THE THEORY AND PRACTICE OF PERSPECTIVE

{ILLUSTRATED & COMPLETE & DETAILED}

By

George. A. Storey

"TEACHER OF PERSPECTIVE AT THE ROYAL ACADEMY"

Illustrated by Murat Ukray

ILLUSTRATED &

PUBLISHED BY

E-KİTAP PROJESİ & CHEAPEST BOOKS

www.cheapestboooks.com

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Istanbul

ISBN:

978-625-6235-89-2

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DEDICATED

TO

SIR EDWARD J. POYNTER

BARONET

PRESIDENT OF THE ROYAL ACADEMY

IN TOKEN OF FRIENDSHIP

AND REGARD

Preface

IT is much easier to understand and remember a thing when a reason is given for it, than when we are merely shown how to do it without being told why it is so done; for in the latter case, instead of being assisted by reason, our real help in all study, we have to rely upon memory or our power of imitation, and to do simply as we are told without thinking about it. The consequence is that at the very first difficulty we are left to flounder about in the dark, or to remain inactive till the master comes to our assistance.

Now in this book it is proposed to enlist the reasoning faculty from the very first: to let one problem grow out of another and to be dependent on the foregoing, as in geometry, and so to explain each thing we do that there shall be no doubt in the mind as to the correctness of the proceeding. The student will thus gain the power of finding out any new problem for himself, and will therefore acquire a true knowledge of perspective.

George Adolphus Storey

Book First

The Necessity of the Study of Perspective to Painters, Sculptors, and Architects

LEONARDO DA VINCI tells us in his celebrated Treatise on Painting that the young artist should first of all learn perspective, that is to say, he should first of all learn that he has to depict on a flat surface objects which are in relief or distant one from the other; for this is the simple art of painting. Objects appear smaller at a distance than near to us, so by drawing them thus we give depth to our canvas. The outline of a ball is a mere flat circle, but with proper shading we make it appear round, and this is the perspective of light and shade.

'The next thing to be considered is the effect of the atmosphere and light. If two figures are in the same coloured dress, and are standing one behind the other, then they should be of slightly different tone, so as to separate them. And in like manner, according to the distance of the mountains in a landscape and the greater or less density of the air, so do we depict space between them, not only making them smaller in outline, but less distinct.'[1]

Sir Edwin Landseer used to say that in looking at a figure in a picture he liked to feel that he could walk round it, and this exactly expresses the impression that the true art of painting should make upon the spectator.

There is another observation of Leonardo's that it is well I should here transcribe; he says: 'Many are desirous of learning to draw, and are very fond of it, who are notwithstanding void of a proper disposition for it. This may be known by their want of perseverance; like boys who draw everything in a hurry, never finishing or shadowing.' This shows they do not care for their work, and all instruction is thrown away upon them. At the present time there is too much of this 'everything in a hurry', and beginning in this way leads only to failure and disappointment. These observations apply equally to perspective as to drawing and painting.

Unfortunately, this study is too often neglected by our painters, some of them even complacently confessing their ignorance of it; while the ordinary student either turns from it with distaste, or only endures going through it with a view to passing an examination, little thinking of what value it will be to him in working out his pictures. Whether the manner of teaching perspective is the cause of this dislike for it, I cannot say; but

certainly most of our English books on the subject are anything but attractive.

All the great masters of painting have also been masters of perspective, for they knew that without it, it would be impossible to carry out their grand compositions. In many cases they were even inspired by it in choosing their subjects. When one looks at those sunny interiors, those corridors and courtyards by De Hooghe, with their figures far off and near, one feels that their charm consists greatly in their perspective, as well as in their light and tone and colour. Or if we study those Venetian masterpieces by Paul Veronese, Titian, Tintoretto, and others, we become convinced that it was through their knowledge of perspective that they gave such space and grandeur to their canvases.

