

Chapter 1

What Is Alive?

Cut flowers with buds can be made to bloom faster if a piece of rotting fruit is put below them. So claimed a gardening expert on TV. This prompted a 7-year-old viewer to write in with a possible explanation:¹

Is the reason that the flowers bloom because rotting is getting too ripe and blooming is also just getting ripe? Does the plant get the idea of getting ripe from seeing the apple rot?

The child's reasoning contains an element of the correct explanation. Rotting and blooming are alike, and both are like ripening in the relevant respect. However, the mechanism by which one case of ripening might affect another is totally unavailable to this 7-year-old. He knows nothing of the role of chemicals in biological processes. He produces, then, a classic case of animistic reasoning. The explanation he suggests imputes intentional states to a plant.

Piaget (1929) placed the phenomenon of childhood animism in the context of the child's causal reasoning. According to Piaget, young children derive ideas of causality from cases in which they themselves intentionally make things happen. In particular, children do not have a notion of mechanical causation distinct from intentional causality. In support of this thesis, Piaget showed that children under 10 interpret physical phenomena in terms of the intentional states of inanimate objects. For example, a 6-year-old might suggest that the sun is hot because it wants to keep people warm. Directly probing beliefs about intentional states, Piaget found that young children said that the sun, cars, the wind, bicycles, clocks, fires, etc., "know where they are" and "can feel a pin prick." When simply asked what is and what is not alive, they judged these same objects to be alive. According to Piaget, these three threads of childhood animism—(1) animistic causal reasoning, (2) overattribution of intentional states to inanimate objects,

and (3) overattribution of “alive” to inanimate objects—are woven together. Because children feel the need to come up with explanations and causes of phenomena not involving people and animals, and because the only schema available is intentional, they attribute intentional states to the active objects involved in those phenomena. Thus, the story goes, since intentionality is attributed to active inanimate objects, so are consciousness and life. Piaget’s account of why activity becomes the *criterion* for life is not entirely clear. Nonetheless, his data have been taken to show that activity and movement do become the basis for children’s decisions about what is alive. (The status of this evidence will be examined below.)

Piaget’s claim that the only causal schema available to young children is intentional, and that only late in the first decade of life does mechanical causality become distinguished from intentional causality, has been criticized from various points of view. Gelman and her collaborators (e.g., Bullock, Gelman, and Baillargeon 1982) and Shultz (1982) have established that the preschool child does *not* lack an appreciation of mechanical causation. Phenomena involving propagation of physical forces through space, whether involving contact or not, are interpreted mechanistically. If this is true, then childhood animism cannot be the result of the absence of a schema of mechanical causation, and we will have to look elsewhere for its interpretation.

Here I will be concerned with only one of the three threads of Piaget’s phenomenon: the overattribution of life to inanimate objects. Through his interviews concerning which things are alive and which are not, Piaget sought to discover the meaning for the child of the word “alive” and to chart how this meaning changes with age. In this way he sought to diagnose the child’s changing concept of life. He began by asking children to tell him what it means for something to be alive, and he asked them to judge whether certain animals, plants, and inanimate objects are alive or not, requesting explanations for each judgment. He followed up each justification with another object that would further probe the children’s commitment to their current formulation of the meaning of “alive.” A sample protocol reads,

VEL (8, stage 1) Is the sun alive? *Yes. Why? It gives light.* Is a candle alive? *No. Why not? (Yes) because it gives light. It is alive when it is giving light, but it isn’t alive when it is not giving light.* Is a bicycle alive? *No, when it doesn’t go it is not alive. When it goes it is alive.* Is a mountain alive? *No. Why not? Because it doesn’t do anything.* Is a tree alive? *No; when it has fruit it’s alive; when it hasn’t any it is not*

Table 1.1
Stages in the meaning of "alive"

	Piaget	Laurendeau and Pinard
Stage 0	No concept Random judgments, or inconsistent or irrelevant justifications	No concept Random judgments, or inconsistent or irrelevant justifications
Stage 1	Activity Things that are active in any way (including movement) are alive	Activity or movement Things that are active, that move, or both are alive
Stage 2	Movement Only things that move are alive	Autonomous movement Things that move by themselves are alive
Stage 3	Autonomous movement Things that move by themselves are alive	Adult concept Only animals (or animals and plants) are alive
Stage 4	Adult concept Only animals (or animals and plants) are alive	

alive. . . . Is an oven alive? Yes, it cooks the dinner and the tea and the supper. Is a watch alive? Yes. Why? Because it goes. . . . Is a bench alive? No, it's only for sitting on. . . . (Piaget 1929:196)

Piaget found five distinct patterns of attribution and justification from which he derived five stages in the acquisition of the concept *alive* (table 1.1). Many young children appear to have no concept of life; they can give no definition and no consistent justifications. Some say everything is alive, some say nothing is, and others respond unsystematically, denying life to some animals as well as granting it to some inanimate objects. This initial period of uninterpretable responses is followed by four systematic stages. In the first stage, things seen to be active in any way are judged to be alive, as in VEL's protocol. In the second, the relevant kind of activity is movement. In the third, only things seen to move by themselves are judged alive, and in the fourth, being alive is restricted to animals and plants, or to animals alone. Inanimate objects are not judged alive in this last stage.

Piaget's results have been subject to many replications, the major one being that of Laurendeau and Pinard (1962). They tested 500 subjects between the ages of 4 and 12 on a standardized version of the clinical interview. Their data essentially agreed with Piaget's, except that they found no evidence for a distinction between Stages 1 and 2.

The modification of Piaget's stages proposed by Laurendeau and Pinard is also shown in table 1.1. Henceforth, when I refer to Stages 0 through 3, I mean the stages as described by Laurendeau and Pinard.

Piaget's goal was the diagnosis of the concept *alive*. Given that the meanings of words are concepts, Piaget's approach is on target, with one proviso. The child's meaning of the word "alive" bears on the child's concept *alive* only if the word has been mapped onto that concept. One cannot simply assume that the word "alive" is a direct pipeline to children's concepts of life. Even if children have a concept of life, "alive" may have some other meaning for them. That is, they may have a concept of life that plays some role in organizing inferences and in the acquisition of new knowledge, even though they have no word that expresses that concept. It is possible that attributions of life to inanimate objects reflect semantic rather than conceptual problems.

