3. Form, Shape, and Mass

from Hale. Abstraction in Nature

There are many categories of form in nature and within them there is much variation. There is so much variation in natural forms that it is hard to believe that forms have much in common. So the best way for us to begin to understand form is to discuss the ways that make it possible for artists to classify things into series of relationships. Drawing concepts like form, shape, and mass enable the artist to understand nature's creations. Of course, you have heard these words before, but you have probably heard them used interchangeably, without any clear idea that each of these words has specific meaning in art. So we will begin by discussing the artist's definition of these words and then go on to discuss their practical use.

The word *form* describes an entity that has a meaningful structure, a thing that generally stands by itself, such as a human, a tree, a horse, a fish, or a microorganism—in the case of manmade things, a boat, a building, a book, or a piece of sculpture. A form in nature is a thing that is built on a pattern that is repeatable. In the case of manmade things, it can be a mass-produced object or an original one-of-a-kind creation. In forms of nature such as animal or human forms, the cells, the bones, organs, and fluids all blend together to form a united creature, all of the parts being inseparable from the whole. In manmade forms, though the parts can often be separated—like a carburetor being removed from an engine—there is also a unity and usefulness. In contrast, a lump of clay is only a lump of matter that may be altered by pressure, but it gains form when the sculptor works it into a form that expresses his intentions.

The word *shape* is a much broader term, less definite than form. Think of a group of people; all have the same general form. It is in their shapes that they differ: fatter, leaner, taller, shorter. More closely, the *shape* of a thigh can be altered by being pressed against a chair or by the tension and relaxation of different muscles, but its form will remain the same unless the whole structure is damaged. The clay mentioned before has accidental shape until the sculptor gives it a meaningful form. Or a granite fieldstone may have a round shape caused by weathering and rolling in a stream, but its form resides in its crystalline structure and grain.

To know the form of a thing requires that you know considerably more about its meaning and purpose than just its outer appearance and shape. So you see that there can be a wide range of possibility and difference between one artist's understanding of form and another's. An artist's grasp of form can be either shallow or deep; it is a matter of his patience in the study of nature and his innate intelligence.

Understanding shape is less complex than understanding form, but to understand shape still demands trained skill and intelligence. The artist learns to feel out shapes with his eye and hand and to coordinate both in the act of drawing. Doing this develops his sense of proportion and his sense of geometry. Both senses are natural capacities that are part of the functioning of his organism which can be expanded with training, practice, and intensive study (Fig. 51).

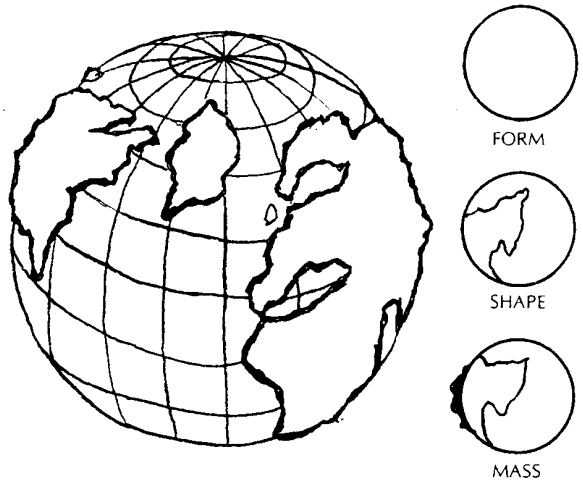
The three words *form, shape,* and *mass* can be easily visualized if you think of a globe of the world with raised mountains which is used in geography classes. The complete globe is a form; the continents are shapes; and the mountains are masses on the shapes (Fig. 52). *Mass* can be looked upon as the swelling or accumulation of substance or, at times, groupings of things. For example, the form of the human figure is composed of individual muscles and series of muscles that possess shapes, but in movement these muscles interact and create temporary bulges or *massings* on the surface of the figure.

In nature, everything overlaps and one thing runs into another; there are not always clearly defined boundaries. This is why it is important to use these three concepts in your drawing. It is also the reason why the three words are generally misused or used interchangeably by almost everyone. The artist must become skilled in the use of these concepts because they make it possible to define what he is drawing, so that he can control his drawing of the forms of nature to make them skillfully clear or even, in some cases, skillfully indefinite.

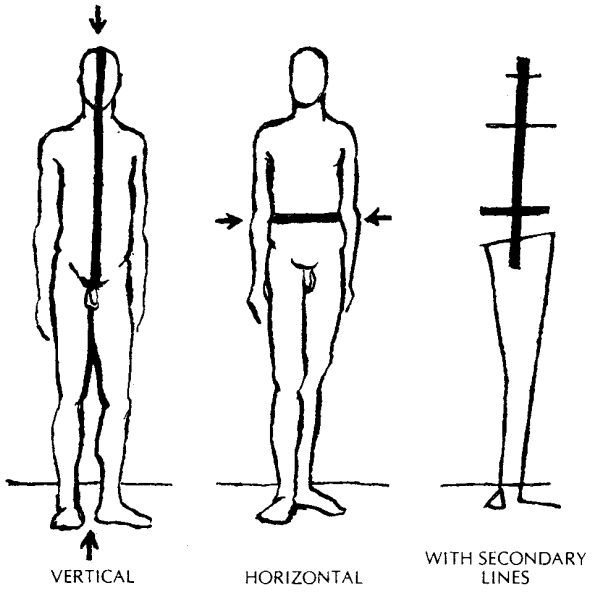
Project: This is an exercise in seeing. The purpose is to accustom you to think in terms of form, shape, and mass. You must train yourself to look for these three categories as you go about your business during the day. I want you to look at everything and analyze its form, its shape, and its mass.

You will find that certain things are very easy to classify and that others are very confusing. Some forms have very simple shapes, while others will have so many shapes that the over-all form is almost hidden. The tendency for beginners is always to fuss with little details rather than to look for the large important shapes. For example, if you are drawing a chest of drawers, the knobs and the decoration are not as important as the over-all cube or rectangular shape. The over-all shape should be considered first and, following that, the shapes of the drawers, *then* the position of the knobs and decoration. But practice looking first and do not draw. This is important because it is always necessary to think these things out before you even put your pencil to the paper.

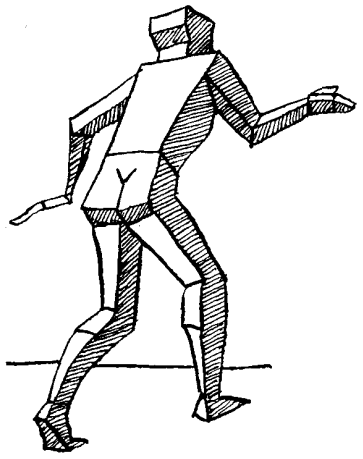
51. *Canon of Proportion after Vitruvius* (Left), Leonardo da Vinci, pen and ink, 13 1/2" x 9 5/8". Academy, Venice. The artist uses the innate feeling of geometry which is inherent in all human beings.



52. The globe used in classrooms illustrates the concepts of form, shape, and mass.



53. This diagram demonstrates the natural coordinate planes which are areas of awareness and feeling of the body.



54. This drawing demonstrates our awareness and feeling of the body's front, back, and sides. (After Cambiaso)

OUR INSTINCTIVE SENSE OF GEOMETRY

We have talked about the way we classify things into form, shape, and mass. Now we must consider some of the basic shapes and what enables us to understand them. The artist is not necessarily a good mathematician, but he develops an instinctive sense and feeling for shapes, angular relationships, and proportion. The artist develops a good sense of geometrical order, he does not force nature into a tight geometrical box, because he knows that if he did he might produce something that is more like an engineering drawing than a work of art. The artist's geometry is not the geometry of drafting board, compass, T-square, and triangle.

The artist uses the basic geometrical functions that are built into the human body. These built-in functions preceded the discovery of formal geometry and are a natural part of all men's reasoning. In Chapter 2, we learned how we see all things from the built-in awareness of the plane of gravity and the line of levitation. It takes no effort to see that gravity and levitation also give us the necessary elements for a natural built-in right angle. In seeing, feeling, and understanding shapes, we have some additional natural endowments. We have a central core—a plane or axis running right down our middle—an anatomical line that divides our two-sided body. Our own core guides us to look for the core, axis, or center plane of anything we see. In addition, we have our own equatorial plane of feeling right at the navel that divides our top half from our lower half (Fig. 53).

In geometry, the concept of a center axis is basic. The concept of coordinate planes is also very important; there are three planes that divide a form at right angles to one another. The globe is divided in this way, with two vertical planes slicing through the north-south axis at right angles to each other, while the third horizontal plane slices through the equator at right angles to the other two. In addition to the natural coordinates, we are aware of front, back, and sides in the trunk of our body; so we are well on the way to a very nice sense of the cube and rectangle (Fig. 54).

The artist relies on the inner feeling of these things to judge his forms. He projects these inner feelings into the objects that he sees and this extension of his feelings helps him to comprehend the shapes in the external world.

Let us go a little further to find more factors in this natural geometry. We see that our arms and legs are joined in such a manner that they can function at any angle from about 180° through 90° and down to about 10°. Arms and legs are jointed in such a way that they can be moved in arcs, circles, and globes. Two arms working together can make squares, angles, and embracing circles.

In practical use of this inner geometry, the artist feels the position and shape of the forms he sees. If he is working from a landscape, he uses the basic geometrical shapes to approximate the actual shapes of trees, rocks, and land masses. If he works with human figures, he tries to find simple angles or curves to enclose the shapes along the axis and skeletal framework of the figure. He uses the geometrical shapes as boxes to contain the real forms as he adjusts his composition.

A tree might be considered as an oval on top of the line of its trunk axis; a boulder might be considered as a rectangle or an ellipse. At first, the artist mentally simplifies

forms so that they may be placed in their proper spatial relationships to the plane of gravity and the line of levitation (Fig. 55). Once this is done, he spends more time in analyzing and drawing the *real* forms with their meanings (Fig. 56).

In completely abstract geometrical art that does not refer to nature, these shapes and directional lines are used in their pure sense. This kind of art *does* deal with real things in that the shapes and directions emerge from the artist's inner geometrical sense and the feelings of balance, direction, and weight as in the paintings by Albers and Mondrian (Figs. 57 and 58). This art limits itself to a very narrow area, but it *is* art and it is through the work of the geometrical abstractionists that we achieve our understanding of the inner geometry.

Project: The first half of this project deals with feeling shapes within your own body. In the second half of the project, we will translate these feelings to the drawing page.

First, make angles with your arms and legs, going through the whole range from obtuse to acute. Pay attention to the feeling. Next, by tilting your head to one side or the other, feel the angle you make by pulling out of line with the right-angle line of levitation and plane of gravity. You can get a clearer idea of this feeling by standing in one spot and leaning your entire body.

There are other shapes that you can make. By bending your torso forward, you make a curve with your spine. You can make a square by using both of your arms held out from your body with your elbows bent and hands touching. By relaxing your arms a little, you can make an embracing circle. With your hands and fingers, you can make many shapes including triangles, squares, circles, open-ended cubes, and globes. You can probably invent a few more too.

All of this will make you more aware that our understanding of shape is not gained by the eye alone, but is a product of the entire body. Even though you might be a little unbending at first and think of this as child's play, you will get into the swing and the feel of it if you stop to think that the free and imaginative play of children is a natural way of learning about the world. In experimenting with this kind of feeling and movement, we come to the area where music, dance, and drawing meet.

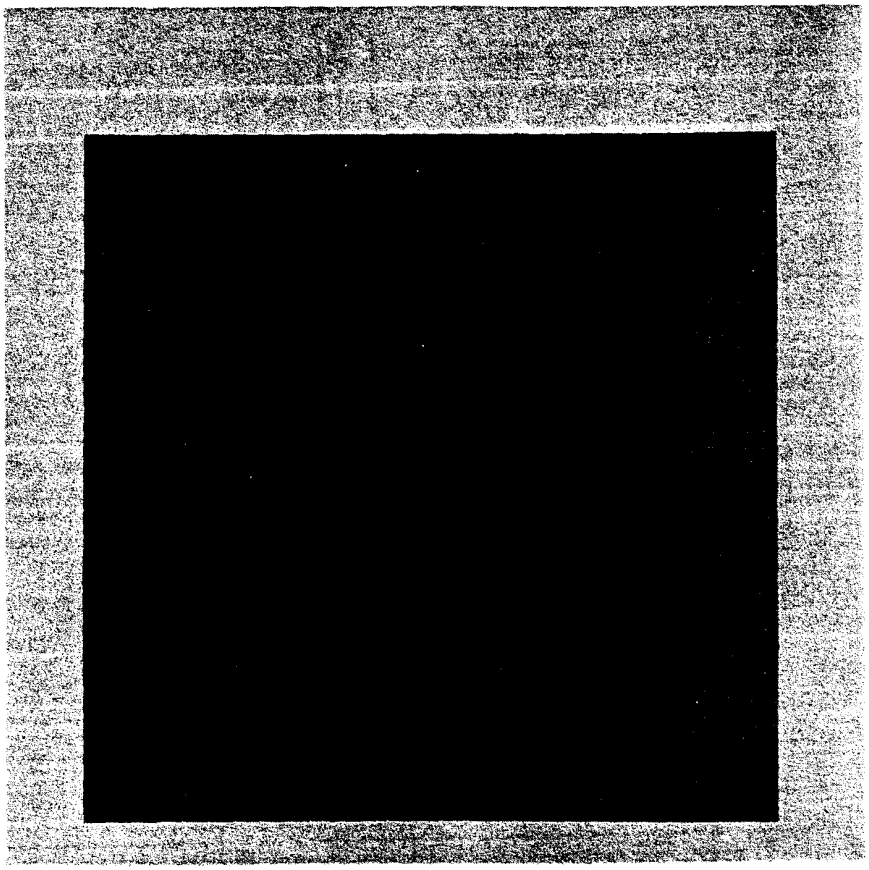
Now we deal with the special ways that artists translate these feelings and movements to the drawing page.

This is what I want you to do: on separate sheets of paper draw all of the shapes that we have discussed. Make them large enough to fit into a 5" square. Once you have made a circle, square, triangle, rectangle, and some open angles, set them in a pile before you. Now, go over these shapes one by one and duplicate the drawing movement with your arm, the entire arm swinging from the shoulder joint. Observe carefully the way your arm moves when you draw each shape and note the feeling. Once you understand your arm movement, note the feeling in the rest of your body. You will find that there are very definite internal feelings with each of these basic shapes.

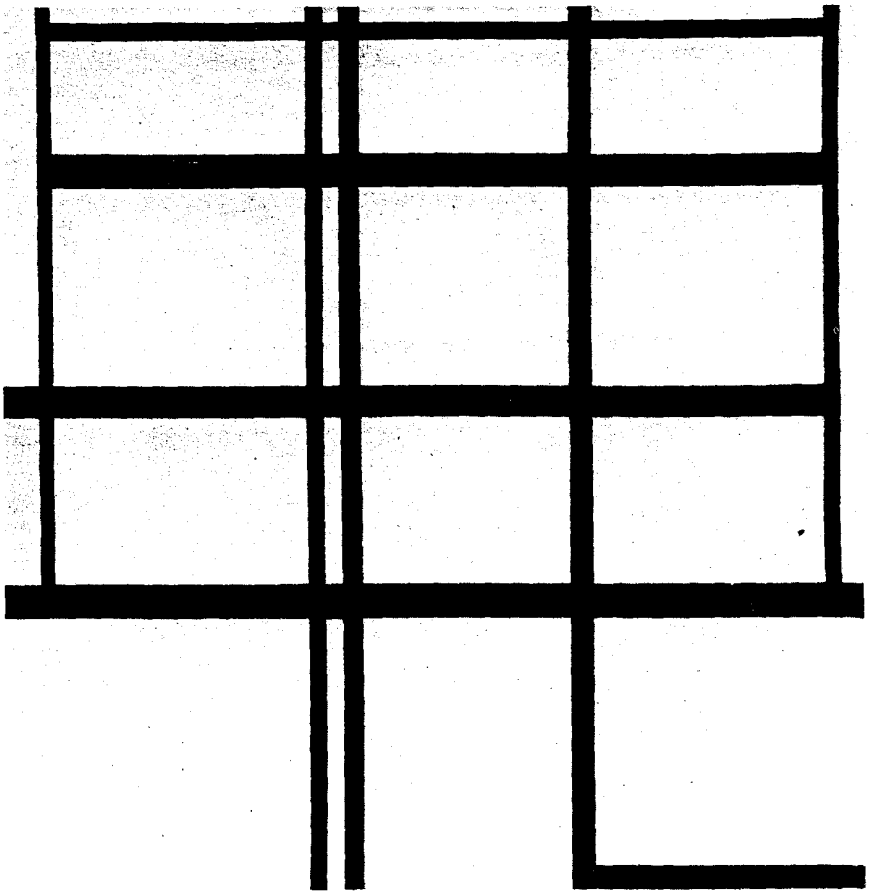
Just as you can make these movements with your entire arm, you can also bring these movements to a fine focus by drawing with your hand and fingers alone. It is best to begin with the shape feeling in the entire body and let this move into the arm and on into the hand. Beginners often

55. This photograph shows different rates of movement and growth—the dynamic elements of landscape.

56. The horizontal lines indicate both unmoving ground and moving water, while the vertical lines represent trees of various ages; the diagonal represents the tilt of the land, which can be considered as land in movement toward the plane of gravity.



57. *Homage to the Square, Silent Hall,* Josef Albers, oil on composition board, 40" x 40". Museum of Modern Art, Dr. and Mrs. Frank Stanton Fund. Albers' painting stresses a geometric volume and a geometric space, which is devoid of life and atmosphere.



58. *Composition in Yellow, Blue and White, I,* Piet Mondrian, oil on canvas, 22 1/2" x 21 3/4". Museum of Modern Art. Sidney and Harriet Janis Collection. Mondrian's work stresses the grid form and linear geometry to the point that curving movements of life and atmosphere are eliminated.

hold back out of fear and shut off the larger feelings of form by trying to squeeze them all out of their fingers. Just as they tend to fuss with the details rather than the large shapes, they tend to make little squiggly movements. So, open up the window and let out some of your inner music!

GOING BEYOND GEOMETRY

Paul Cézanne once made the much-quoted statement that all nature could be reduced to the cylinder, the sphere, and the cube. He was right in the respect that an artist cannot function without a strong internal sense of geometry. However, these geometrical shapes serve only as temporary boxes in the process of realizing the more profound shapes that nature creates. It is interesting to note that Cézanne continually expressed great agony in his struggle to "realize."

Geometrical shapes, when compared to the shapes of nature, are extremely shallow in their range of expressiveness because the forces and functions from which geometry stems do not reflect the deeper vitality and variation of moving and living energy systems—expressions of nature that grow, breathe, and show awareness. But the most meaningful aspects of art are concerned with animation, character, and expressiveness. In order to make geometry come alive, it is necessary to add other factors.

In drawing, once you have decided upon a geometrical shape that estimates the over-all shape, height, width, and position of an object, you have to find the ways that the form deviates from this rigid ideal. In finding the variations of shape, you begin to bring out the true nature of the object. Every single thing in nature is slightly askew, even the crystal forms that are nature's most rigid creations. The tree that you first regarded as having an oval shape resting on the straight line of its trunk will be robbed of life if it is left that way. It is necessary to find the real over-all pattern of form and the smaller shapes and movements within the tree if you are to make a drawing that is vital. The same is true of the boulder that you began by treating as a rectangular geometrical box. In its smaller masses you find the eroded curves, the hollows, and the directional grain that show the rock's origin and history.

Of course, these smaller masses and irregularities also have geometrical shapes and the artist's geometrical sense is used to place them correctly within the larger shapes. But at this time there is something else that comes more strongly into play. You might call it the element of touch. The larger shapes are always defined with simple straight and curved lines at the beginning, and these lines emerge from our bones, our more rigid anatomical structure. But giving character by adjusting shapes, massing, and modeling has a feeling that is softer, more yielding, and tentative. This feeling is soft and fleshy and emerges while you draw in the feeling of patting, fondling, and caressing—or even hitting, pushing, and pulling. These are the tactile sensations that emerge from our own fleshy, muscular structure.

