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Trust in Testimony: How Children Learn About Science and Religion

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Many adult beliefs are based on the testimony provided by other people rather than on firsthand observation. Children also learn from other people's testimony. For example, they learn that mental processes depend on the brain, that the earth is spherical, and that hidden bodily organs constrain life and death. Such learning might indicate that other people's testimony simply amplifies children's access to empirical data. However, children's understanding of God's special powers and the afterlife shows that their acceptance of others' testimony extends beyond the empirical domain. Thus, children appear to conceptualize unobservable scientific and religious entities similarly. Nevertheless, some children distinguish between the 2 domains, arguably because a different pattern of discourse surrounds scientific as compared to religious entities.

As adults, we are dependent on the testimony of other people for forming many beliefs about the world. For example, to learn about the history of Ancient Rome or the deserts of Mauritania, we depend on assertions offered to us by other people rather than on our own firsthand observation. In this paper, we examine the way that children learn from such assertions in the domains of science and religion. We emphasize parallels in the way that children learn in these two domains, thereby raising important questions about the ultimate nature and direction of cognitive development.

Before going any further, it will be helpful to set out a working definition of testimony. For the most part, we borrow from standard philosophical usage. Thus, we take it as uncontroversial that human beings often use language to make credible assertions and that listeners treat such testimony as reliable evidence for the truth of those assertions. This definition is more wide-ranging than standard legal usage in that such testimony need not be accompanied by any explicit avowal or oath regarding the truth of the assertions. This definition also includes, but it is by no means confined to, assertions about religious beings. Finally, this broad definition allows that sometimes informants will make claims based on their firsthand experience (as in so-called eye-witness testimony) but sometimes informants will make claims in the light of their knowledge or expertise,

including testimony that they themselves have received. Note that the philosophical usage focuses primarily on the distinctive status of the knowledge gained by the receiver of testimony. Unlike other forms of knowledge, it is not based on firsthand observation or memory, but on the apparently credible assertions of other people, and in justifying such knowledge, recipients often refer to the claims made by informants as plausible, but not indubitable, evidence for the truth of the claims in question.

Three additional clarifications will be helpful. First, there are many aspects of the world that we can learn about via either firsthand observation or testimony. To establish the outside temperature, we may either step outside or consult a friend who has just come in. To learn what a committee decides, we may either attend the meeting ourselves or consult a colleague. However, there are other aspects of the world that we generally learn about only via testimony because we are in no position to make our own, relevant, firsthand observations. Most historical facts and many aspects of geography fall into this category—as illustrated by the examples of Ancient Rome and Mauritania. Below, we seek to highlight children's dependence on testimony by concentrating on cases in which relevant, firsthand observation is likely to be more or less excluded for them.

Second, we focus on testimony that is conveyed via language. This is not to deny that children may encounter certain types of nonverbal "testimony." Thus, rituals, buildings, and nonverbal symbols may implicitly tell children who or what is valued or important in their culture. In addition, various visual representations, notably pictures or diagrams, may help children to visualize particular entities or

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processes that they cannot easily observe. However, we follow philosophical usage by emphasizing linguistic examples of testimony. This emphasis has the advantage of highlighting an obvious and distinctive feature of the human species, namely our facility at transmitting complex information both within and across generations by means of spoken language. Such testimony may include both explicit and non-explicit claims. Consider the historical assertion that the Emperor Hadrian constructed a wall to defend the northernmost border of Roman Britain. The explicit claim is that Hadrian established a defensive boundary. Yet various other assertions are embedded in that overt claim—that someone called Hadrian once lived, that he became Emperor, that Britain was part of the Roman Empire, and so forth. We anticipate that children are likely to learn from nonexplicit as well as explicit claims.

Finally, although we borrow from philosophical usage and emphasize that children can learn via testimony about hidden or unobservable aspects of the world, we do not wish to imply that children learn about these aspects of the world only via testimony. On the contrary, there is considerable evidence that preverbal infants readily go beyond perceptual information to infer various invisible properties, such as the permanence of a hidden object (Baillargeon, 2004) or the goal of an agent (Sommerville & Woodward, 2005; Woodward, 1998). Our focus is instead on various scientific and spiritual aspects of the world that young children are unlikely to infer from perceptual observation. Specifically, we discuss three examples from science—children's conception of the brain, the shape of the earth, and the function of hidden, bodily organs—and two examples from religion—children's conception of God and the afterlife.

Some philosophers, notably Hume, have argued that we come to trust in others' testimony because we frequently detect a correlation between what we observe to be the case and what others claim to be the case (Hume, 1748/1957). Hume's contemporary, Thomas Reid, argued against this so-called reductionist thesis, proposing instead that we do not need to justify our acceptance of testimony in terms of some other, supposedly more fundamental, source of knowledge insofar as learning from testimony is a natural and nonreducible operation of the mind (Reid, 1785/2002).

In principle, children might adopt the stance of either Hume or Reid toward the offerings of testimony. More specifically, children could elaborate on a strategy that serves them well enough in infancy. They could rely on their own considerable powers of

observation and analysis, withholding assent to any piece of testimony that is either inconsistent with or not supported by evidence that they have gathered for themselves. Adopting this cautious, Humean stance, children might hear, and indeed understand, all sorts of testimony (e.g., claims about the past, present, and future, or about unobservable beings and events) but remain agnostic or skeptical about their truth value. At most, they would accept only those claims that can be checked against, and confirmed by, their own firsthand observation.

At first sight, it is not implausible that young children adopt this conservative strategy. Arguably, they have little need to trust claims about events and situations that lie beyond either the familiar world of the here-and-now or their own immediate and remembered past. Such a strategy would certainly stop them from taking various fictitious or mythical claims too seriously. However, as we argue below, such caution would also lead children to resist the testimony of other people regarding various processes or properties that are difficult for them to observe firsthand. Yet, analysis of the available data on children's conceptual development in the domains of psychology, cosmology, and biology indicates that children do trust and learn from such testimony, just as Reid might expect.

One plausible and attractive conceptualization of this type of trust in testimony is that the observations made by other people, including successive generations of scientists, augment but do not in any way transform the observational powers of young children. Thus, by listening to, and making sense of, other people's testimony, children are offered data that they would not normally be able to gather for themselves. They gain, by proxy, access to data about microscopic processes, hard-to-observe cosmological regularities, as well as events that are historically or geographically remote. On this view, children's trust in testimony dramatically amplifies their access to empirical information but it does not change either the type of data that they gather or the ways in which they come to conceptualize those data.

In the second section of the paper, where we examine children's trust in testimony in the spiritual domain, we argue against this "continuity" thesis. We review emerging evidence that children rely on testimony not just in domains such as psychology, cosmology, or biology but also when they contemplate metaphysical or theological issues. Thus, children are also presented with claims about God and the afterlife. That information cannot easily be construed as straightforward, empirical data, gathered by others as a proxy for children's own

firsthand observation. Nevertheless, children appear to learn from such nonempirical claims—just as they do in more obviously empirical domains. By implication, children’s trust in testimony does not simply amplify the range of empirical data to which they have access, it also leads them to believe in a set of far-reaching but ultimately nonempirical propositions.

In the third section, we compare children’s trust in testimony in the secular and the spiritual domains. In particular, we ask whether young children regard most of the information that they receive via testimony, whether empirical or not, as enjoying the same epistemological standing or whether they gradually construct an epistemological distinction—however tentative—between claims that are open to empirical check or verification and claims that cannot in principle be verified.

Children’s Trust in Testimony: Scientific Domains

As noted above, young children could rely on a strategy that serves them well in infancy: they could rely on their own powers of observation and analysis withholding assent to claims that they cannot verify for themselves. Thus, in the domains of psychology, cosmology, and biology, they could ignore or reject claims that are inconsistent with their own firsthand observation. At first glance, a lively program of research on children’s conceptual and scientific development lends support to exactly this conclusion. Young children are said to resist scientific instruction because they bring to it a variety of countervailing assumptions that are rooted in their own firsthand experience (Gardner, 1991). Close analysis of the available data shows, however, that this portrait of the child as a stubborn autodidact is misleading. To establish this conclusion, we present three case studies: children’s understanding of the brain, the shape of the earth, and the life cycle.