It is not clear from scrutiny of table 1.1 just which concept the word "alive" is supposed to be mapped onto. Clearly, it is not the biological concept of life. Both animals and plants are alive in this sense, but the last stage, the adult concept, is credited to children if they attribute life to animals alone, as well as if they attribute it to animals and plants. Further, the criteria summarized in the table do not transparently apply to plants. Plants are not active; nor do they move, autonomously or otherwise. Indeed, Laurendeau and Pinard state that Stage 1 and Stage 2 children deny that plants are alive. According to the picture in table 1.1, then, animistic attribution of "alive" to inanimate objects reflects children's struggle to distinguish animals from nonanimals more than their struggle to distinguish living things (including plants) from non-living things.

However, this hypothesis is problematic. There is now abundant evidence that the young child (age 2–6, Anglin 1977; age 3–5, Gelman, Spelke, and Meck 1983; Dolgin and Behrend 1984; see also chapter 3 below) represents a concept *animal* that does not include inanimate objects. Anglin found that for preschool children, the word "animal" has a *narrower* extension than for adults; when judging which objects are animals, children exclude people, some peripheral animals, and inanimate objects. Gelman, Spelke, and Meck found, as did Dolgin and Behrend, that a variety of psychological and biological properties, such as eating, having parents, having brains, thinking, and remembering, are not attributed to inanimate objects, even those judged alive in the Piagetian paradigm (see also chapter 3). Thus, although the criteria summarized in table 1.1 are more relevant to the distinction between

animals and nonanimals than to the distinction between living and non-living things, it does not seem likely that the word “alive” is simply mapped onto the child’s concept *animal*.

The word “alive” may not actually be mapped onto the child’s concept that most closely approximates the adult’s concept *living thing*. If not, then studying the development of the meaning of “alive” is not the best way to study the child’s developing concept of life. Whether or not this concern is justified, the development of the meaning of the word “alive” is undoubtedly an interesting case study in semantic development. However, Piaget’s claims for this case study come up against what seems to be an insurmountable obstacle. Beyond Stage 0, Piaget’s stages, and Laurendeau and Pinard’s, presuppose a view of the nature of word meanings that has come under severe criticism. Piaget saw the meaning of the word “alive” as passing through a succession of different necessary and sufficient conditions for something to be judged alive. At each stage the concept is identified with a definitional intension that provides a criterion for an object’s being in its extension. This classical view of concepts is associated with an implicit model of how children actually generate their judgments. When asked whether something is alive, they apply their present criteria for life to that thing, say “yes” if the criteria are true of it and “no” if they are not. In his work on classification, Piaget explicitly endorsed this model of concepts as an achievement of the stage of concrete operations. Stage 0 children, being preoperational, putatively lack the conceptual machinery for holding any concept of this structure; Piaget held this to be one reason that preschool children are at Stage 0 with respect to the concept of life. However, if the widely held criticisms of the classical theory of meanings are correct, then the acquisition of the concept *alive* proposed in table 1.1 cannot be right.

The criticisms of the classical view may be briefly summarized. For most concepts it is simply not possible to provide definitions. That is, exemplars of most concepts bear a family resemblance to each other, rather than meeting a single set of necessary and sufficient conditions for category membership (Rosch 1978, Wittgenstein 1953). Also, the distinction between definitional components of a concept and merely empirical components (the analytic-synthetic distinction) has been shown to break down (Quine 1951, Putnam 1962). That is, even for scientific concepts like *living thing* or *energy*, no definition is immune from empirically driven revision. Finally, philosophers have recently argued that definitions of concepts cannot determine category member-

ship (Schwartz 1979; see Carey 1982 and Smith and Medin 1981 for summaries of the criticisms of the classical view of concepts).

To appreciate the force of these arguments, consider how adults decide whether something is alive or not. For adults, as well as children, there will be unclear cases. What of bacteria, viruses, imagined discoveries on other planets? In these cases adults will defer to experts—biologists—but if forced to make a decision, they will consider complexity of structure, mechanisms of reproduction, metabolism, and myriad other factors. There is no single criterion for life; all of the adult's biological knowledge is brought to bear upon the decision.

In spite of these problems—the ambiguity of what concept “alive” is mapped onto and the presupposing of the classical theory of meaning—Piaget (1929) provided *evidence* that his description is right. Laurendeau and Pinard (1962) reported data from 500 children to back him up. The case rests on this evidence. Let us begin, then, by looking at it closely.

A Close Look at the Published Data: Single-Criterion Definitions

Does the child decide that something is or is not alive by evaluating it with respect to one of the criteria in table 1.1? This model of how children generate their judgments predicts two kinds of consistency in the data: (1) patterns of judgments across items should be consistent with the criterion the child is using in his or her definition of life, and (2) justifications should make consistent appeal to this criterion. The data given by Piaget in his books—fragments of protocols—provide this kind of evidence, but they are difficult to interpret since Piaget used his protocols to exemplify his points, and selected accordingly. In contrast, Laurendeau and Pinard tabulated all of their data, which may be examined with respect to these two kinds of consistency. Strikingly, their data show the child to be consistent in neither of the two ways.

Many Stage 1 and Stage 2 children attribute life to only one or to just a few inanimate objects, even though other objects in the set probed would clearly meet the criterion that characterizes each stage. That is, patterns of judgments are not consistent with single-criterion definitions. Furthermore, consistent appeals to a single criterion in justifications are extremely rare (only 25 of the 500 cases, 5%). Almost every single child produces many different kinds of justifications. This lack of consistency not only is apparent from Laurendeau and Pinard's tables, but also is tacitly acknowledged in their explicit instructions for clas-

sifying children into stages. To be at Stage 1, a child must attribute life to at least one inanimate object and justify at least one judgment with an appeal to activity or movement. For example, if the only inanimate object deemed alive is the sun, and the child just once mentions movement in a justification (for instance, claiming that an insect is alive "because it crawls around"), that child is classified as being at Stage 1. To be at Stage 2 the child must attribute life to at least one inanimate object and justify at least one judgment with an appeal to autonomous movement. In sum, in order to be classified into one of the Piagetian stages, children need not, and do not, provide patterns of data as if their answers were generated by appeals to the criteria in table 1.1.