The touch and modeling of the artist's hands represent his human emotional response to the subject. It is in this sense of touching in the process of drawing that the artist's personality is fused with the subject. This, combined with his feeling for the character of the subject, brings life to the drawing.

You must realize that nature constantly touches and caresses or wears upon and assaults objects and creatures. It is only in developing your own sense of touch that you are able to translate the touchings of nature to the drawing page. The weathered surface of a stone, the lined furrows of an aging face, and the radiating roundness of a baby's bottom or a peach cannot be discovered or told by a dry, impersonal geometrical calculation.

Project: First of all, you must forget the admonition that is the curse of small children and young lovers—"Do Not Touch." By all means, touch with your eyes and your hands anything at all that attracts you—with the exception of poisonous snakes, disagreeable people, high tension electrical wires, and radioactive substances. Part of drawing a thing correctly has to do with transmitting the feeling of the thing, and the purpose of this project is to work with your sense of touch. This is a matter of the feeling within your body as you draw and the attempt to transmit this feeling to the lines that you make.

Select a series of objects such as a ball of cotton, a peach, a block of stone, and a stick of wood and try to draw into them the qualities that you feel. Take as much time as you need. I suggest that you think in terms of line weight, using lighter lines to suggest lightness and heavier lines to suggest more mass. Draw with pencil on paper.

Doing this is a matter of practice, and there is no exact advice that can be given to help you develop this sense other than to describe the goal.

CATEGORIES OF FORM IN NATURE

Almost everyone has played the game "animal, vegetable, or mineral" in which one person thinks of an object and the other players try to find out what it is by asking questions which narrow the possibilities. This game is founded on the basic families of form in nature, possessing qualities that make each one tangibly different from the others. If this were not true the game would never work. Both art and science share a similarity to this game.

On the one hand, science is a game played with very exacting rules, the object of which is to weigh and measure the functions of nature. Science has divided the whole universe into realms of study such as astronomy, physics, chemistry, biology, etc. These sciences have uncovered a vast array of facts about nature. The artist, on the other hand, also looks at all of nature, but with a different eye; he seeks feelings and personal affinities as well as facts. In learning to draw, the artist tries to find the common qualities that all things share so that he will be able to draw anything that he encounters. He may even study science to find the keys to these mysteries of form.

Like science, art also separates nature into categories of form. But these categories of art differ from those of science; they are less precise and less measured, or—as the scientists might put it—art is qualitative while science is quantitative. These two fields sometimes overlap and you will occasionally find a scientist who is very intuitive or an artist who has the ability for precise analysis. As a matter of fact, a good deal of what we know of form today is the result of scientific study that has been re-examined with the artist's eye.

In all, artists divide nature into seven realms; five of these realms are very similar to the "animal, vegetable, or mineral" series, but are more comprehensive. They are the

aerial or atmospheric forms, the liquid or water forms, the solid or earth forms, the plant forms, and the forms of living organisms. The two remaining realms relate to all of the others as they are a central part of their nature; these are the creative forms of pure energy and the realm of death, decay, and disintegration. To list these forms in their proper order, they are: (1) energy forms, (2) atmospheric forms, (3) water forms, (4) solid forms, (5) plant forms, (6) organic forms, and (7) disintegration forms.

This order is somewhat different from the order of the realms of science since it is esthetic and emotional, but in this sense it is very exacting and has very deep meaning. As we proceed through these categories the meaning of the order will become clear.

FORMS OF ENERGY FIELDS

When we attempt to draw the forms of living things, trying to encase the great capacities of life that is in them, we become aware of some intangible quality that animates the world of nature. Try as he may, the most difficult thing for the artist to do is to capture the energy of life Life surrounds us everywhere; it is in the air we breathe and in the rain that falls, yet it is elusive and seemingly invisible. The invisibility of energy has haunted the artist for millennia. But in our time, science has opened the realm of energy and has made many energetic forms visible that were formerly seen only with the artist's intuition.

In earlier times, the most obvious visual expressions of energy were lightning, storm, and fire—all very fearsome and overpowering. But there were also other expressions of energy that were just as powerful but gentler, subtler, and quieter. These were birth and growth, sprouting and blossoming. Feeling some force behind all these things, ancient man developed pagan gods—mythical forces to name and personify what he could not see. Only after centuries of searching have some of the *real* and invisible forces come to light.

Until the discovery of the telescope in 1608—which made visible stellar radiations, cosmic clouds, and the swirling galactic forms—man did not become acquainted with patterns of the great energy forces. It was William Gilbert, the physician to Queen Elizabeth I, who discovered ways of making the earth's magnetic field yield its invisible pattern. When we consider the thousands of years of human development, these are discoveries that are as recent as the space flights that have made visible the earth's vast weather patterns.

Though these forms have seemed to be the special province of the scientist, they are of the utmost importance to the artist as they represent the purest primary expressions of form in nature. The basic forms of energy serve as the patterns—and combinations of pattern—for most of the creations of nature.

Photographs of the swirling galactic forms, cosmic clouds, and the earth's weather patterns bring these gigantic events down to human scale so we can study them, but it is important to keep the vastness of these things in mind. This is always a problem when we study things through the secondhand medium of the photograph. However, an unusual and valuable firsthand study can be made of the magnetic field—the next project. This is an example of a basic energy form that can be made visible and can be felt through simple experiment. As this is a form that permeates all of nature, the study of it gives us a keener sense of the true nature of those forces that are beyond our immediate perception.

There is a definite relationship between all of these forms that is important to note. We have already seen that the galactic form is a variation of the spinning wave and have examined the linear and circular forms of radiation. The form of the magnetic field has some relationship to both. Seen from the side view (Fig. 59), the magnetic field appears to be constructed of a series of spinning waves, while viewed from either end it bears a striking relationship to the radiation patterns (Fig. 60). Though these may seem at first to be only interesting coincidences, they show the artist how simple and yet inventive the forms of nature can be.

The form of the magnetic field is extremely versatile in that it contains most of the basic forms of geometry: an axis, triangular shapes, cones, circle and ellipse, longitudinal lines, dividing planes, etc. (Fig. 61). In addition, it has some of the basic characteristics of living forms in that it has a head-to-tail directional organization, a fibrous structure, internal loopings, a life span, and a soft, cushiony feeling that is very much like flesh (Fig. 62). Two magnetic fields can superimpose to become one field or can join by segmentation to form a long series (Fig. 63). This form is about the best teaching device because it has so many fascinating, meaningful, and yet mysterious qualities. It is the ultimate in meaningful abstraction.

Project: This project will enable you to see, feel, and draw the magnetic field. It will take a little time because you will have to send away for the proper materials. I recommend sending for these items because the common horseshoe-shape magnets or long bar magnets distort the shape of the field and obscure it in such a way as to make it impossible to see clearly. It is important to use a magnet that will duplicate the shape of the earth's magnetic field.

Purchase from Cenco Scientific Supply (1700 West Irving Park Road, Chicago, Illinois) two No. 78292 bar magnets (1" x 3/4" x 1/2") and a container of No. 78395-2 iron filings. These items should cost about three dollars. In addition, you will need a 12" x 18" pane of window or picture glass, which you should have no trouble finding around the house.

To set up the experiment, tape a piece of white paper under your glass and find a couple of books that will support the glass 3/4" above the table surface. Place one magnet under the center of the glass and sprinkle the iron filings on the glass above it. As the field becomes visible, tap the glass lightly to clear the pattern. When you have drawn the field pattern seen from its side, sweep off the iron filings, position the magnet on its end, and re-sprinkle the filings so that you can examine the pattern of one pole at a time. Once you have drawn this, draw the patterns of the two magnets in various relationships by taping them to the table surface.

To feel the form manually, hold a magnet in each hand and feel the pull of the magnets. Use the field of one

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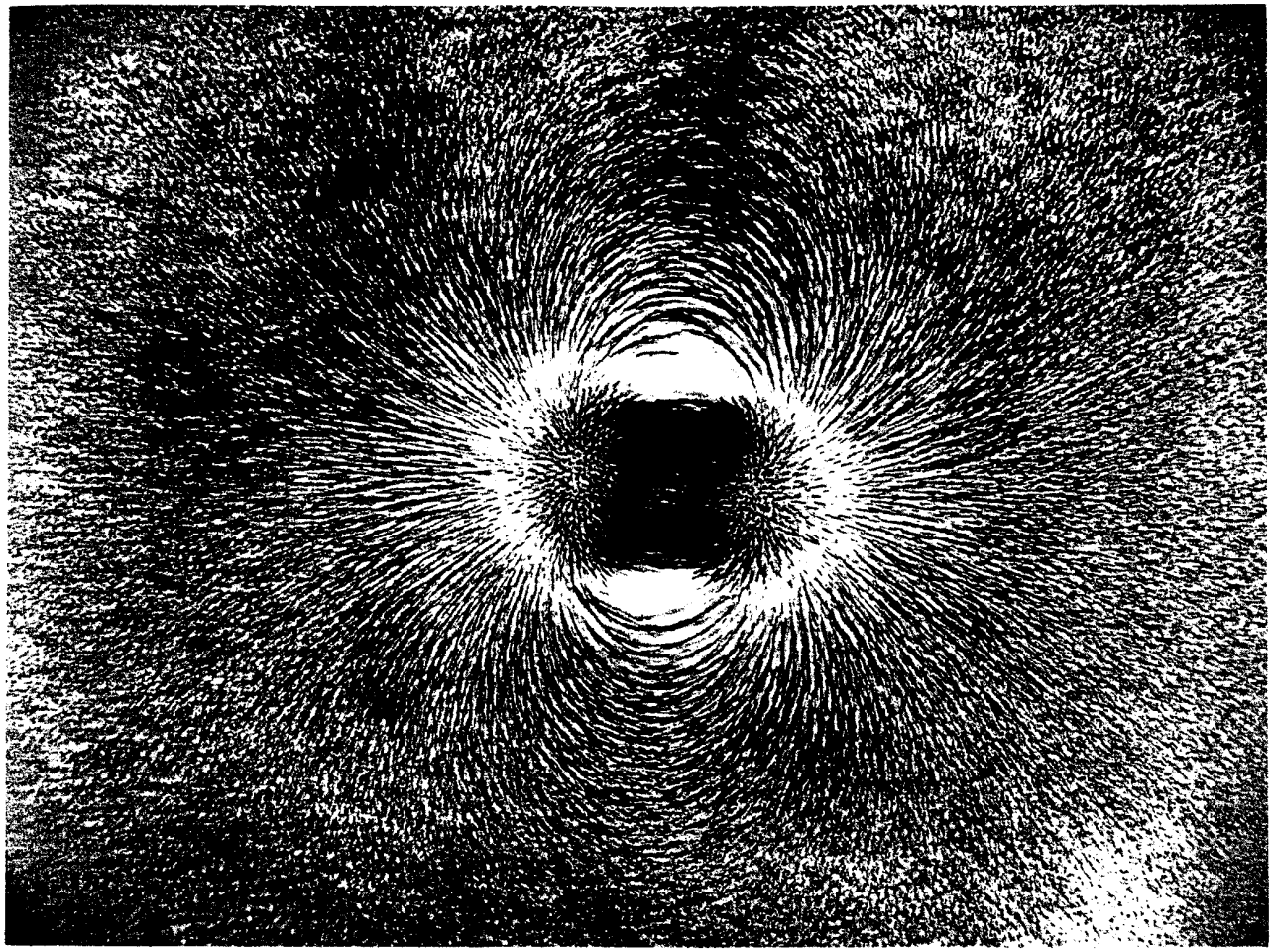
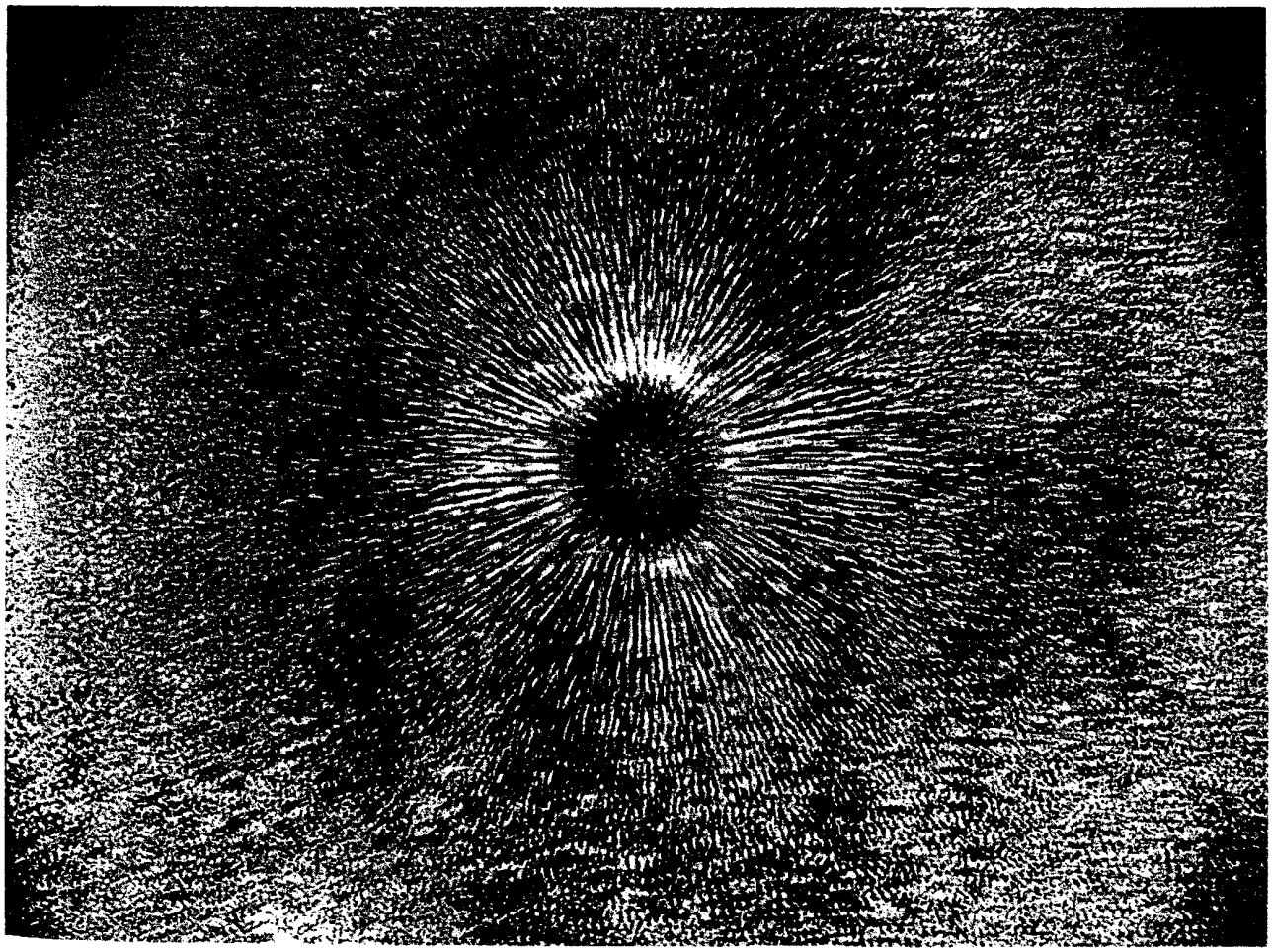
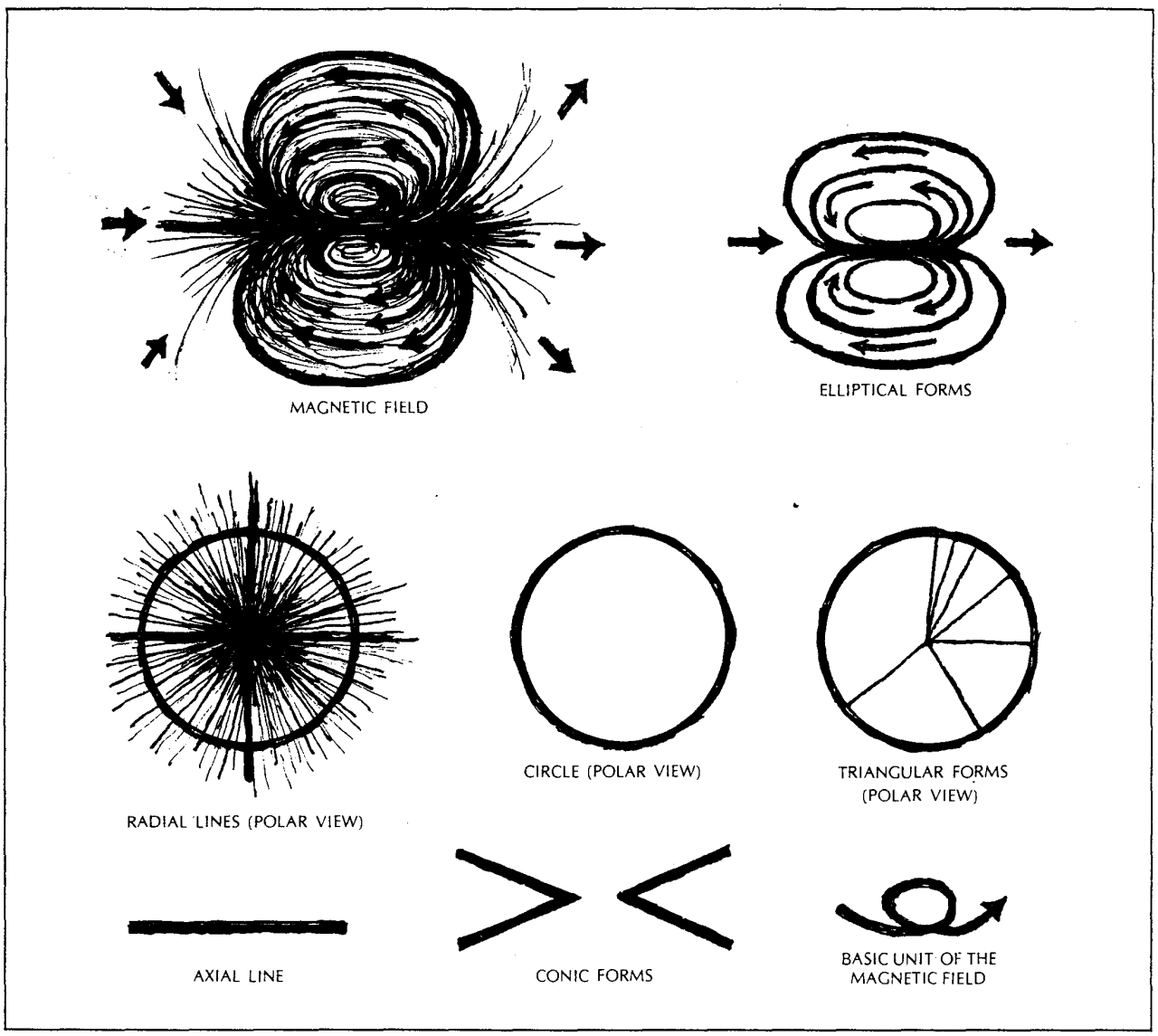
59. (Above right) The magnetic field, seen from the side, shows the spinning wave structure.

