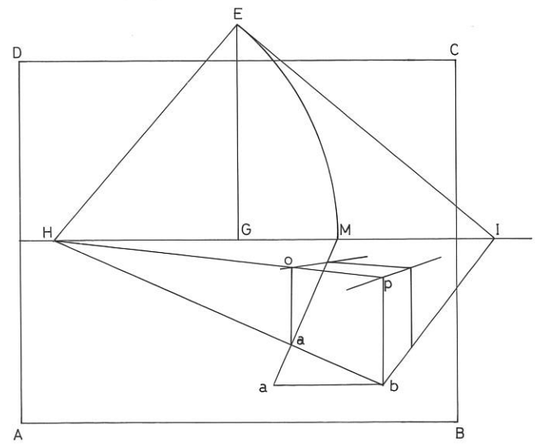


297. Demonstration of the folding of the viewing plane and subject plane into the picture plane, from Kirby's *Dr. Brook Taylor's Method*.



299. Perspective projection of hollow figures from Kirby's *The Practice of Perspective*.

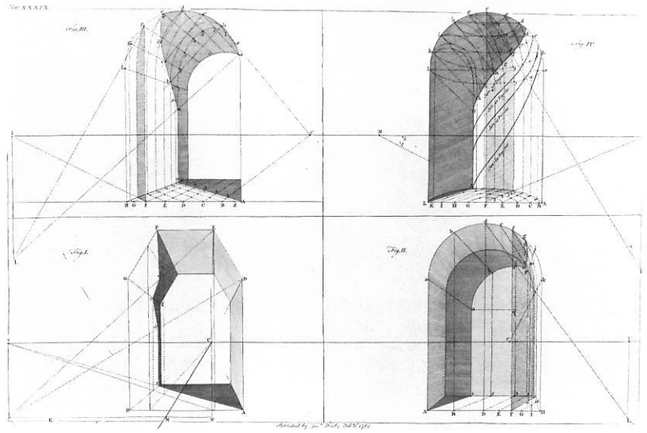
298. Demonstration of the 'measure point' method, based on Kirby's *The Practice of Perspective, being the Second Part of Dr. Brook Taylor's Method of Perspective Made Easy*, Ipswich, 1755.



Britain, provided the future George III with instruction in the rudiments of the art.

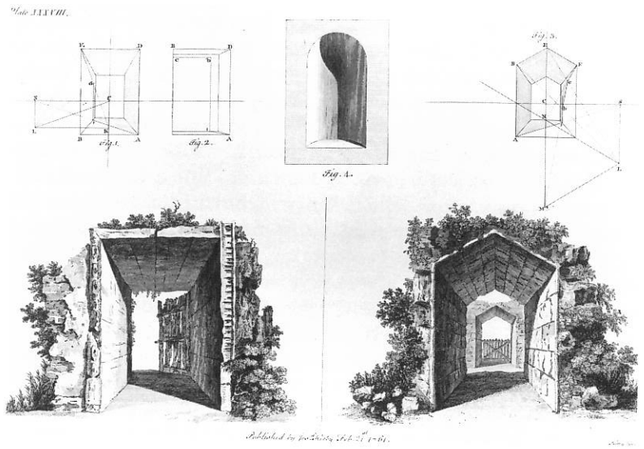
His treatises show a natural talent for geometry, and it is clear that he learnt a good deal from Hamilton as well as Taylor, although he confesses that Hamilton's work can be comprehended by 'very few of those Persons who are Students in the Arts and Design'.[234] He provides a useful anthology of the latest British opinions on optical questions, including the mechanism of the eye. His primary source was Robert Smith's *A Compleat System of Optics* (1738), a book of considerable importance which we will have cause to quote in Chapter V. He also showed himself to be alert to the latest debates on problems of perception, and, as a result, steered a middle course between absolute obedience to rule and reliance upon 'our common Judgement and Estimation of the Appearance of objects from Custom and Experience'.[235] In spite of these introductory qualifications, the instructions which comprise the bulk of his three treatises are founded securely on the mathematics of projection. He makes a thoroughly good job of easing the reader into a consideration of Taylor's ideas in