One final fact belies the developmental story summarized in table 1.1. Laurendeau and Pinard report a class of justifications, "anthropomorphic traits," that is not reflected in the putative stages of the child's definition of "alive." Some examples are: tables are alive because they have legs, or tables are not alive because they do not have faces or because they do not breathe. Anthropomorphic traits are mentioned as commonly in justifications as movement or activity, more commonly than autonomous motion. Thus, not only do children fail to produce patterns of judgments and justifications that are consistent with single-criterion definitions, they commonly produce a type of justification that is ignored in the characterization of stages.

Piaget commented on this class of justifications, maintaining that such justifications do not reflect true criteria for life. Laurendeau and Pinard expanded Piaget's argument, suggesting that sometimes children have merely been told that animals (or animals and plants) are alive and have not yet formulated a criterion for life. They then sometimes judge a particular animal alive because it is considered an animal, and produce a justification (an anthropomorphic trait) relevant to its being an animal. Alternatively, they may judge an inanimate object not alive because of knowing it is not in the extension of the concept *animal*, and produce a justification (an anthropomorphic trait) relevant to its not being an animal. This is, of course, a quite different model of judgment generation than the one presupposed by the single-criterion characterizations in table 1.1. It is one that might be used by adults.

There are two very serious problems with Laurendeau and Pinard's attempt to rescue the single-criterion stage analysis in table 1.1 from the fact that children frequently cite anthropomorphic traits to justify calling something alive. First, their argument that anthropomorphic traits are epiphenomenal justifications could apply equally well to move-

ment, activity, and autonomous motion. How are the latter justifications established as the “true” criteria for life? They may be merely salient anthropomorphic traits, produced in support of judgments based on category membership. That is, a child might judge an animal alive because of knowing the extension of the concept, and produce a justification relevant to its being an animal—that it is active, or moves, or moves by itself. The second problem is even more damaging. How do children know the extension of the concept *animal*? How do they decide that worms are in, and dolls, the sun, the wind, and so on, are out? In some cases they simply may have been told. But they classify previously unknown objects as animals (for evidence to this effect, see chapter 3 and Anglin 1977), and they also make many errors, as their judgments that inanimate objects are alive attests. Some productive process must underlie their judgments, even if they are based on decisions of category membership. The stage analysis depicted in table 1.1 is an attempt to sketch that productive process, as well as how it changes with age. If this sketch is wrong, we must replace it with a more accurate one.

I am not doubting the replicability of the Piagetian data. There is a long history of claims of nonreplication of Piagetian animism (e.g., Huang and Lee 1945, Klingensmith 1953, Klingberg 1957). But as two extensive reviews (Looft and Bartz 1969, Laurendeau and Pinard 1962) point out, as long as the scoring method described above is employed, the phenomenon is very replicable. My claim is quite different. Table 1.1 provides a highly theoretical summary of the results of a case study of semantic development: the development of the meaning of the word “alive.” These results purport to show that with development the child adopts several different single-criterion meanings for the word. My argument is that the data, although replicable, do not support this description of development.

The first experiment to be reported here was a very modest replication of Laurendeau and Pinard’s massive study. Most important to me was whether the child, like the adult, is attempting a biological classification—either into animals and nonanimals or into living things and nonliving things. I wanted some more direct information about what conceptual distinction the child spontaneously maps the contrast “alive–not alive” onto. To this end, Laurendeau and Pinard’s protocol was slightly modified. The child was asked at the beginning of the procedure to give examples of some things that are not alive as well as of some things that are alive. Also relevant was a closer look at the

justifications given. A particularly important category was that of anthropomorphic traits, since some such traits, like growing and reproducing, are highly relevant to the biological concept of living things, including plants, whereas others, like having eyebrows, talking, having legs, etc., are relevant only to the concepts of people and animals. Laurendeau and Pinard do not distinguish these two types of anthropomorphic traits.

Experiment 1: A Replication of Laurendeau and Pinard

Ten children at each of three ages (4, 7, and 10) participated in the study. They were drawn from an elementary school in an upper middle class suburb of Boston and from a nursery school for the MIT community.

As in the Piagetian procedure standardized by Laurendeau and Pinard, children were first asked if they knew what it means for something to be alive. After answering, they were asked to name some things that are alive, and then some things that are not alive. After this orientation to the task, the children were told that they would be shown several pictures, and they were to try to figure out, for each object pictured, whether it was alive or not. Laurendeau and Pinard's series was then presented, in the same order as in their study: mountain, sun, table, car, cat, cloud, lamp, watch, bird, bell, wind, airplane, fly, fire, flower, rain, tree, snake, bicycle, and pencil. After each judgment the children were asked for a justification by inquiring "How do you know?" Several times during the session, they were encouraged with the phrases "Uh huh, how did you know that?" or "Uh huh, why do you think that?" Such encouragement did not depend upon the correctness of the judgment. In addition to the tester, a scorer was present to note the judgments and justifications. The sessions were taped and the scorer's protocols checked against the tapes.

Results

Patterns of Judgments Two judges independently scored the 30 protocols according to Laurendeau and Pinard's criteria. Agreement on placement was perfect. Stage 0 children (no concept) either said that all of the objects were alive, said that none were, or answered unsystematically, denying that some animals were alive and affirming that some, but not all, inanimate objects were. Stage 1 children attributed life to at least one inanimate object, appealed to activity or movement in their

justifications, and did not appeal to autonomous motion. Stage 2 children differed from those placed in Stage 1 in that they at least once made the distinction between autonomous movement or activity, on the one hand, and movement or activity caused by human agency, on the other. Stage 3 children made no animistic overextensions.

Table 1.2 shows the distribution of stages. Laurendeau and Pinard's data from these age groups are included for comparison. Despite the fact that we tested only 30 subjects, compared to their 199 (100 at age 4, 49 at age 7, 50 at age 10), agreement was substantial. Over half of both groups of 4-year-olds were at Stage 0 and roughly half of both groups of 10-year-olds were at Stage 3. Our 7-year-olds were slightly more advanced, being significantly more represented at Stages 2 and 3 than were Laurendeau and Pinard's ($p < .01$, Fisher exact test, 2-tailed). But although our 7-year-olds were more represented in the higher stages, the two groups did not differ in the overall level of animistic responses (table 1.3). Table 1.3 shows the percentage of all inanimate objects judged alive, excluding data from Stage 0 children. Again, the two studies largely agree.