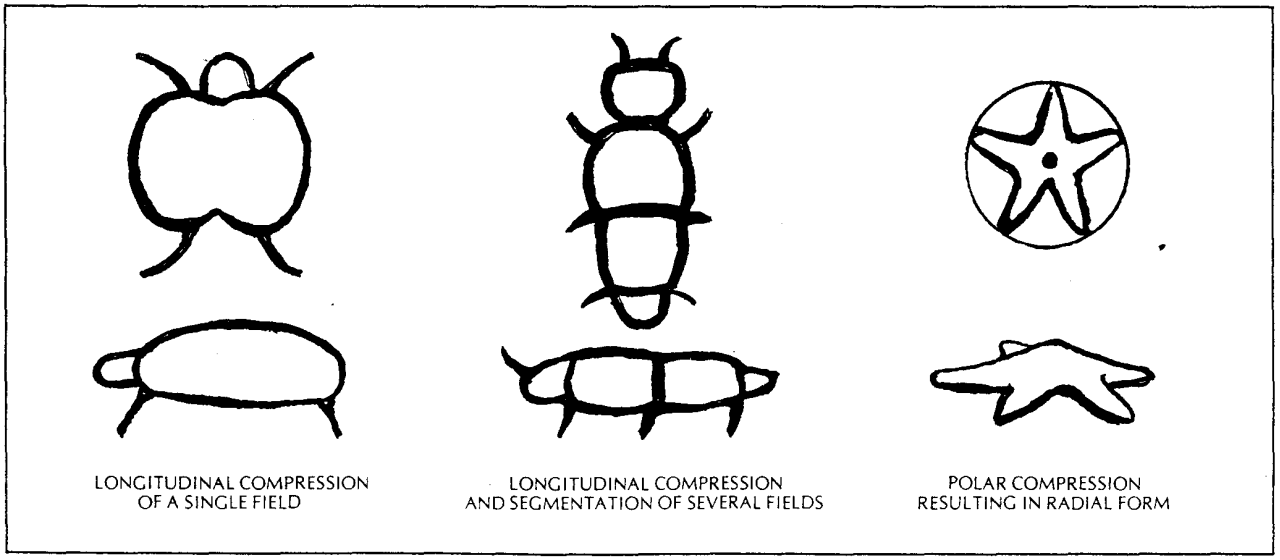
60. (Below right) The magnetic field, from one of the polar ends, shows the radiation of energy into and out the other side of the core of the field.



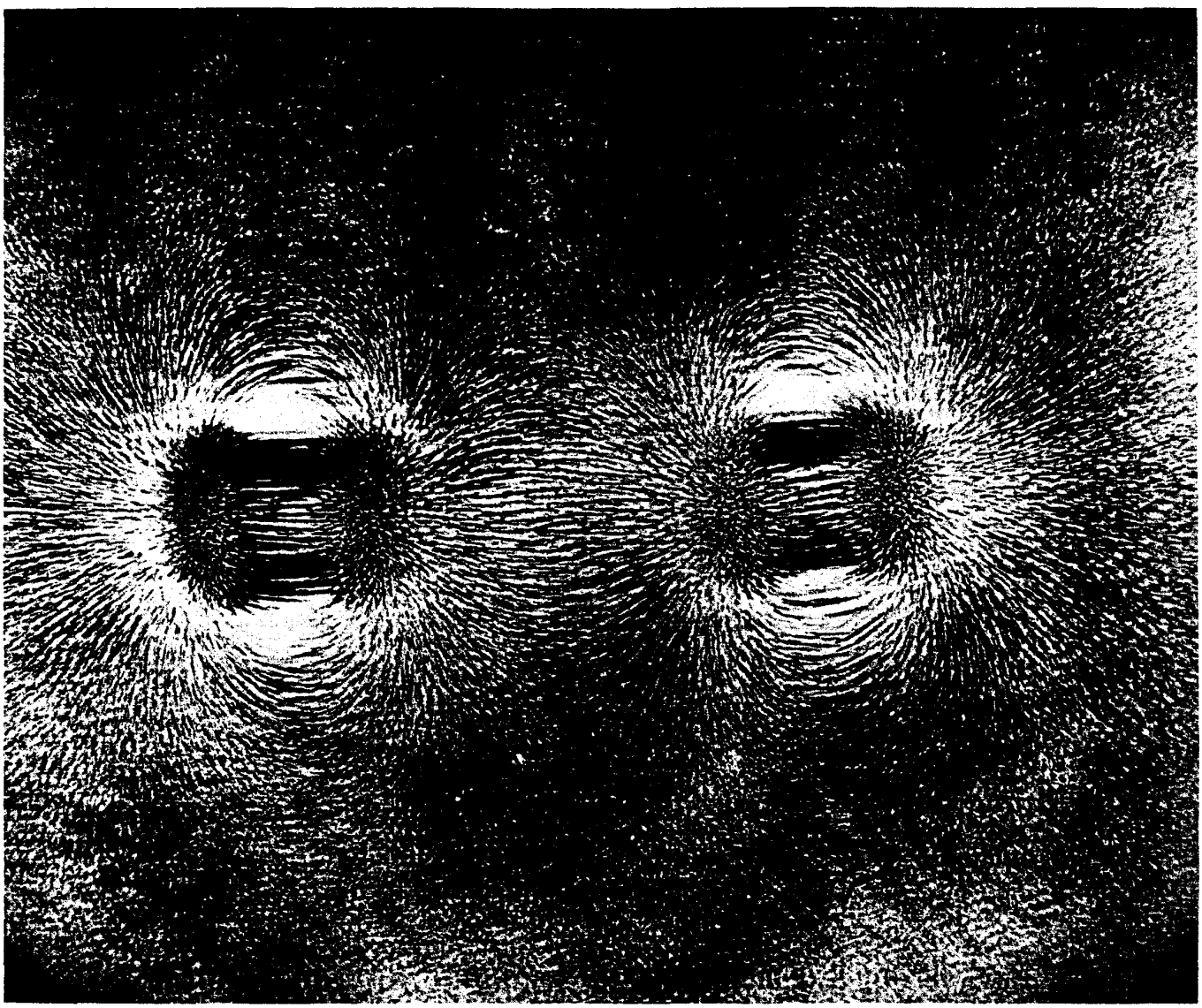




61. These are some geometrical forms created by the magnetic field.



62. These forms demonstrate the relationship of the magnetic field to the structure of organisms.



63. The "arms" of energy of the magnet of the right lock into those of the magnet on the left going in the same direction, and the two are drawn together.

magnet to follow the form of the other. Pay careful attention to the direction of the field and the soft, fleshy quality. I am sure that you will agree with me that this is one of the most interesting forms in nature. As you draw the field, try to interpret these qualities that you have felt.

AERIAL AND ATMOSPHERIC FORMS

The atmosphere of the earth is so much a part of our lives that we walk through it and breathe it without remembering that it is there. The earth's atmosphere is part of the great magnetic field that surrounds and penetrates our planet. Knowing the magnetic field enables us to visualize our atmosphere's form. We have had firsthand experience with the field. You must always keep the shape of the magnetic field and its layers in mind as you try to visualize the atmosphere.

Air moves and you can feel it. If you consider your own breathing and make it conscious for a moment or two, you will be reminded that air does have substance and form. You can observe this form in a number of ways and one is by watching cigarette smoke curl and spiral in dreamy rhythmic waves (one of the dubious pleasures of smoking). Another way is when your whole body feels the atmosphere as you walk and run through it. Children are particularly aware of the feel of the atmosphere. If you think back to your childhood, you will remember puffing your cheeks and blowing your breath at leaves or feathers or the down of the thistle. You will remember twirling and running through space for the sheer pleasure of the feel of the air. Even on days when you were sick in bed, you watched dust motes swirl and dance in a shaft of light. Air has form!

There is another aspect of the atmosphere that is often forgotten and this is sound. We tend to look on sound as something that emerges from a mouth or a radio that jumps directly to our ear without any relationship to the space between. It is only upon reflection that we remember the waves of sound follow the pattern of circular radiation. But drawing, painting, or sculpture does not deal with sound in the ordinary sense. Sound in the visual arts is conspicuous by its absence and is a thing that is suggested rather than produced directly. There are some fine Gothic sculptures of saints at the front of the great cathedral of Toledo, Spain, that not only seem to be listening to the words of Christ but hearing them also.

So the things that are not directly said by art can still be important. If you bend the trees or the grasses in a drawing, the unseen wind is suggested and seems visible.

CLOUD FORMS

Of the visible atmospheric forms, the first that we think of are clouds. In considering the forms of clouds, we have to find ways to understand them that we can memorize because these forms are constantly changing—appearing and disappearing. Clouds are borderline forms between the invisible forms of energy and the visible forms of matter.

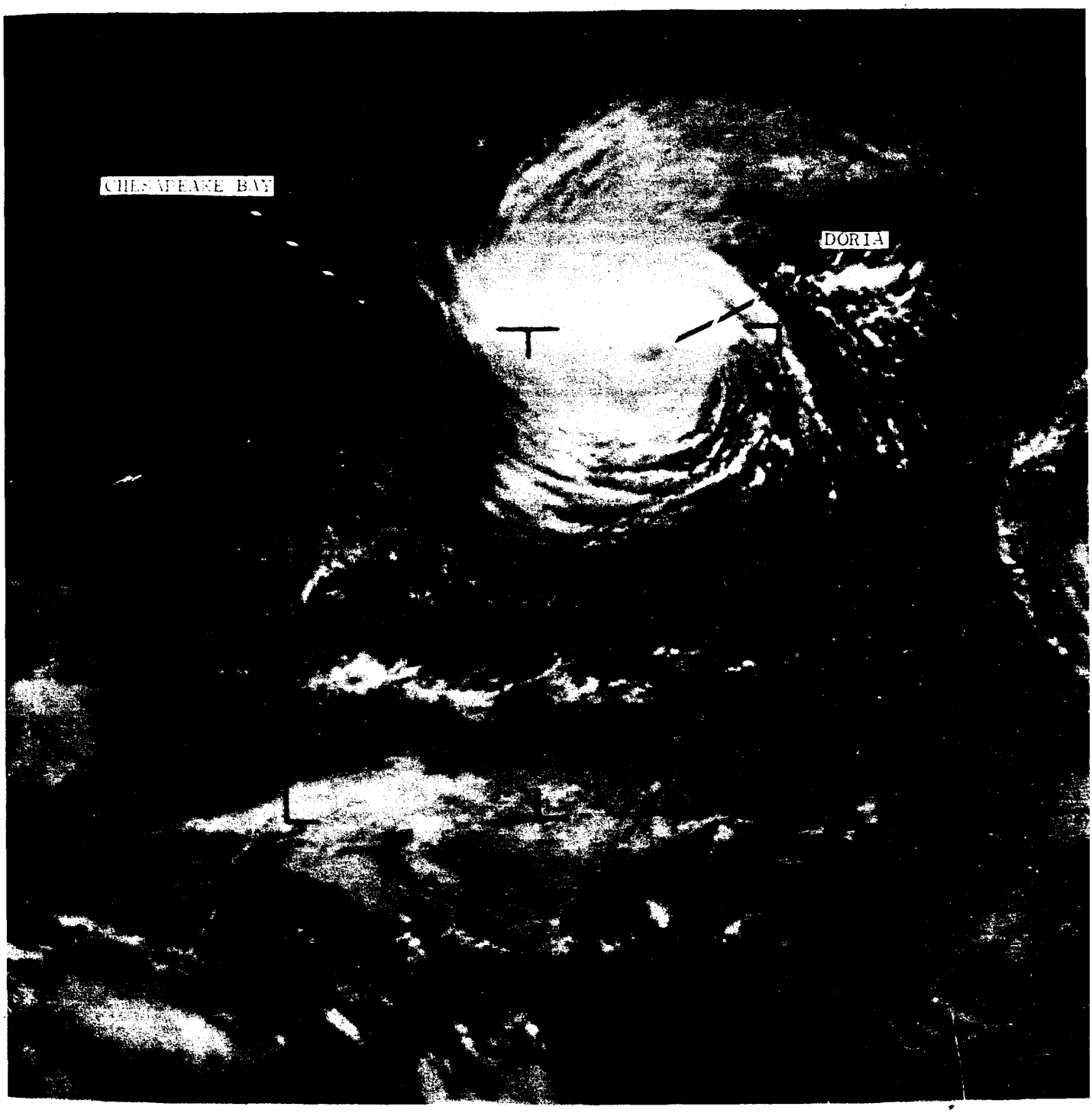
First, we consider the structure of the *place* in the atmosphere where clouds form. In this, the shape of the magnetic field is very useful to us as *it is* the shape of the earth's layered atmospheric field; it shows the layering that parallels the earth's surface just like the "ceiling" height of cloud formations. Depending on the weather and the season, clouds can form very close to the ground or at a few hundred, or a thousand, feet above the surface, and on up to several miles. There are, on occasion, clouds that form as high as thirty miles in the stratosphere (Fig. 64). But to the artist, the evenness of the layering is most important. Anyone who has done much flying has noticed that the undersides of cloud formations are often as flat as the ocean's surface on a calm day. The tops of clouds rise and swirl upward with a lot of variation, but in most cases the upper border of the whole formation is surprisingly even also.

Another way that the magnetic field is useful to the artist studying cloud masses has to do with the fibrous lines that go from pole to pole. We can often observe that cloud formations show a linear direction that strongly repeats this north-south line (Fig. 65). Sometimes this series of north-south lines is very clear and straight; other formations show wavy north-south lines that very much resemble water waves. As weather moves from the west toward the east, the cloud formations cross the north-south lines of the magnetic field at right angles so there is actually an invisible gridwork of forces in the atmosphere that governs cloud formation (Fig. 66). Although clouds do occasionally show this pattern clearly, they travel more frequently in scattered clumps and constantly changing wisps. Even these shapes can only be organized if we use the concept of the grid and of atmospheric layering.

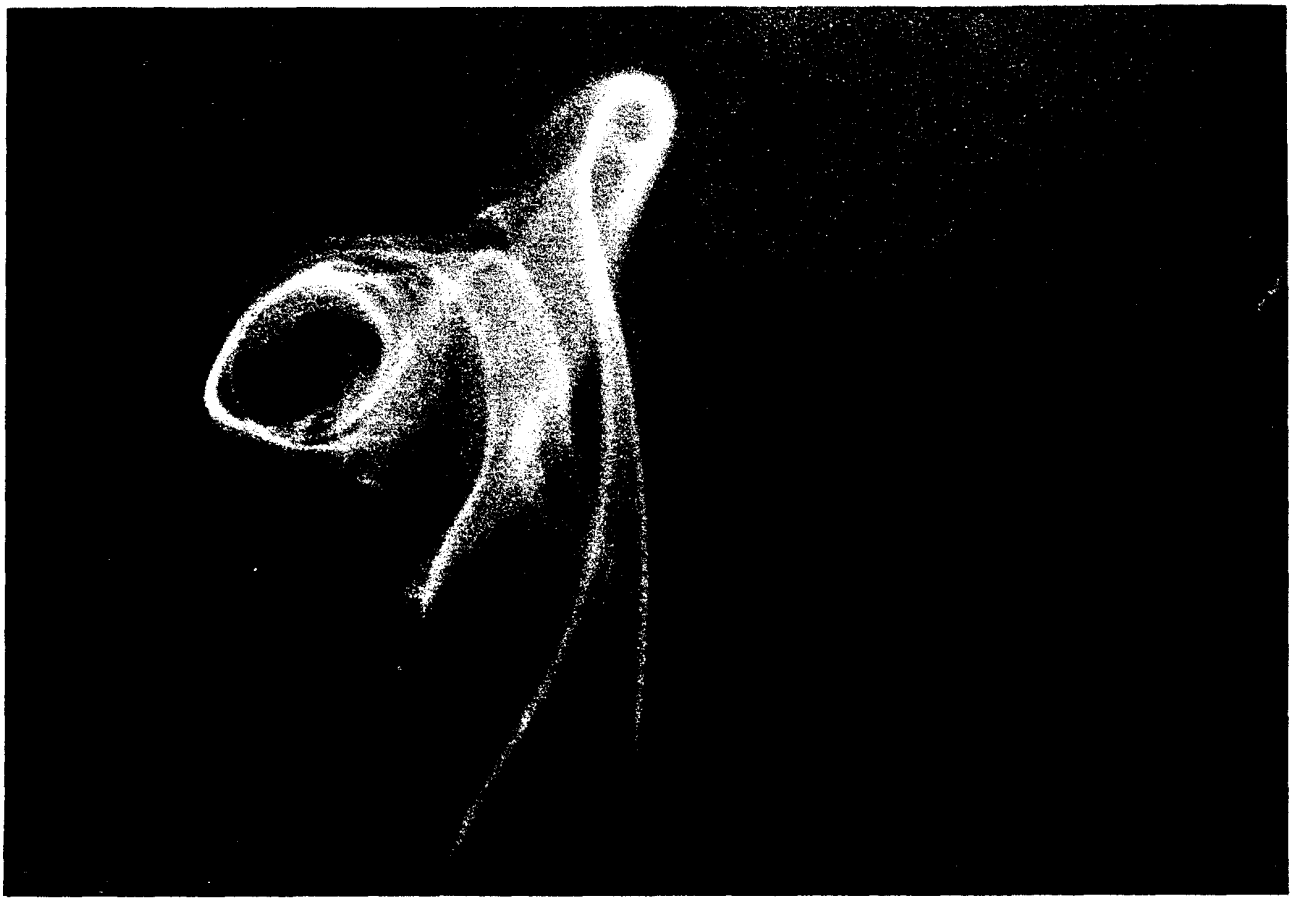
There is another weather pattern that has been photographed by the astronauts of Apollo 8 on the return from the moon. This is the great cyclonic pattern of cloud formations that occurs in both the Southern and Northern hemispheres. In form, this vast weather pattern is an exact duplication of the two-armed, spinning galactic form. This form is a natural outgrowth of the energy stream of the planet's orbit which moves from west to east and crosses the north-south structure of the magnetic field at right angles. The orbital force moves the atmosphere along, while the longitudinal structure of the magnetic field tends to hold it in one place, which helps create a spinning movement toward the poles. This explanation is simplified, for there are other complex forces at work. This great weather form is useful to the artist since it is the secret of making the invisible wind becomes visible. Even small gusts of wind move in this swirling fashion.

Wind patterns and cloud patterns have a direct relationship to one another as cloud patterns are accumulations within the moving atmosphere that are modeled both by forces within and by the winds surrounding them. Watching patterns of smoke (Figs. 67, 68, and 69) and steam is an extremely useful way for the artist to study the creation and disintegration of atmospheric forms. Because these forms change so rapidly, photographs can be used to study the movement for a beginning analysis. You will find that these forms move in spinning waves which invaginate—or turn in—upon themselves. If you begin by tracing these patterns from the photos and committing the movements to memory, you will find that it is much easier to observe the actual event.

It is simple to apply the same procedure to cloud formations. You will find that the cloud forms change at a different time rate. The forms move and change in the same patterns as smoke and steam, but as though the change were being shown in a slow-motion movie. Time-lapse motion pictures show that the movement of clouds is very much like the movement of smoke, except that clouds move into their own form while smoke swirls in spinning



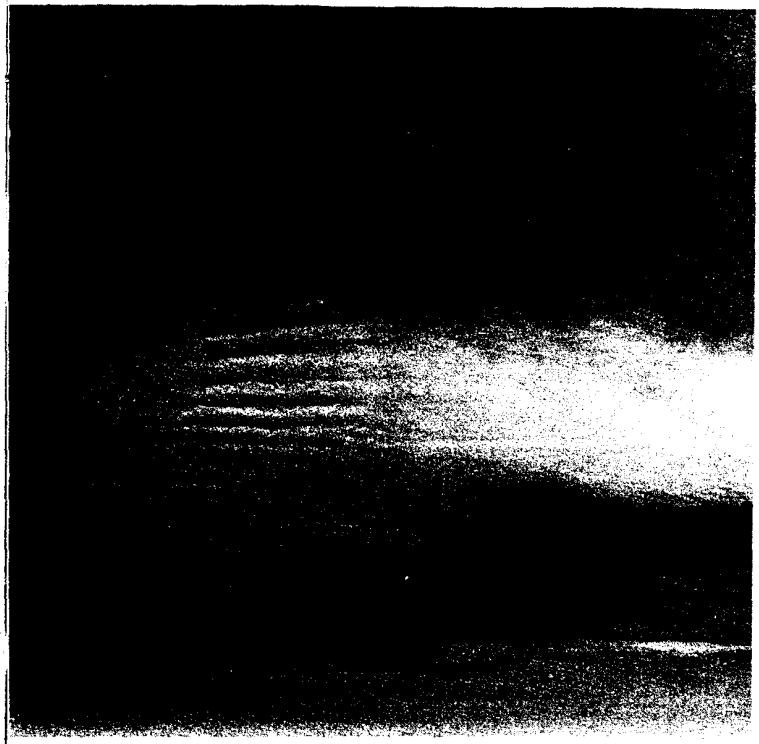
64. The great weather patterns of our planet swirl in the same huge movements as the galaxies. (Courtesy of the National Aeronautics and Space Administration)



67. Watching smoke patterns or studying their movements in photographs is a good way to understand the creation and disintegration of atmospheric forms.