I need not name all the great artists who have shown their interest and delight in this study, both by writing about it and practising it, such as Albert Dürer and others, but I cannot leave out our own Turner, who was one of the greatest masters in this respect that ever lived; though in his case we can only judge of the results of his knowledge as shown in his pictures, for although he was Professor of Perspective at the Royal Academy in 1807—over a hundred years ago—and took great pains with the diagrams he prepared to illustrate his lectures, they seemed to the students to be full of confusion and obscurity; nor am I aware that any record of them remains, although they must have contained some valuable teaching, had their author possessed the art of conveying it.

However, we are here chiefly concerned with the necessity of this study, and of the necessity of starting our work with it.

Before undertaking a large composition of figures, such as the 'Wedding-feast at Cana', by Paul Veronese, or 'The School of Athens', by Raphael, the artist should set out his floors, his walls, his colonnades, his balconies, his steps, &c., so that he may know where to place his personages, and to measure their different sizes according to their distances; indeed, he must make his stage and his scenery before he introduces his actors. He can then proceed with his composition, arrange his groups and the accessories with ease, and above all with correctness. But I have noticed that some of our cleverest painters will arrange their figures to please the eye, and when fairly advanced with their work will call in an expert, to (as they call it) put in their perspective for them, but as it does not form part of their original composition, it involves all sorts of difficulties and vexatious alterings and rubbings out, and even then is not always satisfactory. For the expert may not be an artist, nor in sympathy with the picture,

hence there will be a want of unity in it; whereas the whole thing, to be in harmony, should be the conception of one mind, and the perspective as much a part of the composition as the figures.

If a ceiling has to be painted with figures floating or flying in the air, or sitting high above us, then our perspective must take a different form, and the point of sight will be above our heads instead of on the horizon; nor can these difficulties be overcome without an adequate knowledge of the science, which will enable us to work out for ourselves any new problems of this kind that we may have to solve.

Then again, with a view to giving different effects or impressions in this decorative work, we must know where to place the horizon and the points of sight, for several of the latter are sometimes required when dealing with large surfaces such as the painting of walls, or stage scenery, or panoramas depicted on a cylindrical canvas and viewed from the centre thereof, where a fresh point of sight is required at every twelve or sixteen feet.

Without a true knowledge of perspective, none of these things can be done. The artist should study them in the great compositions of the masters, by analysing their pictures and seeing how and for what reasons they applied their knowledge. Rubens put low horizons to most of his large figure-subjects, as in 'The Descent from the Cross', which not only gave grandeur to his designs, but, seeing they were to be placed above the eye, gave a more natural appearance to his figures. The Venetians often put the horizon almost on a level with the base of the picture or edge of the frame, and sometimes even below it; as in 'The Family of Darius at the Feet of Alexander', by Paul Veronese, and 'The Origin of the "Via Lactea"', by Tintoretto, both in our National Gallery. But in order to do all these things, the artist in designing his work must have the knowledge of perspective at his fingers' ends, and only the details, which are often tedious, should he leave to an assistant to work out for him.

We must remember that the line of the horizon should be as nearly as possible on a level with the eye, as it is in nature; and yet one of the commonest mistakes in our exhibitions is the bad placing of this line. We see dozens of examples of it, where in full-length portraits and other large pictures intended to be seen from below, the horizon is placed high up in the canvas instead of low down; the consequence is that compositions so treated not only lose in grandeur and truth, but appear to be toppling over, or give the impression of smallness rather than bigness. Indeed, they look like small pictures enlarged, which is a very different thing from

a large design. So that, in order to see them properly, we should mount a ladder to get upon a level with their horizon line (see Fig. 66, double-page illustration).

We have here spoken in a general way of the importance of this study to painters, but we shall see that it is of almost equal importance to the sculptor and the architect.

A sculptor student at the Academy, who was making his drawings rather carelessly, asked me of what use perspective was to a sculptor. 'In the first place,' I said, 'to reason out apparently difficult problems, and to find how easy they become, will improve your mind; and in the second, if you have to do monumental work, it will teach you the exact size to make your figures according to the height they are to be placed, and also the boldness with which they should be treated to give them their full effect.' He at once acknowledged that I was right, proved himself an efficient pupil, and took much interest in his work.

