

**Trust in Testimony:
How Children Learn about Science and Religion**

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Introduction

Evolutionary biologists have emphasized the deceptive ploys that are likely to emerge in animal signaling systems (Dawkins & Krebs, 1978). In the context of human testimony, the risks of being misled are, if anything, even more pervasive: the testifier could be making an honest mistake, telling a deliberate lie, or presenting speculation as fact. In principle, children might deal with these multiple dangers by adopting a default stance of skepticism toward the potentially suspect 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. On this argument, children might hear, and indeed understand, all sorts of testimony (e.g., claims about the past, present and future, or about unobservables 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 first-hand observation.

At first sight, it is not implausible that young children adopt this conservative strategy. Arguably, they have little need to place any trust in 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 would be difficult for them to observe

first-hand. Yet, according to our account, 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.

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, dramatically 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, and historically remote events. On this view, children's trust in testimony extends their access to empirical information but it does not radically 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, 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 receive information about God and the afterlife. That information cannot easily be construed as straightforward empirical data, gathered by others as a proxy for the child's own first-hand observation. Nevertheless, children appear to learn from such non-empirical 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 non-empirical propositions.

In the third section, we explore the implications of this wide-ranging trust in testimony. 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 empirically verifiable claims on the one hand and non-empirical claims on the other.

I. Children's trust in testimony: Scientific domains

As noted above, 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, children could ignore or reject claims that are inconsistent with their own first-hand observation. At first glance, a lively program of research on young 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 first-hand experience. 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.

1. 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 re-work 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 re-working is apparent in the more detailed pattern of findings reported by Gottfried et al. (1999). Prior to 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 first-hand. Hence, they must rely on other people's testimony for information. Children's developing appreciation of the role 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 re-work 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 species to another.

2. 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 growing up in various cultures frequently adopt a mental model of the earth that includes a flat surface. For example, they 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 is flat and needs support lead them to resist or distort the claim that the earth is an unsupported, spherical planet. However, closer scrutiny of the available findings reveals a different message, one that has rarely been emphasized, namely that – to varying degrees – children come to accept other people's testimony about the shape of the earth even if it is partially inconsistent with their first-hand experience.

Four findings highlight the impact 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 that children adopted was actually that of a sphere rather than any of the alternatives, including the particular models cited above. 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 first-hand 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 first-hand 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, 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 6-11 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 children accept testimony regarding an aspect of the world that is impossible for them to observe accurately on a first-hand 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.

3. Children's understanding of the life-cycle

A long tradition of research has shown that young children gradually adopt a coherent, biologically grounded understanding of the life cycle. They come to recognize that the process of growth and ageing 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 realization that the timing and sequelae of death are also biologically governed. They no longer think of death as a continuation of life in some altered state. Instead, it is understood to be an inevitable

and irreversible event that is brought about by the breakdown of critical life-supporting functions and results in the cessation of all bodily and mental processes.

Conceivably, children reach this conclusion by first-hand observation. For example, they might observe the death of various creatures, including pets, wild animals, birds and insects. Such experiences might 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.

Evidence for the role of this type of information concerning hidden body parts is provided by Jaakkola and Slaughter (2002). They found that a group of 4- and 5-year-olds could be sub-divided 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, Jaakkola and Carey (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 comes from a recent training study that presented preschoolers, who were identified as life-theorizers and non-life-theorizers at pre-test, with training on vital body organs and processes (Slaughter & Lyons, 2003). The experimenter's 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 one week after the training session. First, 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 by the time of posttest. A second, more striking result was the fact that non-life-theorizers showed significant increases on every subcomponent of the death concept, including the facts that death is irreversible, inevitable, universal to living things, etc. 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. How? As the authors suggest, the acquisition of a vitalistic understanding of the body

enabled children to re-formulate and make sense of previously learned facts in a coherent framework.

Exactly how children construct a biological account of living things is not well understood. We do know, however, that cultural input and exposure to nature play important roles in the development of folk biological thinking (Ross, Medin, Coley & Atran, 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 children and adults with Williams syndrome 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 younger, normal children – 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 (e.g., regarding the function of blood or lungs) they also go on to re-work such claims into a relatively systematic conceptualization of the way in which the life-cycle depends on the operation of those internal functions.