68. (Above) If you study photos such as these, committing smoke patterns to memory, you will find it easier to study the actual event.

69. (Right) Smoke patterns show the spinning wave movement in the atmosphere.



70. There is a double layering of cloud formations in this picture.

waves until it eventually dissipates and loses all form. You can observe form changes in smoke in a matter of seconds while it is necessary to watch a cloud for at least fifteen minutes if you are to see any major alterations in shape.

No two clouds have quite the same shape, but there are some general patterns that do apply to them all. Weather scientists and artists have classified clouds into four basic categories. These are four forms that are distinctly different from one another, but also interpenetrate to create secondary forms.

The high feathery and fibrous clouds are called *cirrus* clouds (Fig. 70). The fluffy clumps of clouds that grow upward from a more or less flat base are called *cumulus* clouds (Fig. 71). The clouds that form in shapes of flat sheets or layers are called *stratus* clouds. The big towering rain clouds are called *nimbus* clouds. When these forms combine they are called cumulo-nimbus or cirro-stratus, etc. (Figs. 72 and 73).

Ordinarily when we think of the cloud form we think of the cumulus. This shape is built up of the typical puffy curves that move slowly inward in spinning waves to create interlocking invaginated shapes. In the huge cumulo-nimbus rain clouds, the whole internal movement of the cloud is in the form of a magnetic field with its axis pointing straight upward along the line of levitation (Fig. 74). Stratus clouds relate to the magnetic field too in that they are thin layers above the earth like one of the layers in a Bermuda onion. But all of the cloud forms, when examined very closely, are somewhat fibrous in their structure and similar to anastomotic lines.

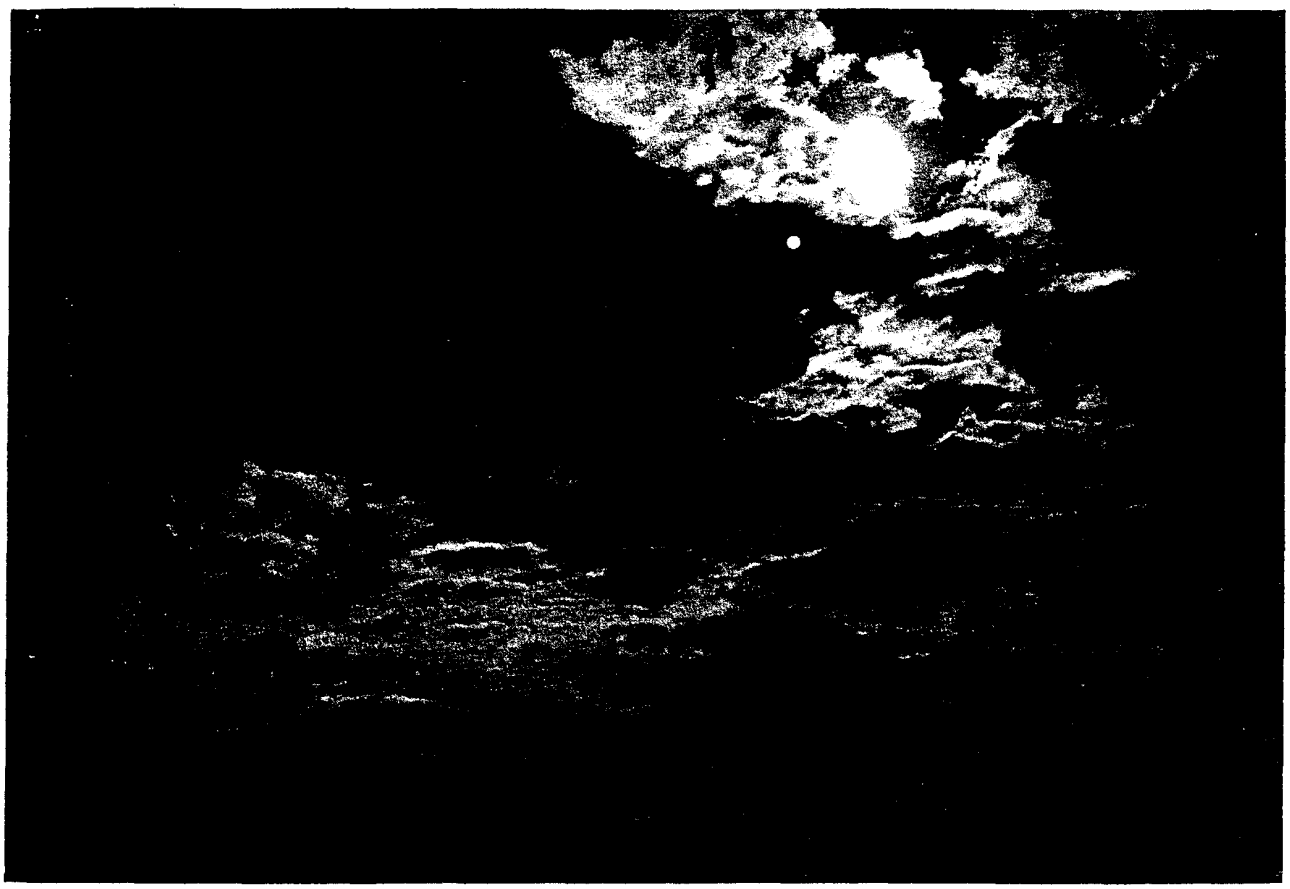
In recent times, there has been a tendency for artists to ignore the atmospheric forms, but there are a number of abstract painters whose forms do stem from atmospheric feelings and insights. Chinese painting in the greatest periods touched these forms most beautifully. The French Impressionists dealt with them too, although the academicians of the time could not understand their doing so.

Project: Since you cannot order clouds to appear on demand, this project is one that you will have to work on over a long period. The observation is every bit as important as the drawing. So you must grasp the opportunity to look at clouds when you have the chance. First, study the cloud from the over-all view, deciding what its general form category is. Next, you must see the pattern of the whole sky, its big direction lines and its structure lines. These lines will converge in the distance just like the two rails on a train track. You must see these things before you begin to draw.

At this stage, it will be better for you to draw one cloud at a time. Do this drawing in an outline of the shapes and masses. We will deal with cloud groupings later. At this point, it is more important for you to watch than it is for you to turn out a finished drawing of a sky full of clouds.

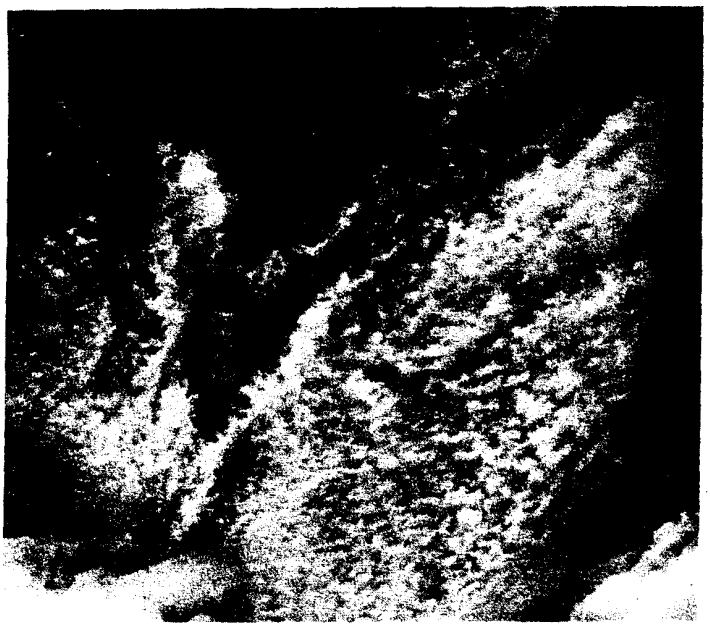
WATER AND LIQUID FORMS

The atmospheric forms we have discussed relate very closely to the water forms, a fact that is easily understood since water has an atmospheric origin. Yet it is difficult to think of water as having any shape at all. Like the atmosphere, we accept water so completely that it is an unconscious part of our daily lives. We have to think a little to realize that we are delighted by the splashing

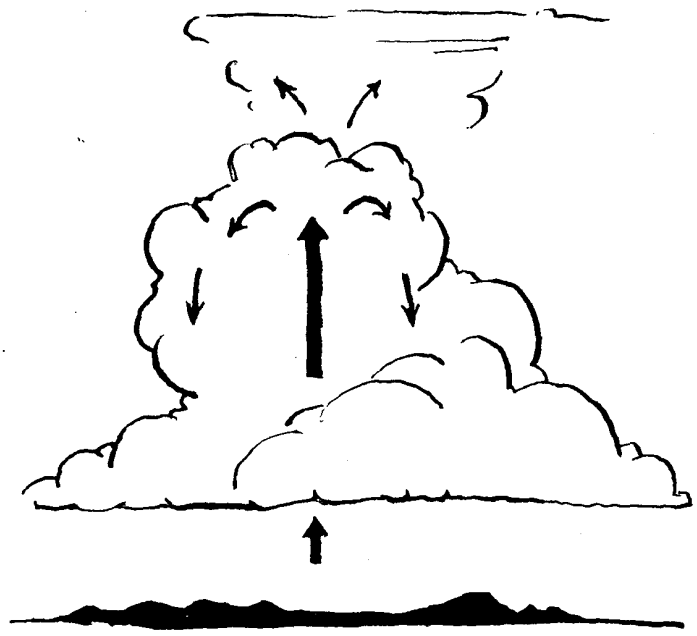


71. Cumulus clouds on a stormy day show a strong contrast in light and dark tones.

72. These cumulo-nimbus clouds over Sanibel Island, Florida, are typical of rain clouds in semitropical areas.



73. Cumulo-stratus clouds have a feathery, light texture.



74. The magnetic field movement occurs in cumulo-nimbus cloud formations.

shapes that are created by a simple act as filling a glass with water. We watch the swirling clouds of cream in our coffee with a similar unconscious pleasure. In bathing or swimming, we appreciate the feel and look of the flowing shapes of water just as thoughtlessly. Children are more aware of water, however, and take great pleasure in playing and splashing in it. This is true particularly of the act of urinating; in this function, young children feel a natural delight, not only with the feeling of release but with the bubbling and splashing forms.

There is certainly nothing odd or unnatural in this because we are, as organisms, a highly refined system of circulating fluids. In fact, we are composed of 72% fluids and of only 28% solid matter. The percentage of fluids is certainly large enough to make it quite evident that our form and the forms of all living things follow the patterns and ways of water.

We have spoken of the streaming, branching, and anastomotic lines, along with the galactic form, vortex, radiating lines and circles, and the wave and spinning wave lines. We have found all of these to be rooted in energy expressions and have followed them further into the realm of the atmosphere. You can find similar forms in water and fluids once you overcome the difficulty of observation because water is so changeable. Water forms are difficult to observe in the same way that smoke and steam forms are difficult; these forms arise and dissipate in seconds, almost faster than the eye can follow them.

With patience, we can observe water forms. Leonardo da Vinci, who was a very careful observer of nature, was able to understand many of these forms (Figs. 75, 76, and 77). Today, we are aided by the photograph and motion picture which can slow down or freeze the movement. But remember that these aids are only for temporary help in our primary goal of observing these things directly as Leonardo did.

We begin our observations with the fact that water responds to the force of gravity and seeks the lowest level. When water reaches the level it seeks, its top surface forms a flat plane as on a still lake or a lagoon, in a basin or a tub. In this still state, the edges of the flat plane follow the contours of the shore line, perfectly marking the water level. In drawing still water, we want to establish this water level line in relation to all of the land masses. Another important characteristic of still water is its ability to reflect a mirror image of all that is above. Even in wavy and moving water there is a certain amount of reflected image. We will discuss this in more detail later.

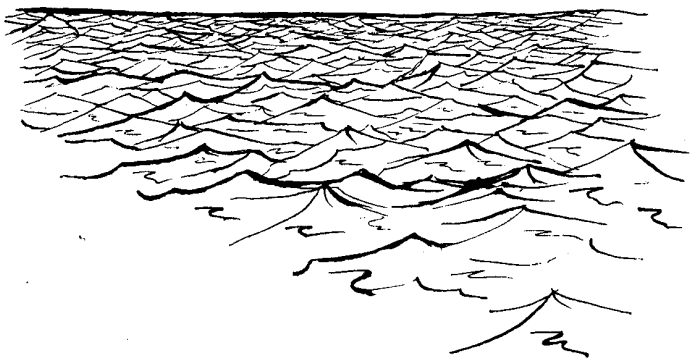
Maybe you have seen a mountain lake at dawn that was as still and as flat as a mirror. As the sun rises on such a lake, the surface changes to ripples which move gently across the surface. Gradually, these ripples change into waves so that the entire surface is covered with a complex texture. You look at such a surface and ask how the artist can possibly understand such complexity. There is too much there to deal with the waves one by one! So the answer is that the artist must find a broad pattern which will explain *all* of the smaller variations. Actually there are two patterns—a series of wave lines that run parallel to one another and the network of anastomotic lines.

Occasionally, waves do run in parallel wave lines when current and wind run in the same direction and when the wind is not too brisk. In most instances though, the water surface is broken and irregular; in this case, the pattern is *anastomotic* (Fig. 78). We can draw all degrees of wave and

75. *Study of Eddies of Water* (Above left), Leonardo da Vinci, pen and ink. The Royal Library, Windsor Castle. Leonardo's studies of water demonstrate keen and careful observations.

76. *Study of the Human Blood Stream* (Above right), Leonardo da Vinci, pen and ink. The Royal Library, Windsor Castle. Leonardo made studies such as this one of currents, eddies, and jets which occur in the human blood stream as well as in nature outside of man.

77. *Study of Eddies and Falls* (Above), Leonardo da Vinci, pen and ink. The Royal Library, Windsor Castle. These studies are the results of actual experiments with streaming water.



78. Anastomotic lines in water occur where the form breaks and changes directions.

chop by seeing the entire water surface as an anastomotic network enclosing irregular diamond shapes (Figs. 79 and 80). Regarding the surface this way works well for water with both small and large surface waves. We can treat the larger waves as triangular shapes that are pulled up here and there from the network surface. In a situation with storm waves or waves created by high winds, the surface tends to be directional. The waves group in series that are closer to wavy lines generally at right angles to the wind source, or the line that comes from the point of origin of the storm.

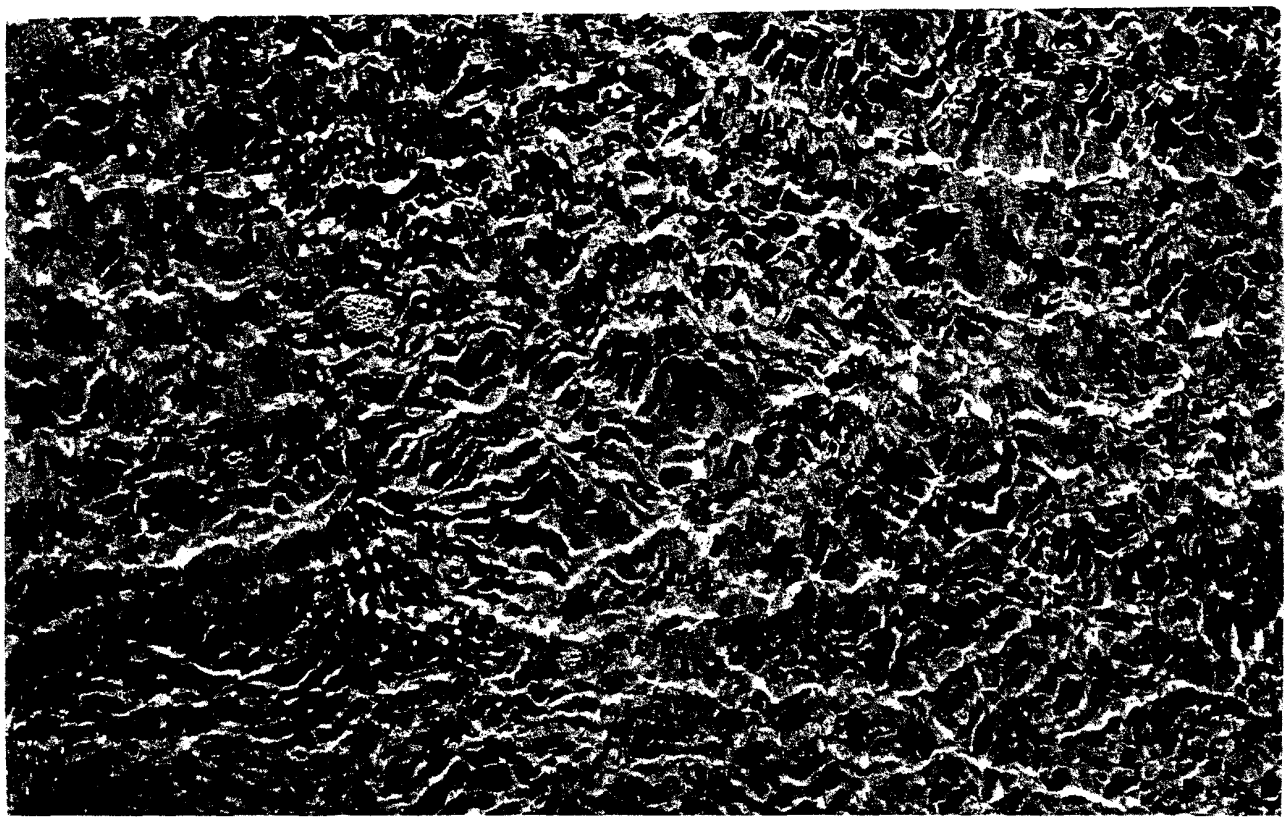
Shore waves begin near the shore where the bottom of the ocean or lake begins to rise up toward the land. These waves form in lines parallel to the shore (Fig. 81). One individual wave can be longer than a city block or as short as fifty feet. On one area of the shore, a wave may be just breaking, while at the adjacent strip the water will be receding. There is always variation all along a shore line (Fig. 82).

The patterns of shore waves have always been attractive to artists and the surf is generally appealing to people. But the pattern is difficult to grasp because there are many things going on at the same time; all of them begin slowly and increase in velocity. So the problem is to see the wave's life, its growth, development, and decline. You can do this if you examine the wave from three viewpoints. First, get a bird's-eye view from above for the spacing and frequency of the waves and their growth point (Fig. 83). Next, get the view from the shore as described above. Finally, you must see the waves from the side as though you were separated from them by a big sheet of plate glass that would allow you to see them all the way to the bottom (Fig. 84).

