Where Pelicans Kiss Seals

IN THE SURPRISING WORLD OF CHILDREN'S ART, DELIGHTFUL IMAGES AND ORIGINAL RULES ARE CREATED TO REPRESENT THE WORLD.

BY ELLEN WINNER

The story of how children learn to draw seems at first glance to be a simple one: At a very early age they begin by scribbling with any available marker on any available surface. At first children's drawings are simple, unsy and unrealistic; gradually they become more technically skilled and realistic.

But the development of drawing is not quite so simple and straightforward. In fact, the story turns out to be quite complex. Watch a 2-year-old scribbling. The child moves the marker vigorously across the page, leaving a tangled web of circular and zigzag lines. It looks as if the marks themselves are an accident—the unintended result of the child's arm movements. But if you replace the child's marker with one that leaves no trace, the child will stop scribbling, as psychologist James Gibson and Patricia Yonas, then a graduate student, showed in 1968. Even though very young children enjoy moving their arms vigorously, they are also interested in making marks on a surface.

If we do not watch a scribble in the making, but only see the final product, it may look like a meaningless tangle of lines. And this is how scribbles have traditionally been viewed—as nonsymbolic designs. But 1- and 2-year-olds are rapidly mastering the concept that words, objects and gestures stand for things. So why shouldn't they also grasp that marks on a page can stand for things? Some of the more recent studies of children as they scribble suggest that these early scrawls are actually experiments in representa-
To a 2-year-old, scrabbles aren't just scrabbles, they're a plane flying across the sky.

Psychologist Dennie Wolf, preschool teacher Carolee Fucigna and psychologist Howard Gardner of Project Zero at Harvard University studied how the drawing of nine children developed from age 1 to 7. The researchers took detailed notes on the process of scribbling, and their investigations show us that children have surprising representational abilities long before they spontaneously produce a recognizable form.

At first the representation is almost entirely gestural, not pictorial. Wolf observed a 1½-year-old who took the marker and hopped it around on the page, leaving a mark with each imprint and explaining as she drew, "Rabbit goes hop, hop" (Figure 1). This child was symbolizing the rabbit's motion, not its size, shape or color. The meaning was carried primarily by the marker itself, which stood for the rabbit, and by the process of marking. Someone who saw only the dots left on the page would not see a rabbit. Nonetheless, in the process of marking, the child was representing a rabbit's movement. Moreover, the dots themselves stood for the rabbit's footprints. Here in the child's earliest scribbles we already see glimmerings of the idea that marks on a page can stand for things in the world.

Two-year-olds rarely spontaneously create recognizable forms in their scribbles, but they have the latent ability to do so. When Wolf or Fucigna dictated to 2-year-olds a list of features (head, tummy, arms, legs), these children plotted the features systematically on the page, placing them in correct relative positions (Figure 2). But they lacked the notion that a line stands for the edge of an object and had no way to represent parts of features, since each feature was either a point or a patch. The children clearly understood, however, that marks on a surface can be used to stand for features "out there," off the page, and that they can be used to show the relative spatial locations of features.

Typically at age 3, but sometimes as early as age 2, children's spontaneous scribbles become explicitly pictorial. They often begin by making gestural scribbles but then, noticing that they have drawn a recognizable shape, label and further elaborate it. For example, one 3½-year-old studied by Wolf, Gardner and Fucigna looked at his scribble and called it "a pelican kissing a seal." He then went on to add eyes and freckles so that the drawing would look even more like a pelican and a seal (Figure 3). Another child, on the eve of his second birthday, made some seemingly unreadable marks, looked at his picture and said with confidence, "Chicken pie and noodles" (his word for noodles). Clearly he saw the similarity between the lines on the page and noodles on a plate.

Sometimes children between 2 and 3 will use both gestural and pictorial
Figure 3: Halfway into this drawing, the 3½-year-old artist said it was "a pelican kissing a seal."

Why Do 3-Year-Olds First Draw a Person As an Odd Armless 'Tadpole'—A Circle With Two Lines?

A 2-year-old studied by art educator John Matthews of Goldsmiths College in London drew a cross-like shape, then looked at it and called it "an airplane." One month later, this same child moved his brush all around in a rotating motion while announcing, "This is an airplane." The label was the same, but the processes and products were different. In the first case, the drawing was an airplane because it looked like one. In the second case, it was an airplane because the marker moved like one, leaving a record of the airplane's path.