I cannot help thinking that the reason our public monuments so often fail to impress us with any sense of grandeur is in a great measure owing to the neglect of the scientific study of perspective. As an illustration of what I mean, let the student look at a good engraving or photograph of the Arch of Constantine at Rome, or the Tombs of the Medici, by Michelangelo, in the sacristy of San Lorenzo at Florence. And then, for an example of a mistake in the placing of a colossal figure, let him turn to the Tomb of Julius II in San Pietro in Vinculis, Rome, and he will see that the figure of Moses, so grand in itself, not only loses much of its dignity by being placed on the ground instead of in the niche above it, but throws all the other figures out of proportion or harmony, and was quite contrary to Michelangelo's intention. Indeed, this tomb, which was to have been the finest thing of its kind ever done, was really the tragedy of the great sculptor's life.

The same remarks apply in a great measure to the architect as to the sculptor. The old builders knew the value of a knowledge of perspective, and, as in the case of Serlio, Vignola, and others, prefaced their treatises on architecture with chapters on geometry and perspective. For it showed them how to give proper proportions to their buildings and the details thereof; how to give height and importance both to the interior and exterior; also to give the right sizes of windows, doorways, columns, vaults, and other parts, and the various heights they should make their towers, walls, arches, roofs, and so forth. One of the most beautiful examples of the application of this knowledge to architecture is the Campanile of the

Cathedral, at Florence, built by Giotto and Taddeo Gaddi, who were painters as well as architects. Here it will be seen that the height of the windows is increased as they are placed higher up in the building, and the top windows or openings into the belfry are about six times the size of those in the lower story.

What Is Perspective?



FIG. 1

PERSPECTIVE is a subtle form of geometry; it represents figures and objects not as they are but as we see them in space, whereas geometry represents figures not as we see them but as they are. When we have a front view of a figure such as a square, its perspective and geometrical appearance is the same, and we see it as it really is, that is, with all its sides equal and all its angles right angles, the perspective only varying in size according to the distance we are from it; but if we place that square flat on the table and look at it sideways or at an angle, then we become conscious of certain changes in its form—the side farthest from us appears shorter than that near to us, and all the angles are different. Thus A(Fig. 2) is a geometrical square and B is the same square seen in perspective.

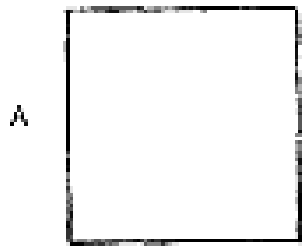


Fig. 2

The science of perspective gives the dimensions of objects seen in space as they appear to the eye of the spectator, just as a perfect tracing of those objects on a sheet of glass placed vertically between him and them would do; indeed its very name is derived from perspicere, to see through. But as no tracing done by hand could possibly be mathematically correct, the mathematician teaches us how by certain points and measurements we may yet give a perfect image of them. These images are called projections, but the artist calls them pictures. In this sketch Kis the vertical transparent plane or picture, O is a cube placed on one side of it. The young student is the spectator on the other side of it, the dotted lines drawn from the corners of the cube to the eye of the spectator are the visual rays, and the points on the transparent picture plane where these visual rays pass through it indicate the perspective position of those points on the picture. To find these points is the main object or duty of linear perspective.

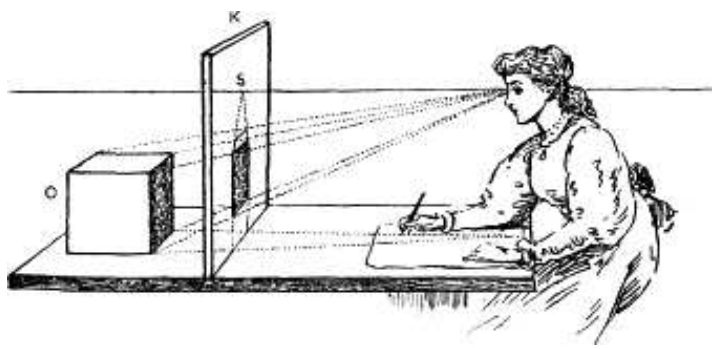


FIG. 3.