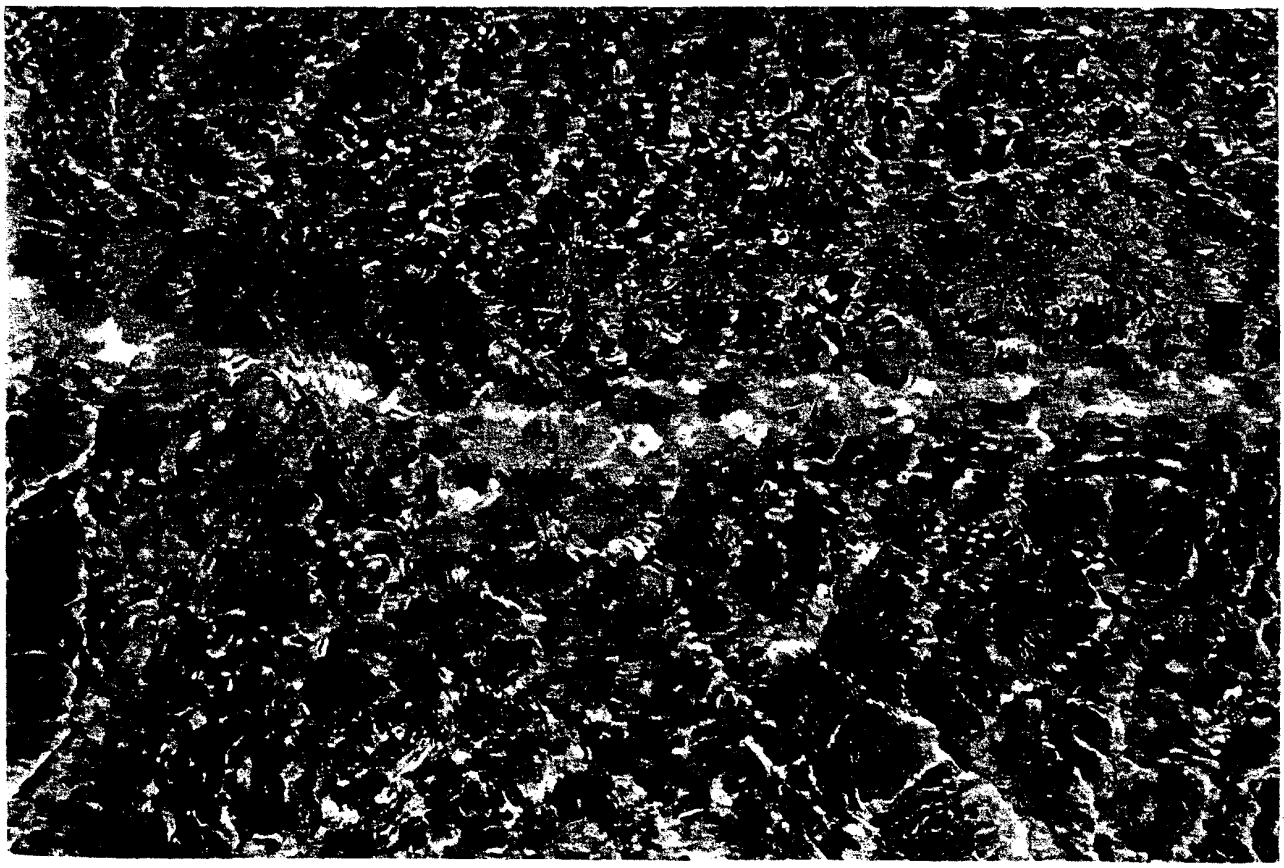
When you see the wave develop from the side view, it seems to emerge from the rounded shape of the surface swell (Fig. 85). This form is created because the water at and near the surface is moving in spinning waves. As the water reaches the shallower areas of the shore line, there is less space for these spinning waves to revolve and so the wave thrusts upward into the air. As the water becomes shallower the wave reaches a stage where the body of the spinning wave is almost completely above the trough level. At this point, the spinning wave turns over in the air before it changes its shape in the process so that it is like one arm of the galactic form while the air in front of it is the other arm. The water and air spin and mix and rush over the water at trough level, creating splashes and foam and forward-moving swirls. Then the water is thrust up onto the beach as a linear, forward-moving, curved stream or sheet.

As this water comes to rest at the final rise, it seems to pause. Here it may be covered by a swiftly moving sheet that emerges from a new wave, or the sheet may be overlapped on one or both sides. As it rushes back it may pull an incoming sheet up short and then back with it. Finally, as it gains body, the water will move in an undertow of spinning waves that run counter to the surface movement. This is like a great symphony with major and minor themes, the great pulsing rhythms of the spinning waves, the superimposition of the two elements—water and air—that give birth to swirl and foam.

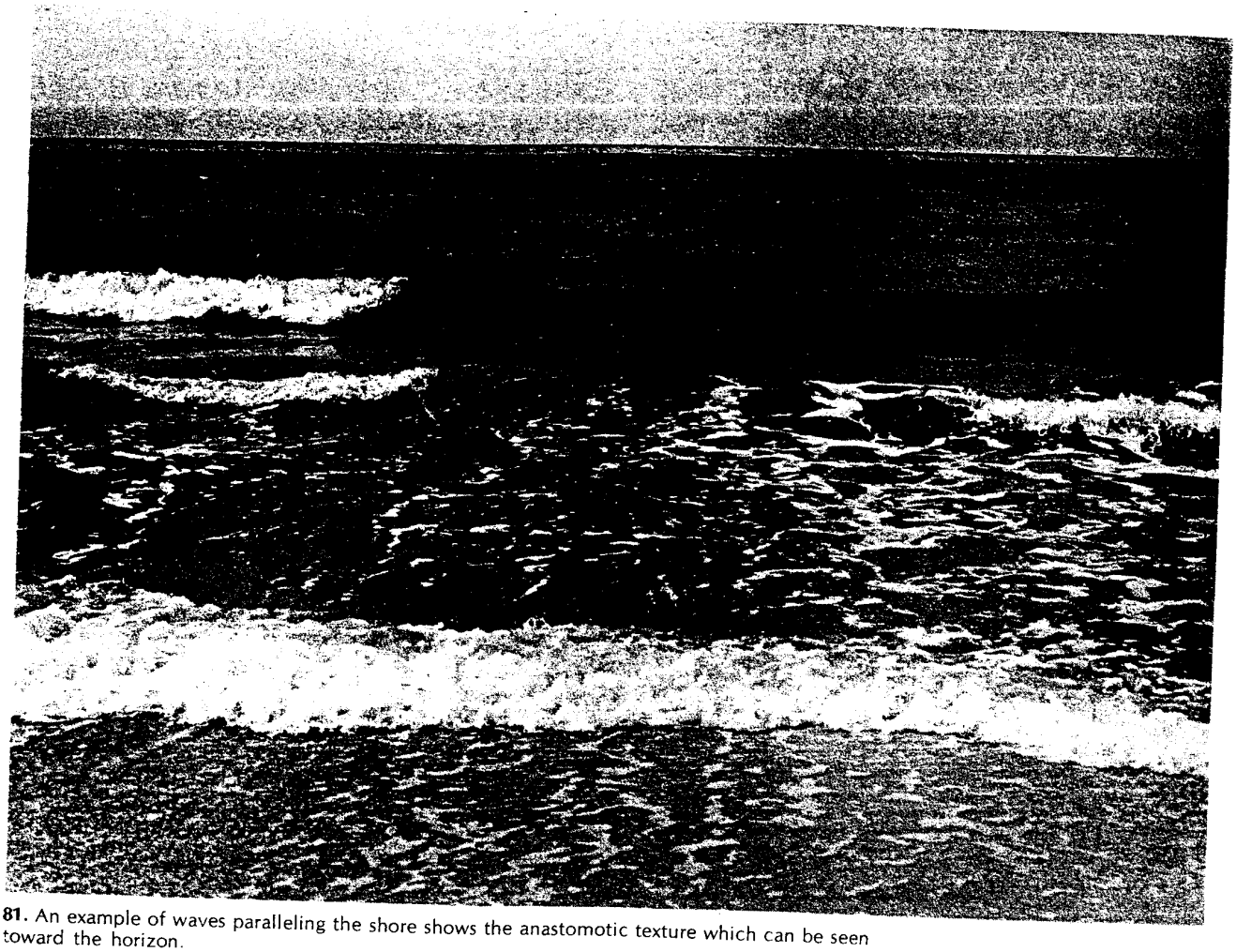
Water is a most responsive and sensitive medium as its forms are generated by the movements from the air that borders above it, by the shapes of its earthly bed below, and by the shapes of its own internal movements. All of the water forms are variations on the spinning wave form, from



79. Water, atmosphere, and light create these forms; the atmosphere moves the water, causing swellings which act like lenses focusing light patterns on the sand below.

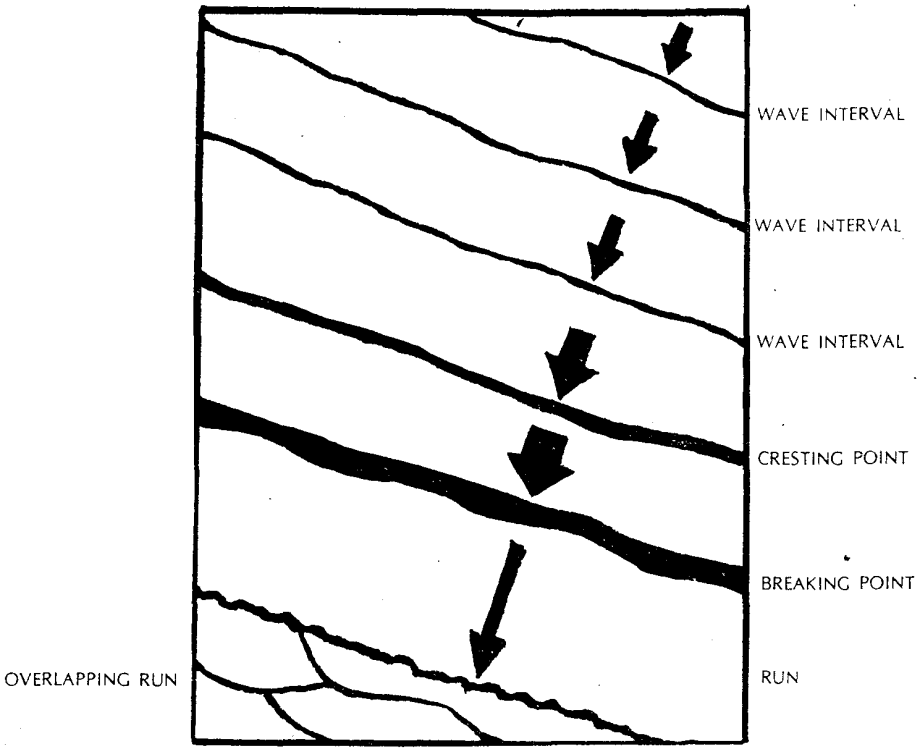


80. The streak of light along the center of this anastomotic pattern was caused by a ripple or wavelet.

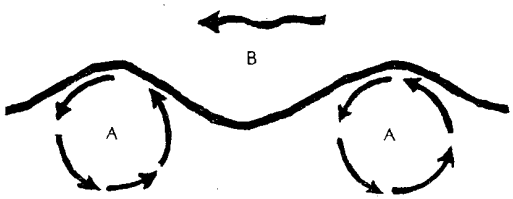


81. An example of waves paralleling the shore shows the anastomotic texture which can be seen toward the horizon.

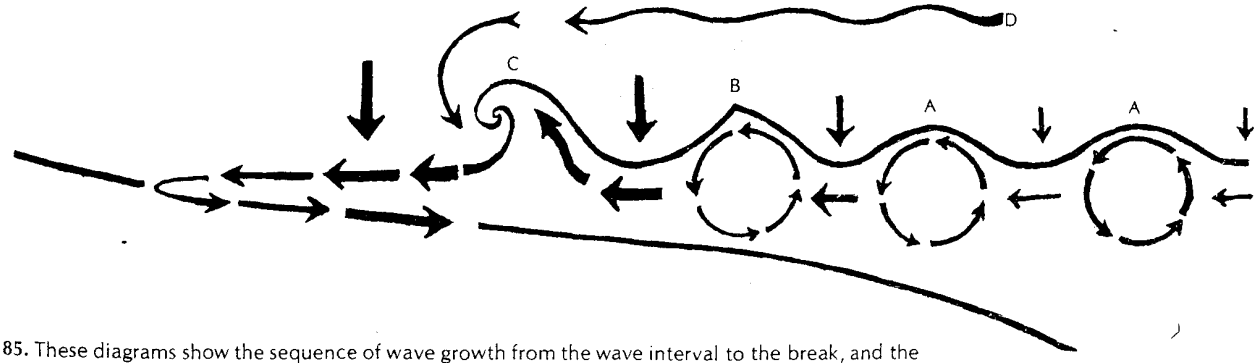
82. *Long Island Sound from Fish Island,* John Frederick Kensett, oil on canvas, 15 1/2" x 30 1/2". The Metropolitan Museum of Art, Gift of Thomas Kensett. This painting has the simple structural pattern of receding horizontal lines that is characteristic of ocean waves.



83. A bird's-eye view of shore waves shows the spacing and frequency of waves as they grow.



84. This cross section of waves shows the internal movement of wave systems. (A) represents the internal movement of the wave and (B) shows the movement of the wave toward the shore.



85. These diagrams show the sequence of wave growth from the wave interval to the break, and the final surge of water on the beach. (A) represents the wave interval, (B) is the crest, (C) shows the break of the wave, and (D) is the surface wind.

the smallest splash to the largest ocean current. Let us take a look at the forms that occur in moving water.

Well known to everyone, because they occur so commonly in water, are circular radiating waves and the wake radiation (Figs. 86, 87, 88, and 89). The circular radiating waves come about when some object—such as a raindrop, a stone, or a boulder—falls into a body of water. The circular waves are generated by the stone displacing some water and creating a splash hole into which the water rushes back toward the center and then rebounds in spinning waves which move outward in series across the surface of the water. Their size and the distance they travel depend upon the size of the object, its weight, and its velocity plus the surface conditions of the water. The larger the stone and the smoother the surface, the larger and further the pattern will extend. The wake radiation is merely a variation on the same theme; it is caused by the forward movement of the vessel plus the displacement of water by its mass. The angle of the wake pattern is approximately 60°.

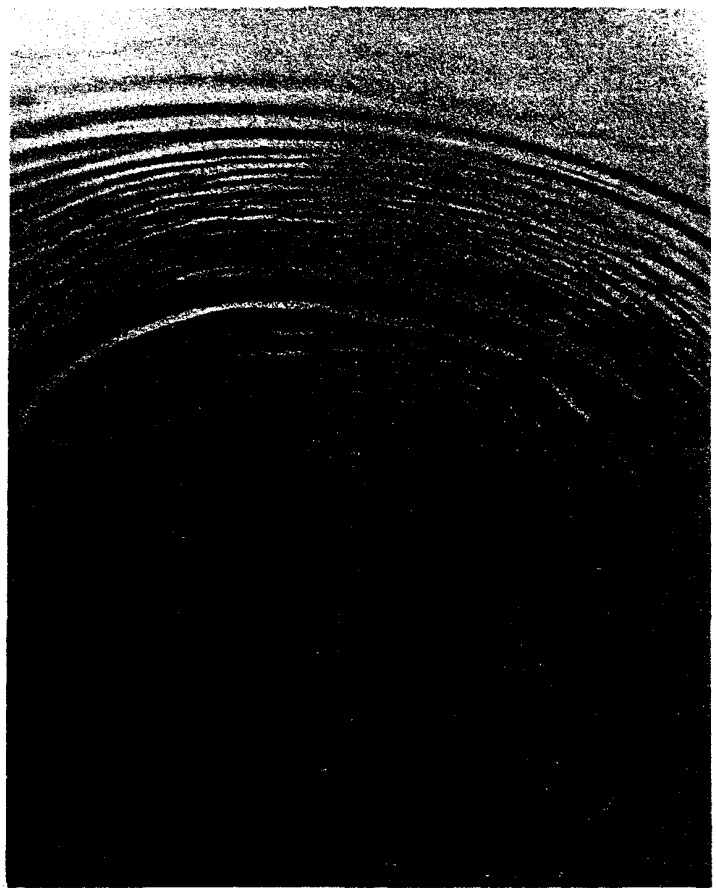
The forms of splashes and bubbles also have very interesting shapes (Fig. 90). The combination of the air passage and the water displacement in a splash creates a sequence of forms (Fig. 91), which begins with a cone form with slightly curved sides and grows into a tubular form with wavelike sides as the stone falls deeper into the water. While this sequence develops, the water around the opening on the surface rushes inward to form a ring of splashes that rises up and outward. As this occurs, the opening is closed by a spout of water that comes up from the center of the hole.

Patterns similar to the splash are created in water when colloidal liquids of a heavier body than water are poured into water. The swirls of cream in your coffee can create cloudlike forms, or the drop of India ink in water swirls like smoke (Figs. 92 and 93). Many other shapes are formed by mixing two liquids of different density. These range from a simple teardrop to a lens form (Figs. 94 and 95), to forms so complex that they almost defy words.

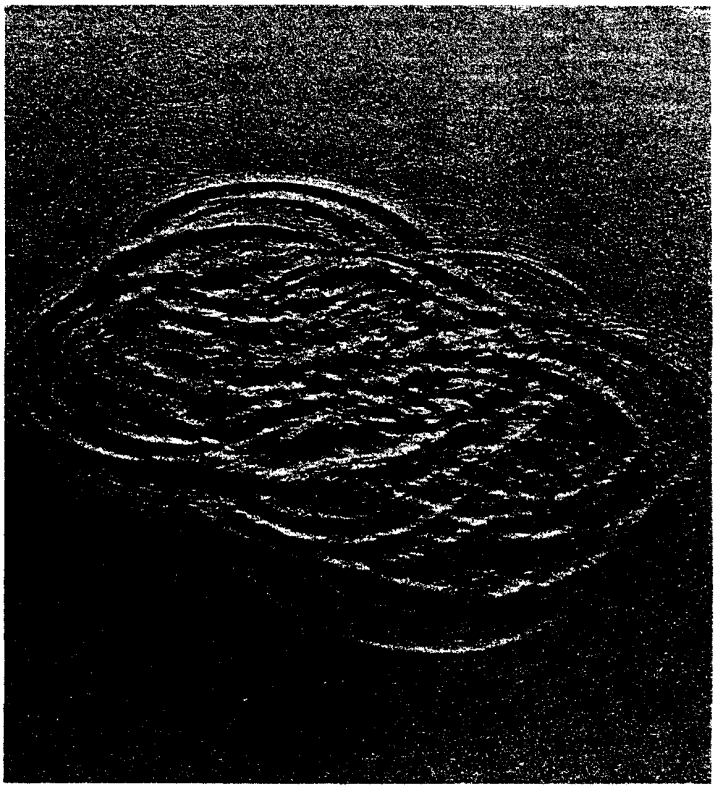
The forms of bubbles and foam are significant water forms too. The single bubble of sea water and air is as close to being a perfect globe as any form found in nature. But the bubble form is capable of a number of interesting changes. When bubbles are packed together in a single film, the formerly round bubbles become hexagon shaped (Figs. 96, 97, and 98). When these spheres are piled in masses, they assume a fourteen-sided shape called a *tetrakaidahedron* (Fig. 99).

The forms of running water are even more varied because they include all the foregoing forms as well as forms created by streaming and flowing. There are several factors that create the forms of flowing water. The first is the energy structure of water and its tendency to freely form itself in spinning waves (Figs. 100, 101, and 102). Also important is the water's response to the movement and attraction of the air and atmosphere. Air and water dance together; they mix and mate; they are sympathetic. On the other hand, water and matter are not on such good terms; matter tries to stop the movement of water to make water still and inert like itself, but water swirls and moves all the more for this restraint and eventually wears matter down to the point where it will express the movement and characteristics of fluid as much as it does mass.