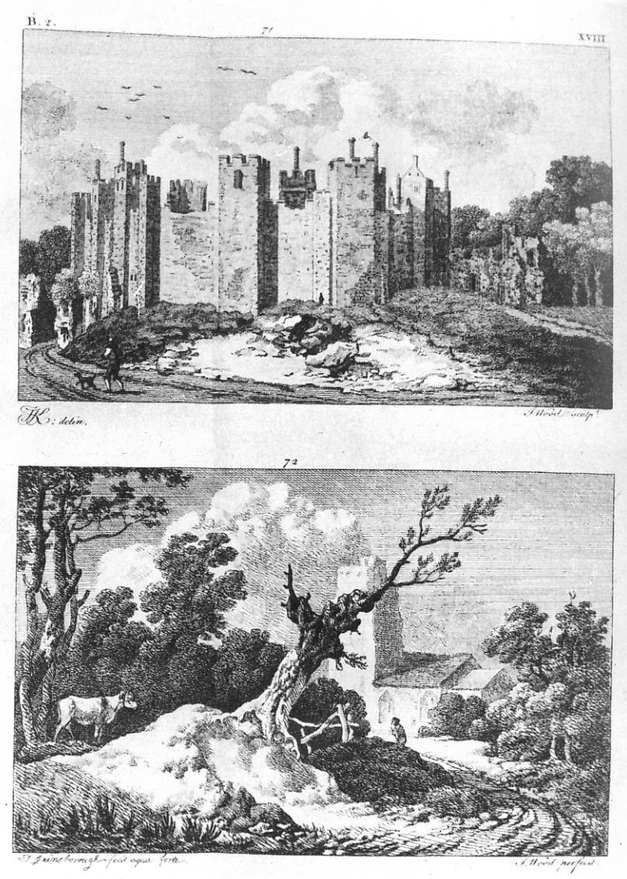
theory and in practice, providing lucid analyses and illustrations of such Taylorian questions as vanishing points in inclined planes (pl. 296). Those diagrams in which he shows the consequences of folding the planes into one another (pl. 297) certainly help the reader to interpret the flat geometry of his other demonstrations. He also provides important elaborations of the measure point method, showing it can be applied to the construction of various forms (pl. 298). Many of the problems are of an uncompromisingly geometrical nature, including his projection of a hollow box standing on one corner (pl. 299), and his studies of cast shadows in niches (pl. 300) which were published in his *The Perspective of Architecture* (1761).[236] However, he always keeps an eye on the implications for pictorial practice, providing some nice exemplars



300. Geometrical demonstration of the shadows in niches from Kirby's *The Perspective of Architecture*, London, 1761.

301. Studies of shadows and perspective from Kirby's *The Perspective of Architecture*, Ipswich, 1761.



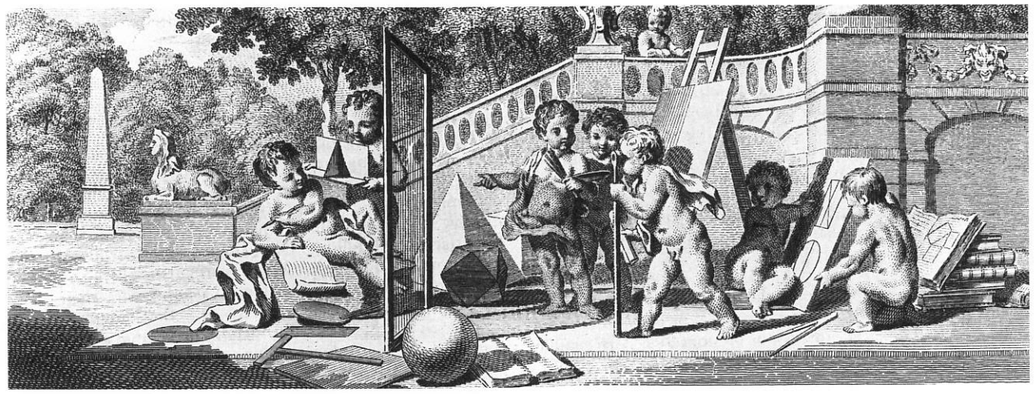


302. Joshua Kirby, *Castle* and Thomas Gainsborough, *Landscape*, from *Dr. Brook Taylor's Method*.

(pl. 301), and illustrating topographical works of art by Gainsborough and himself (pl. 302).

When the academic movement in England reached its climax with the establishment of the Royal Academy in 1768, it is not surprising that the founders followed European precedent by making specific provision for the teaching of perspective.[237] The first Professor of Perspective was Samuel Wale, who had provided a charming vignette for the first chapter of Kirby's 1761 treatise (pl. 303).[238] Wale had been a vigorous advocate of the need for an official Academy, publishing *An Essay on Design including proposals for the erecting of a Public Academy* in 1749. As early as the 1740s, he had acquired a good working knowledge of perspective design, as is shown by the roundel in the manner of Canaletto which he painted in 1748 for the Foundling Hospital and by his architectural illustrations (pl. 304).[239]

The first really substantial treatise on perspective produced within the environment of the new Academy was Thomas

