NEGOTIATING THE BOUNDARIES OF SCIENCE AND RELIGION: THE CONVERSION OF ALLAN SANDAGE

by William A. Durbin

Abstract. In the early 1950s, astronomer Allan Sandage inherited from Edwin Hubble the task of determining whether expansion was real. In the succeeding forty years, Sandage "established the discipline of observational cosmology" (Overbye 1991, 188). At the same time, he encountered the limits of science to address the full mystery of existence. In seeking an answer to the question of purpose, in particular, Sandage came to the "abyss of reason" and made the "leap of faith." This conversion, however, involved, and continues to involve, an ongoing process of balancing two avenues to the truth, drawing upon resources from both scientific and religious traditions. Reason and faith seem reconcilable in life lived as an experiment and in "bowing before the mystery" (Sandage 1990). Ultimately, Sandage suggests that religious conversion comes not so much through reasoned pursuit as in the realization of being pursued.

Keywords: conversion; existentialist; god of the philosophers; hound of heaven; John of the Cross; leap of faith; materialist-reductionist; mystery; natural theology; Blaise Pascal; purpose.

In the circles of American astronomy, Allan Sandage has achieved something like legendary status. In the fifty years since he inherited Edwin Hubble's research program to measure space-time, Sandage has been credited with "establish[ing] the discipline of observational cosmology" (Overbye 1991, 188). His achievements have earned him the highest professional honors, including the Crafoord Prize, the Royal Swedish Academy's equivalent of the Nobel for astronomy. His uncompromising attitude and passion for precision have been known to drive assistants to despair, at the

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same time earning him a reputation as a tireless investigator, a scientist's scientist. Famous for a "feistiness" and admired for an "absolute integrity," Allan Sandage is recognized for laying the groundwork for scientific claims about the size, age, shape, and fate of the cosmos (Golden 1997; Overbye 1991, 263).

The fervor with which Sandage has pursued this task has led some to see it as essentially a religious quest. In the first place, he is known to be "a religious man," as cosmologist James Gunn put it, adding that this is "a peculiarity among our breed" (Overbye 1991, 177). Science writer Dennis Overbye placed Sandage's story at the heart of the contemporary "scientific quest for the secret of the universe," concluding that the gifted astronomer has pursued science "with a religious intensity ascending to charismatic exuberance and plunging to brooding curses of self-doubt" (1991, 163). In professional controversies that have swirled around the value of the Hubble Constant (H_0—the rate of the expansion of the universe), friend and foe alike have acknowledged Sandage's religious sensibilities—though drawing different conclusions. His longtime colleague, Swiss astronomer Gustav Tammann, has observed that Sandage "is *forced* to find the truth; otherwise he is a sinner. But he must admit that he is sometimes wrong, that he is sometimes a sinner, and that makes life only harder for him" (Croswell 2001, 181). French cosmologist Gérard de Vaucouleurs, an early adversary in the so-called Hubble wars, believed that Sandage's science smacked of theology, tainted by a kind of religious conviction in an orderly universe (Croswell 1993; 2001, 172–202; Overbye 1991, 266–72). In general, those familiar with Sandage's religious feelings sometimes suspect that his science has provided him with an avenue for a deeper search for meaning.

On the one hand, Sandage seems to invite such suspicions. He often compares the solitude and contemplative nature of the astronomer's life to that of a monk. He describes all-night vigils, seated at the "prime focus cage" of the world's largest telescopes and listening to classical music, as "inspirational, like being in a Trappist monastery, which is what I've always wanted to do" (Golden 1997, 59). Although he typically makes such allusions with tongue in cheek, he has, more seriously, referred to himself as "a pantheist, in the mode of Spinoza." He concedes that "to believe firmly that the laws of physics, which are not chaotic, permit an ordered universe" is to be "pantheistic in a very strong way" (Sandage 1990). On the other hand, Sandage consistently maintains that religion has nothing to do with science. "There is no meaning in science," he insists. "There are only facts and the interpretation of them. By 'meaning' I mean meaning at the deepest level. Whereas religion—the whole thing is meaning" (Sandage 1990; 2002, 52). To claims that he finds some religious consolation in scientific research, he responds: "science holds an entirely separate fascination for me; at the telescope, I am a strict reductionist" (Golden 1997, 57).