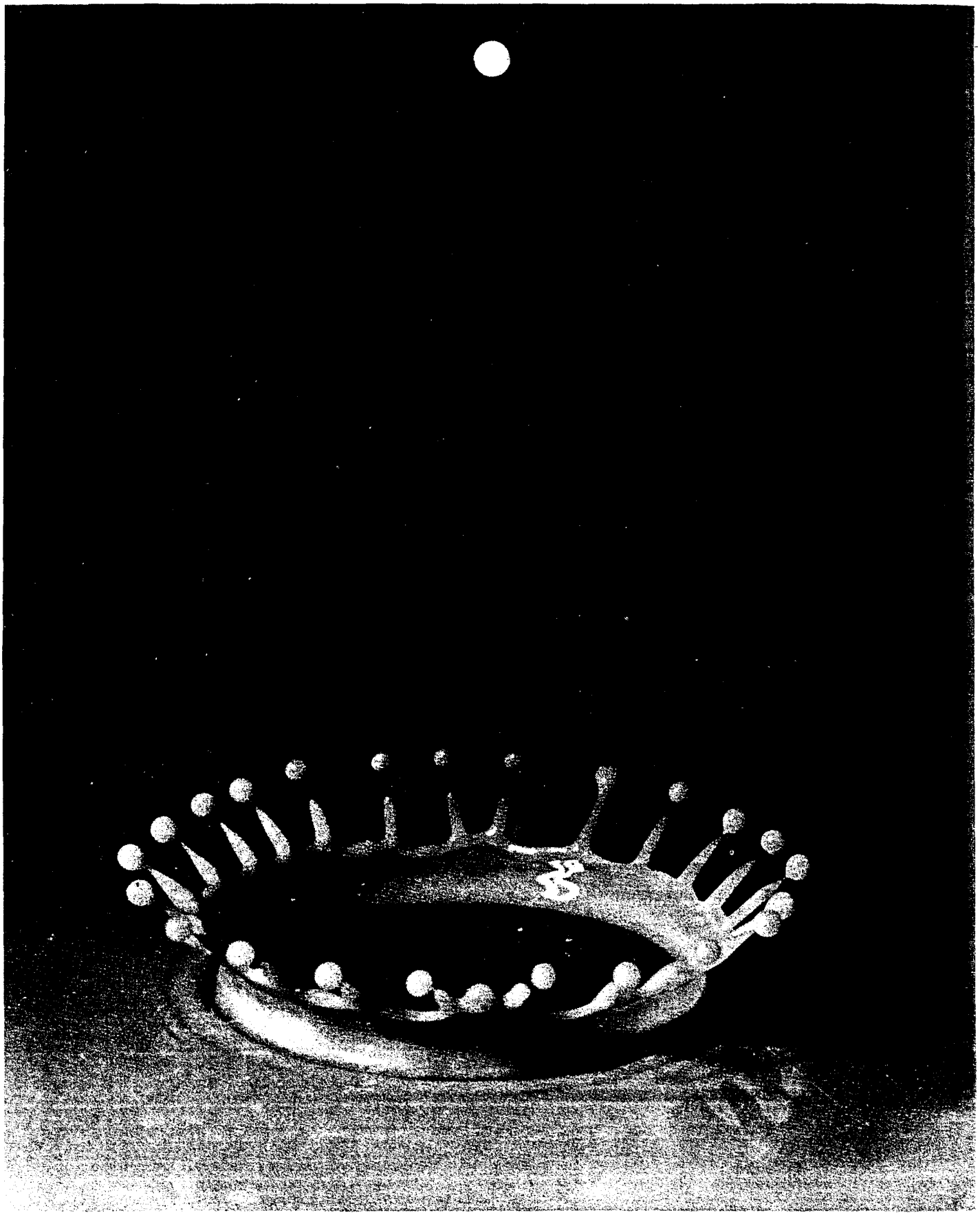
Streaming water will shape the sand and mud of stream bottoms in rippling wave patterns that duplicate water's



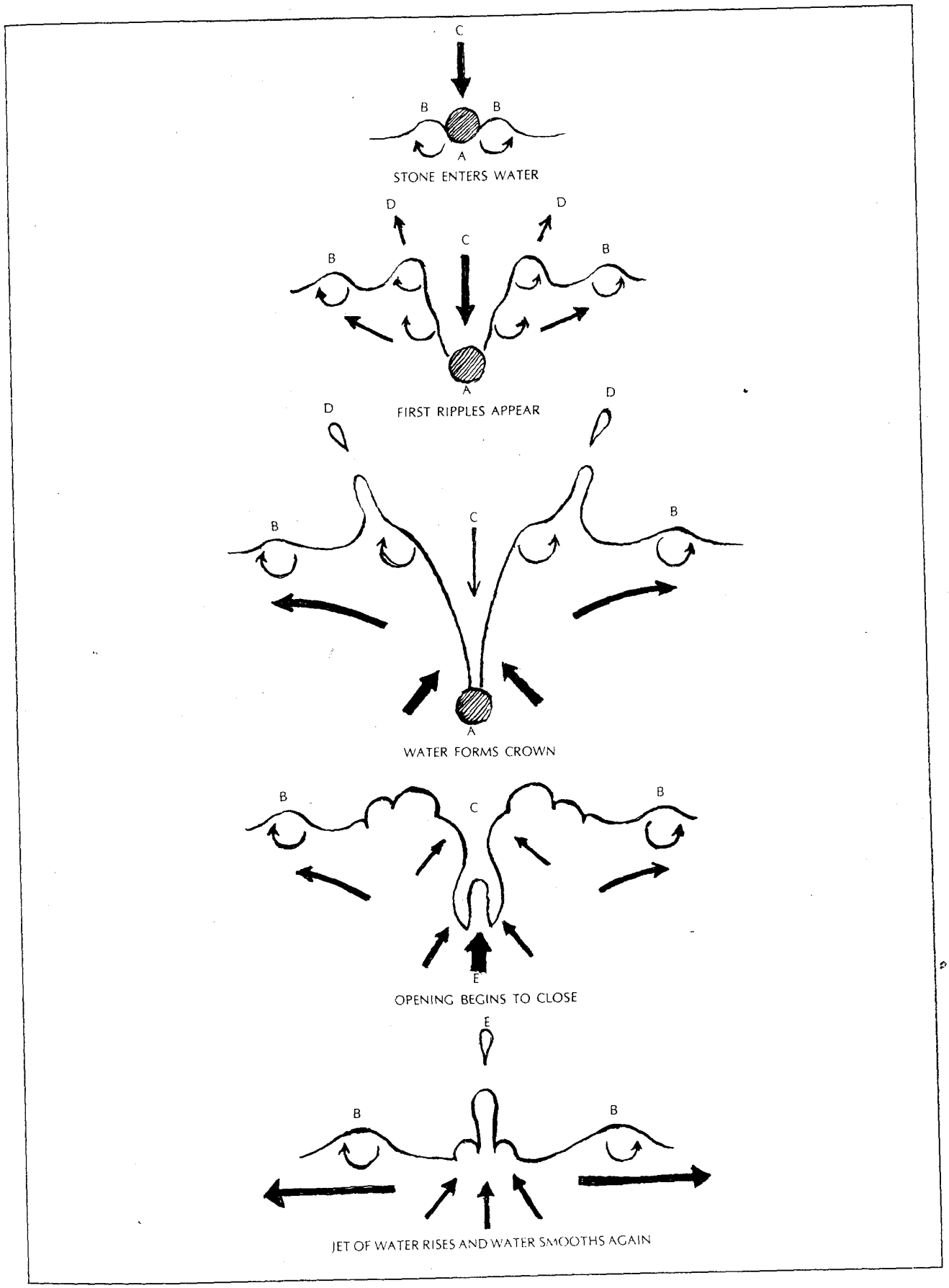
88. This is an example of circular radiating waves with a single source radiation.



89. About six radiations start at the same time.

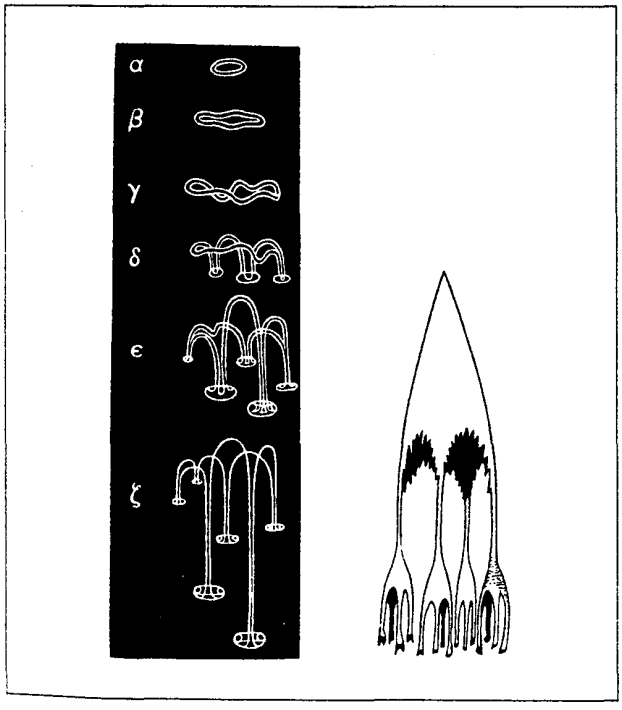


90. This is No. 3 in the splash sequence. (Photo by Harold E. Edgerton, Massachusetts Institute of Technology)

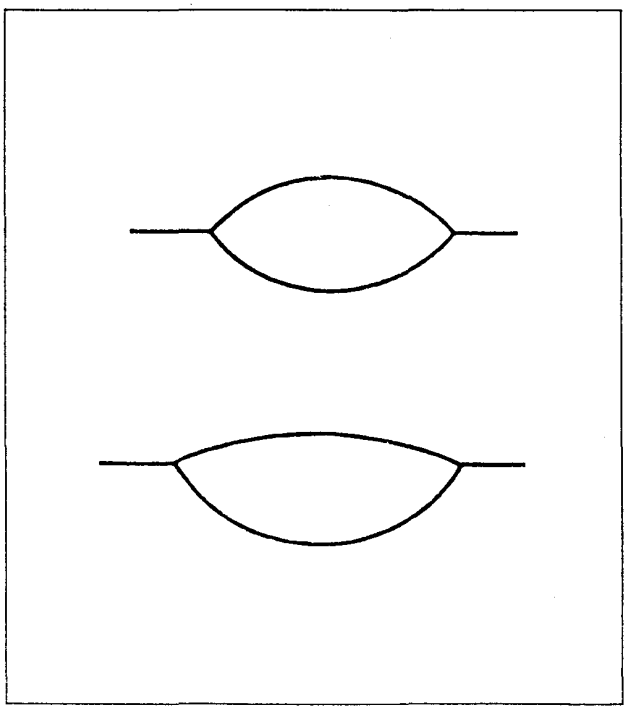


91. These five diagrams illustrate the splash sequence.

93. Compare these colloidal forms with the spinning wave and smoke patterns.

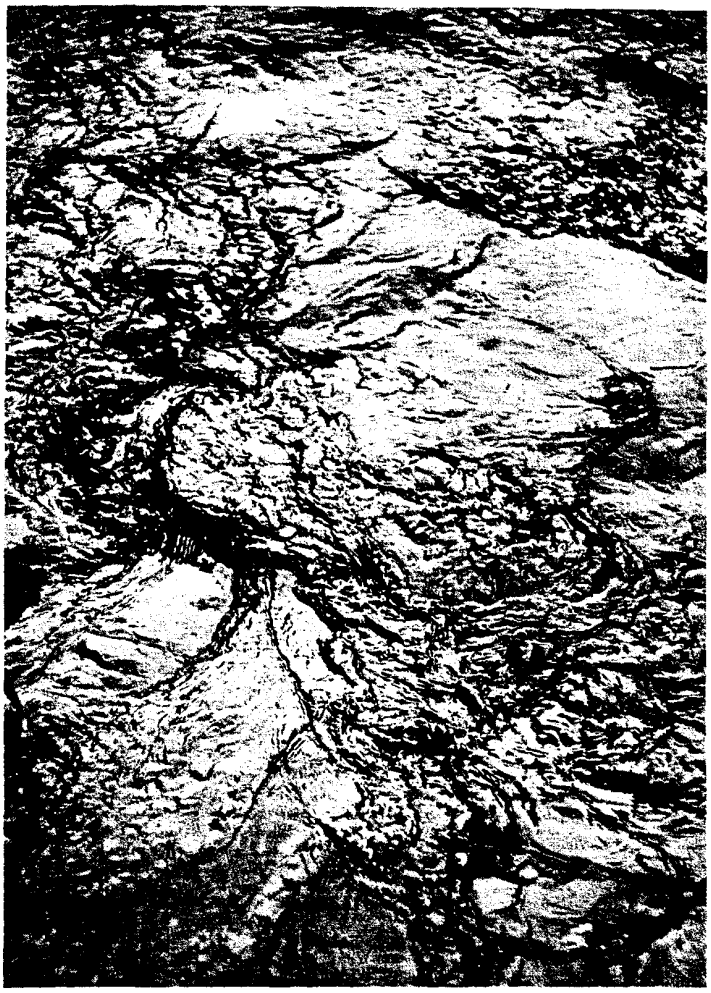


94. This diagram demonstrates the sequence of a drop of India ink in water. (From *On Growth and Form*)



95. The lens form is created by two fluids—one denser than the other—and the atmosphere. (From *On Growth and Form*)

106. Water falls in waves and spirals, which are forms of the spinning wave.



107. Vortices and eddies occur in a swiftly moving stream flowing around a rock. Both forms are variations of the spinning wave.

144. In these two plants, we see examples of the spinning wave.

FORMS OF ORGANISMS

Though we are organic forms that pulsate with life as we move about in the activities of living, we have no absolute necessity to understand why or how we live. We live for the sake of living. We accept the life within us and the life around us. Only occasionally do we ask the question "What is life?"

However, when we do ask this question and we think about life seriously and deeply, we find that we have some mysterious and intuitive way of knowing what goes on in other living creatures. All of us have some of this insight, but some people are incredibly sensitive to life and we call them seers or geniuses. But almost all human beings have the innate quality of deeper understanding because the forms and movements in the world outside of man are duplicated within the human organism and its internal movements. When you understand a thing outside of yourself, you are actually recognizing something that is felt within you.

This has to do with not only the energy forms, atmospheric forms, liquid forms, and the forms of solid matter; it has to do also with the forms of other living creatures. Man has, or has had, within him all the stages of evolution from a one-celled organism to the fish, reptile, and other levels of animal development. You might say that we are a specialized organism that has evolved to know and feel all of these realms.

When artists and talented children begin to draw something, they do not just copy its lines, contours, and shapes, but while drawing they *become* the thing that they wish to draw. Whether it is a living creature, a stone, or a cloud, the artist and the child always seek the feeling of that thing within themselves. They find the feeling of weight or lightness, movement or stillness, pattern and direction from the storehouse of movement and processes within themselves. The children's game of pretend is an important feature of human learning and this game is a worldwide phenomenon. When an adult seeks to understand a thing he still plays this game.

In our discussion of line in Chapter 2, we found that the stick figure originates from man's awareness of his own

skeleton through his inner feeling of it. By placing the stick figure on all fours, we apply the same concept to animal forms, just as children do when they go on all fours, playing "doggy" or "horsey." But this is only part of how man has learned to draw; he had to learn to fill in the volume of the creatures that he wanted to represent. The stick figure has a certain amount of life and animation, but man feels more than this. He feels volume, weight, and the pulsation of life. The question remains, "Where does the concept of roundness and fullness come from?"

When talented children begin to draw they not only have an instinctive grasp of the stick figure, but often use rounded forms to duplicate the rounded segments of the body (Fig. 156). The segments that they duplicate all the time are the trunk and head. Some children then use lines for arms, legs, hands, and feet, but others will use rounded forms for every part of the body. This is a result of their internal feeling—the feeling of fullness in each segmented part of their bodies. These children have intense feelings within themselves and these are feelings of shape as well as life. The mature artist is one who has kept the awareness of these same feelings in himself, and therefore draws not only what he sees but what he knows by his inner feeling.

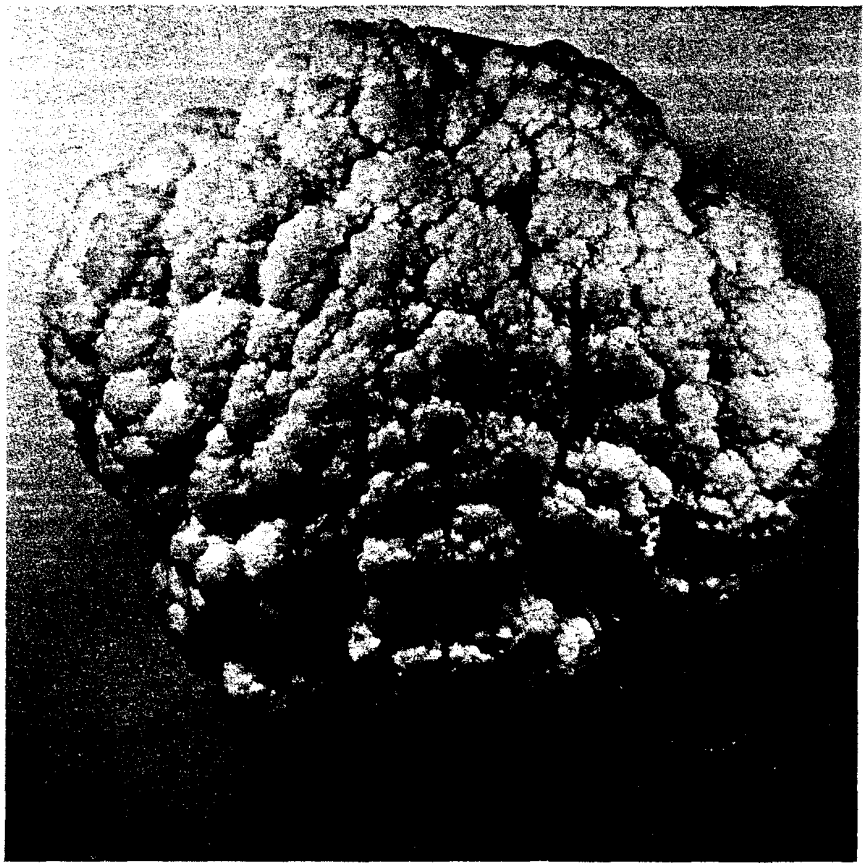
As I said earlier, geometrical forms do not correspond to the actual forms of nature. Geometrical forms have no feeling because they are arrived at by a dry, mechanical formula that does not take into consideration the state of energy or the feeling within the subject. Furthermore, geometrical forms can be constructed by people who have little or no feeling for life and growth at all. The talented child does not use geometry as a source of his feeling of form, nor does the talented artist. When they make full shapes they are not trying to make circles or ovals. Instead, they are drawing out the shape of the flowing feeling within themselves, and the shape of the flowing forms found in nature. In our search for natural form principles we have found some of these forms, forms rich with content and feeling. We have found these forms in all of the other realms of nature and it is a possibility that they may give us some clues that will lead us to the abstract forms of living creatures.

When we examine living creatures—ranging from the one-celled swimmers, found in every pond all over the world, to those higher up the scale of life—two forms emerge that blend together and fit the shape of life. The teardrop shape that so well describes the seeds of plants is the *orgonome* (the form of energy in living systems described by Wilhelm Reich) of water creatures. This form has great similarity to the bodies of animals, if we overlook the heads and legs. Since animals have evolved from the swimming creatures it is logical that they have kept some aspects of their form. But animals have added new capabilities that enable them to move over the earth and reach outward. Did the creatures of the land actually *add* these new ways? It is possible that we have overlooked something about the form of the swimmers and if we look more deeply we will find an additional meaningful form within the orgonome or the teardrop shape, another form that is fused with it (Fig. 157).