II. Children's trust in testimony: Spiritual domains

In each of the 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. Recall that such a stance would involve the rejection of information (or "the suspension of belief" in information) that cannot be checked against first-hand observation. Such checks are not available in the domains under discussion and yet children trust what they are told.

As noted, it could be objected that children are simply echoing various local and particular claims that they have heard without understanding the broader conceptualization that unites those claims. However, in each domain 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 encode adult testimony in a piecemeal fashion, they re-work 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 normally invisible processes and entities.

It would be a deep mistake, however, to suppose that children's reliance on testimony inevitably leads them 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.

1. God

Presumably, children have no first hand experience of God. On the other hand, depending on the particular community that they are growing up in, they are likely to encounter 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 we 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 being 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 Yucatán; 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 children accept that God has extraordinary cognitive powers as compared to human beings, but it is possible that they have only 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 counter-intuitive quality of religious claims that makes them both remarkable and easy to retain (Boyer, 2002; Sperber, 1982).

To explore these two alternatives, Harris and Giménez (2001) 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 non-fundamentalist communities in the Midwest: "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 non-fundamentalist 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 non-fundamentalist 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 spontaneously invoke the notion of a creator and then, as they get older, the teaching of Darwinian theory gradually undermines that initial assumption – at least, among children in non-fundamentalist communities. However, close inspection of Evans’ findings indicates that testimony probably influences children’s invocation of both a creator and of evolution. First, 6-year-olds (and not just older children and adults) offered creation explanations more often in the fundamentalist community than in the non-fundamentalist community. Second, all age groups in the fundamentalist community endorsed creation explanations more emphatically than their peers in the non-fundamentalist community. It is unlikely that these early emerging differences can be attributed simply to the teaching of Darwinian theory in the non-fundamentalist

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 (Kelemen, 2004). Thus both when 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, in press) in each case. 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.

Conceivably, children's recognition of God's special powers simply reflects an 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, children might carry out an assiduous study of the beliefs espoused in the community that they live in without subscribing to those beliefs themselves. This interpretation is not very plausible – after all, a nice differentiation between what they believe and

what others believe is scarcely characteristic of young children. Still, 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 Western culture. 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 effectiveness of prayer as compared to making a wish this would lend support to the argument that children not only come to understand religious testimony about God but actively subscribe to its tenets.

Evidence that a distinction between wishing and praying does emerge has been gathered by Woolley and her colleagues (Woolley, Phelps, Davis & Mandell, 1999). Children ranging from 3-6 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 to 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 first-hand 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 fundamentalist and non-fundamentalist 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 non-divine 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.

2. 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 – that experience is 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 end-point of the biological life cycle – an end-point that involves the irreversible cessation of all bodily functions and organs. While 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, 1992).

Against this backdrop, it is important to recognize that most 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 the 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 beliefs 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, the lungs – continue to function as they did prior to 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 after-life 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 including 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 with age 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 non-believers 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 probably a joint product of such selective retrenchment combined with exposure to explicit community beliefs in an afterlife. Harris and Giménez (in press) 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 non-secular context involving a religiously oriented narrative. In line with the results obtained by Bering and his colleagues (Bering, 2002; Bering & Bjorklund, 2004) children 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. Overall, then, recent sociological and developmental findings point to the following conclusions: (i) children construct a biological conception of death during the early school years; (ii) they are nevertheless prone to expect certain mental processes to continue despite death; (iii) these expectations are supported by widespread community endorsement of belief in an afterlife; (iv) many pre-adolescents 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.

III. 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. A great deal of research on cognitive development reinforces a more or less implicit assumption, namely that in the course of development children move toward an increasingly accurate and objective conceptualization of various natural phenomena, whether it be the nature of the life-cycle, the conservation of matter, the shape of the earth, or the laws of probability. 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 cognitive development may or may not involve such increasing objectivity. Especially in those domains where children cannot make any relevant first-hand 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 acknowledgement, 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 shown any sensitivity to the differential status of ontological claims in the secular and spiritual realms.