Table 1.2
Percentage of children in each stage

Age	Stage 0		Stage 1		Stage 2		Stage 3	
	Exp. 1	L&P	Exp. 1	L&P	Exp. 1	L&P	Exp. 1	L&P
4	60	73	10	23	10	4	20	0
7	0	8	10	43	40	10	50	39
10	0	0	20	22	30	24	50	54
Overall Average	20	27	13	29	27	13	41	31

Table 1.3
Percentage of all judgments of inanimate objects
that were animistic.
(Stage 1, 2, and 3 children only.)

Age	Experiment 1	Laurendeau and Pinard
4	21 ($n = 4$)	49 ($n = 27$)
7	20 ($n = 10$)	20 ($n = 45$)
10	11 ($n = 10$)	16 ($n = 50$)

Laurendeau and Pinard's subjects spanned a greater range of social classes than did ours. Also, we used photographs of the objects probed, whereas they did not. Either of these factors could account for the slightly lower level of animistic responses by our subjects. Nonetheless, tables 1.2 and 1.3 show that the procedural and sample differences between the two studies had little effect on the outcome. The phenomenon of judging inanimate objects alive, tapped by Laurendeau and Pinard's procedure, is remarkably stable.

The Introductory Questions Only 3 of our 30 subjects failed to provide examples of living things (all 3 were among our Stage 0 4-year-olds). The remaining 27 gave as examples "people" (16 times), "animals" (11 times), specific animals such as "turtles" or "my puppy Betsy" (11 times), "plants" (5 times), and specific plants such as "trees" (4 times). These numbers total more than 27, since many children gave multiple answers ("people, cats, animals"). Animals are clearly more salient examples of living things than plants, and of the animals, people are the most so.

In sharp contrast to the ease with which the children produced examples of living things was the difficulty they had in coming up with examples of things that are not alive. Only one of the 4-year-olds managed to provide any appropriate inanimate objects ("bricks, pipes, doors"). Even at age 10 three children failed to do so. Some children remained mute, while others provided examples of nonliving things that reflected a distinction other than the intended one between animate and inanimate objects. These were of three or four types:

the distinction between alive and dead: "dead animals," "George Washington"

the distinction between real and imaginary: "monsters," "fairies"

the distinction between real object and representation: "pictures," "people on TV"

the distinction between alive and extinct: "dinosaurs" (this may be the same as the distinction between alive and dead, or between real and imaginary, depending upon the child's beliefs about dinosaurs)

It is clear that many children do not immediately fathom just which abstract distinction the experimenter intends with the contrast "alive—not alive." Several are available, including alive-dead, real-imaginary, and real-representation. Which does the experimenter mean? Young children have plenty of linguistic evidence for each of these possible

interpretations: “not alive” usually means “dead,” and sometimes “extinct.” The child is assured that the scary image in a movie, in a book, or on TV is “not alive” or “not real.” Moreover, the candidate interpretations are closely intertwined conceptually, all related through the child’s concept of death.

Aside: A 3-Year-Old’s Struggle with the Concept of Death Observations of my preschool daughter, Eliza, illustrate what every parent knows: the concept of death is conceptually difficult for young children. Over an 18-month period Eliza brought the matter up many times: it was one of the things that she thought about and wanted to talk about. Table 1.4 shows five vignettes, all but one initiated by her. Besides illustrating the importance of immobility to Eliza’s concept of death (vignettes 2 and 3), these vignettes show that nonexistence is closely related to the concept of death, at least to her mind. The emotional impact of death follows from its being a transition from existence to nonexistence. This is especially clear from vignette 4, in which Eliza is denying this implication of death. Surely, life goes on as usual for the dead, just underground. (Not only Eliza is denying the finality of death. My “they just lie there” is a misleading description of the transition from body to dust.) In vignette 5 Eliza equates “not alive” with “dead,” and “dead” with “nonexistent” (“you can’t see him”). Both vignettes 5 and 3 show she has not grasped the distinction between living or dead, on the one hand, and living or inanimate, on the other. Statues, and her bear, are not alive, which to her means they are dead; but they are not dead either, at least not in the sense her grandpa is. Her resolution (vignette 3) that the bear is “middle-sized” between alive and dead is obviously unsatisfactory, and my attempted explanation (vignette 5) *that some things are not alive and never were, whereas others are first alive and then die*, sails right over her head.

The emotional and conceptual salience of the concept of death may make the young child assume that the distinction being probed in the Piagetian paradigm is that between alive and dead—hence, “George Washington” as an example of something not alive. But the concept of death itself is not clear, and it is closely tied to the concept of nonexistence—hence, “monsters” and “dinosaurs” as examples. Finally, Eliza’s difficulty in straightening out the two distinctions suggests that she, at least, did not yet see death as solely a property of animals or living things. This may also be true of some of the young subjects in Experiment 1.

Table 1.4One preschooler's struggle with the concept of death

Vignette 1 (2:6)

Eliza first became interested in the concept of death at about 2:6 when she was told that her grandfather, Eli, had died before she was born. Out of a long explanation she gathered that when somebody is dead you can't talk to them. For several months, she would bring up the fact that her grandpa was dead and that was sad because you couldn't talk to him.

Vignette 2 (3:6)

Watching a TV program where somebody was shot, she said excitedly, "He's dead—I can tell because he's not moving."

Vignette 3 (around 3:6)

S. What do you have in you?

E. Skin.

S. Inside?

E. Bones.

S. Anything else?

E. Blood.

S. Does your bear have bones and blood inside her?

E. No, because she's not a big, real person.

S. Are you?

E. Yes, well, not very big—she can never die, she'll always be alive!

S. Is she alive?

E. No—she's dead. HOW CAN THAT BE?

S. Is she alive or dead?

E. Dead.

S. Did she used to be alive?

E. No, she's middle-sized—in between alive and dead. She moves sometimes.

Vignette 4 (around 3:6)

E. How do dead people go to the bathroom?

S. What?

E. Maybe they have bathrooms under the ground.

S. Dead people don't have to go to the bathroom. They don't do anything; they just lie there. They don't eat or drink, so they don't have to go to the bathroom.