With pictorially based representations, the child begins to draw enclosed shapes such as circular forms and discovers that a line can be used to represent an object's edge. This major milestone marks the child's invention of a basic rule of graphic specialization. This invention cannot be attributed to closer observation of nature, since objects don't have lines around them. Nor can it be attributed to the influence of seeing line drawings. As shown by psychologist John Kennedy at the University of Toronto, congenitally blind children and adults, when asked to make drawings using special equipment, also use lines to stand for an object's boundaries.

Sometime around 3 to 4 years of age, children create their first image of a human—the universal "tadpole"—consisting of a circle and two lines for legs. Figure 4 shows a typical tadpole, with a circle standing for either the head alone, or, more probably, head and trunk fused; it has two legs but no arms. It was drawn by a 3-year-old; by 4, children begin to distinguish the head from the trunk and often add arms to their figures.

The tadpole is indisputably a purely graphic (rather than gestural) representation of a human. But why would children universally invent such an odd image to stand for a person? Many people believe that children draw humans in this queer fashion because this is the best they can do; the tadpole is simply a failed attempt at realistic representation. According to some investigators, including psychologist Jean Piaget, children's drawings are intended to be realistic, but children draw what they know rather than what they see. Hence, the tadpole, with its odd omissions of trunk and arms, must indicate children's lack of knowledge about the parts of the human body and how they are organized.

Psychologist Norman Freeman of the University of Bristol has a different way of accounting for the typical omissions. He notes that children draw a person from top to bottom, in sequence. We know from verbal-memory tasks that people are subject to "primacy" and "recency" effects—that is, after hearing a sequence of words, they recall best the words they heard first and last and tend to forget those that came in between. The child, Freeman argues, is showing such effects in drawing, recalling the head (drawn first) and legs (drawn last) and forgetting the parts in the middle. As Freeman sees it, tadpoles result from deficient recall, not deficient concepts.

But other research suggests that we should look on the tadpole more positively. Psychologist Claire Golomb of the University of Massachusetts in Boston suggests that children know more about the human body than about how to draw it, and their body-part omissions are not due to forgetting. She found that when 3-year-olds were asked to name body parts, they almost always mentioned arms, although they typically omitted them from their tadpoles. She also discovered that such children were less likely to create tadpoles when they made Play-Doh people or when they were given a two-dimensional assemble-the-parts task. Even on a drawing task when Golomb gave children a drawing of a head with features to complete, 3- and 4-year-olds (who ordinarily drew tadpoles) typically differentiated head and a trunk. Finally, if children were asked to draw someone playing ball—a task implicitly requiring that they draw arms—they were likely to include them (Figure 5).

One 3-year-old drew a tadpole but described it in full detail as she drew it, naming parts that were not there, such as feet, cheeks and chin. Clearly this child was not trying to show all of these parts, because she made no special marks for them. Instead, her simple figure stood for an entire human in all its complexity.

Although adults make drawings
that are far more complex, they, too, do not (and cannot) draw all that they see. Young children are more selective than adults, no doubt because drawing is difficult for them, but also because they have not yet been fired up by the peculiarly Western pictorial ideal of realism.

Psychologist Rudolf Arnheim, formerly of the University of Michigan, argues that children try to create the simplest form that can still be "read" as a human. Because they have a limited repertoire of forms, they reduce them to simple geometric shapes. In the case of the tadpole, they usually reduce the human body to a circle and two straight lines.

Adult artists often deliberately select a limited repertoire of forms and, like children, reduce natural forms to a few simple geometric shapes. They recognize that realism is but one ideal among many and may choose not to be realistic. Young children, however, seem to draw simple geometric shapes in part because realism does not spark their interest. Once they do catch the desire for realism, Golomb says, that desire begins to overcome their natural tendency to simplicity, leading them toward more complex, graphically differentiated drawing.

By late childhood or early adolescence, children in our culture begin to master linear perspective, the Western system for creating the illusion of three-dimensional depth on a two-dimensional surface, invented and perfected during the Renaissance.

Many people believe that the ability to use perspective is taught, either explicitly in art class or tacitly through exposure to pictures showing such perspective. But something far more creative on the part of children may be happening, says psychologist John Willats, formerly of the North East London Polytechnic.

