II. THINKING IN THREE DIMENSIONS

This section offers some suggestions and exercises which can help with basic orientation to this strange world of "depth illusions."

Linear perspective is a sophisticated method of creating the illusion of three dimensions on a two dimensional surface. For many students constructing this illusion does not come naturally. The reading of an image is a learned behavior which engages the imagination and relies on preconceived symbols and clues. To begin with, one must assume the page itself represents a "hole" and not a "surface." Figures 1-6 below are a demonstration of this and how one's thought effects perception. (See Chapter 1 of the book.)

Fig. 1 This figure can easily be read as flat!

Fig. 2 Yet this can be seen as a flat design or a 3-D wire cube.

Fig. 3 If corner X is imagined on the front side, it is a cube seen from the TOP

Fig. 4 If corner X is imagined on the back side it is a figure seen from the BOTTOM

Fig. 5

Fig. 6

When more clues are added, the '3-D illusion' becomes more difficult to resist.
A. SKETCHING THE FIVE BASIC 3-D ILLUSIONS

The illusion of depth can be created by a number of simple devices short of full linear perspective. Five of these are shown below and in the text on page 7. Because not everyone reads these three dimensional illusions easily, and because many find them awkward to draw, it's worth spending some time in class encouraging students to sketch and "doodle" with these devices.

As a beginning warm-up exercise in class, have students do several random drawings suggesting depth based on the examples below. Keep the drawings simple and focused on the depth illusion technique. (See page 7 of the book.)

Fig. 7

OVERLAP          SHAPE          SHADING        CLARITY        SIZE
B. PRACTICING PARALINE SQUARES AND CUBES

Learning to "see" squares and cubes in space and learning to execute them rapidly is a great aid for conceptualizing and sketching. The faster students can conjure up a well formed cube, the greater control they will develop over 3-D forms and spaces.

Start with rapid sketching in "paraline," (see Chapter 3 of the book), then later move on to perspective.
-Ask students to come to the board in rotation while others work at their tables.
-On the instructor's count, have them draw the figures by the following steps.
  Start slowly, but increase the speed with every repetition - until they can no longer keep up.

1. SQUARES (PARALINE)

On the Count of 4, lay out a square stroke by stroke, keeping the lines parallel and over extending them to keep them straight. (Stroke 4 is the most critical as it determines whether the figure is "square"). Repeat (fig. 9) to fill the page, then go back and correct (fig 10).

Fig. 8
2. **CUBES (PARALINE)**

- Proceed the same way with the cube. This time on the count of 9, continuing from stroke 4 which sets the square, to stroke 5 which sets the depth.

*Fig. 11*
After filling the page, as with the squares above, have students go back and make adjustments and corrections.

C. PRACTICING PERSPECTIVE SQUARES AND CUBES

Once the paraline drawings are under control, the same kind of exercise can be used with perspective.
The pressure to move quickly not only helps develop fluency and control in sketching out ideas, but it wastes no time in getting students to confront and correct their mistakes. These methods work well when undertaken by the whole class, but it is important to find the right pace for the group. It's good to push them to go just a little faster than they want to go.

1. **SQUARE/CUBE** (1 POINT PERSPECTIVE).

*Fig. 14*
Once a cube has been established in Perspective, keep the original horizon line and proceed to fill up the page with the cubes in new positions and sizes. Try using diagonals to multiply and divide them. (see Chapter 5 in the book - GEOMETRICTOOLS)
D. PRACTICING WITH GRIDS:

Sketching up 3-D shapes off a simple grid is a quick way to get into the "depth illusion". Start with standard grid paper, turn it at any angle and then start adding vertical lines to build 3-D objects and spaces. This is great framework for casual doodling, but it can also be expanded into a more complex assignments like conjuring up a cityscape (See pages 31-38 and page 171 of the book).

Fig. 16

Fig. 17

Simple forms

Developed

Note: Try this both on a drafting table with T Square and triangles and freehand.
E. PRACTICING ROTATIONS (CHANGING POINTS OF VIEW)

Imagining an object from another point of view is a good exercise for developing the ability to navigate through imaginative three dimensional space. To "imagine" is to "picture." Have students try to "picture" what the object or space would look like, if they were standing in another place.

Start these rotation exercises with simple objects (in paraline) and then move on to more complex ones (in perspective).

1). ROTATING THE CUBE CHAIR

Fig. 18

ELEVATION / PLAN
What would this chair look like if seen from the other side? Or down below?
2). ROTATING COMPLEX FORMS
Have students draw their own simple plans, then draw those designs in three different views.

As a variant, have them use a photo or stand before a real object and then try to sketch it from another side and/or another angle. (See IV Perspective Photo Gallery)