Understanding the Brain

By the age of 5–6 years, children understand that the brain is a prerequisite for mentation. They judge that a brain transplant, unlike a heart transplant, would alter one’s ability to count, to know the meanings of words, to remember, and to dream (Johnson, 1990; Experiment 2). Similarly, they realize that thinking and remembering would cease if the brain were removed (Gottfried, Gelman, & Schultz, 1999; Experiment 2). By the age of 7–8 years, children also judge that a person’s sense of identity is

intimately connected to his or her brain. They assert that if a child’s brain were transplanted to a pig, the pig would claim to be a child, not a pig (Johnson, 1990; Experiment 1). Similarly, they assert that if a rabbit’s brain were transplanted to a skunk, the skunk would have memories of being a rabbit, not a skunk (Gottfried et al., 1999; Experiment 2).

Whatever access children have to mental processes, they presumably cannot make any relevant observations of brain processes. Hence, their understanding of the relationship between the brain and mental processes must be based on information supplied by other people. Admittedly, it could be argued that children arrive at only a piecemeal understanding on the basis of such testimony. Yet this objection is undermined by two considerations. First, Johnson (1990; Experiment 1) found that children aged 7 and older were highly coherent in their answers about the effects of a transplant. Across a lengthy battery of questions, most children consistently assumed that preferences, memories, and a sense of identity would all be transplanted along with the brain. Second, children appear to eventually go beyond what they are told. They do hear remarks (e.g., “Think hard—use your brain”) suggesting that the brain plays a role in knowledge or thinking (Gottfried & Jow, 2003) but they are rarely, if ever, explicitly told about the consequences of a brain transplant for personal identity. By implication, even if children are offered only fragmentary or disconnected information via testimony, they nonetheless rework that information into a coherent conception of the brain as a critical organ for all mental processes, including the sense of personal identity.

Evidence for such reworking is apparent in the more detailed pattern of findings reported by Gottfried et al. (1999). Before the age of 7–8 years, children appear to think of the brain as an activator or energizer that is critical to various cognitive processes. Hence, they realize that a brain is necessary to engage in those processes, but they also assume that anyone’s brain, including a brain acquired via a transplant, might do the job effectively—much as a battery might be successfully “transplanted” from one electrical gadget to another. By the age of 7–8 years, children have revised this conception. They come to think of the brain not simply as an energizer but as a container within which various individualized mental processes, including those connected to the sense of personal identity, are housed. At this point, they acknowledge that someone’s personal identity is so tied to their brain that it would necessarily be “transported” to a new host in the context of a brain transplant.

In summary, this example provides a first illustration of what will turn out to be a recurrent pattern. Whatever children's skill in perceptual observation, there are various key aspects of the world that they can rarely, if ever, observe firsthand. Hence, they must rely on other people's testimony for information. Children's developing appreciation of the existence and functioning of the brain offers an illustration. By the age of 7–8 years, children understand the pervasive nature of the linkage between mental processes and the brain. Their conceptualization is dependent on adult testimony but it is also evident that children do not assimilate such testimony in either a piecemeal or passive fashion. They rework what they are told so as to arrive at a coherent conceptualization that permits them to go beyond the explicit claims or directives that they hear. Thus, by the time that children come to think of the brain as an individualized container they are well equipped to answer unfamiliar questions about the effects of transplanting a brain from one creature to another.

Understanding the Shape of the Earth

Research on children's developing understanding of the shape of the earth has emphasized that children are slow to acquire a concept of the earth as a sphere. It is claimed that such a concept conflicts with two of their fundamental presuppositions about physical objects, namely that objects need support and that the ground is flat. In support of this argument, Vosniadou (1994) reports that children aged 6–9 years growing up in various cultures adopt a mental model of the earth that includes a flat surface. For example, some children claim that the earth is a flattened sphere, or a disc resting on a support, or even a rectangular surface. These findings suggest that children's tacit presuppositions that the earth's surface needs support and is flat lead them to resist or distort the claim that the earth is an unsupported, spherical planet. Hence, they amalgamate testimony and firsthand experience into an alternative model, such as that of a flattened sphere. However, close scrutiny of the available findings highlights a different message, namely that many children come to fully accept other people's testimony about the shape of the earth. Although that testimony is inconsistent with some aspects of their firsthand experience, they eventually accept it even if some children initially amalgamate the two source of information.

Four findings highlight children's acceptance of such testimony. First, in an initial study of American children ranging from 6 to 11 years, Vosniadou and

Brewer (1992) report that although various alternative mental models of the earth were identified, the most frequent mental model was that of a sphere. For example, among children who could be classified as having a consistent mental model, almost half (47%) adopted a spherical model. By contrast, less than 10% conceived of the earth as a flattened sphere. Second, this same pattern emerged in subsequent, cross-cultural replications. Thus, for children in all four of the countries studied (USA, Greece, India, Samoa), the most frequent mental model was that of a sphere (Vosniadou, 1994). Third, whatever the particular shape of the mental model of the earth that children espouse—even if they think of it as a rectangular body—it is important to note that they are still being swayed by testimony. Specifically, they are accepting the claim that the earth is a planet, no matter whether they are correct about its overall shape. After all, nothing in children's firsthand experience is likely to suggest that the earth is anything more than an extended surface. Finally, even those children who did not adopt the spherical model still subscribed to a model that reflected some assimilation of the claim that the earth is round—despite introducing a flat surface into their model. More specifically, children appeared to think of the earth as a flattened sphere, a hollow sphere, a disc, or both a surface and a separate sphere. In all these cases, children have assimilated the claim that the earth has a round surface even if they do not realize that it is completely spherical. Note again that there is nothing in children's firsthand experience that is likely to lead them to such a conclusion. As Vosniadou and Brewer (1992) point out, what children normally perceive is a surface that extends to the horizon. Although they may observe for themselves that the sun or the moon has a round shape, they do not have access to an equivalent perspective with respect to the earth. Even from the elevation of an airplane, the earth does not look round. By implication, either via verbal testimony or via verbal testimony supplemented by two- or three-dimensional models (Callanan, Jipson, & Soennichsen, 2002), children come to accept a claim that they cannot verify for themselves.

Again, it might be objected that children's acceptance of the claim that the earth is round reflects, at best, the acceptance of one specific, local piece of testimony rather than the emergence of any coherent and consistent understanding. The available evidence, however, casts doubt on that cautious interpretation. First, Siegal, Butterworth, and Newcombe (2004) assessed children's consistency with respect to a series of five questions about the shape of the earth—including questions that children are

unlikely to hear discussed in any explicit fashion (e.g., “If you walked for many days in a straight line, would you fall off the edge of the world?” and—with reference to a spherical model of the earth—“Some children think the sky is all around; other children think that the sky is only on top. Point to where the sky really is”). By the age of 8–9 years, the majority of children in two samples (English and Australian) consistently answered all five questions about the shape of the earth in terms of sphericity. Comparable results emerged in a parallel study by Nobes et al. (2003). By 8 years of age, the majority of children in two different British samples (White and Gujarati) gave correct replies to each of the two probe questions cited above. Similarly, in an assessment of Swedish children ranging from 6 to 11 years, the majority not only considered the earth to be a sphere and maintained that one can live anywhere without falling off, they also invoked the concept of gravity—even if they were not able to use the exact term (Schoultz, Säljö, & Wyndhamn, 2001).

In summary, this example, like the previous analysis of children’s conception of the brain, shows that by the age of 8–9 years, children accept testimony regarding an aspect of the world that is impossible for them to observe accurately on a firsthand basis. Moreover, children not only accept such testimony, they eventually go beyond what they are told to build a coherent concept of the earth as a sphere—a sphere that is entirely surrounded by sky and that supports locomotion indefinitely.