Willats seated groups of children of different ages in front of a table with objects on it and asked them to draw what they saw (Figure 6a). The children, 108 in all, who were from 5 to 17 years old, used six different systems of perspective; these, Willats found, formed a developmental sequence:

The 5- and 6-year-olds were entirely unable to represent depth. They simply drew a rectangular box for the tabletop and let the objects float above it (stage 1: Figure 6b). Seven- and 8-year-olds drew the tabletop as a straight line or thin surface and placed the objects on that line (stage 2: Figure 6c).

Again, their pictures contained no recognizable strategy for representing depth.

At about age 9, children made their first readable attempts to depict the third dimension. They drew the tabletop as a rectangle and placed the objects inside or on top of the rectangle (stage 3: Figure 6d). These children had invented a system for representing depth: To depict near objects, draw them on the bottom of the page; to depict far objects, draw them on the top of the page. In other words, transform near or far in the world into down or up on paper. No one teaches a child to draw this way. Moreover, no child actually sees a tabletop as a rectangle (unless looking at it from a bird's-eye view). Hence, this strategy is a genuine invention.

Younger adolescents drew the table-

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Some children show more drawing ability than others and produce elaborate, realistic drawings at an early age. When others are still drawing tadpoles, these children are drawing human figures with differentiated body parts in correct proportion and are even putting depth cues into their drawings. People often assume that these advanced artists are brighter than those who lag behind and produce primitive, undifferentiated, unrealistic drawings.

Indeed, psychologists have developed intelligence tests based, in part, on the assumption that drawing level reflects cognitive level, IQ or both. For instance, as part of the Stanford-Binet Intelligence Scale, children are asked to copy shapes, and the Goodenough-Harris Draw-a-Man test uses drawing as a measure of IQ, with more parts and details yielding higher scores.

But studies of both normal and abnormal people show that drawing ability is independent of ability in other areas. The most dramatic evidence comes from studies of idiot savants who, despite severe retardation, autism or both, draw at an astonishingly sophisticated level.

The best-known case, studied by psychologist Lorna Selfe, formerly of the University of Nottingham, that of Nadia, an autistic child who as early as age 3½, drew in an unusually realistic style reminiscent of Leonardo da Vinci. In addition to her studies of Nadia, Selfe compared "retarded autistic" children who were gifted in drawing with normal children of the same mental age. She found that the retarded children were better able to depict proportion, depth and the overlap of objects in space.

In a similar vein, psychologists Neil O'Connor and Beate Hermann of the Medical Research Council Developmental Psychology Project in London studied five young mental retardate savants who had special drawing ability but very low verbal and performance IQ scores and con-
Top: Nadia, 6½, extremely autistic and artistic, made the drawing (left) that resembles a Leonardo da Vinci sketch (right). Below: An early elementary school child drew in perspective, revealing unusual ability.

Providing details or in their levels of motor control and coordination. If gifted artists—both retarded and nonretarded—aren’t necessarily more intelligent, what skills enable them to draw better than other people? To address this question, O’Connor and Hermelin used a battery of other tests, all of which assessed visual memory. When retarded artists were compared with retarded nonartists, the artists outperformed the nonartists on all tests.

Visual-memory skill, independent of IQ, also seems to help normal children to excel at drawing. Recently, Hermelin and O’Connor compared artistically gifted normal children with nongifted children matched in IQ. They found that the artists had superior memory for two-dimensional designs and were more skilled at identifying incomplete pictures.

With psychologist Elizabeth Rosenblatt at Harvard’s Project Zero, I recently completed a study along the same lines. We compared preadolescent children, selected by their art teachers as gifted in drawing, with other children selected as average in drawing ability. We showed the youngsters pairs of pictures and asked them to indicate their preferences. Later we showed them the paired pictures again, but one member of each pair had been slightly altered (in line quality, color, form, composition or content). We asked the children to identify which member of each pair had been changed and to say what was different about it.

The artistically gifted students performed significantly better than the nonartists on both aspects of this task, even though, when they first saw the pictures, they did not know that they would be asked later to recall them. Apparently, children with drawing talent simply cannot forget the patterns they see around them, just as musicians often report being unable to get melodies out of their minds.
PICASSO: I USED TO DRAW LIKE RAPHAEL, BUT IT HAS TAKEN ME A WHOLE LIFETIME TO LEARN TO DRAW LIKE CHILDREN.

top as a parallelogram rather than as a rectangle (stage 4: Figure 6e). As in the previous stage, they incorrectly drew the lines parallel, not converging, but they now correctly used oblique lines to represent edges receding in space. Again, such a system for representing depth is neither taught nor based on visual experience, since using parallel lines is not optically correct.