S. But they ate or drank before they died—they have to go to the bathroom from just before they died (triumphant at having found a flaw in my argument).

Vignette 5 (around 3:8)

E. Isn't it funny—statues aren't alive but you can still see them?

S. What's funny about that?

E. Grandpa's dead and you can't see him.

S. Oh, I see. Well, you know, people and animals can be alive and dead—first they are alive and then when they die, they're dead. But other things, like chairs—they aren't ever alive, so they can't die.

S. That's right. Tables and chairs are not alive and they're not dead and you can still see them. Isn't that funny, they're not alive, but you can still see them.

Von Hug-Hellmuth (1964) reports extensive diary records of a young German boy's spontaneous questions and comments about death. The diary was made by the boy's parents at the turn of the century, beginning in 1908 when the boy was 3½ years old. It is uncanny how similar the entries are to those in table 1.4. Ernie asks questions such as "And when we are dead, can we only speak softly?" He asks whether a dead person can "make a rumpus" in his coffin; when talking about a dead child, he suggests questioningly, "So the men can shovel the sand away and pull the flowers away from the grave and can sell the little boy to his mother again, so she can have her child again?" Von Hug-Hellmuth stresses that the idea that a person cannot feel and think after death is something completely incomprehensible to Ernie at this age. The question recurs again and again, "But what does a man say while he is dead?" I return to the child's conception of death in chapter 2; here I simply recommend Von Hug-Hellmuth's article for a rich portrait of the conceptual and emotional aspects of the preschooler's concern with death.

The Introductory Questions, Concluded When asked to give an example of something that is not alive, all Stage 0 and Stage 1 children in Experiment 1 responded irrelevantly or not at all. In contrast, two-thirds of the Stage 2 and Stage 3 children gave examples of inanimate objects ($p < .001$, Fisher exact test). This suggests that for Stage 0 and Stage 1 children, part of the problem in childhood animism is semantic.

All of the nonintended distinctions (exists—does not exist, real—imaginary, alive—dead, alive—extinct) are related, directly or indirectly, to the contrast between life and death. In one of the first major replications of Piaget's animism studies, Russell and Dennis (1940) introduced their protocols by saying, "Do you know what it is for something to be alive? A cat is alive, but when a car runs over it, it is dead." They then proceeded to query, of a series of objects, whether each one was living or dead! Of course, buttons, tables, rocks, and the sun are neither living nor dead, but the children dutifully answered all of the questions and produced data exactly like those of Piaget and those of Laurendeau and Pinard. The same sorts of justifications appeared, with the addition of usefulness. Broken things were judged dead, because they were no longer any good to anyone, and this reasoning sometimes was extended to objects such as rocks. The results from the present experiment help make sense of these findings. Apparently many children in the Piagetian interviews spontaneously interpret the questions as Russell and

Dennis instructed their subjects to and are trying to decide how to apply the distinction between living and dead to the sun, cars, the wind, and so on. Since inanimate objects are neither living nor dead, it is not surprising that such subjects do not perfectly draw the animate-inanimate distinction.

Safier's (1964) data make the same point. She sought the relation between the young child's concepts of what things are alive and what things die. She asked about each of several objects (e.g., a dog, a ball, a bike, the moon) whether it is alive, whether it hurts when it is hit, whether it grows, and whether it dies. She found that her youngest subjects (4 to 5 years old) interpreted "living" and "dead" in opposition to each other, and judged that objects are in flux from one state to the other. Example protocols (Safier 1964: 290–291): "A ball is living when it goes up in the air and when the ball goes down, it dies dead," "The moon is dead today, but at night it lives," "The ball dies when the air is let out, but when you blow it up again, it lives."

These data reveal a mapping component in the phenomenon of childhood animism. Many young children do not interpret the question as intended by the experimenter. To say this is not to deny that conceptual differences between young children and adults are the main source of animistic attributions of life to inanimate objects. Most probably, conceptual differences are the reason that the words "alive–not alive" are not mapped onto the child's concepts that most closely approximate the adult's concepts *alive–not alive*. After all, the distinctions *alive–dead* and *alive–inanimate* are not conceptually independent, and conceptual problems children have with one have implications for conceptual problems they have with the other. Further, some attributions of life to inanimate objects occur in the absence of any semantic confusion. Two-thirds of the Stage 2 children produced relevant examples of nonliving objects when asked to list some things that are not alive (e.g., "rocks," "tables," "machines") but also made at least one animistic judgment. Even some children who are trying from the beginning to distinguish the class of living things, such as animals, from the class of nonliving things, such as tables, sometimes include the sun, the wind, etc., among the living.

Justifications The children in Experiment 1 provided justifications that exemplify the purported stages in criteria for life: activity, movement, and autonomous movement. They frequently gave justifications in other categories as well. Examples are provided in table 1.5, along

Table 1.5
Justifications of responses in Experiment 1

Group	Percentage of responses	Justifications
I	18	Use: A table is alive because you can eat on it. Facts: A mountain is not alive because grass grows on it. Existence: Trees are alive because I've seen them.
II	33	Movement: A mountain is not alive because it just stays there. Activity: A clock is alive because it goes tick-tock.
III	25	Anthropomorphic trait: A watch isn't alive because it does not have eyes. Comparison to people: A bird is alive because I am.
IV	11	Built by people: A car is not alive because people made it. Autonomous motion: A bicycle isn't alive because you have to pedal it.
V	13	Growth, death, reproduction: A tree is alive because it grows. Composition: A cloud isn't alive because it's just made out of water.

with the percentage of all codable justifications of each type. A total of 4% of all justifications were not codable: "I just know," "I don't know," "My mommy told me," etc. The list in table 1.5 contains eleven categories of justifications that have been further divided into five groups. Two independent judges scored each justification into one of the eleven categories. Agreement was over 99%; the few disagreements were resolved by discussion. Although the basic categories should be self-explanatory, a few comments are in order concerning their further subdivision.