Perspective up to a certain point is a pure science, not depending upon the accidents of vision, but upon the exact laws of reasoning. Nor is it to be considered as only pertaining to the craft of the painter and draughtsman. It has an intimate connexion with our mental perceptions and with the ideas that are impressed upon the brain by the appearance of all that

surrounds us. If we saw everything as depicted by plane geometry, that is, as a map, we should have no difference of view, no variety of ideas, and we should live in a world of unbearable monotony; but as we see everything in perspective, which is infinite in its variety of aspect, our minds are subjected to countless phases of thought, making the world around us constantly interesting, so it is devised that we shall see the infinite wherever we turn, and marvel at it, and delight in it, although perhaps in many cases unconsciously.

In perspective, as in geometry, we deal with parallels, squares, triangles, cubes, circles, &c.; but in perspective the same figure takes an endless variety of forms, whereas in geometry it has but one. Here are three equal geometrical squares: they are all alike. Here are three equal perspective squares, but all varied in form; and the same figure changes in aspect as often as we view it from a different position. A walk round the dining-room table will exemplify this.

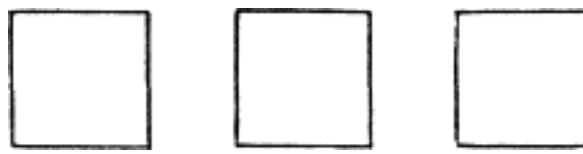


FIG. 4.

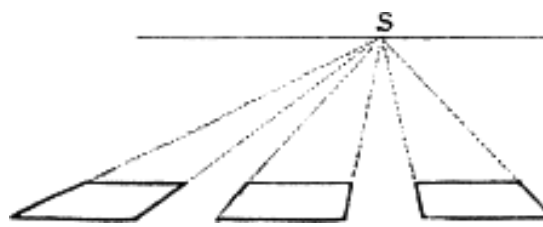


FIG. 5.

It is in proving that, notwithstanding this difference of appearance, the figures do represent the same form, that much of our work consists; and for those who care to exercise their reasoning powers it becomes not only a sure means of knowledge, but a study of the greatest interest.

Perspective is said to have been formed into a science about the fifteenth century. Among the names mentioned by the unknown but pleasant author of The Practice of Perspective, written by a Jesuit of Paris in the eighteenth century, we find Albert Dürer, who has left us some rules and principles in the fourth book of his Geometry; Jean Cousin, who has an

express treatise on the art wherein are many valuable things; also Vignola, who altered the plans of St. Peter's left by Michelangelo; Serlio, whose treatise is one of the best I have seen of these early writers; Du Cerceau, Serigati, Solomon de Cause, Marolois, Vredemont; Guidus Ubaldus, who first introduced foreshortening; the Sieur de Vaulizard, the Sieur Dufarges, Joshua Kirby, for whose Method of Perspective made Easy Hogarth drew the well-known frontispiece; and lastly, the above-namedPractice of Perspective by a Jesuit of Paris, which is very clear and excellent as far as it goes, and was the book used by Sir Joshua Reynolds.2