Understanding the Life Cycle

A long tradition of research has shown that during the elementary school years, young children gradually adopt a coherent, biologically grounded understanding of the life cycle. They come to recognize that the process of growth and aging is unidirectional (Rosengren, Gelman, Kalish, & McCormick, 1991) and regulated by internal, genetic factors that dictate individual characteristics such as eye and skin color as well as species membership (Gelman & Wellman, 1991; Giménez & Harris, 2002; Hirschfeld, 1995; Solomon, Johnson, Zaitchik, & Carey, 1996). One particularly significant aspect of this emergent biological understanding is children’s growing realization that the causes of death are also biologically governed. Even preschoolers understand that death is not just a continuation of life in some altered sleep-like state. Thus, they realize that death, unlike sleep, removes any capacity for independent movement and agency (Barrett & Behne, 2005) and brings various living processes to an end,

including growth and excretion (Bering & Bjorklund, 2004). Between approximately 5 and 10 years, however, children also come to understand not just the immediate consequences of death but the fact that it is an inevitable and irreversible biological event that is brought about by the breakdown of critical life-supporting functions (Slaughter, Jaakkola, & Carey, 1999; Speece & Brent, 1984, 1992).

Conceivably, children reach this conclusion by firsthand observation. For example, they might observe the death of various creatures, including pets, wild animals, birds, and insects. Such experiences might indeed lead children to the realization that death awaits all living beings, including themselves. Yet it is not obvious that such personal experiences could lead children to conceptualize death in terms of the breakdown of various internal and generally invisible biological functions. An alternative, and more plausible, explanation is that children arrive at this conclusion by coordinating various pieces of testimony about those hidden biological processes. Thus, they might be told about the death of a close relative, and given some explanation of the immediate cause of death, be it a heart attack, stroke, or cancer. More generally, they will be told about the function of various normally invisible bodily organs: the heart, the lungs, the stomach, and so forth. Information about hidden body parts can be ultimately coordinated into a coherent framework in which death is seen as the inevitable and irrevocable breakdown of the internal parts of the biological machine and not as a continuation of life in some altered or restricted fashion.

Three studies by Slaughter and her colleagues offer persuasive evidence for the impact of testimony concerning hidden body parts. First, Jaakkola and Slaughter (2002) found that a group of 4- and 5-year-olds could be subdivided into two groups: so-called “life-theorizers” and “non-life-theorizers.” The two groups differed in two ways. As compared to non-life-theorizers, life-theorizers were more likely to mention the life-maintaining function of particular body parts (e.g., “if somebody didn’t have any blood, they would die”) and also to know the canonical function of particular body parts (e.g., to know that lungs are for breathing). By implication, children begin, on the basis of relevant testimony, to appreciate both the proper function of a given body part and its necessity for the maintenance of life. Does such knowledge of invisible function help children to construct a biological interpretation of death? Slaughter et al. (1999) gave the two groups an interview about death. As expected, those children who knew more about the function of hidden body

parts—the so-called life-theorizers—proved to be more accurate in recognizing that death is inevitable, irreversible, applies only to living things, and terminates various bodily functions such as eating and breathing.

Further support for the role of testimony in the domain of biological reasoning was obtained from a training study that presented preschoolers, who were identified as life-theorizers and non-life-theorizers at pretest, with training on vital body organs and processes (Slaughter & Lyons, 2003). The training, which used a body poster as a visual aid, emphasized the fact that each organ is necessary to maintain life and highlighted the integrated nature of different body parts working together. Children again received the pretest interviews (a body interview and a death interview) exactly 1 week after the training session. The results of the posttest body interview demonstrated that 95% of the children who were non-life-theorizers at pretest became life-theorizers following training. Of the non-life-theorizers who were not trained, only 20% became life-theorizers at posttest. A second, more striking result was the fact that trained non-life-theorizers showed significant increases on every subcomponent of the death concept, including the realization that death is irreversible, inevitable, and universal to living things. This result is significant given that the concept of death was not mentioned in the training. Hearing about how parts of the human body function to sustain life changed children's understanding of death.

Exactly how children construct a biological account of living things is not fully understood. We know that input and exposure to nature play important roles in the development of folk biological thinking (Gelman, 2003; Ross, Medin, Coley, & Aturan, 2003). We also know that in cases of developmental psychopathology, the constructive process discussed above may not occur. Thus, Johnson and Carey (1998) report that although both children and adults with Williams syndrome (ranging from 10 to 32 years) can appropriately attribute bodily properties (e.g., breathes, has a heart) to dogs and birds as well as people, they perform poorly when asked more conceptually demanding questions about biology, including the nature of death. For example, they do not refer to death as the cessation of behavioral or bodily processes. Instead, they give responses similar to those of normal 6-year-olds—they are prone to describe death as an absence, a departure, or a sleep-like state. Such piecemeal understanding brings into focus the different path taken by normal children: not only do they accept various

claims that they cannot establish or verify for themselves, regarding, for example, the function of blood or lungs, they also go on to rework such claims into a coherent conception of the way in which the life cycle depends on the operation of those internal functions.

Conclusions

In each of the three examples considered above, we have seen that children can conceptualize objects or processes that are normally hidden from view. They trust what they are told about the relationship between mental processes and the brain, the overall shape of the earth, and the life-maintaining function of normally invisible, internal organs. The evidence from these three case studies shows that children do not adopt a conservative stance of skepticism toward other people's testimony. Such a stance would involve the rejection of (or the "suspension of belief" in) information that cannot be checked against first-hand observation. Such checks are not available to children in the domains under discussion and yet they trust the testimony that they receive.

It could be objected that children are simply echoing various piecemeal claims and do not understand the broader conceptualization that unites those claims. Certainly, analysis of child–parent dialogue suggests that parents typically provide only fragments of explicit explanatory information (Callanan & Jipson, 2001). Thus, whether parents answer a question in the course of domestic conversation (Callanan, Pérez-Granados, Barajas, & Goldberg, 1999), volunteer an explanation in the context of a museum visit (Crowley & Galco, 2001; Crowley et al., 2001), discuss picture-book illustrations (Gelman, Coley, Rosengren, Hartman, & Pappas, 1998; Jipson & Callanan, 2005), or comment on a globe representing the earth (Callanan et al., 2002), they rarely articulate the relevant scientific principles in an explicit fashion.

Nevertheless, in each of the domains reviewed above, children display an increasingly systematic understanding across a battery of interview questions. In addition, they are able to answer questions that they are not likely to have previously discussed. By implication, even if children at first receive and encode adult testimony in a piecemeal fashion, they rework that testimony and its implications so as to arrive at a coherent understanding of the domain in question. This process of conceptual reorganization takes time—and in cases of severe psychopathology it may never occur. Still, it seems plausible to conclude that it would never be set in motion in

the first place if children were not prepared to accept and build upon assertions about a variety of processes and entities that are normally invisible to them.

A further objection is that an emphasis on verbal testimony neglects the potential role of visual representations of otherwise invisible entities. Consider, for example, the shape of the earth. Arguably, children's everyday encounters with globes play an important role in their understanding that the earth is a sphere. Similarly, diagrams and pictures may help children understand that the human body contains a brain as well as other life-maintaining organs. It is important to note, however, that such three- or two-dimensional representations are not likely to be interpretable in the absence of verbal testimony. Mere visual inspection of a classroom globe cannot inform children that the earth is a sphere. To understand that the globe is a representation of the earth, children need someone to call their attention to the possibility of mapping from that visual representation to the earth itself (Callanan et al., 2002). Similarly, although visual depictions of bodily organs may offer children helpful, supplementary information about the size, shape, and location of those organs they cannot in themselves inform children about the life-maintaining functions that they serve (Slaughter & Lyons, 2003). Thus, even if visual aids can serve as a supplementary source of information, verbal testimony would appear to be critical.

The three examples highlight potentially important variation in the type of testimony that children hear. Some testimony appears to supply knowledge that helps children elaborate on their preexisting intuitions. For example, testimony concerning the functions of the brain is likely to help children build on their preexisting intuitions about various mental processes (Corriveau, Pasquini, & Harris, 2005; Johnson & Wellman, 1982). Some testimony supplies information that may be inconsistent with children's preexisting intuitions. For example, testimony concerning the spherical shape of the earth may conflict with children's intuitions rooted in firsthand experience (Vosniadou, 1994). Finally, testimony about the breakdown of particular, hidden body parts may supply knowledge where children have few or no preexisting intuitions (Slaughter & Lyons, 2003). It is too early to assess whether conceptual change is more or less problematic depending on the relationship between children's preexisting intuitions and the testimony that they hear. For the time being, however, we may draw the important conclusion that even when children have preexisting intuitions

(as in the case of the shape of the earth), those intuitions do not constitute an enduring obstacle to the acceptance of conflicting testimony.