The most important subdivision comes between the first three (use, facts, and existence) and all the rest. Often, children simply mentioned true facts about the objects in their justifications, facts not biologically relevant in any way. These were dubbed "facts" and were produced by almost 40% of the sample. Appeals to use and existence are also irrelevant to the biological distinctions between living and nonliving things and between animals and nonanimals. Such appeals probably reflect the semantic problem discussed above, the child interpreting the questions as being about death. Death is associated with being broken and with no longer existing. Life, in contrast, is associated with being func-

tional and simply with existing. Two Stage 0 children appealed to the objects' existence fairly consistently. Both said all of the items probed were alive, and mentioned having seen them, being able to point to examples, etc., in their justifications. One of these children gave "dead animals" and one gave "monsters" as examples of nonliving things.

All of the remaining types of justification are biologically relevant, to greater or lesser degrees. They all refer to properties of people or animals, and some refer to properties relevant to the adult characterization of all animals or all living things. Activity and movement (Group II) are properties of people and of all animals. These are the most frequent justifications. Anthropomorphic traits (Group III) are properties of people that some but not all other animals share (e.g., having faces, having legs). These justifications underscore the salience of people as exemplars of living things. Children often feel that "because people are" or "because I am" is sufficient justification for judging some other object alive; such reasons are classified as "comparison to people." The justifications in Group IV, autonomous motion and being built by people, are also relevant to the biological distinction between animals and nonanimals. Some children are aware of classes of objects that move or are active, but not autonomously so, because they are machines built by people or because they require a human agent to activate them. Finally, growth, reproduction, and death (Group V) are biological properties of all living things, including plants. What things are made of (composition) was mentioned only when justifying that inanimate objects are not alive (clouds are *just* water; rocks are *just* made out of stone, etc.). These rarely observed justifications were placed in Group V because they reflect a relatively sophisticated piece of biological knowledge—that living things are made of complex, variegated materials and parts.

No child used autonomous motion as *the* justification for attribution of life, nor did any use only movement, only activity, or only anthropomorphic traits. Rather all children, at all ages and stages, appealed to several types of justifications for their judgments. For example, a Stage 3 10-year-old mentioned activity, movement, composition, growth, and comparison to people; a Stage 0 4-year-old mentioned facts, movement, use, and activity. As with Laurendeau and Pinard's data, these results provide no evidence for single-criterion definitions of life.

It might be argued that no subclassification of the child's reasons is justified. Given the prevalence of simple facts as justifications, how are we to know that the child is not always merely stating a salient fact

Table 1.6
Percentage of all codable justifications in each category

Group	Type of justification	Stage			
		0	1	2	3
I	Biologically irrelevant	57	8	4	14
II	Movement; activity	28	67	42	22
III	Anthropomorphic trait; comparison to people	12	16	17	38
IV	Autonomous motion; built by people	0	0	20	13
V	Growth, reproduction, death; composition	2	10	17	13

about the object? It may be accidental that the salient fact sometimes has something to do with the biological notions *animal* or *living thing*. Similarly, why aren't all of the justifications in Groups II through V merely anthropomorphic traits? Every property of all living things is a property of people; why are we licensed to draw distinctions among them? One reason is that the prevalence of justifications in the different categories changes systematically with stage (table 1.6). All Stage 0 children produced biologically irrelevant justifications; 57% of all codable responses were placed in Group I. Movement and activity were mentioned by children of all stages, but they dominated the justifications of the three Stage 1 children; 67% of all their justifications referred to motion and activity. All three of these children produced dead beings as examples of nonliving things, namely, "George Washington," "my grandmother," and "dead bears." Movement and activity are highly relevant to telling whether something is dead or alive. Instances of the remaining three groups of justifications increase with stage, the sharpest break generally occurring between Stages 1 and 2.

For no child does movement or activity (autonomous or otherwise) constitute the single criterion for life. Indeed, the analysis in table 1.6 suggests that we must interpret reference to movement and activity differently according to the stage of the child. For some Stage 0 children, movement and activity are no more than salient properites of some objects. These children produced mainly biologically irrelevant facts to justify their judgments. For other Stage 0 children, and for Stage 1 children, appeals to movement and activity, like appeals to existence, reflect the child's attempt to decide whether each object is living or dead. Finally, for Stage 2 and Stage 3 children, movement and

Table 1.7

Percentage of judgments that plants are alive

Stage	4- to 7-year-olds	10-year-olds	Overall
0	100 (<i>n</i> = 12) ^a	—	100 (<i>n</i> = 12)
1 and 2	93 (<i>n</i> = 16)	100 (<i>n</i> = 8)	96 (<i>n</i> = 24)
3	17 (<i>n</i> = 12)	100 (<i>n</i> = 12)	58 (<i>n</i> = 24)

^a*n* = the number of judgments probed of plants. Each subject was asked about two plants, so the number of subjects in each group is half the number given.

activity are simply two of a large number of biologically important properties of living things.

The Classification of Plants (Flower and Tree) According to the developmental progression summarized in table 1.1, virtually no Stage 1 and Stage 2 children should judge that plants are alive, and only some Stage 3 children should. Stage 1 and 2 children putatively define life by activity and movement, hardly salient properties of plants. Indeed, although they do not present their data on the matter, Laurendeau and Pinard state that Stage 1 and Stage 2 children do not attribute life to plants. Table 1.7 shows that these generalizations are not true of the data collected in Experiment 1. Instead of denying life to plants, Stage 1 and Stage 2 children called flowers and trees alive on 96% of all opportunities. Stage 3 children were less likely to attribute life to plants.

A closer look at the data makes clear what is going on. Young Stage 3 children (4- to 7-year-olds) differed from older children (10-year-olds) with regard to their classification of plants. Young Stage 3 children denied that plants are alive, while children of the same age in Stages 1 or 2 credited plants with life ($p < .01$, Fisher exact test, 2-tailed). In other words, young children who interpreted “alive” to refer to animals alone made no animistic overextensions. But those who attempted to encompass animals and plants in a single category also judged some inanimate objects alive. This suggests that 4- to 7-year-olds have a clear concept of animals, as distinct from inanimate objects, but that they do not have a concept of living things, as distinct from inanimate objects. By age 10, many children have achieved the biological concept *living thing* and have mapped it onto the word “alive.”