But nearly all these authors treat chiefly of parallel perspective, which they do with clearness and simplicity, and also mathematically, as shown in the short treatise in Latin by Christian Wolff, but they scarcely touch upon the more difficult problems of angular and oblique perspective. Of modern books, those to which I am most indebted are theTraité Pratique de Perspective of M. A. Cassagne (Paris, 1873), which is thoroughly artistic, and full of pictorial examples admirably done; and to M. Henriet's Cours Rational de Dessin. There are many other foreign books of excellence, notably M. Thibault's Perspective, and some German and Swiss books, and yet, notwithstanding this imposing array of authors, I venture to say that many new features and original problems are presented in this book, whilst the old ones are not neglected. As, for instance, How to draw figures at an angle without vanishing points (Fig. 162, &c.), a new method of angular perspective which dispenses with the cumbersome setting out usually adopted, and enables us to draw figures at any angle without vanishing lines, &c., and is almost, if not quite, as simple as parallel perspective (Fig. 150, &c.). How to measure distances by the square and diagonal, and to draw interiors thereby (Fig. 144). How to explain the theory of perspective by ocular demonstration, using a vertical sheet of glass with strings, placed on a drawing-board, which I have found of the greatest use (Fig. 29). Then again, I show how all our perspective can be done inside the picture; that we can measure any distance into the picture from a foot to a mile or twenty miles (Fig. 94); how we can draw the Great Pyramid, which stands on thirteen acres of ground, by putting it 1,600 feet off (Fig. 224), &c., &c. And while preserving the mathematical science, so that all our operations can be proved to be correct, my chief aim has been to make it easy of application to our work and consequently useful to the artist.

The Egyptians do not appear to have made any use of linear perspective. Perhaps it was considered out of character with their particular kind of decoration, which is to be looked upon as picture writing rather than

pictorial art; a table, for instance, would be represented like a ground-plan and the objects upon it in elevation or standing up. A row of chariots with their horses and drivers side by side were placed one over the other, and although the Egyptians had no doubt a reason for this kind of representation, for they were grand artists, it seems to us very primitive; and indeed quite young beginners who have never drawn from real objects have a tendency to do very much the same thing as this ancient people did, or even to emulate the mathematician and represent things not as they appear but as they are, and will make the top of a table an almost upright square and the objects upon it as if they would fall off.

No doubt the Greeks had correct notions of perspective, for the paintings on vases, and at Pompeii and Herculaneum, which were either by Greek artists or copied from Greek pictures, show some knowledge, though not complete knowledge, of this science. Indeed, it is difficult to conceive of any great artist making his perspective very wrong, for if he can draw the human figure as the Greeks did, surely he can draw an angle.

The Japanese, who are great observers of nature, seem to have got at their perspective by copying what they saw, and, although they are not quite correct in a few things, they convey the idea of distance and make their horizontal planes look level, which are two important things in perspective. Some of their landscapes are beautiful; their trees, flowers, and foliage exquisitely drawn and arranged with the greatest taste; whilst there is a character and go about their figures and birds, &c., that can hardly be surpassed. All their pictures are lively and intelligent and appear to be executed with ease, which shows their authors to be complete masters of their craft.

The same may be said of the Chinese, although their perspective is more decorative than true, and whilst their taste is exquisite their whole art is much more conventional and traditional, and does not remind us of nature like that of the Japanese.

We may see defects in the perspective of the ancients, in the mediaeval painters, in the Japanese and Chinese, but are we always right ourselves? Even in celebrated pictures by old and modern masters there are occasionally errors that might easily have been avoided, if a ready means of settling the difficulty were at hand. We should endeavour then to make this study as simple, as easy, and as complete as possible, to show clear evidence of its correctness (according to its conditions), and at the same time to serve as a guide on any and all occasions that we may require it.

To illustrate what is perspective, and as an experiment that any one can make, whether artist or not, let us stand at a window that looks out on to a courtyard or a street or a garden, &c., and trace with a paint-brush charged with Indian ink or water-colour the outline of whatever view there happens to be outside, being careful to keep the eye always in the same place by means of a rest; when this is dry, place a piece of drawing-paper over it and trace through with a pencil. Now we will rub out the tracing on the glass, which is sure to be rather clumsy, and, fixing our paper down on a board, proceed to draw the scene before us, using the main lines of our tracing as our guiding lines.