Children's Trust in Testimony: Spiritual Domains

So far, we have argued that children accept testimony about hidden entities and processes and they use that testimony to construct a more coherent conception concerning the role of the brain, the shape of the earth, or the biology of life and death. In emphasizing children's constructive role in reworking and organizing the various pieces of testimony that they receive, we deliberately wish to echo the kind of constructive process that Piaget emphasized. However, we depart from Piaget in placing more emphasis on the fact that in certain domains the "evidence" that children assimilate is not gathered via firsthand observation but is derived from others' testimony.

At first sight, it might be concluded that this shift of emphasis has minor consequences for our conception of cognitive development. It simply underlines the role of testimony as an important source of evidence that children marshal. In our view, however, such a conclusion underestimates the ramifications of children's trust in testimony. More specifically, it would be a mistake to suppose that such trust inevitably leads children in the direction of an enlarged understanding of secular truths, as illustrated by the three case studies just described. Children also use testimony to move in a different direction: they come to understand and accept various spiritual claims. We discuss two illustrative examples: children's developing concept of God and their belief in an afterlife.

God

We make the assumption that children do not actually have any direct, firsthand experience of God and that children do not arrive at a belief in God via firsthand experience of God. This is not to deny that children who become believers in God may claim to communicate with him or to register his presence. Our more positive assumption is that many children, depending on the particular community that they are growing up in, will encounter and trust claims about God's existence, omniscience, immortality, and powers of creation. We briefly review recent studies examining the extent to which children understand and accept these claims and then consider the implications.

In a clever series of experiments, Barrett, Richert, and Driesenga (2001) examined the concept of God held by American children aged 3–6 years, recruited from Reformed and Lutheran Protestant churches. Children were shown a familiar cracker box; they discovered that, contrary to what they expected, the box contained rocks rather than crackers and they were shown that the crackers had been shifted to a bag. They were then asked to say where various types of beings would believe the crackers to be located—given a choice between the cracker box and the bag. Five- and 6-year-olds showed a clear differentiation between ordinary beings and God. For example, they claimed that their mother would mistakenly expect the crackers to be in the cracker box (just as they themselves had done) but they claimed that God would immediately know that the crackers were in the bag. In a follow-up experiment, 5- and 6-year-olds also claimed that God would know what was in a darkened box whereas an ordinary human being would not. Thus, by the age of 5–6 years, young children—at least, those growing up in a Christian culture—credit God with special cognitive powers. He is not subject to the visual constraints that restrict the knowledge of ordinary human beings.

Similar conclusions have emerged in several other studies. For example, 5-year-olds asserted that a partially occluded, ambiguous drawing would not immediately be understood by their mother but would be understood by God (Barrett, Newman, & Richert, 2003). In addition, the majority of children aged 5 years and older claimed that God “just knows” what one is praying for—he does not have to use his ears; indeed they also claimed that prayers need not be said aloud (Woolley & Phelps, 2001). Finally, an acknowledgement of God’s special cognitive powers has also been found among Maya children in the Yukatán; 7-year-olds claimed that a doll character would mistakenly expect a familiar food container to contain tortillas whereas God would know the true contents (i.e., an article of clothing; Knight, Sousa, Barrett, & Atran, 2004).

These findings show that young children accept that God has extraordinary cognitive powers as compared to human beings. However, it is possible that they have a very restricted conception of his special powers. For example, they might assume that God is different from human beings only insofar as he comes to know things in the absence of ordinary visual or auditory access. Moreover, children might reach that conclusion not because they hear any testimony to that effect but because they frequently observe adults praying to an invisible and inaudible

interlocutor—and are encouraged to engage in the same activity themselves. An alternative possibility is that children not only encounter various claims about God’s special powers but also find such claims provocative and memorable because they stand in stark contrast to what children know about ordinary human beings. Cognitive anthropologists have advanced such a proposal. Noting the ease with which religious ideas are transmitted and sustained across generations, they have proposed that it is precisely the counterintuitive quality of religious claims that makes them both remarkable and easy to retain (Boyer, 2002; Sperber, 1982).

To explore these two alternatives, Giménez-Dasí, Guerrero, and Harris (2005) gave 3-, 4-, and 5-year-old children living in Madrid two different interviews—an “omniscience” interview in which children were asked about the extent to which both their best friend and God are subject to perceptual constraints in their acquisition of knowledge and an “immortality” interview in which they were asked whether the life cycle of their best friend and of God are subject to biological constraints. The findings for the omniscience interview replicated and extended the findings reported by Barrett et al. (2001) and Knight et al. (2004). Older children attributed ignorance more often to their best friend than to God. Moreover, in justifying their attributions, they were more likely to invoke perceptual constraints when talking about their best friend in contrast to the special powers that they invoked when talking about God.

A similar pattern of results emerged for the “immortality” interview. Older children were more likely to attribute mortality to their best friend than to God, and in explaining their attributions, they invoked biological constraints in the case of their best friend and special powers in the case of God. Taken together, the results for the two interviews support the proposals made by cognitive anthropologists. Despite their paradoxical nature, religious claims about the extraordinary powers of special beings such as God are readily transmitted to young children and understood by them. Children recognize that God is extraordinary not just with respect to his cognitive powers but also with respect to his life cycle.

Further evidence for children’s understanding of God’s special status has emerged from research on how children conceptualize the origin of species. Evans (2001) put the following question to 6-, 9-, and 11-year-olds as well as to adults living in fundamentalist and nonfundamentalist communities matched by educational level and locale: “A long, long

time ago there were no things on earth. Then there were the very first things ever. Now, think about [target animal]. How do you think the very first [target animal] got here on earth?" Among participants in the fundamentalist community, references to a creator or divine force predominated at all ages whereas references to spontaneous generation (e.g., "grew on earth from eggs, like birds") or to evolution (e.g., "slowly followed the path of evolution") were rare. Among participants in the nonfundamentalist community, by contrast, references to a creator or divine force were less frequent. Indeed, among participants in the two oldest groups (11-year-olds and adults) references to creation were no more frequent than references to evolution. A similar difference between the two communities emerged when participants were invited to say how far they agreed with the three types of explanation. In the fundamentalist community, participants of all ages strongly agreed with creationist explanations and disagreed with both spontaneous generation and evolution. In the nonfundamentalist community, participants expressed less agreement with creation and more agreement with evolution, and in the two oldest groups these two types of explanation attracted an equal degree of agreement.

One possible interpretation of these findings is that a belief in God as creator comes naturally to children, independent of any teaching from adults. On this view, the findings reported by Evans (2000, 2001) show that young children may be construed as "intuitive theists" who spontaneously invoke the notion of a creator (Kelemen, 2004). Subsequently, as they get older, the teaching of Darwinian theory gradually undermines that initial assumption—at least, among children in nonfundamentalist communities. However, close inspection of Evans's findings indicates that testimony probably influences children's invocation of both a creator and evolution. First, 6-year-olds (and not just older children and adults) offered creation explanations more often in the fundamentalist community than in the nonfundamentalist community. Second, all age groups in the fundamentalist community endorsed creation explanations more emphatically than their peers in the nonfundamentalist community. It is unlikely that these early emerging differences can be attributed simply to the teaching of Darwinian theory in the nonfundamentalist community. After all, few children learn about evolutionary theory in kindergarten or elementary school. Instead, it is plausible that this early difference between the communities is due to the positive endorsement of God as creator in the fundamentalist community.

This is not to deny that children in both communities may bring their own intuitive ideas to their assimilation of creationist claims. In particular, if young children understand that artifacts are created by humans for a given purpose whereas various natural kinds are not created by humans (Gelman & Kremer, 1991), they are likely to confront the question of how humans and animals came to be the way they are. If the surrounding culture makes available the idea that God, as omnipotent agent, can create such natural kinds, children may well be receptive to that claim (Kelemen, 2004). Thus, both when elementary school children are invited to generate their own ideas about why various entities exist (including animals) and also when invited to evaluate creationist ideas that are put to them, they are likely to endorse the notion of a designing agent (Kelemen & DiYanni, 2005). Nevertheless, as the community variation revealed by Evans (2000, 2001) makes clear, we should not assume that young children simply invent and maintain the notion of a God with extraordinary powers of creation, oblivious to the surrounding culture. As more research on children's conception of special beings is carried out in various cultural and religious communities, we shall be in a stronger position to assess how far children bring strong intuitive biases to their conceptualization of those beings and how far they are swayed by the testimony that is widespread in their own community.