Conclusions from Experiment 1

The phenomenon is not in doubt. In Piagetian clinical interviews children do attribute life to inanimate objects, and this demands an explanation. But there is not just one explanation; rather, there are two distinct sources of childhood animism. First, some young children are answering the wrong question, valiantly trying to decide whether a bicycle is alive or dead. It is easy to see, for these subjects, why objects obviously capable of activity are judged alive. The way you tell whether an animal—your pet gerbil or fish, a cowboy on TV—is dead is to see whether it is moving. Further, adults speak of “dead batteries,” “dead cars,” “dead parties,” “dead telephones,” etc., all characteristically active things no longer functioning. Second, other young children are indeed attempting to answer the right question, but still make animistic judgments. At least one source of their attribution of life to inanimate objects may be incomplete biological knowledge, for these judgments are more likely when the child is attempting to rationalize the inclusion of both animals and plants in the category of living things.

The above account, although consistent with the data presented so far, goes well beyond them. Support for it could come from the study of the young child’s biological knowledge. What does the child know? How is that knowledge structured? How is it deployed in making judgments about life and in making other inferences? What knowledge is acquired between the ages of 7 and 10, and how is this new knowledge deployed in the 10-year-old’s inferences? Can the 4- to 7-year-old’s attribution of life to inanimate objects, and the lack of it in 10-year-olds, be understood in terms of these characterizations of biological knowledge? The rest of this monograph will focus in part on these questions.

Even if we can understand why 4- to 7-year-olds do not represent the biological concept *living thing* and hence why they have difficulty rationalizing the inclusion of animals and plants in a single category, we must also explain the particular animistic overattributions. Why especially the sun, the wind, cars? For this I believe we must appeal to the semantic source of the children’s judgments. For the child for whom the distinction between living and nonliving things is not yet well motivated by biological knowledge, the ambiguity of “not alive” may pose a problem. The preschooler’s difficulty in appreciating the two distinctions (alive-dead and alive-inanimate) may persist until the biological distinction is well established. Whenever the distinction between living

and dead things intrudes, activity and movement become all the more salient.

My account differs from Piaget's in three essential respects. First, I argue that the patterns of attribution of "alive" partly reflect a semantic confusion. Second, and more important, I dispute the characterization of the development of the meaning of the word "alive" summarized in table 1.1. Children, no less than adults, have no simple definitions of life. The method by which children generate their judgments does not differ in kind from the method by which adults generate theirs; both appeal to a systematic body of knowledge rather than to single criteria. Finally, I would place the disappearance of animistic attributions in a slightly different context than Piaget did. He considered the essential development to be the growing distinction between intentional and mechanical causation. For this I would substitute the child's developing biological knowledge.

A Final Possible Source of Childhood Animism

In the Piagetian procedure children are made very conscious of the predicate "alive." They must define it, justify each judgment, and partition a set of objects with regard to whether each is alive or not. This procedure might trap the child into animistic judgments. For example, having just said that a bird is alive "because it flies," a child might feel compelled for the sake of consistency to judge an airplane alive. Perhaps the Piagetian procedure induces conscious theory building about life on the part of children, and does not simply diagnose their concept of life. That is, the procedure may reflect how the child comes to adopt a conscious criterion for life by trying various ones, testing them against intuitions, modifying them, and finally settling on one, then making all further intuitions consistent with that criterion. In the course of a clinical interview, the process of settling on a criterion may take some time. A crude test for this possibility is to see whether consistency in justifications is greater among the questions in the second half of the protocol than among those in the first half. The answer is no. Children produced an average of 3.8 different kinds of justifications in the first half of the protocol and an average of 4.2 different kinds in the second half. There was no hint of settling on one criterion as the interview progressed. Still, it is possible that the phenomenon *does* depend upon the self-conscious search for criteria. Being trapped into animistic judgments may reflect only local, short-lived attempts at consistency,

which would explain why so many children judge only 1 or 2 inanimate objects alive.

Klayman (1979) has provided evidence against the possibility that animism is an artifact of conscious criterion search on the part of the child. He contrasted two groups of 4- to 7-year-olds. One group was required to provide a definition of “alive” and also to give justifications for judgments; the other group was required to provide neither. The two groups were identical in their degree of animistic overattribution of life to inanimate objects. However, Klayman’s procedure is like the Piagetian clinical interview in that the child is still required to focus entirely on attribution of life. Even without definitions or justifications, this may induce conscious criterion building on the part of the child. Perhaps animistic judgments would disappear if the task were different, not requiring the partitioning of a set of objects solely with regard to being alive or not. In the second experiment to be reported here, children do not say what it means for something to be alive, nor do they give examples of living and nonliving things. They are questioned about several objects, and for each object many properties, not just life, are probed. All of the questions about a single object are asked before the next is presented. Finally, no justifications are required. Thus the procedure of Experiment 2 removes all those aspects of the Piagetian clinical interview that encourage the child to consciously reflect on principles that distinguish living from nonliving objects.

Experiment 2: Removing the Trap of Conscious Criterion Building

The primary purpose of Experiment 2 was to suggest a model of how children generate responses to questions such as “Does a dog breathe?” (see chapter 3). Here only the data relevant to the pattern of attribution of the word “alive” will be discussed.

There were two sets of materials. In one, all of the objects were highly familiar to the child; in the other, many were unfamiliar:

<i>Familiar objects</i>	<i>Unfamiliar objects</i>
person	person
dog	aardvark
fish	hammerhead (a hammerhead shark)
fly	stinkoo (a stinkbug)
worm	annelid (a worm)
tree	baobab (a tree)

<i>Familiar objects</i>	<i>Unfamiliar objects</i>
flower	orchid
car	harvester (a harvesting machine)
table	rolltop (a desk)
sun	sun
cloud	cloud
hammer	garlic press

Because some of the objects were unfamiliar to the child and had to be pictured (e.g., harvester, stinkoo), three drawings of each object were prepared. The properties probed included some true of all living things (is alive, grows), some true of all or many animals (eats, breathes, sleeps, has a heart, etc.), and some true of specific genera or species of animals (lives in the water, makes honey, etc.). Many were not properties of any living things (e.g., needs gasoline, is bigger than a house, is kept in the refrigerator). All the questions about one object were asked before the next object was introduced. The questions for each object were separately randomized once, and the order of presentation kept constant throughout all of the testing. The order of presentation of the objects was separately randomized for each child.