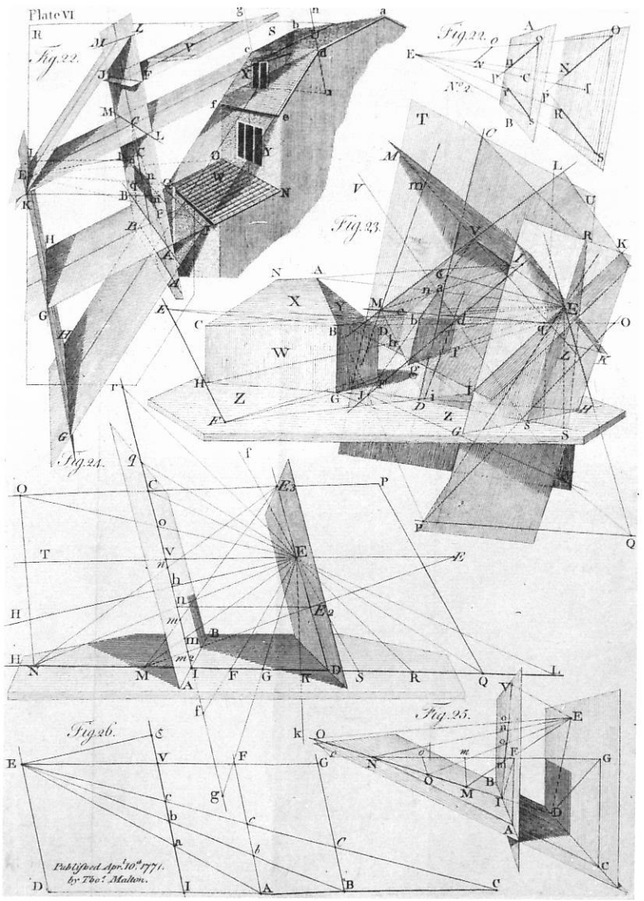


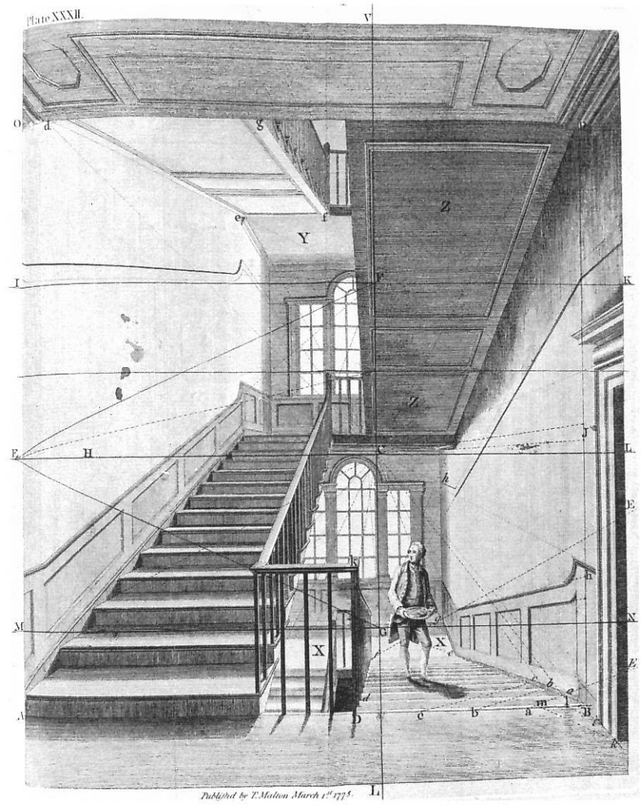
303. Samuel Wale, *Putti Engaged in the Study of Geometry and Perspective* from J. Kirby's, *The Perspective of Architecture*, London, 1761.

Malton's *A Compleat Treatise on Perspective in Theory and Practice on the True Principles of Brook Taylor* (1779), the subscription list of which reads like a 'Who's Who' of British art.[240] In some ways, Malton's writings are curious in tone. He was undoubtedly widely read in the subject, and possessed a real measure of geometrical understanding, providing ingenious demonstrations with folding flaps and strings, but he treats opinions which run counter to his devotion to the rules of perspective with a form of dismissive bluster which works against the kind of balanced discussion promoted by Kirby.[241] However, as a handbook to perspectival geometry, his trea-

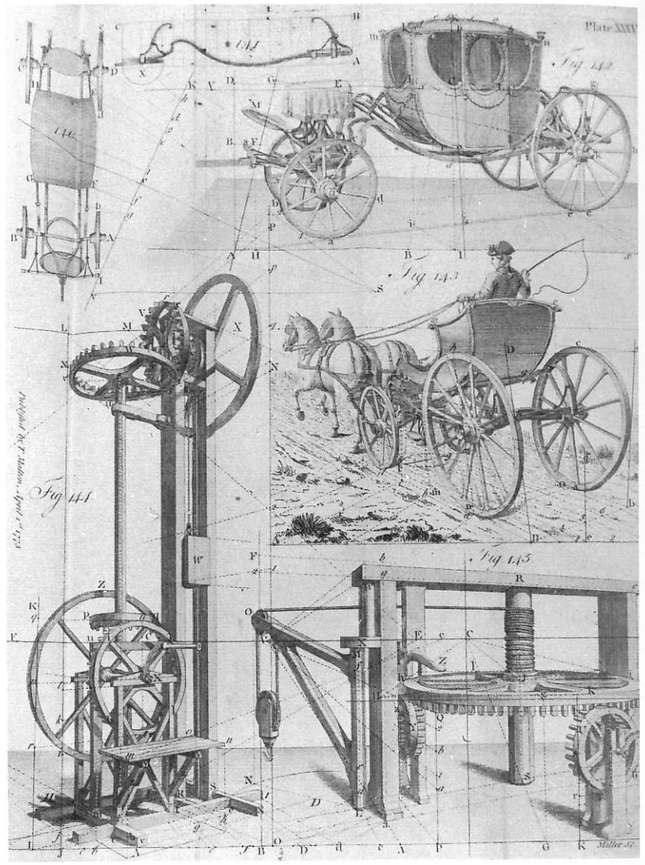
304. Samuel Wale, *St. Stephen Walbrook by Sir Christopher Wren*, engraved by J. Miller, 1746.