If we take pains over our work, we shall find that, without troubling ourselves much about rules, we have produced a perfect perspective of perhaps a very difficult subject. After practising for some little time in this way we shall get accustomed to what are called perspective deformations, and soon be able to dispense with the glass and the tracing altogether and to sketch straight from nature, taking little note of perspective beyond fixing the point of sight and the horizontal-line; in fact, doing what every artist does when he goes out sketching.

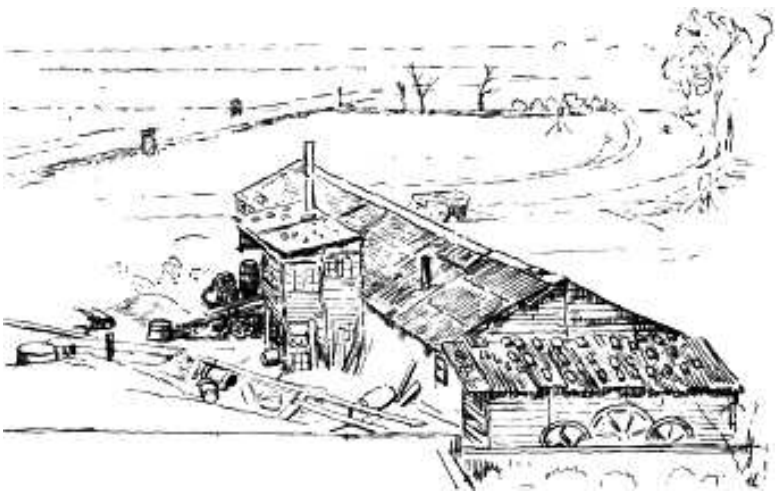


FIG. 6. This is a much reduced reproduction of a drawing made on my studio window in this way some twenty years ago, when the builder started covering the fields at the back with rows and rows of houses.

The Theory of Perspective

Definitions I

Fig. 7. In this figure, AKB represents the picture or transparent vertical plane through which the objects to be represented can be seen, or on which they can be traced, such as the cube C.

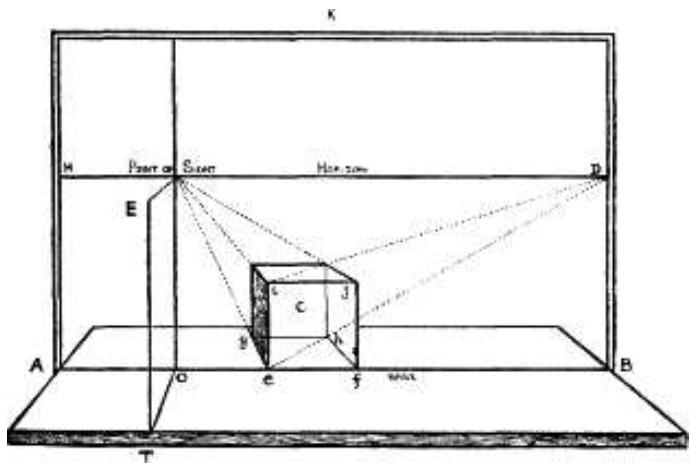


FIG. 7.

The line HD is the **Horizontal-line** or **Horizon**, the chief line in perspective, as upon it are placed the principal points to which our perspective lines are drawn. First, the **Point of Sight** and next D, the **Point of Distance**. The chief vanishing points and measuring points are also placed on this line.

Another important line is AB, the **Base** or **Ground line**, as it is on this that we measure the width of any object to be represented, such as ef, the base of the square efgh, on which the cube C is raised. E is the position of the eye of the spectator, being drawn in perspective, and is called the **Station-point**.

Note that the perspective of the board, and the line SE, is not the same as that of the cube in the picture AKB, and also that so much of the board which is behind the picture plane partially represents the **Perspective-plane**, supposed to be perfectly level and to extend from the base line to the horizon. Of this we shall speak further on. In nature it is not really level, but partakes in extended views of the rotundi-