In the last two stages, older adolescents drew in perspective, making the lines of the tabletop converge. Some made the lines converge only slightly (naive perspective—stage 5: Figure 6f); others achieved geometrically correct perspective (stage 6: Figure 6g).

This sequence cannot be explained simply by a growing desire and ability to draw objects as they really appear, because as children develop, their drawings actually get less realistic before they get more realistic. A tabletop, viewed from eye level, might be seen as an edge (stage 2), or from a bird’s-eye view it might be seen as a rectangle (stage 3). But no one ever sees a tabletop as a parallelogram (stage 4) or with incorrectly converging edges (stage 5).

Willats believes this sequence does not result from copying pictures in perspective. After all, he argues, in our culture drawings with perspective rarely depict a rectangular surface as either a rectangle (stage 3) or a parallelogram (stage 4).

But I believe these two stages may indeed be attempts to copy the perspective seen in pictures. A tabletop drawn in perspective shows its surface (and stage 3 is an advance over stage 2 because it shows the surface), and its lines are at nonright angles (and stage 4 is an advance over stage 3 because...
the angles are oblique). But if children are trying to copy perspective drawings, they are doing it at their own developmental level. For example, in stage-4 drawings, children reduce what should be a trapezoid to a simpler, more regular parallelogram.

One way to test the effect of exposure to pictorial perspective is to ask children to copy such pictures. Freeman did just this, finding that although children could not copy the model's perspective system accurately, they could adopt a system more advanced than the one they used spontaneously. Freeman showed children ages 5 to 8 a drawing of a table in oblique perspective (stage 4) and asked them to copy it. About half of the children produced stage-3 drawings. What is significant is that, in their attempts at imitation, half of these children—who were at the age when they would be expected to make stage-1 or stage-2 drawings—actually drew at stage 3.

Thus, children do not acquire perspective by directly copying pictures drawn in perspective. But exposure to such pictures does stimulate them to try a perspective system at least one step more advanced than they might otherwise use.

Children as well as adults are in conflict when drawing in perspective because this way of drawing does not match what we know about objects. For example, a table drawn in perspective does not show the top surface as a rectangle, yet we know the tabletop is rectangular. Although we would like to show things as we see them, we also want to show them as we know they are. Perhaps this is why, as shown by psychologist Margaret Hagen and Harry Elliot, then a graduate student at Boston University, adults prefer drawings with stage-4 perspec-

tive to those with stage-6 perspective; stage-6 drawings make objects look too distorted.

Knowing that a good pictorial likeness is not necessarily an exact copy of a scene as it actually appears, artists often deliberately break the rules of perspective. For example, to correct for the size distortion called for by the rules of perspective, they may draw a distant mountain larger than it would appear in a photograph. Perhaps for similar reasons, children may not at first draw objects with optical realism; they are interested in showing things in the most informative way rather than showing exactly how things look.

Do children improve further as they get older? If realism is the standard, the answer is clearly yes. For example, their figures become more complex, and they can represent depth through linear perspective. But I believe, on esthetic grounds, that children's drawings actually get worse with age.

Because preschool children are unconcerned with realism, their drawings are free, fanciful and inventive. Suns may be green, cars may float in the sky and complex, irregular forms in nature are reduced to a few regular geometric shapes. They produce simple, strong pictures that evoke the abstractions found in folk, "primitive" and contemporary art (Figure 7).

The older child's drawing may be more realistic, neat and precise, but, in my opinion, it is also less imaginative and less striking (Figure 8). Suns are now appropriately yellow and placed carefully in the corner of the picture, and cars now rest firmly on the ground.

This development is inextricably tied up with acquiring the technical skills essential for adult artistic activity. Nonetheless, once such skills are mastered, artists often turn back to young children's drawings for inspiration and may work hard to do consciously and deliberately what they once did effortlessly and because they had no choice. "I used to draw like Raphael," Picasso is quoted as saying, "but it has taken me a whole lifetime to learn to draw like children."