Indeed, the more one talks with the "feisty old man of astronomy" (whom younger astronomers also know as "Uncle Allan" [Panek 1999, 25]), the more one confronts the ambiguities of the science-religion relationship. On the spectrum of possible ways of relating the two realms—conflict, independence, dialogue, or integration—Sandage seems all over the lot. His insistence on a separation (which seems to result, in part, from a need to defend his scientific integrity) includes a sense that science proceeds in a context of mystery, provoking religious feelings and prompting questions whose answers lie beyond scientific understanding. In the end, the story of his religious conversion suggests the conflicted nature of a dialogue between "two halves of [his] psyche" and the simultaneous need to distinguish yet reconcile "two ways of knowing" (Sandage 1990).

Naming the Mystery

Sandage's story begins, as it does for many astronomers, in a childhood fascination with the stars. From the first time he looked up through a borrowed telescope, he says, he felt a sense of "vocation" and "destiny." From age eight, "I knew I had to be a physicist. I knew I had to be an astronomer" (Sandage 1990). He also describes how, as a boy, everything in nature seemed "enchanting" to him. "The world was magic," he recalls; and he was continually surprised and amazed that "there was something and not nothing." Out of this sense of wonder and curiosity, he felt "compelled" to learn how the world works (Lightman and Brewer 1990, 69, 72).

This feeling of duty and of being driven eventually led him to Caltech. There, as a graduate student in the late 1940s, the demand to become an analytical machine quickly dispelled any boyhood sense of magic. At the same time, the process of becoming a professional astronomer seemed to give rise to a substitute sensibility—one shaped by scientific discipline yet not wholly foreign to a childhood fascination. "By doing science in the Caltech way," Sandage observes, "in the problem-solving curriculum in the physics tradition, the world, in fact, became more mystical" (Lightman and Brewer 1990, 73). To grasp "the deep interconnections of the laws of physics" and to perceive "the interconnection of all of physics with mathematics [is] quite a mystical experience, one that takes enormous preparation." Immersed in science, Sandage came to believe that "reality *was* the equations. Reality was the interconnection of the laws of physics" (Sandage 1990). In the "maturation process" of graduate school, then, "the magic of existence was replaced by the mysteries of the textbooks" (Lightman and Brewer 1990, 73).

During his subsequent scientific work of age-dating stars, measuring galactic distances, and confirming the Hubble law of universal expansion, Sandage became convinced that there had to be an "organizing principle" at work in the universe (Golden 1997, 56). "As scientists," he explains, "we

have to try everything to discover how the world works. But the deeper you dig, the more complicated the thing becomes. There are layer upon layer of the intricate gears of a watch; and you keep uncovering layer upon layer, and finding more and more connections." He speaks carefully here, almost apologetically, as if caught between a desire to share his "sense of the mysterious" (to use Einstein's phrase) and still maintain his stance as a "hardnose scientist." From his point of view, it simply became "less and less clear that all this could have occurred without an ordering principle; and that ordering principle I guess I called God in order to give a name to the mystery" (Sandage 1990; Overbye 1991, 185–86).

At this point, one might conclude that, at the depths of scientific understanding, religion and science somehow merge. The scientific quest seems fundamentally a religious one, as Einstein suggested. But Sandage insists not; and all his religious references are contradicted by equally forceful denials that science has anything to do with religion. In fact, by his account, stark boundaries between scientific and religious understanding emerge just at the point where they seem to converge. For Sandage, naming the mystery became merely a first step in negotiating those boundaries.

A Science of Creation

The quandaries involved become particularly apparent in Sandage's own field of cosmology (see Ferguson 1999; Ferris 1998). Like others in the field, Sandage has himself drawn upon the language of traditional religion to characterize the striking achievements of modern science. He notes how developments in twentieth-century physics (which have linked the science of the very small with that of the very large) amount to nothing less than "an inquiry into *being*—in this case, the existence and being of the cosmos and its contents." This investigation into the whole of things "becomes nothing less than an inquiry into the question of creation" (Sandage 1987, 251). Citing pioneer twentieth-century cosmologist and Belgian Catholic priest Abbé Georges Lamaître, Sandage adds that the expansion of the universe serves as "the scientific prediction of the creation event" (Sandage 1987, 253).