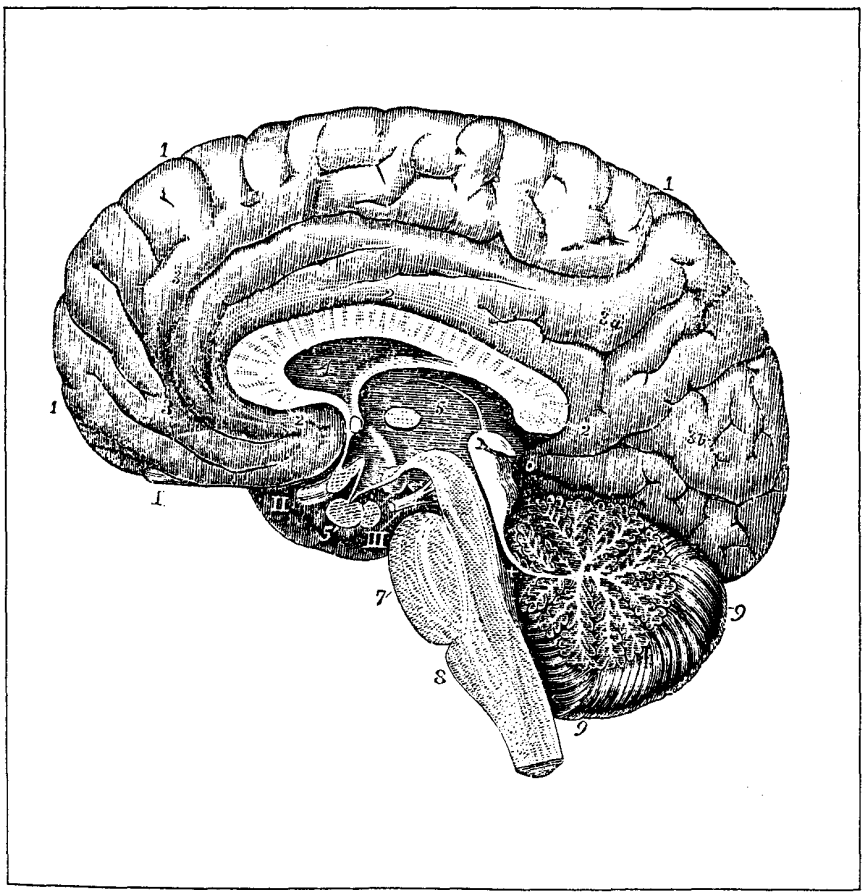
The other natural form that shows the greatest over-all

147. These two plants are examples of the vortex form.

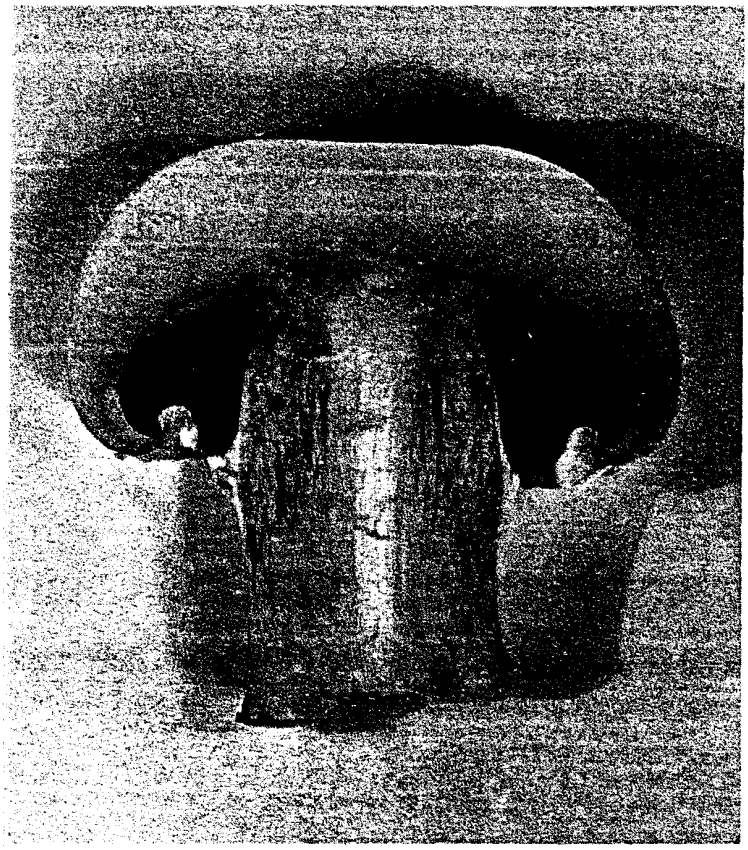
146. (Left) A daisy shows both radiating lines, as in the magnetic pole, and a spiraling movement, as in the galactic form.



150. We can see the cloud form in a cauliflower.



151. A parallel of the cloud form is found in the convolutions to the human brain.



154. This cross section of a mushroom shows its relationship to the jet form of water.

resemblance to walking and crawling creatures is the *magnetic field*. This form possesses a fullness, a mouth-to-anus direction in its internal parts as well as the internal shapes and forms of organs. In addition, the two forms merge so beautifully that the two together resemble a single-celled creature, or a fish, and with a little more emphasis on the magnetic form the arms and legs begin to fill out the form of a land creature. When you realize that the magnetic field of the earth surrounds and contains everything we know of life and nature, you will understand that its basic form should be echoed in all forms.

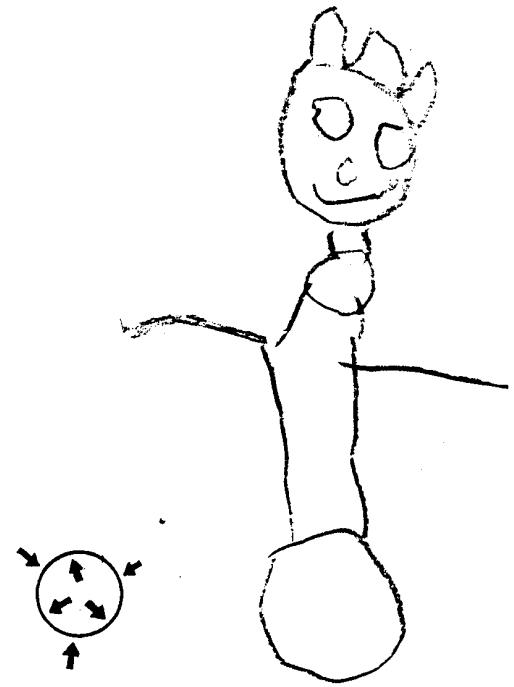
The abstract forms we have found throughout all of the other realms of nature are also in many variations and combinations in living creatures. The form of the orgonome and the magnetic field are the basic forms and they tend to dominate or produce the rest. For example, the form of the embryo or the form of the male and female sexual organs follows the form of the jet of water (Fig. 158). The bronchial tubes of humans and animals reproduce the branching form. The veins, arteries, and nerves are anastomotic networks. A kidney or an intestinal tract bears great resemblance to the invaginated form of the cumulus cloud, etc. (Fig. 159). But all of these forms are produced within the orgonome and the magnetic field.

It is important for the artist to understand that all of these shapes and forms are variations of the spinning wave line. This line expression seems to be basic to all growth and movement. It is also important to consider how the forms that are hidden within organisms help to create the outer form. In drawing organic forms, you should realize that the inner movements and shapes create the most important aspects of the form, which is not the outline or surface roundness, but the pulsation of the life within and the flow of energy. The inner movements express the process of life—the rhythmic heartbeats and breathing, etc.—while the flow of energy in the muscles or at the skin expresses the emotional feeling and the reaction of a creature to the environment (Fig. 160).

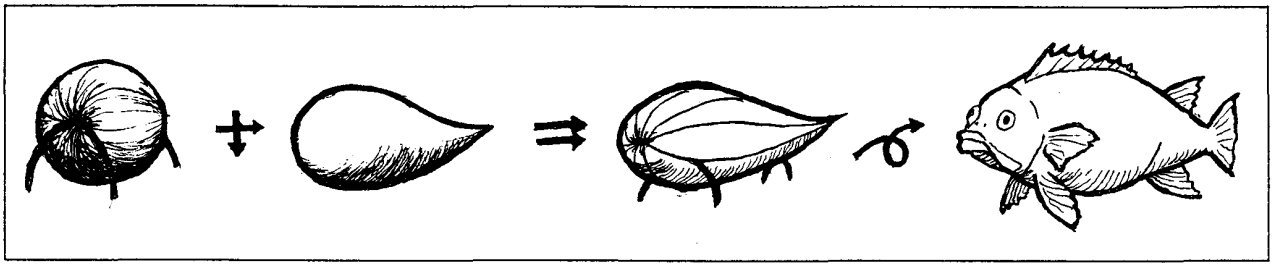
In other words, knowing the movement within the form, —seeing it and feeling it—is the key to drawing it well. It is the key to understanding what a living creature is—what makes it different from the plant, the mineral, the inert form. Knowing this about life means that you recognize that male and female living creatures are drawn together in the sexual embrace, that in this the creatures express the creativity that fills the universe. Not only are the forms of the animals designed for this union but in the actual union itself the male and female together create a pattern that is found throughout nature—the galactic form. In the lower animals this convulsive movement follows the galactic pattern alone, but in humans the male and female complete the pattern of the magnetic field in their embrace as well as the general form of the swirling galaxy. These forms, these feelings, and these purposes are all subjects for the artist's deeper understanding.

To attempt a description of the forms of all animal life is more than a lifetime task because there are over a million known species. The fish family alone has so many variations in form, shape, and coloration that it would fill a large volume. The creatures above water are just as varied, and this is why we have to think in terms of the principles of form that are common to all living things. The human form, even though we see it all our lives, is the most complex of all because the range of expressions is so very

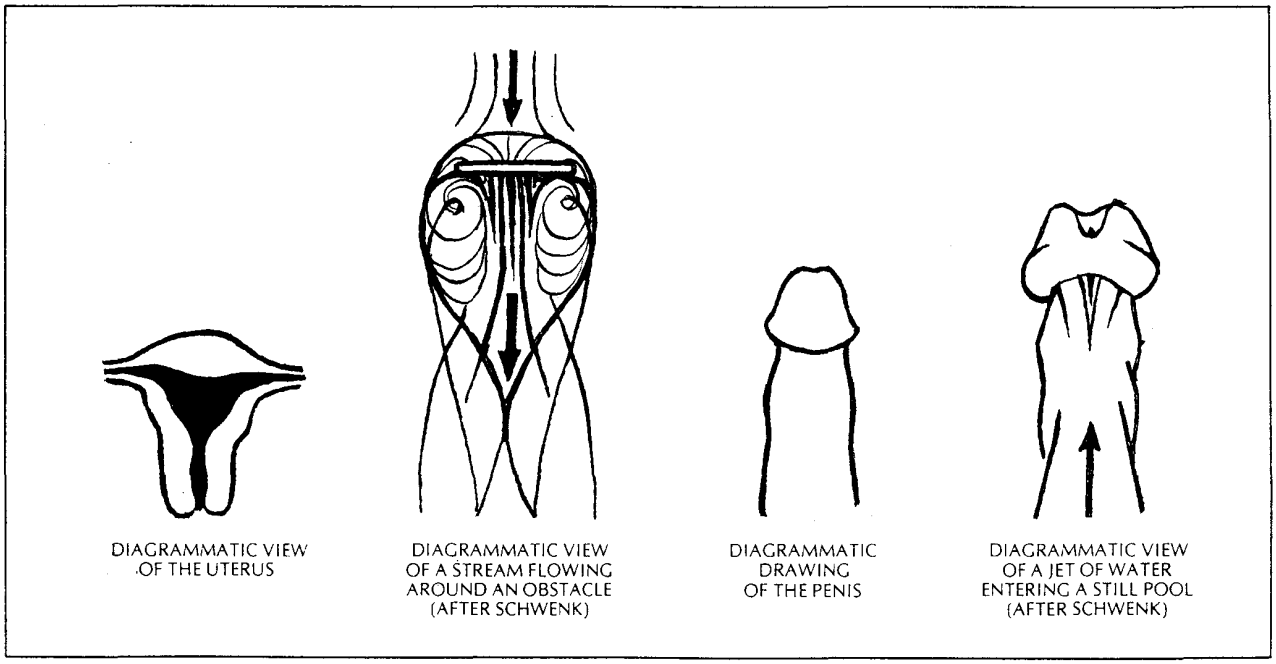
155. This wood burl shows a remarkable relationship to the forms of swirls and eddies of moving water.



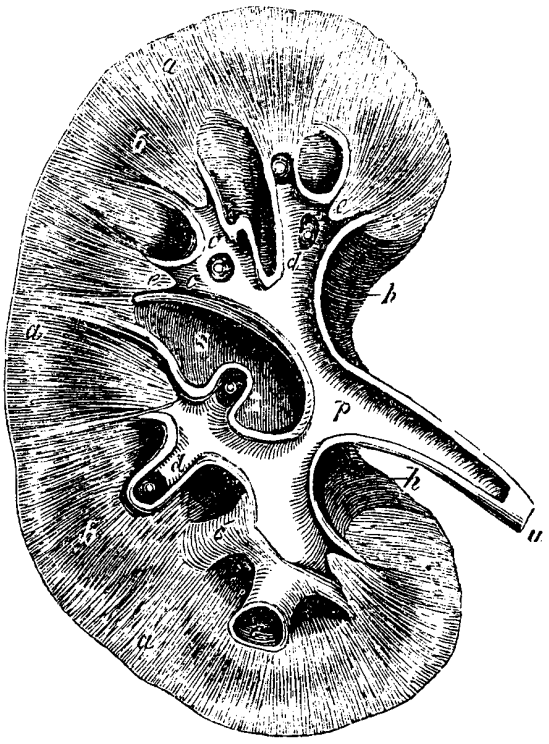
156. Children draw rounded forms as though they have the same qualities of pulsation as organisms. The arrows outside the diagram show the sense of an outside force (atmosphere) and those inside (the inner life). (Drawing by Lisa Hale).



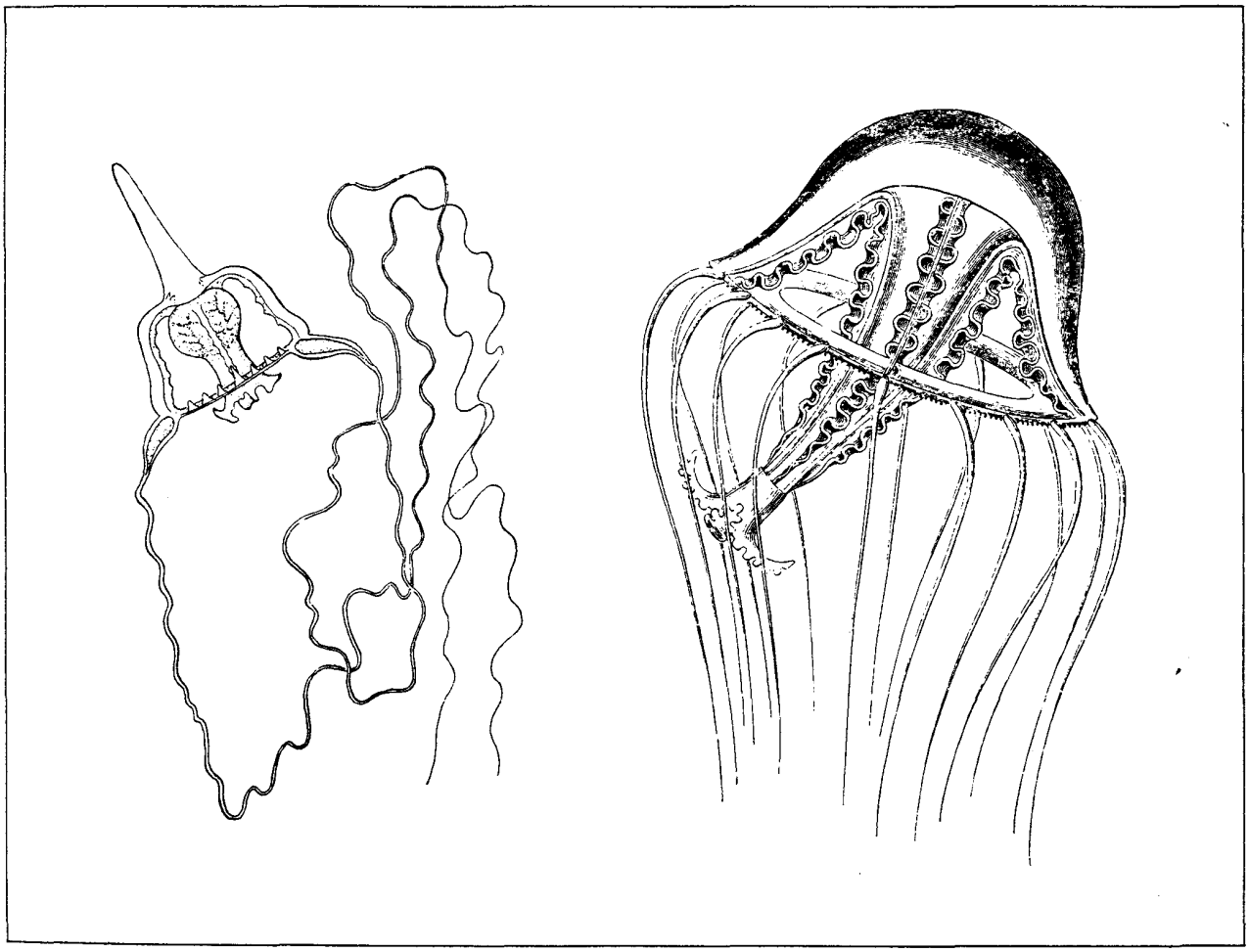
157. The magnetic field and the orgonome merge in the form of a fish.



158. The human female and male sexual organs reproduce forms similar to jets of water.



159. Some human organs follow the jet form: the kidney follows the shape of the inward flow of the fluids that it purifies. (From *On Growth and Form*)



160. Some organisms also follow the jet form: the jellyfish is a structure of fluids living in a fluid medium and follows the movement of its surroundings.

wide. Yet the human figure is the very center of the artist's interest. It is his standard and what he learns from the simpler organisms, he applies to the study of the human form. This is called comparative anatomy and it is very much like the game that children play of being "doggy" or "horsey." Organisms can be compared because their cells all function in the same way and their organs are similar. In the vertebrates, there is an astounding similarity in skeletal structure and musculature because all vertebrates are constructed on the same principles. So it is these principles of form that are important to the draftsman. The basic organic shapes of the orgonome and the magnetic field are the foundation forms of life.

However, the artist must follow the development of the actual growth and forming patterns of the creatures that he wishes to understand. Each living thing should be seen not just as a form of the present but as a history of growing movements which started in the parents' creative embrace and continued in the embryonic growth, birth, and development to maturity. No creature is young forever; all creatures are a part of the great cycle of life. Each stage within this cycle has its own specific tale to tell in form as well as in content.

Project: This is a twofold project in the basic organic forms and movements. You need your pencil and paper. You will have to do some collecting along the seashore or spend some time in the natural history museum, aquarium, and zoo.

It simplifies things to study living forms that have kept a record of their shape and development in the forms of their shells. Shellfish are excellent study material because they specialize in one or two basic forms and movements (Figs. 161-177).

It is a simple matter to collect models of all of the basic forms in shellfish. In coral forms you will find branching, radiating lines, and invaginations (Figs. 179-186). Horn shells show the vortex form, whereas the conch and the whelk show the vortex *and* the equiangular spiral. Many shells show variations of the wave form including the cockle, the oyster, and the murex. Limpet shells show circular radiating waves. Sea urchins are beautiful examples of radiating lines. There are many others.