Children's recognition of God's special powers might reflect a purely intellectual acknowledgement of what they take adults to believe. More specifically, it is possible that young children recognize that adults attribute extraordinary powers to God, but remain dubious themselves. Like anthropologists, they might carry out an assiduous study of the beliefs espoused in the community that they live in without subscribing to those beliefs themselves. The argument that children trust in testimony about religious matters would be bolstered if it could be shown that children not only understand claims about God's special powers but also actively subscribe to such claims themselves.

As Woolley (2000) has pointed out, there are interesting parallels between praying and making a wish. Both practices involve a mental process that is aimed at bringing about some desired end without recourse to ordinary means-end activity. At the same time, the two practices are situated differently within Christian communities. Making a wish is generally regarded as a superstitious practice, one that adults might encourage children to carry out on ritual occasions but one that is not generally regarded as

having genuine efficacy. On the other hand, most believers regard prayer as a serious and efficacious practice rather than a piece of harmless superstition. Do children make that same distinction? If children increasingly differentiate between the efficacy of wishing and praying, this would lend support to the argument that children not only come to understand religious testimony about God but also actively subscribe to its tenets.

Evidence that a distinction between wishing and praying does emerge has been gathered by Woolley, Phelps, Davis, and Mandell (1999). Children ranging from 3 to 6 years were interviewed about making a wish. In line with earlier findings by Vikan and Clausen (1993), most of these preschoolers claimed that they themselves had made a wish. On the other hand, there was an age change when children were asked about the efficacy of wishing. Three- and 4-year-olds were more likely than 5- and 6-year-olds to claim that a story character's wish would be granted. In addition, when given an opportunity to make a wish themselves (i.e., to wish that a desirable object would materialize inside a box), 3- and 4-year-olds were more likely than 5- and 6-year-olds to claim—before opening the box—that their wish had come true.

In a related study, Woolley and Phelps (2001) interviewed children about the efficacy of their past and future prayers. In each case, only about half of the younger children, aged 3–5 years, said that their prayers had been, or would be, answered, compared with approximately three quarters of the older children, aged 6–8 years. Thus, if we compare across the two sets of findings it appears that children's confidence in the efficacy of making a wish wanes as they get older whereas their confidence in the efficacy of prayer waxes. This is just what we would expect if children's confidence is a function not of any informative firsthand experience with respect to the efficacy of either practice, but of the type of selective testimony that children are exposed to regarding a harmless, half-serious ritual on the one hand versus a central religious practice on the other. Finally, it is worth noting that children themselves recognized the connection between prayer and belief in God: from the age of 4 years, they were more likely to judge that someone was engaged in prayer if they knew about God. In addition, in the context of teaching someone how to pray, children said that it was important that the person believed in God.

In summary, young children increasingly acknowledge that God has various extraordinary powers—cognitive, biological, and creative. Close comparison of children growing up in fundamen-

talist and nonfundamentalist communities suggests that children do not simply invent these extraordinary powers. Instead, they are receptive to the testimony that they hear and the availability of testimony about God's powers varies from one community to another—as does the availability of testimony about nondivine mechanisms such as evolution. Finally, young children are not agnostic students of the beliefs that they find extant in their community. Their trust in the power of prayer shows that many young children not only understand claims about God's special powers—they subscribe to those beliefs themselves.

The Afterlife

Just as it is reasonable to suppose that children have no direct experience of God, it is also plausible that they have no direct experience of the afterlife. Indeed, to the extent that children do have any close contact with death—for example, when they see an animal killed or see a dead fish or bird cooked and eaten—such encounters are unlikely to provide any support for the concept of an afterlife. On the other hand, children in many communities are exposed to the religious claim that life does not entirely cease after death. Thus, it is worth asking in some detail about the extent to which children understand and accept that claim.

Recent research, growing in part out of the Piagetian tradition, has primarily examined the extent to which children's understanding of death fits into their broader understanding of the biological domain. As discussed earlier in connection with children's understanding of the life cycle, there is considerable evidence that children increasingly conceptualize death as the endpoint of the biological life cycle—an endpoint that involves the irreversible cessation of all bodily functions and organs. Although investigators may disagree about the exact timetable of development, most document a progressive mastery of this biological conception of death between the ages of 5 and 10 years (Bering & Bjorklund, 2004; Hoffman & Strauss, 1985; Keynon, 2001; Lazar & Torney-Purta, 1991; Slaughter et al., 1999; Speece & Brent, 1984, 1992).

Against this backdrop, it is important to recognize that many children in the United States grow up in communities where a belief in the afterlife is widespread. For example, according to replies to the General Social Survey (Davis, Smith, & Marsden, 1998), the majority of American adults believe that there is life after death. Not surprisingly, the exact proportion varies from group to group. Thus, a belief

in life after death is more frequent among North American Protestants and Catholics (above 80%) than among those who report no religious affiliation (approximately 60%) (Greeley & Hout, 1999). Nevertheless, as these figures indicate, most North American children grow in communities where the majority of adults endorse a belief in the afterlife. A similar pattern emerges from the European Value Surveys conducted over the last 25 years. Despite the continuing erosion of Christianity, especially among younger people, belief in the afterlife remains widespread (Lambert, 2001).

When the developmental and sociological findings are placed alongside one another, they raise a provocative question. Insofar as young children appear to adopt an increasingly biological framework implying the cessation of all processes at death, when and how do they come to espouse the afterlife beliefs that are endorsed by most adults in the surrounding adult community? One possibility is that as children get older they simply abandon the biological framework and replace it with a different set of afterlife beliefs—at least with respect to the lives of human beings. A second possibility is that young children, including those who have constructed a systematic, biological concept of death will—when probed more extensively or explicitly—reveal a more or less endogenous belief in the afterlife. A third possibility is that children are confronted with two different modes of discourse about death, one supporting a biological conception of death and the other supporting an independent religious conception of death, and increasingly learn to articulate both. We consider various findings and arguments in an attempt to decide among these three possibilities.

The first suggestion—that children simply abandon the biological framework as they get older—is conceptually implausible. We assume that when American and European adults are interviewed about their belief in life after death, they appropriately recognize that they are not being asked whether various bodily organs—the heart, the brain, and the lungs—continue to function as they did before death. Rather, they are being asked to contemplate the possibility of some different form of life, one that may not be contingent on the continued functioning of the human body. Thus, no matter when and how adults come to adopt their afterlife beliefs, we assume that they continue to recognize—in line with the developmental findings cited earlier—that death construed as a biological event involves an irreversible cessation of bodily functions.

However, the conclusion that children not only construct a biological framework but also retain that

framework into adulthood leaves open the question of exactly how and when they also come to believe in the afterlife. One possibility is that such a belief owes little to the surrounding community but is an endogenous construction. Thus, Bering (Bering, 2002; Bering & Bjorklund, 2004) proposes that there is a natural disposition—among children and adults alike—to assume that whatever the fate of key biological processes at death, certain mental processes continue to function. Specifically, Bering hypothesizes that when children and adults try to assess whether a particular process ceases at death, they are influenced by past experience. They find it easy to bring to mind periods when various psychobiological states (e.g., feeling hungry, feeling thirsty) are suspended, but they find it much harder to bring to mind periods when various mental states (e.g., thinking, desiring, feeling an emotional attachment) are suspended. Guided by this differential past experience, they are likely to judge that death leads to the permanent suspension of psychobiological processes such as hunger and thirst but not to the suspension of psychological processes such as cognition and emotion. In line with this expectation, Bering and Bjorklund (2004) report that although there is a general increase between 4 and 12 years in discontinuity responding (i.e., in the claim that internal processes cease at death), that increase is less evident for various mental processes. Moreover, Bering (2002) reports that adults display a similar *décalage* in their judgments about psychobiological as compared to mental processes and they do so irrespective of their self-classification as believers or nonbelievers in various types of afterlife.