305. Study of vanishing plains in roofs etc., from Thomas Malton's *A Compleat Treatise on Perspective* . . . , London, 1779.



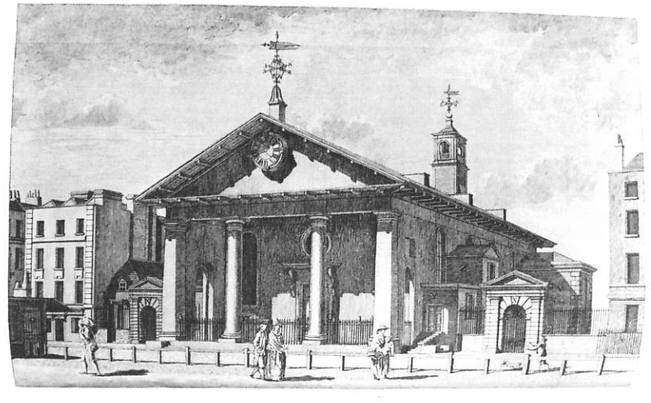


306. Perspectival study of a staircase, from Malton's *A Compleat Treatise*.



308. Carriages and mechanical devices, from Malton's *A Compleat Treatise*.

307. *St. Paul's, Covent Garden*, from Malton's *A Compleat Treatise*.



tise fulfills its function more than adequately, and he provides some startlingly brilliant illustrations of lines, planes and bodies in space, as applied to the depiction of actual objects (pl. 305). His own measured skill as an architectural draughtsman stands him in good stead when he comes to provide examples of the portrayal of complex spaces (pl. 306) and of the depiction of actual buildings with the fall of shadows properly calculated (pl. 307). He also provides clear demonstrations of the value of perspectival draughtsmanship to those working in the fields of applied design and engineering (pl. 308), contexts which were to provide the setting for an increasing number of handbooks on systems of technical illustration.

All this body of theorising certainly had an effect on the practice of art at the Academy, above all on the genre of topographical illustration, and most particularly on the portrayal of townscapes and historical buildings in the wake of Canaletto. The levels of skill achieved by English draughtsmen can be vividly illustrated by the *Studies for a Bridge of Magnificence at Somerset House* (pl. 309), a project illustrated at the Academy in 1781 by the Professor of Architecture, Thomas Sandby, whose brother, Paul, was also a leading illustrator of

309. Thomas Sandby, *Studies for a Bridge of Magnificence at Somerset House*, 1781, showing the vista across the centre of the bridge, at right angles to its main axis, Windsor, Royal Library.

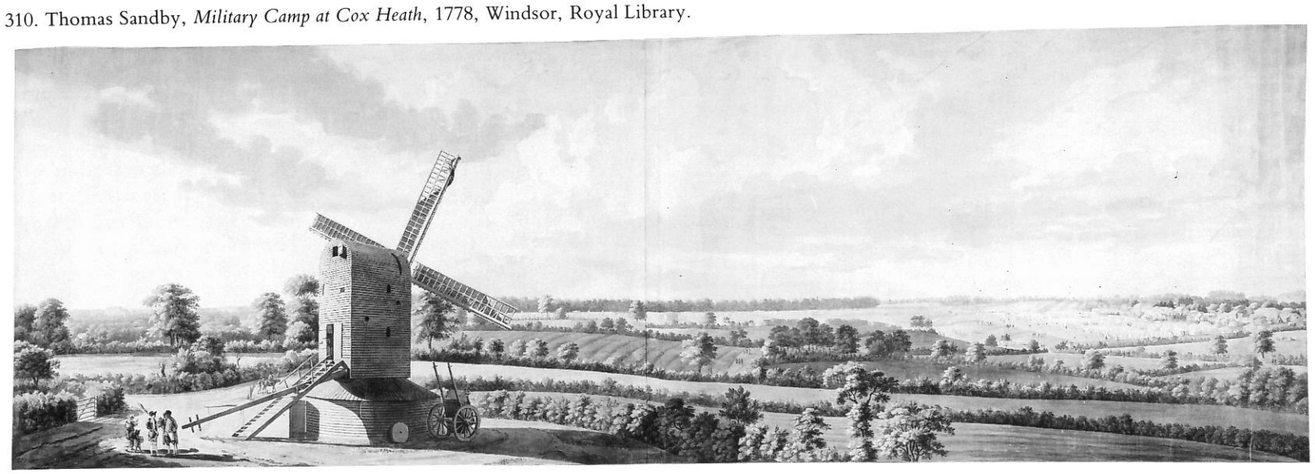
architectural views.[242] Thomas's grasp of shadow projection on curved surfaces is illustrated by the windmill in his fine panorama of the *Military Camp at Cox Heath* in 1778 (pl. 310).