1. 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 many 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 frequently 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) and by Isaacs (1930) 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?" and "Why doesn't the ink run out when you hold up a fountain pen?" In all three cases, it is plausible

that the children had arrived at some approximate generalization (objects rest on top of flat surfaces; fingers can make holes in various substances; liquids fall from inverted containers) and they sought some resolution of the inconsistent outcome that they had noticed (butter does not remain on a flat surface; fingers do not make a hole in water; ink does not pour from a pen). 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 only trusted information rooted in first-hand experience 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 a 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 and Hughes (1994) 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 to them 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).

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) – including the examples given earlier concerning butter on hot toast, hands plunged in water, and inverted fountain pens – do pertain to secular phenomena, i.e., observable but puzzling exceptions to established regularities. However, children also pose questions about anomalous spiritual phenomena in much the same way. 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 could not conceive of any creative act that would 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 of a secular phenomenon or in the context of testimony regarding a spiritual phenomenon, 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 re-emphasize 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.

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.

2. 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 naïve realists about spiritual matters and indeed about 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 first-hand. 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 regarding their existence because first-hand 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 sure of their existence, and by way of justification for their beliefs they frequently offer some generalization about their properties. 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 any normally unseen entity. If children are asked about the existence of various creatures whose existence

is a 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 have considerable faith in adult testimony with respect to entities that they cannot observe for themselves in those cases where the adult consensus regarding their existence is high.

If children are indeed sensitive to adult consensus, 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 scope, 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 are questioned about special beings such as the Tooth Fairy or God, they assert their existence and express confidence in that assertion. At the same time, as compared to invisible, scientific entities such as germs or oxygen, children are less systematic in their existence claims about such special beings, express less overall confidence in their existence claims, and are less likely to insist that other people make such claims (Harris, Pasquini, Duke, Asscher & Pons, 2005). In summary, although young children believe in various extraordinary beings such as God or the Tooth Fairy, they do not place them on the same ontological footing as scientific entities such as germs.

There are various plausible explanations for this difference. 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., 2005). 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, children rapidly appreciate that God has special powers as compared to ordinary mortals (Barrett, et al. 2001; Harris & Giménez, 2001). 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. A very different possibility, however, is that children are sensitive to the type of discourse that surrounds them. 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 God or Santa Claus, on the other hand, children may well hear avowals such as "There really is a Santa Claus" or "I believe in God." Such avowals may lead children to conclude that the existence of these 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 what they are told about those entities. This cleavage points to an informative line of investigation. Ethnographic studies of traditional, small-scale, closed communities have shown that the existence and efficacy of certain special beings, such as witches or ancestors, are generally taken for granted. By implication, in these communities children would rarely encounter the type of belief avowal that is common in Western, Christian communities regarding God or other special beings. Nor would they encounter people who express doubt or disbelief in the existence of witches or the ancestors. To the extent, therefore, that they are guided by the surrounding discourse, children growing up in such communities should be as convinced of the existence of witches or the ancestors as they are of everyday natural kinds. On the other hand, if children harbor some doubts about the existence of such special beings because of the extraordinary powers attributed to them – or because of their inaccessibility to ordinary observation, then even children growing up in traditional communities will differentiate between such special beings on the one hand and ordinary – or scientific – entities – on the other.

Conclusions

Two pieces of evidence converge to indicate that children do not adopt a conservative attitude of skepticism toward the testimony supplied by adults. First, with respect to various objective, but normally unobservable, features of the world, children trust what adults tell them, and indeed they appear to re-work that information into a coherent concept of the domain in question, whether it is the role of the brain, the shape of the earth or the nature of death.

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 of God, the immortality 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 the future concerns the extent to which children differentiate between the scientific and the spiritual realms. If we look at the form of their questions, children do not obviously distinguish between them. They ask for explanations of everyday phenomena for which an evidence-based materialist, explanation is available – hot toast melts butter, semi-solids like sand and snow are different from liquids like water – but they also ask for explanations of spiritual phenomena for which no such materialist explanation is available – God 'just did' create humans. On the other hand, there are preliminary indications from children's ontological judgments that they do distinguish the two realms. Children express more confidence in the existence of unobservable but scientific entities – such as germs – as compared to unobservable but spiritual beings – such as God. Arguably, children are sensitive to an underlying conceptual difference in the perceptual accessibility or 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 natural kinds. For them, the special beings of the spiritual realm will be just as real the flora and fauna of the natural world.

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