One possible interpretation of these findings is that children and adults are not influenced by community testimony about the afterlife. Rather, in the face of an increasingly coherent biological conception of death, there is a gradual retrenchment of the assumption that life is everlasting combined with a natural proclivity to resist such retrenchment in the case of various apparently incessant mental processes. However, other evidence points to the more plausible hypothesis that afterlife beliefs are a joint product of such selective retrenchment combined with exposure to explicit community beliefs in an afterlife. Thus, as in the case of God as creator, even if children bring their own ideas to the religious testimony that they encounter, it is also important to examine the impact of such testimony on children's developing religious ideas.

With this in mind, Harris and Giménez (2005) asked Spanish 7- and 11-year-olds about the fate of various processes after the death of an elderly

person. The questions were posed in two different contexts: a secular context involving a medically oriented narrative and a nonsecular context involving a religiously oriented narrative. In line with the results obtained by Bering and his colleagues (Bering, 2002; Bering & Bjorklund, 2004), children in both age groups were more likely to make discontinuity judgments for biological as compared to mental processes. In addition, however, children's replies varied sharply with narrative context. In the secular context, they were likely to assert that most functioning ceases at death—and to offer a biological justification. In the religious context, by contrast, they were likely to assert that functioning continues after death—and to offer a religious justification. Moreover, this context sensitivity was more evident among older than younger children.

A similar pattern of findings was found among Vezo children and adults in Madagascar (Astuti & Harris, 2005). Particularly when death was presented in the context of a narrative that focused on the ancestral practices associated with the afterlife rather than on the corpse, children and adults were likely to claim that particular mental processes continue after death. This assertion of an afterlife increased with age, especially with respect to those mental processes that are associated with the ancestors among the Vezo.

In summary, recent sociological and developmental findings point to the following conclusions: (i) children construct a biological conception of death during the early school years; (ii) nevertheless they often expect certain mental processes to continue despite death; (iii) these expectations are supported by widespread community endorsement of belief in an afterlife; (iv) many preadolescents and adults operate with two distinct conceptions of death, one framed in biological terms implying a cessation of function, and one framed in religious terms implying a continuity of function.

Thinking About the Secular and the Spiritual

Children's credulity in the spiritual domain underlines an important implication of the claim that children learn via testimony. As Wellman and Gelman (1998) have pointed out, a great deal of research on cognitive development, whether conducted within a Piagetian framework or in the context of more recent theory-theory proposals, suggests that conceptual change in the child resembles conceptual change in science. In the face of mounting, inconsistent evidence, conceptual change moves in the direction of more coherent theorizing, be it with re-

spect to the life cycle, the conservation of matter, the laws of probability, or the nature of our mental life. By implication, children gradually construct theories that are more predictive, explanatory, and accurate. For example, 5-year-olds who understand false beliefs are better placed than 3-year-olds to predict what people will do and say, to explain their mistaken actions and statements, and to grasp the true nature of their mental life.

Even when theory-theorists acknowledge that children depend on other people for much of their information, they still tend to make the assumption that development proceeds toward greater objectivity. Thus, Gopnik, Meltzoff, and Kuhl (1999, p. 171) envisage a truth-seeking collectivity: "Babies depend on other people for much of their information about the world. But that dependence makes babies more in tune with the real world around them, not less . . . Together the children and the grown-ups (and other children) who take care of them form a kind of system for getting to the truth."

The present focus on testimony, by contrast, implies that cognitive development may or may not proceed toward greater objective truth. In this respect, conceptual development in children and conceptual change in science are dissimilar. Children's willingness to believe in special beings whose role is contested (God as a creator of species) or in processes that cannot be subjected to any impartial evaluation (the existence of an afterlife) highlights the fact that children's conceptual stance is not necessarily aimed at objective truth nor reformulated in the wake of inconsistent evidence. In those domains where children cannot make any relevant firsthand observations, they are guided by the testimony that they are offered, for better or for worse.

In this final section, we conclude by focusing on a question that arises quite naturally from this expanded portrait of cognitive development. To the extent that children are creatures of faith and conviction, do they themselves show any acknowledgment, however tentative, of that fact? More specifically, insofar as children seek to understand and make sense of spiritual as well as secular phenomena, do they make any distinction in their own mind between the two domains? In the next sections, we approach this question in two ways. First, we examine children's questions in order to see whether they reason about both types of phenomena in much the same way. Second, we review recent findings on children's ontological judgments, and ask whether children show any sensitivity to the differential status of ontological claims in the secular and spiritual realms.

Children's Questions

In developmental psychology there has been a long-standing interest in children's questions. For example, Sully (1896) offers a thoughtful discussion of one child's "why" questions posed between the age of 3 and 6 years. Following Piaget (1926), attention focused on the presuppositions apparently underlying such questions. Piaget argued that young children mainly pose "why" questions because they naively assume that many natural phenomena are designed and intended for human purposes. Thus, rather than seeking a mechanical explanation ("What causes X to happen?") children seek a teleological account ("What human purpose does X serve?"). Arguing against Piaget's account, Isaacs (1930) noted that some of children's "why" questions are clearly prompted by the identification of an anomalous or unexpected outcome rather than by any generalized assumption of purpose. More specifically, he argued that children ask "why" questions when a particular outcome is inconsistent with some working generalization that they have arrived at. For example, 4-year-olds studied by Sully (1986), by Isaacs (1930), and more recently by Callanan and Oakes (1992) posed the following questions: "Why doesn't butter stay on top of hot toast?" "How is it that when we put our hand into the water we don't make a hole in it?" "Why doesn't the ink run out when you hold up a fountain pen?" and "Why does Daddy, James (big brother) and me have blue eyes and you have green eyes?" In all of these examples, children appear to have arrived at a generalization (objects rest on top of flat surfaces; fingers can make holes in various substances; liquids fall from inverted containers; people in our family have blue eyes) and sought some resolution of an inconsistent observation (butter does not remain on a flat surface; fingers do not make a hole in water; ink does not pour from a pen; Mommy has green eyes). Isaacs (1930) makes the interesting comment that scientific enquiries often have just such an observed anomaly as their starting point. It is worth underlining four additional features of children's "why" questions.

First, although it is certainly noteworthy that children draw out generalizations, register anomalies, and seek to resolve them, an equally important point is that children's questions show that they are prepared to seek information from an adult in order to resolve the anomaly. Children who primarily relied on their own firsthand observation would presumably try to resolve an anomaly by engaging in active, independent experimentation with the phenomenon in question. Such active experimentation is

often regarded, especially within Piagetian theory, as the major engine of cognitive development. Yet children's "why" questions to adults show that they also think of adults as trustworthy sources of information concerning hidden, causal mechanisms or explanatory factors.

Second, as Tizard & Hughes (1984) have emphasized, a narrow focus on those questions that are prefaced by "why" or "how" is likely to lead to an underestimate of the extent to which children seek explanations in the context of dialogue with a familiar adult. When they observed 4-year-olds talking at home with their mothers, they frequently observed conversational episodes that they termed *passages of intellectual search*. Puzzled by something that they realized they did not understand, children would pose a sequence of persistent questions, consider the adult's answers, and relate those answers to their own knowledge; this, in turn, might prompt still further questions. Moreover, children would often provide evidence of rapidly incorporating what they had been told in answer to an earlier question by reintroducing that information in posing a subsequent question. For example, having just learned that flat roofs typically have drains to let the rainwater run away, one 4-year-old went on to ask if snow on a flat roof also called for a drain (Tizard & Hughes, 1984). Further evidence for the early emergence of such sustained questioning has emerged from analysis of children's causal questions using the CHILDES database (McWhinney & Snow, 1990). Frazier, Gelman, and Doumas (2005) found that children ranging from 2 to 4 years reacted differently depending on whether or not they were offered an explanation in response to their initial "why" or "how" question. When not given an explanation, they persisted in trying to elicit one by adding more details or by reiterating or rephrasing the original question. If they were given an explanation, they were more likely to ask a follow-up question. Indeed, children asked such follow-up questions after almost one fifth of the explanations they received. In sum, these findings reinforce the claim that children pose questions in order to obtain adult testimony that explains phenomena that puzzle them; their mode of questioning is sometimes sustained and tenacious.