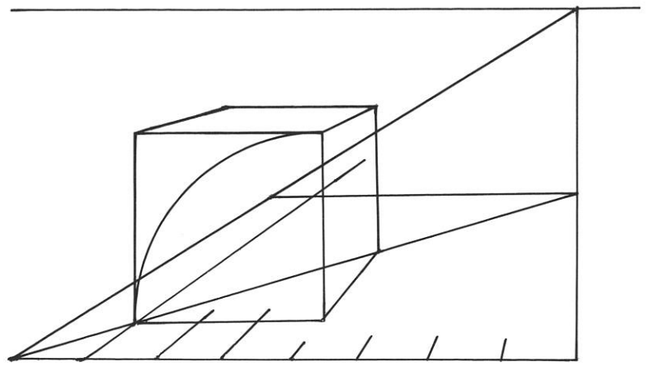
Such artists provided the environment in which the precociously talented Turner grew to maturity as a topographical watercolourist. We know that Turner later consulted a wide range of perspective books, in preparation for his lectures at the Royal Academy.[243] His first direct encounter with a practitioner of the science of art was probably during his early tuition by Thomas Malton the Younger, whose brother, James, joined the family tradition by composing *The Young Painter's Maulstick, being a Practical Treatise on Perspective containing the Rules and Principles for the Delineation of Planes* (1800). James claimed to be uniting the rules of Vignola and Sirigatti 'with the theoretic principles of the celebrated Dr. Brook Taylor'.[244] The close attention he pays to the earlier Italian sources, Sirigatti in particular, helps confirm how amenable the geometricising tastes of the Renaissance theorists proved to be in the context of late eighteenth-century Britain. Although Thomas is reputed to have despaired of teaching perspective to Turner, there is no reason to doubt that the young painter's perspectival interests were well fired by his contacts at an early stage of his career.

The post of Professor of Perspective did not prove to be an easy one to fill. Edward Edwards, a friend of the Sandbys, was employed to teach pespective in succession to Wale, and published his own version of Taylor's principles, but he could not become the Professor since he was not a full Academician.[245] By the early nineteenth century, no instruction had been provided for more than a dozen years. In 1806 the Council of the Academy decided that it was time to re-establish instruction on a proper basis. Given the dearth of willing and suitably qualified candidates, Turner himself put his name forward with a show of reluctance, and he was duly elected as Professor of Perspective in 1807.[246]

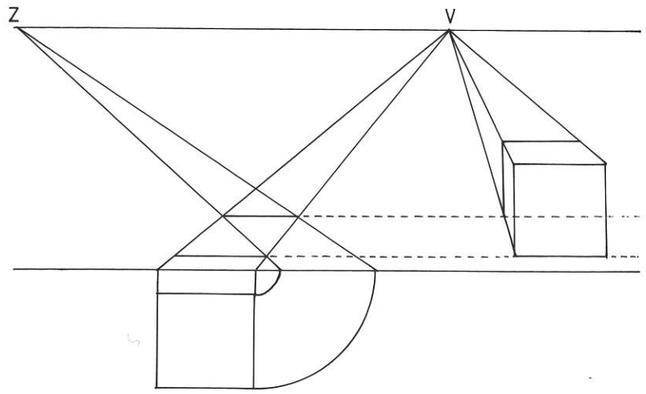
His statutory obligation as Professor was to deliver six annual lectures. He appears to have worked hard in preparing his lectures, feeling a real sense of responsibility to his beloved Academy, but felt it necessary to make a series of postponements. He finally began his first course on Monday 7 January 1811. During the next seventeen years he gave a further twelve series of lectures. Turner was not a systematic thinker, nor, by most accounts, a lucid lecturer. His erratic pronunciation,