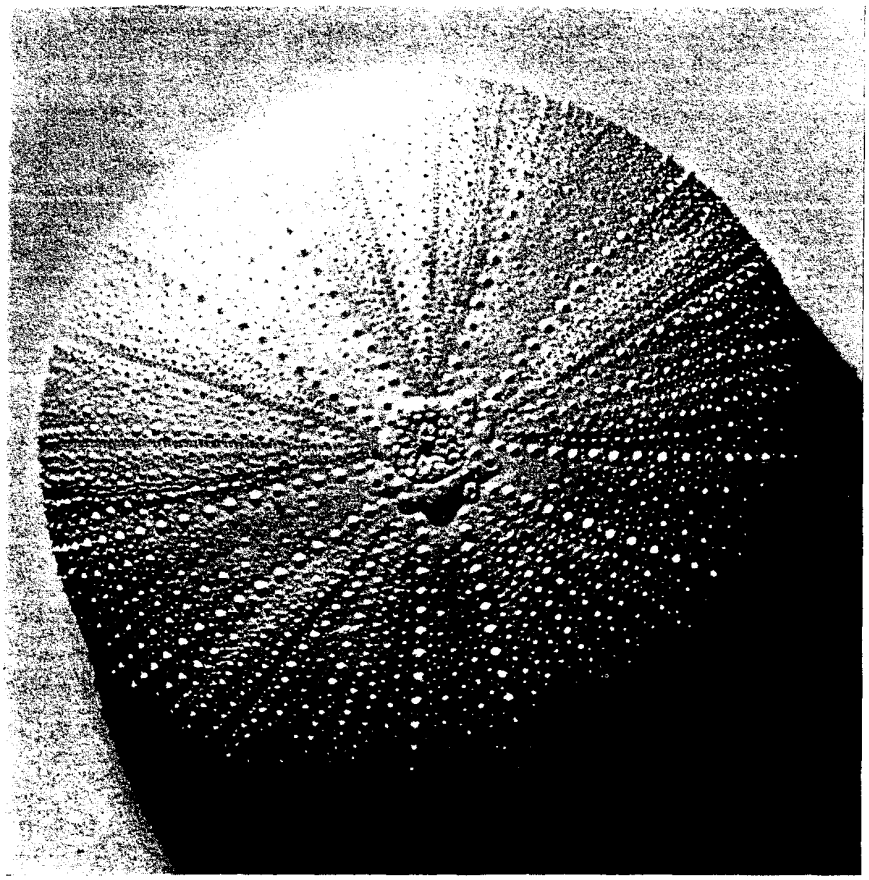
Among other sea creatures the radiolarians, foraminifers, diatoms, and other tiny creatures produce the entire range of structure in their skeletal formations (Figs. 187-194). Among larger water creatures the starfish (Fig. 22) shows the well-known forms of radiating lines, while the octopus' body is a combination of the orgonome and the radiating lines of his tentacles. Jellyfish are shaped in the splash or droplet form (Fig. 195), but the rainbow comb jellyfish (Fig. 196) is a perfect example of the magnetic field form. As we said earlier, the fish forms show the orgonome form most strongly although they sometimes distort it in incredible ways. You must draw as many of these forms as you can find, but first fix the universal principles of form in your mind.

For the study of basic life movements there is nothing better than looking with a microscope at the little creatures that are found in ordinary pond water. In these creatures, you see pure pulsation and streaming movement in the simplest and most beautiful expressions. If you can get to the local high school or college biology laboratory, you will be able to see these little creatures. Or you might buy one of the inexpensive microscopes that are made today, as I have. One way or the other, this is an experience you should not miss. Look for a while and then try to draw what you have seen. Do not worry about the detail of the creature, but work for the over-all movement and feeling of life.

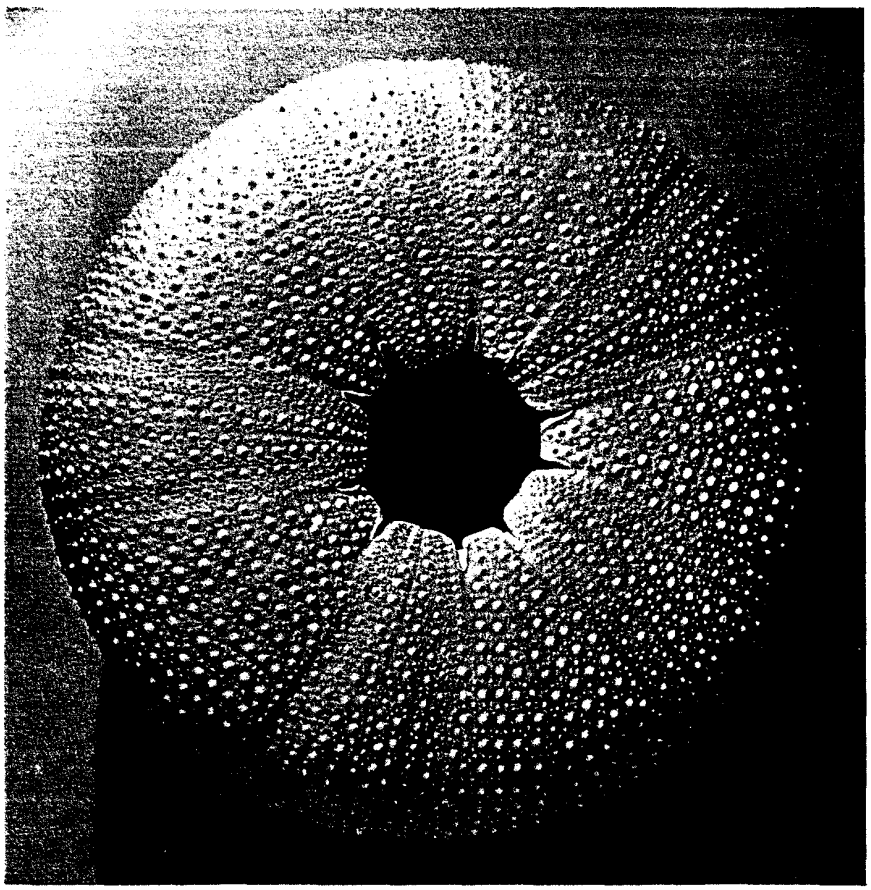
Goldfish or aquarium fish are also excellent subjects to work from as they move fairly slowly and often hold still long enough for a quick drawing to be made. Kittens, puppies, or infants are fine to draw also, but you will quickly find that their form is more complex. Be sure to look for the basic forms that the simple and complex creatures have in common.

There is one very interesting basic exercise that is marvelous for beginners who cannot seem to get the hang of drawing living forms. Take a toy balloon and fill it with water and tie the top. The filled balloon represents the animal membrane with the plasmatic fluid inside. The balloon can be drawn as it sits on a table or it can be squeezed into different shapes. The total effect is very lifelike and quite easy to draw. There is a fascinating responsiveness in this form that will open a beginner up and enable him to make the transition from hard shapes to the soft yielding ones.

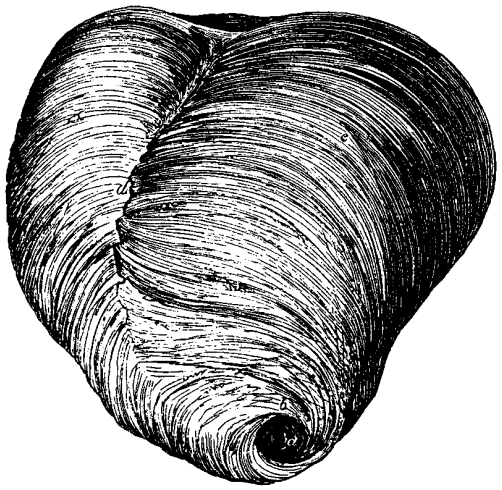
162. (Left) This shell is a closed spiral which connects itself as it grows along its long axis, creating a solid form.



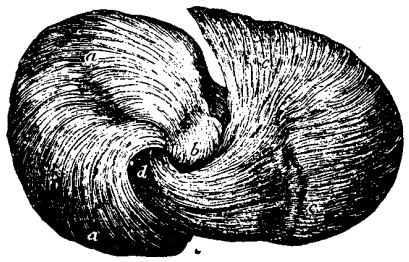
163. The top of the skeletal form of the sea urchin shows a relationship to the polar end of the magnetic field.



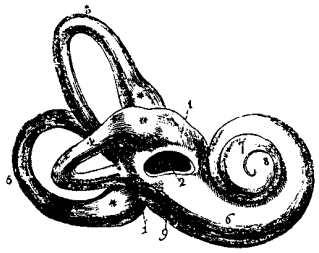
164. The bottom of the sea urchin shows radiating lines as well as a relationship to the polar end of the magnetic field.



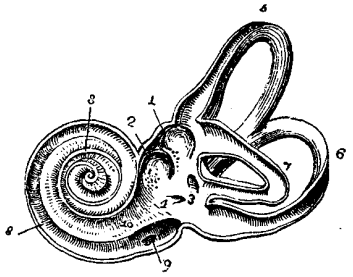
VENTRICLES OF THE HUMAN HEART



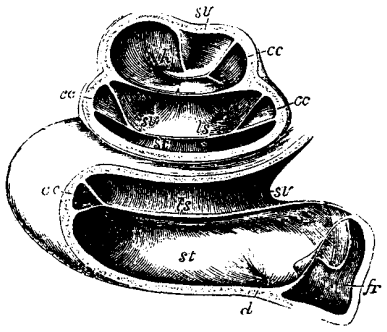
VORTEX FORM IN THE CROSS VIEW OF A SHEEP'S HEART



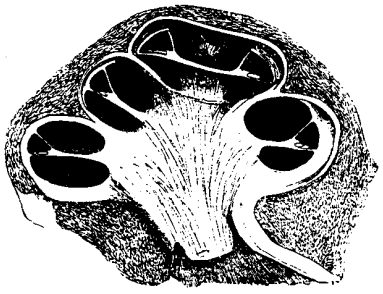
EXTERIOR OF RIGHT BONY LABYRINTH



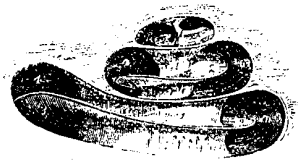
INTERIOR OF THE LEFT LABYRINTH OF THE HUMAN EAR



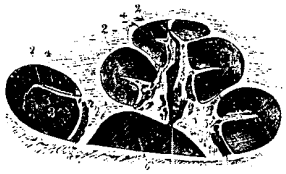
LEFT COCHLEA OF A YOUNG CHILD'S EAR



COCHLEA OF A FETAL CALF

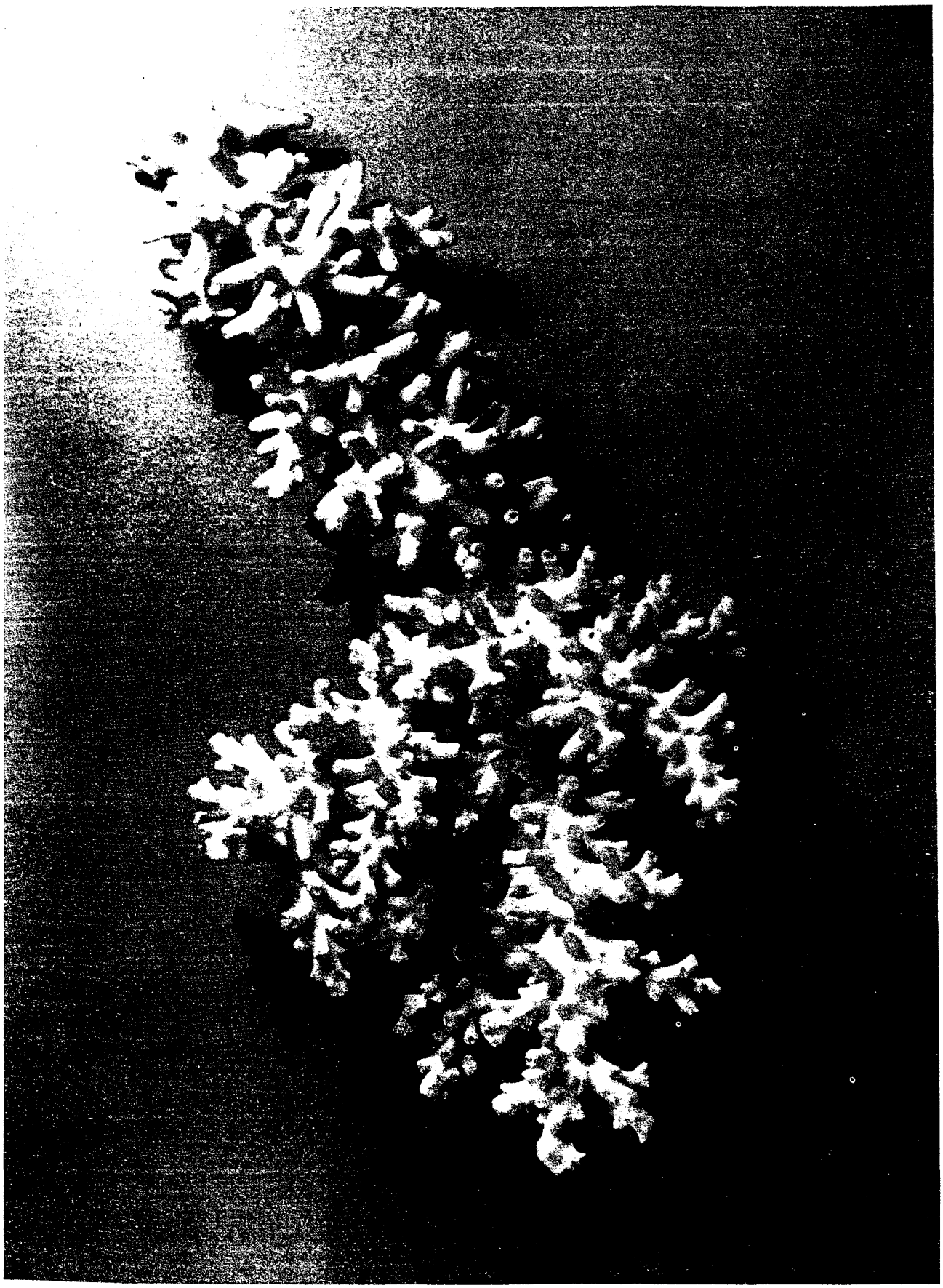


OSSEOUS COCHLEA OF THE HUMAN EAR

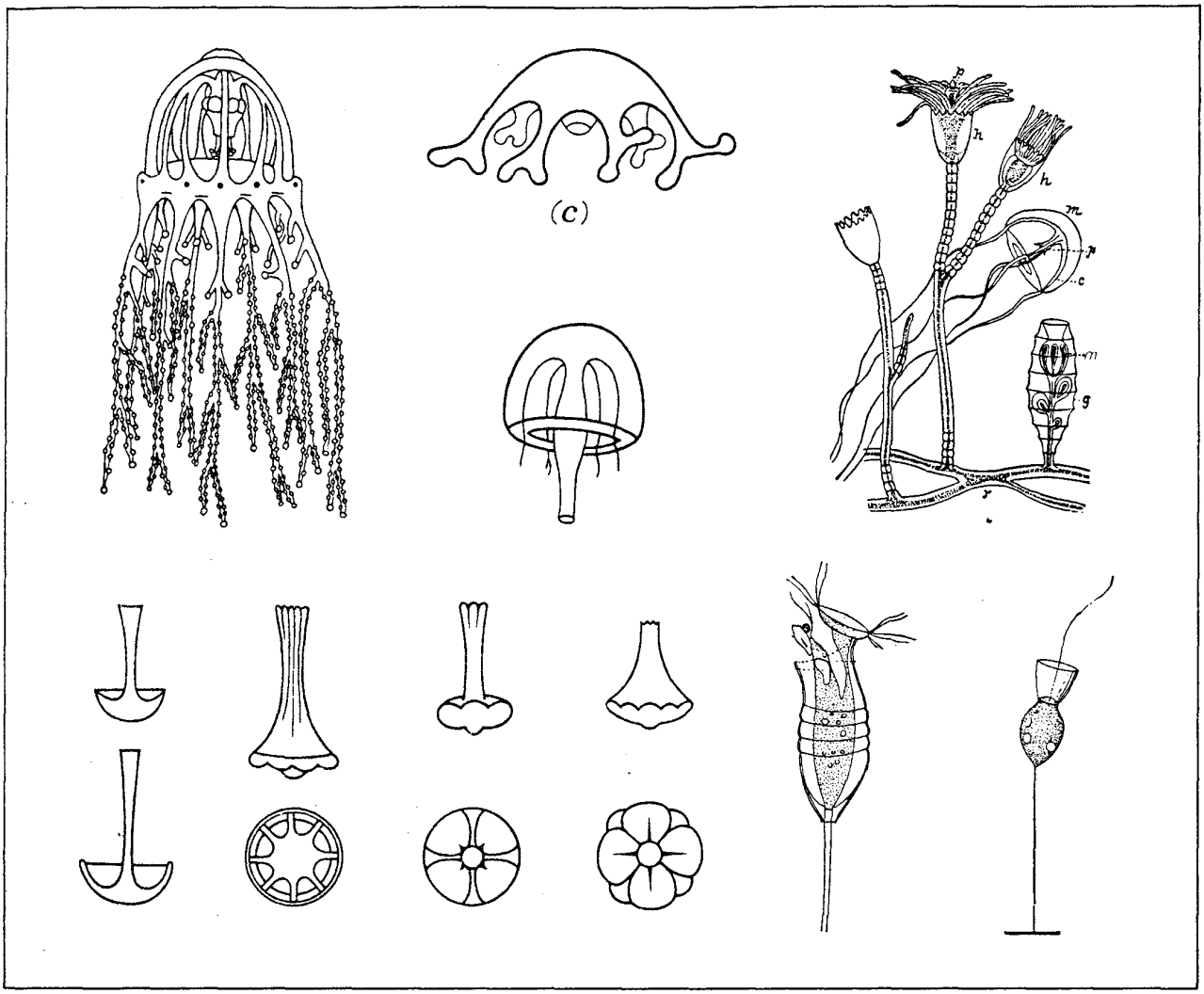


OSSEOUS COCHLEA IN CROSS SECTION

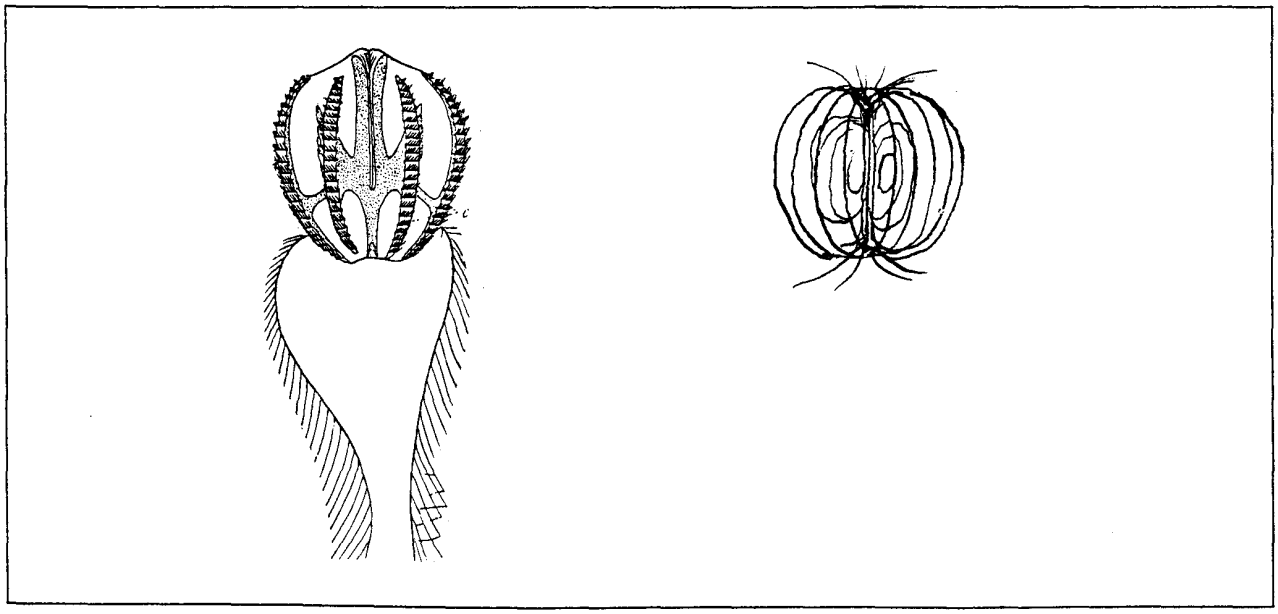
178. Examples of shell-like spiral forms can be found in the human body and in animals.



179. This coral shows the immense variation possible in just one form of life.



195. Minute organisms follow many forms, both those whose substance is composed mostly of fluid follow the forms made by water, such as the splash form. (From Ernst Haeckel)



196. The pattern of comb jellyfish can be compared to the pattern of the magnetic field.