Third, and particularly important for our thesis, children's questions do not simply arise with respect to ordinary, secular phenomena. It is true that many of the questions cited by Isaacs (1930) and by Callanan and Oakes (1992)—including the examples given earlier concerning butter on hot toast, hands plunged in water, inverted fountain pens, and eye color—do pertain to such phenomena, i.e., observa-

ble but puzzling exceptions to apparent regularities. Indeed, contemporary research has focused on the possibility that children's questions might help them to increase their informal scientific understanding in various secular domains, including biology, cosmology, and psychology (Callanan & Jipson, 2001). Moreover, consistent with that assumption, parents do often invoke relevant antecedent causes rather than teleological explanations (Callanan & Oakes, 1992; Kelemen, Callanan, Casler, & Pérez-Granados, 2005). However, children also pose questions about anomalous spiritual phenomena in much the same way as they ask about anomalous secular phenomena. For example, Isaacs (1930) notes a 6-year-old who asked: "Why do angels never fall down to earth when there is no floor to heaven?" Apparently, the child assumed, reasonably enough, that angels, like most other animals and human beings, need a supporting surface to remain aloft, and was therefore puzzled by how angels manage to remain in heaven. Sully (1896) quotes a 4-year-old who asked: "How did God put flesh on us and make what is inside us?" Presumably, the child had accepted the notion of divine creation but was interested in the process behind a creative act that could produce a flesh-and-blood creature. The same 4-year-old also asked: "It's only the naughty people who are buried, isn't it, because auntie said all the good people went to heaven?" And—on being told that *all* people are buried, concluded: "Oh, then heaven must be under the ground or they couldn't get there." Apparently, the child could not reconcile his aunt's claim about the afterlife in heaven with his knowledge that people are buried in the ground. In each of these cases, we see children puzzling about the spiritual domain in much the same way as they puzzle about the observable, secular domain. They have not observed the relevant phenomena (angels in heaven; God creating human beings; people going to heaven) for themselves. Rather, they have learned about them from supposedly trustworthy informants. Yet these alleged phenomena are difficult for children to reconcile with known regularities.

Fourth, whether children's identification of an anomaly occurs in the context of their own observation or in the context of testimony, children show that they are capable of simultaneously holding onto two conflicting elements—the expectation that springs from their knowledge of various regularities and the mismatching phenomena that they have either observed or been told about. The anomaly does not lead children to abandon the expectation of regularity, and conversely the expectation of regularity does not lead children to ignore or deny the

anomaly. They retain both elements despite the mismatch between them. Thus, in approaching an adult with a question, they set up what might be called a "somehow" mental slot. They recognize that *somehow* butter does not stay on top of hot toast and that *somehow* angels do not fall to earth. Yet, they also hold on to their assumption that normally such phenomena should not occur. The task, as they see it, is to insert explanatory information into this empty slot. With their questions, they seek suggestions from adults about how to fill that empty slot or they offer a suggestion themselves in consultation with an adult. In short, children's questions reemphasize the fact that children are not stubborn autodidacts. Their frequent, and sometimes tenacious, interrogation of adults demonstrates their recognition of adults as potentially useful sources of information and explanation.

Finally, this admittedly brief scrutiny of children's interrogation of adults underlines the trust that they display in adults' testimony regarding spiritual as well as secular matters. Indeed, the available evidence suggests that children adopt essentially the same tactic in each domain: they are able to keep in mind the way that things normally work while concurrently identifying exceptions that they have observed or been told about. In either case, they turn to adults in search of some conciliatory explanation.

Children's Ontology

To the extent that children rely on adult testimony to learn about both spiritual and secular matters, it is possible that they make no systematic differentiation between these two domains. In support of that possibility, we have just seen that children quiz adults in approximately the same way whether they are grappling with a question about liquids or a question about angels. If this line of speculation is correct, children might be plausibly characterized as naive realists with respect to spiritual matters and indeed with respect to all matters that they learn about via testimony. More specifically, they might assume that the claims that they hear regarding the existence of God, Heaven, and the afterlife are on the same footing as any other claim that they cannot verify firsthand. For example, children learn about historical figures such as Julius Caesar or Abraham Lincoln, about inaccessible places such as the ocean floor or the planet Venus, about extinct animals such as dinosaurs and dodos, and about microscopic entities such as germs and vitamins. In all these cases, they must normally rely on adult testimony regard-

ing their existence and properties because firsthand observation is impossible. Thus, children might reasonably conclude that God, Caesar, and germs all have the same, fairly secure, ontological status as each other. On this view, children would presumably realize that the known world extends way beyond what they themselves can observe but—having ventured outside that relatively bounded, personal space—they would regard all the manifold creatures that they hear about as being as real as one another.

Although such undifferentiated trust is feasible, another scenario is also worth considering. Suppose, as this paper has repeatedly insisted, that children rely extensively on adult testimony for key pieces of information about the causal fabric and ontological features of the world. Granted that wide-ranging dependence, children might nonetheless be equipped with heuristics or strategies for assessing the quality or plausibility of the testimony that is made available to them. Consider, in this light, what children might hear about germs. They will hear a variety of warnings (“Don’t eat that—it may have germs”), exhortations (“Wash your hands to get rid of the germs”), and explanations (“I don’t want to give you my germs”), all of which take the existence of germs for granted. Indeed, the various actions that are prescribed—or proscribed—by informants would not make sense were it not for the existence of germs. In short, children are likely to encounter a coherent and consensual body of testimony regarding the existence of germs. Consistent with that analysis, recent evidence confirms that young children acknowledge the existence of germs (Au, Romo, & DeWitt, 1999; Kalish, 1999). Moreover, even though children acknowledge that they do not know what germs look like, they claim to be quite sure of their existence, and by way of justification for their beliefs they frequently offer some generalization about the properties of germs. Indeed, children express as much confidence in the existence of germs as they express in the existence of various natural kinds that they can observe for themselves, such as cats or giraffes (Harris & Pons, 2003). Importantly, however, children do not display a generalized pattern of credulity toward all normally unseen entities. If children are asked about the existence of various creatures whose existence is generally doubted by adults—for example, mermaids, ghosts, and witches—children typically deny their existence, and express confidence in their denials. By implication, young children are guided by adult testimony with respect to entities that they cannot observe for themselves: They accept the existence of some hidden entities but deny the existence of others.

If children are indeed sensitive to the pattern of adult testimony, what stance will they take toward various extraordinary beings such as God or the Tooth Fairy? On the one hand, other people’s testimony might lead children to believe in such beings in much the same way, and with as much confidence, as they believe in other normally invisible entities—such as germs. On the other hand, if children are sensitive to the consistency, coherence, or plausibility of others’ testimony, they might conclude that there is sufficient disagreement or qualification in that testimony for various doubts to enter their mind.

Our recent findings provide support for this second position. Thus, when 5- and 6-year-olds living in a cosmopolitan, urban community in the United States were questioned about special beings such as the Tooth Fairy or God, they did assert their existence. At the same time, as compared to invisible, scientific entities such as germs or oxygen, children were less confident of their existence and less likely to insist that other people believe in their existence (Harris, Pasquini, Duke, Asscher, & Pons, 2006). In summary, although young children believe in various extraordinary beings such as God or the Tooth Fairy, they do not always place them on exactly the same ontological footing as scientific entities such as germs.

There are various plausible explanations for this differentiation. One possibility is that children begin to notice and think about the way in which various entities can be detected. In the case of germs, for example, special instruments such as microscopes can be used to observe them. By contrast, children might reach the conclusion that God is impossible to see or hear—even with the help of special instruments. On this “observation” hypothesis, children would think of scientific entities as being just as real as ordinary entities such as cats or rocks because they are, at least in principle, open to perceptual inspection whereas they would think of special beings as having a less secure ontological status.

There are, however, various considerations that undermine this initially plausible hypothesis. First, children rarely justify their belief in scientific entities by referring to a possible encounter, including an encounter facilitated by special instruments. Rather, children focus on the alleged properties of the entity, including the causal properties (Harris et al., in press). Second, although the “observation” hypothesis can be applied to germs, it is intuitively unlikely that children regard a colorless, odorless, tasteless gas such as oxygen as available for inspection—even with the help of specialized instruments. Of course,

oxygen enables various perceptible outcomes, such as breathing and combustion, but in that respect it is not obviously different from the Tooth Fairy or Santa Claus—allegedly, they too bring about various perceptible outcomes. In short, the “observation” hypothesis does not offer a systematic and plausible explanation of the fact that children are more confident of the existence of scientific entities as compared to special beings.