310. Thomas Sandby, *Military Camp at Cox Heath*, 1778, Windsor, Royal Library.



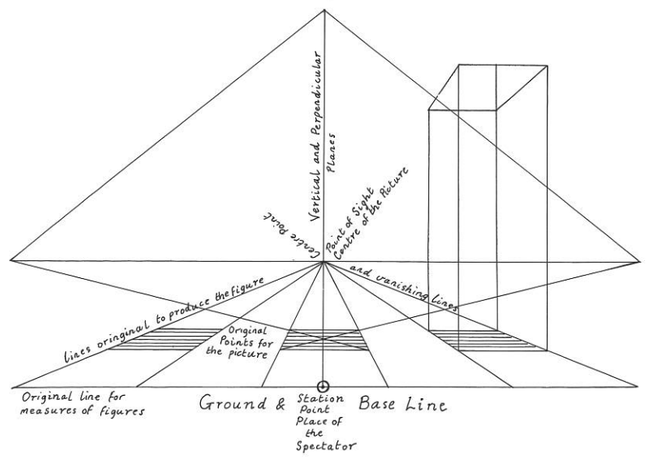


311. The perspective method of 'Vredeman Friese 1619', according to J.M.W. Turner.



312. The perspective by 'The Jesuit Method', according to Turner.
V—'Vanishing Point' Z—'Distance Point'

313. The perspective method of Brook Taylor according to Turner (labelled to correspond to Turner's annotations).



mumbling delivery and fragmented arguments rapidly discouraged many members of his audience, and the later lectures seem to have become something of a charade, with only one or two people—including Turner's faithful father—bothering to attend on a regular basis. He was criticised for departing from his brief by his inclusion of a wide range of visual topics, including colour, which stood outside the field of perspective proper.[247] However, he did try to establish an orderly syllabus of the expected kind, as his surviving notes testify:

1. INTRODUCTION—its main origin, use and how connected with Anatomy, Painting, Architecture and Sculpture. Elements of Parallel, Angular, Aerial perspective. I shall show how an original subject appears on the plane of the picture with geometrical definitions necessary to be known and practiced.
2. VISION—Subdivision of the elements and terms of perspective necessary to be understood. Parallel perspective, the cube by the Old Masters.
3. ANGULAR PERSPECTIVE—Circles, colour.
4. AERIAL PERSPECTIVE—Light, shade and colour.
5. REFLEXIES—Reflections and colour. Shadow of the sun and moon, and artificial lights and reflection from still water or mirror.
6. BUILDINGS—Introduction of Architecture and Landscape. Application of rules of Perspective to the different parts of architecture, the examples here produced show their necessity to Painters as well as Architects.[248]

The range of topics he discussed under these headings are essentially the same as those found in the standard treatises, albeit with some eccentricities in terminology. Like many of his predecessors, he attempted to provide some basic instruction in the fundamentals of pure geometry through a discussion of Euclid's *Elements*.[249] It may be worth noting that Malton himself had published a popularising book of mathematics, *The Royal Road to Geometry* in 1774. Turner also reviewed and provided illustrations of famous earlier methods. Some of these, such as the techniques he credits to 'Peter John a Priest' in 1505 (i.e. Jean Pélerin!) and 'Vredeman Friese 1619' (pl. 311), were known second hand, mainly through the historical review provided by Kirby, while others were consulted in the original.[250] His pithy comments, such as that on the 'Jesuit Method' by Dubreuil or Lamy—'like Vredeman's but we have not the number of moves on his drafts table' (pl. 312)—show a lively appreciation of the characters of the works, though he did not in every instance make full sense of all the technical procedures.[251] The up-to-date methods recommended by Turner are drawn from the Brook Taylor succession (pl. 313), particularly Kirby and Malton.

Turner achieved a considerable if not infallible understanding of the techniques and endeavoured to provide working definitions of the necessary terms e.g. 'the *Vanishing Plane* is a supposed plane, passing from the Eye Parallel of the original one'.[252] A report of one of the 1815 series suggests that not all the members of his audience missed the point of his basic definitions:

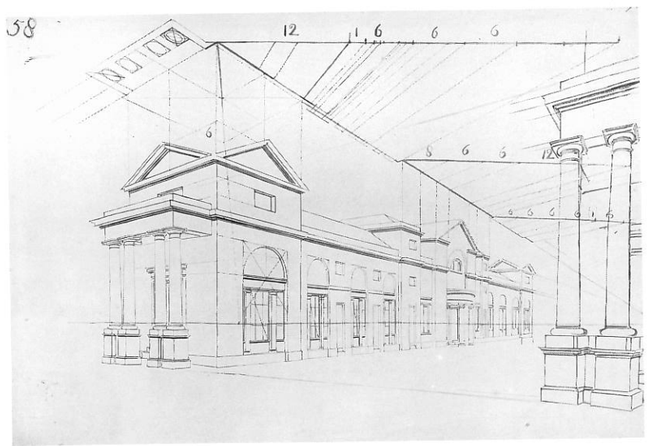
> Mr. Turner thought it necessary to explain some of the principal elementary terms, such as the original plane or ground plan, that on which the spectator is to stand; the original line, that is the intersection of the original plane with the picture; the point of sight which in parallel perspective ought to be the centre of the picture, and the station point and the vanishing lines.[253]

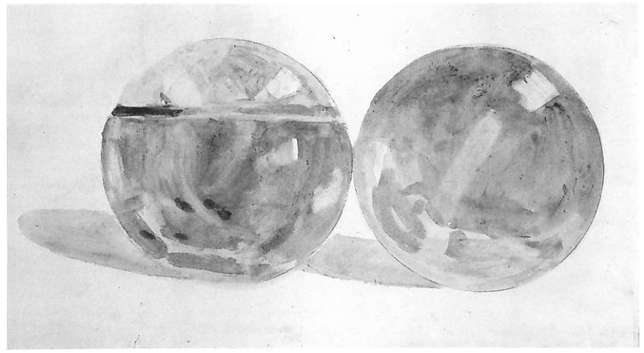
One of the most attractive features of his lectures, and one which did much to repay those patient enough to sit through them, were the drawings which he used to demonstrate his points. In keeping with the treatises of Kirby and Malton, these included elaborate demonstrations of the perspective rendering of actual buildings (pl. 314). The illustrated example shows the use of a measure point in the Malton manner to plot the dimensions (recorded on the horizontal lines) on to the oblique planes of the building, according to the rules of 'angular perspective', upon which he placed special emphasis.