The experimental session was introduced by telling the children that they would be asked questions about a number of things. For the unfamiliar series they were warned that they might never have seen or heard of some of the things. All children were told that some questions would be easy, some silly, and some hard, and they were told to say what they thought was the right answer when they did not know for sure. Before being asked any questions about an object, children were shown three 4×6 index cards, each with a slightly different hand-drawn rendering of the object, and it was named for them.

Subjects were 50 children from the same population as those in Experiment 1. The familiar series was given to 10 children at each of the ages 4, 7, and 10. The unfamiliar series was given to 10 children at each of the ages 4 and 10. Three sessions of about 20 minutes each were required for 4-year-olds, two for 7-year-olds, and one for 10-year-olds. The 4- and 7-year-olds were tested individually; the 10-year-olds were tested in small groups of 3 or 4 children, working from prepared booklets.

Table 1.8
Percentage of children in each stage

Age	Experiment	Number of subjects	Stage 0	Stages 1 and 2	Stage 3
4	L&P	100	73	27	0
	Exp. 1	10	60	20	20
	Exp. 2	20	5	45	20
7	L&P	50	8	53	39
	Exp. 1	10	0	50	50
	Exp. 2	10	0	60	40
10	L&P	50	0	46	54
	Exp. 1	10	0	50	50
	Exp. 2	20	0	30	70
Overall, each age weighted equally	L&P		27	42	31
	Exp. 1		20	40	40
	Exp. 2		12	45	43

Results

Laurendeau and Pinard's Stages 1 and 2 are distinguished only by appeals to autonomous motion in justifications. Since children were not asked for justifications in Experiment 2, these two stages cannot be differentiated. Therefore, children were classified as Stage 0 (random responding, all objects judged alive, or no objects judged alive), Stage 1 or 2 (at least one inanimate object judged alive), or Stage 3 (no animistic overattributions of life). Responses on the familiar and unfamiliar objects did not differ, so the results from the two series were combined. Table 1.8 compares the data from Experiment 2 with those from Experiment 1 (Laurendeau and Pinard's data are also included). There were fewer Stage 0 4-year-olds in Experiment 2 than in Experiment 1, although the difference did not reach statistical significance. Among the 7- and 10-year-olds, the two sets of data did not differ. The procedural differences did not decrease the level of animistic responding. The phenomenon of attribution of life to inanimate objects does not depend for its manifestation on the Piagetian clinical interview.

Besides differing in how they encourage the child to reflect upon what makes something alive or not, the procedures in Experiments 1 and 2 differ in other ways that bear on the interpretation of the phenomenon of animistic judgments. In Experiment 2 more than half of the objects probed were animals and plants. Further, many biological properties, such as eating, growing, and breathing, were probed. Laurendeau and Pinard's series contain only a few animals and plants and probes only the property of being alive. The procedure of Experiment 2

Table 1.9
 Percentage of animistic overgeneralizations by
 non-Stage 0 children

	Age 4	Age 7	Age 10
L&P ^a	43 (<i>n</i> = 27)	20 (<i>n</i> = 45)	18 (<i>n</i> = 50)
Exp. 1 ^a	20 (<i>n</i> = 4)	20 (<i>n</i> = 10)	10 (<i>n</i> = 10)
Exp. 2	35 (<i>n</i> = 13)	16 (<i>n</i> = 10)	7 (<i>n</i> = 20)

^aBased on sun, cloud, table, car, pencil for comparability to Experiment 2.

may orient the child toward the biological distinction between animals and inanimate objects, or between living and inanimate objects. This may be the reason for the slightly lesser degree of Stage 0 responding observed in Experiment 2. However, if even in the Piagetian procedure children beyond Stage 0 are basing their decisions on a variety of biological considerations, but their biological knowledge is inadequate, then highlighting the biological context should not affect the level of animistic responses. And this was indeed the case: non-Stage 0 subjects provided the same level of animistic responses here as in the standard Laurendeau and Pinard procedure (table 1.9). This finding—as much animism in Experiment 2 as in Experiment 1—supports two arguments. First, childhood animism is not an artifact of the testing method of the Piagetian clinical interview. Second, it would seem that young children, like adults, are applying their biological knowledge to the question of what is or is not alive, but that they simply do not know enough biology to draw the same distinction that adults draw.

Conclusions

In this chapter I have stressed my disagreements with the standard Piagetian treatment of the phenomenon of childhood animism. I have denied the developmental description illustrated in table 1.1. I have suggested that one source of animistic responses is inadequate biological knowledge and that one source of the decline of animism is the acquisition of biological knowledge in the years before age 10.

Let me conclude by underlining the points on which I instead agree with Piaget's treatment. First, the phenomenon of animistic attribution of life is real, nonartifactual, and important. The meaning of the word

“alive” does change with age. And although one source of the young child’s responses is a mapping problem—the child interprets the distinction in a way not intended by the experimenter—Piaget is also correct that the underlying concept of life itself develops during these years, attaining its recognizable adult form around age 10. These are major points of agreement. What follows in this monograph is an attempt to shed light on the developing concept of life in the years before age 10. In order to explore the suggestions that emerged from Experiment 1, I shall analyze the development of the concept of life in terms of the acquisition and reorganization of biological knowledge.

Piagetians will argue that my account misses the heart of Piaget’s work on childhood animism. His primary concern was not the development of the meaning of the word “alive,” nor even the development of the concept of life. Rather, he was concerned with the child’s causal notions. At the same ages when children say that the sun, the wind, cars, etc., are alive, they also maintain that the sun knows where it is, that it shines in order to keep us warm, that it can feel a pinprick—in short, that it exhibits intentional states and purposeful activity. As I will spell out in the next chapter and in chapter 7, I agree that the development of the concept of living things and animals is entwined with developing notions of causal explanation. I agree that the separation of intentional causality from other types is central to what is changing over the years from 4 to 10, although mechanical causality is not at issue. But that part of the story must await presentation of the results from more studies.