An alternative aspect of children’s conceptualization of these two domains concerns the role of everyday causal constraints. As discussed earlier, young children rapidly appreciate that God has special powers as compared to ordinary mortals (Barrett et al., 2001; Giménez-Dasí et al., 2005). Arguably, children reach similar conclusions concerning Santa Claus and the Tooth Fairy—after all, they both travel extensively but imperceptibly, and they both display a puzzling omniscience about who lives where. The extraordinary nature of these beings may incline children to adopt a cautious stance toward their existence. By contrast, although germs and oxygen may be attributed very distinctive causal powers (e.g., causing illness; enabling combustion), children are unlikely to know of any wider causal regularities that these entities defy.

Both of the above hypotheses raise the possibility that children are attentive to the underlying nature of normally unobservable entities and differentiate among them accordingly. A very different possibility, however, is that children are sensitive to the type of discourse that surrounds these entities rather than to their underlying nature. As noted earlier, children hear people talk in a matter-of-fact fashion about the causal properties of germs or oxygen. Such remarks do not explicitly attest either to the existence of those entities or to the speaker’s faith in their existence. Thus, children rarely hear utterances such as, “There really are germs” or “I believe in oxygen.” Instead they hear claims and warnings that take the existence of the entities for granted, for example, “Throw that away—it has germs” or “He needs oxygen to breathe.” In the case of Santa Claus, by contrast, children may well hear avowals such as “There really is a Santa Claus” and, with respect to God, children are likely to hear explicit discussions about faith in God, especially in certain contexts, such as a church service. These avowals of belief may lead children to conclude that the existence of such special beings is not altogether beyond doubt. A related possibility is that children are sensitive not so much to the presuppositions embedded in the discourse that they hear as to the degree of consensus across various interlocutors. After all, children will scarcely

ever encounter anyone who queries the existence of germs or oxygen but they may sometimes meet adults or children who express doubt about the existence of special beings such as God, Santa Claus, or the Tooth Fairy.

How might these different lines of explanation be tested? There is an important cleavage in the explanations reviewed. On the one hand, children might be guided by their own autonomous conceptualization of the entities. Alternatively, they might be guided by the pattern of discourse surrounding them. This cleavage points to an informative line of investigation because the pattern of discourse about special beings is likely to vary from one community to another, offering a natural laboratory for probing the impact of particular discourse practices. We consider two different types of community.

Anthropological and ethnographic research in traditional, small-scale communities indicates that the existence and efficacy of certain special beings, such as witches, ancestors, or spirits, are taken for granted. Thus, children growing up in such communities would rarely encounter the type of explicit avowal of belief or faith that is common in communities subscribing to the Abrahamic tradition—the tradition that embraces Judaism, Christianity, and Islam (Bloch, 2002). Nor would they encounter people who express doubt or disbelief in the existence of witches, ancestors, or spirits. To the extent, therefore, that they are guided by the routine presuppositions of everyday discourse, children in these communities should be convinced of the existence of these special beings—just as North American children are convinced of the existence of germs. As Keesing (1982, p. 38) writes of childhood among the Kwaio, a Solomon island community, “No child could escape constructing a cognitive world in which the spirits were ever-present participants in social life, on whom life and death, success or failure, depend.”

As a second example, consider children growing up, not in a cosmopolitan, urban community, but a relatively homogeneous Christian community of the United States where the existence and efficacy of God are routinely taken for granted. Explicit avowals of faith would presumably occur in such a community. Nevertheless, God is also likely to be frequently invoked in everyday causal discourse. Moreover, children would rarely encounter people openly doubting or denying the existence of God. Accordingly, as in the traditional, small-scale communities just considered, this pattern of discourse might lead children to have complete confidence in the existence of special beings such as God.

On the other hand, if children harbor doubts about the existence of special beings either because of the extraordinary powers attributed to them or because of their inaccessibility to ordinary observation, then children growing up in small-scale traditional communities or in homogeneous Christian communities should differentiate between such special beings on the one hand and ordinary—or scientific—entities, on the other, replicating the pattern described earlier for children living in a cosmopolitan urban setting (Harris et al., in press).

Future Research and Conclusions

Children's potential sensitivity to the pattern of discourse in their community opens up two additional questions for future research. We anticipate that all children, irrespective of the discourse practices that prevail in their community, will encounter certain, recurrent forms of testimony. They will learn something of the history of their community and its connections to the wider world, of the hidden or microscopic entities that affect people's health and well-being, and of special beings—be they spirits, Gods, or ancestors. Nevertheless, the way in which such testimony is conveyed to children is likely to vary. For example, social class differences in mother-child dialogue have been consistently reported. Mothers with higher socioeconomic status are likely to pose more questions and to provide more information (Hart & Risley, 1995; Hoff-Ginsburg & Tardif, 1995). Thus, Tizard and Hughes (1984) found that, as compared to working-class mothers, middle-class mothers were more likely to ask questions of their children, view their children's questions positively, and offer adequate explanations. In turn, middle-class children posed more questions to their mothers, and were more persistent in their questioning. In future research, it will be important to ask whether such persistent variation in the exchange of information via conversation leads to important differences among children in their working epistemology. More specifically, children may vary in the extent to which they think of dialogue, particularly dialogue involving questions, as an important vehicle for enlarging their understanding of aspects of the world that they have not personally experienced.

A second issue for future research concerns the impact of conflicting testimony. As noted in the previous section, some children grow up in relatively homogeneous communities. However, the twin processes of urbanization and globalization mean that an increasingly large number of children grow up in fluid, cosmopolitan, communities encompass-

ing several migrant groups (Berger, 2002). Whereas children in homogeneous communities are likely to encounter a common body of testimony in key domains, children growing up in a more heterogeneous community will have opportunities to register conflicting testimony. How will they respond to that diversity? Kuhn and Franklin (in press) argue that children will frequently adopt a nonevaluative or "multiplist" response. For example, Kuhn, Cheney, and Weinstock (2000) presented children ranging from 10 to 17 years with competing claims in various domains. Participants were asked to say whether only one claim was right—and in cases where they judged each claim to have some merit to say whether it was possible to adjudicate between them. The most frequent response pattern was to assert that more than one claim might be right but to deny that adjudication was possible. Indeed, when the claims pertained to hidden properties of the physical world (e.g., the composition of atoms or brain functioning), only a minority of participants judged that adjudication was possible. A plausible implication of this set of findings is that children who encounter conflicting beliefs in their community are likely to acknowledge that more than one belief may be right—but they will be unlikely to either propose or reflect upon ways of adjudicating among those beliefs. To the extent that children often learn about science and religion by actively assimilating the testimony of other people, rather than by actively participating in the explicit evaluation of conflicting beliefs that characterizes research communities, their disregard for processes of evaluation is not surprising. It does, however, imply that they will rarely seek out or endorse the type of competitive hypothesis testing that scientists find congenial.

In conclusion, two different bodies of evidence converge to indicate that children do not adopt a conservative attitude of skepticism toward the testimony supplied by other people. First, with respect to various objective, but normally unobservable, features of the world, children trust what adults tell them, and indeed they appear to rework that information into a coherent concept of the domain in question, whether it is the role of the brain in mental processes, the shape of the earth, or biological constraints on the life cycle.

Second, that trust is not confined to objective but normally hidden properties of the world. Children also accept the religious claims that adults make with respect to the omniscience, immortality and omnipotence of God, the efficacy of prayer, and life after death. In other words, it would be a mistake to conclude that children's trust in testimony simply

offers them a way to amplify or extend their own powers of observation. Although in some domains it does just that, it also leads them to be credulous toward spiritual claims that are not ultimately grounded in observational evidence.

A key question for future research concerns the extent to which children differentiate between the scientific and the spiritual realms. Arguably, children are sensitive to an underlying conceptual difference in either the perceptual accessibility or the properties of entities in these two realms. Equally plausible, however, is the possibility that children keep track of the testimony that surrounds entities in the two realms. On this latter hypothesis, children who grow up in communities where the existence of extraordinary beings—such as the ancestors—is more or less universally presupposed will regard those special beings as having an ontological status that is just as secure as the status of natural kinds. For them, the special beings of the spiritual realm will be just as real as the flora and fauna of the natural world.

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