Turner also attempted, in his unsystematic yet original way, to deal with the optical complications which worked against the integrity of geometrical perspective. He certainly discussed at some length the vexed question of the apparent bending and convergence of the horizontal and vertical edges of large buildings when viewed under a wide angle, though he apparently stopped short of devising and implementing a fully-fledged alternative to the orthodox system.[254] He was also worried by a number of the other problems with the orthodox method, such as the distortion of square and circular forms at the lateral edges of a wide-angle view and the way in which laterally placed columns apparently subtend a wider angle than more central columns located along the same line parallel to the picture surface.

In addition to such conundrums of geometrical perspective, he devoted a fair amount of time to the beguilingly complex effects of reflection and refraction, devising innovatory demonstrations with water-filled spheres which he represented

314. J.M.W. Turner, *Perspective Demonstration of Pulteney Bridge, Bath*, *c.*1815, London, British Museum, Turner Bequest CXCV 113.





315. J.M.W. Turner, *Studies of Reflection and Refraction in Glass Spheres containing Water*, *c.*1815, London, British Museum, Turner Bequest, CXCV 117C.

in huge watercolours (pl. 315). The effects of colour naturally attracted his attention—more so than was strictly justified for perspectival purposes—as we shall see in Chapter VII.

The general thrust of Turner's analyses is to acknowledge the importance of geometrical understanding while insisting that the painter's eye should remain supreme when the implementation of geometry alone results in forms that look 'wrong'. His willingness to override the rules of perspective is entirely consistent with his general attitude to 'rule' and 'science'. He had no patience whatsoever with 'restrictive rule', but he was fascinated by the way in which science revealed the awesome powers of nature. Light, for Turner, was a dynamic force, and its scientific study enhanced rather than diminished its emotional potency. The exciting juxtapositions of scale occasioned by long perspective vistas, and the plunging force of strongly-characterised spaces were powerful weapons in his visual armoury. A fine example is provided by the pair of paintings looking in either direction along the terrace at Mortlake on the Thames (pls. 316–17)[255]. Making obvious reference to Canaletto's views from Somerset House (pls. 279–81), he has combined a particularly rhythmic use of perspective with his own special vibrancy of light and shade which both amplifies and competes with the linear effects. There is more than a hint of the curving of the horizontal lines under the wide-angle views—an effect which becomes pronounced when the same kind of orbital description is accomplished within a single painting (pl. 318).[256] The radiating spokes of the perspective scheme in this latter picture—to which we will return—are defined by the cast shadows and by the stream of excited dogs who rush out to greet their master with a respect for perspectival regularity worthy of Uccello's orthogonal animals.

More often than not, we may feel that Turner uses perspective to suggest the infinite vastness of space, rather than its enclosed, Euclidian, box-like quality. The awesome sense of the sublime infinity of space had been evoked regularly by the early Romantic poets who did so much to nourish his imagination. A passage from Akenside quoted in his lectures

316. J.M.W. Turner, *Mortlake Terrace, Early Summer's Morning*, 1827, New York, Frick Collection.

317. J.M.W. Turner, *Mortlake Terrace, Summer's Evening*, *c.*1827, Washington, National Gallery.

318. J.M.W. Turner, *Petworth Park, Tillington Church in the Distance*, *c.*1828, London, Tate Gallery.

gives a perfect flavour of the way the Romantics exulted in the Newtonian vastness of space:

> The various forms which this full world presents
> Like rivals to his choice, what human breast
> E'er doubts, before the transient and minute,
> To prize the vast, the stable, the sublime.[257]

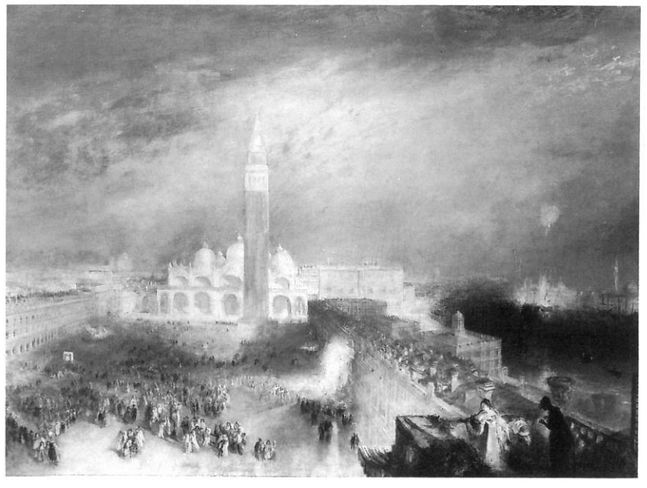
Or, as Turner said in his own words when discussing Euclidian geometry: 'each point, one line, is out of the many in the Building of Nature, a building too collossal for the intellectual capacity, its height to measure or its depth to fathom—the Universe and Infinitude'.[258] All this is much in the spirit of Milton: 'Beyond is all abyss, Eternity whose end no eye can reach.'[259]

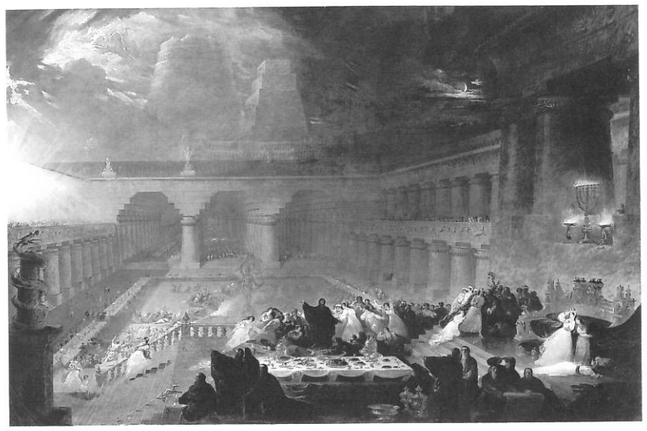
Turner was certainly much in tune with those aspects of British Romanticism that regarded Newtonian science as a source of rapture rather than as a demystification of the powers of nature. One of the more improbable expressions of this sentiment occurred in the *British Manufacturer's Companion and Callico Printer's Assistant* by C. O'Brien:

> for, while philosophy on one hand, bursting through all the elementary barriers of nature, pursues her to her inmost recesses and analyses those objects, whose minuteness confounds the imagination, and which are only perceptible by their effects; on the other hand; it not only adds new orbs to our solar system, but darts into the immeasurable expanse and scrutinises objects that as equally confound by their magnitude, and the spaces they possess; in short, it can be said, it exposes immensity itself, gages the very Empyreum, and exhibits its construction!!![260]

When we look at Turner's most perspectively assertive compositions, such as *Juliet and her Nurse* (pl. 319), we may feel that the perspective does not so much enclose a defined space as suggest that it is an expansive fragment of infinitude.[261] It is, as Gowing has written, one of Turner's 'visions of the world as an endless continuum' which is 'appropriately peopled with an almost indeterminate human clay, barely separated into individuals'.[262]

319. J.M.W. Turner, *Juliet and her Nurse*, 1836, Argentina, Collection of Sra. Amalia Lacroze Fortabat.





320. John Martin, *Belshazzar's Feast*, 1820, New Haven, Yale Center for British Art.

It is at this stage in the history of art that the new visions of infinite space formulated in the Scientific Revolution and the perspectival formula of parallel lines meeting at infinity move into expressive union in the context of painting. Much as we might like it not to be so, the visions of space in science and art are some two hundred years out of step.

The vision of infinite space conjured into optical reality by the exploitation of perspective on scales of implied vastness is even more literally expressed at this time in the cacophonous narratives of John Martin (pl. 320).[263] Given his scientific contacts and his propensity for scientific speculation on his own account, Martin provides a kind of caricature of one aspect of Turner's genius. His unambiguous spatial message was certainly not missed by contemporary observers, such as Bulwer-Lytton: 'vastness is his sphere, yet he has not lost or circumfused his genius in its space; he has and wielded and measured it at will; he has translated its character into narrow limits; he has compassed the infinite itself with mathematical precision'.[264]

So spectacular was Martin's use of perspective that it won praise in one of the specialist perspectival treatises. A.W. Hakewill, in his introduction in 1836 to an English treatise based on Thenot's French handbook, believed that the painter had raised perspective to the supremely expressive power previously reserved for the figurative expression of passion in history paintings:

> Throughout his extraordinary performances, the magic of linear and aerial perspective is substituted for that great level of our sympathies, the portrayal of passion and sentiment . . . The mysterious and electrifying suggestions of boundless space and countless multitudes which their wonder-working elements shadow forth, captivate the fancy, by entangling it in a maze of unearthly conceptions —the result chiefly of a copious and intelligent display of the resources of perspective, and without the aid of any of the higher attributes of art.[265]

This kind of painting is at once perspectival and anti-rational. It uses the inherent dynamism of perspective to suggest that there are cosmic and mental factors which lie infinitely far beyond the circumscribed techniques of orthodox perspective. The stage-like boxes of tangible space which had been the perspectivists' goal for centuries have effectively lost their containing walls, floor and roof. The paintings of Turner and Martin are at once the climax of the story we have been telling and potent manifestations of intellectual and aesthetic factors that weakened the foundations of the neat edifice constructed by generations of perspectivists. These factors are to be discussed in Chapter V.