Anticipating what is now majority scientific opinion,[1] Sandage has long maintained that this event, "signaled by the expansion of the Universe, has happened only once. The expansion will continue forever, the Universe will not collapse upon itself, and therefore this type of creation will not happen again" (Sandage 1985, 54). Initially, he expressed "terrible surprise" at this discovery when, in 1974, he and Tammann had enough reliable data to announce the fate and shape of the cosmos: expansion would continue forever; the universe is open (news item, *Time* 1974). The answer contradicted what he himself had long assumed, namely, that the universe was closed and finite, likely to collapse back upon itself—a view

that dominated cosmology in the early 1970s and itself likened to a "theological" position. But after some twenty years of research, Sandage had to conclude the opposite. Reality appeared otherwise to him.

In 1985, he felt comfortable enough to share his ongoing amazement publicly. At a conference in Dallas that brought together atheists and theists to debate a wide variety of topics, Sandage observed that the notion of a one-shot universe "comes close to saying that this universe was created. It is unique." His tone, again, was both cautious and matter-of-fact—as if he would like to avoid announcing the implications but had no choice in the matter. "Here is evidence for what can only be described as a supernatural event. There is no way to predict this in physics as we know it. It is truly supernatural, that is, outside our understanding of the natural order of things, and by this definition a miracle" (Durbin 1985).

Almost in the same breath, however, Sandage asserted that the scientist cannot, thereby, affirm religious belief. "Knowledge of the creation is *not* knowledge of the creator," he said in a published interview that same year. Reiterating the strict need to maintain a materialist-reductionist point of view, he insisted that scientific investigators must confine themselves to claims about reality that can be tested. "Scientists, in their practice of science, in the laboratory or observatory, must stop at the point where they cannot apply reason." In the case of scientific cosmology, the most one could say is that "astronomers may have found the first effect, but not necessarily thereby the first cause sought by [medieval theologians] Anselm and Aquinas" (Sandage 1985, 54). In other words, no matter how dramatic or mystical their musings about creation, scientists can only provide "a description of the consequent *processes* that began just after the instant of creation." Most significantly, no astronomical findings can "tell us *why* the event occurred." In the end, scientific understanding of "the mystery of existence" stops short of answering questions of purpose (Sandage 1987, 251).

At this point, the boundaries between scientific and religious understanding appear quite stark. In Sandage's words: "There is an edge to science"; and the scientist, in his "inquiry into being," continually confronts a horizon "beyond which the questions of *why* are outside the realm of science" (Overbye 1991, 385). While the distinction between how and why questions is a common way to separate scientific and religious realms, for Sandage the separation was felt at a profoundly personal level. It involved the need to find an answer to the question of purpose—and the inability to do so in science. The answer to that question, he says, came "through an entirely different forest." He speaks of *that* quest as involving a confrontation with "the abyss of reason" and making "a leap of faith." In terms of scientist's quest for the secret of the universe, it involved a realization that "confronted with the entire mystery of existence—and it is such a great mystery—we have to bow before the mystery" (Sandage 1990).

Negotiating the Boundaries

As a graduate student at Caltech, Sandage gained quick recognition by astronomers at Mount Wilson and Mount Palomar for his skills as an observer. In 1952, he was called to the mountain top to become Edwin Hubble's graduate assistant. Hubble had just begun a comprehensive research program to confirm that expansion was real. As Sandage described it later, that project essentially entailed a "search for two numbers": the Hubble Constant (H_0), or rate of expansion, and the deceleration parameter (q_0), or the rate at which expansion was slowing. When Hubble died of a heart attack in 1953, Sandage took up his mentor's project, only suspecting how monumental it might be but feeling a moral duty to carry on.

Upon graduating from Caltech in that same year, and joining the small and privileged ranks of professional astronomers, Sandage also experienced a profound personal crisis. In his words, "Immediately upon graduation I said, okay, what are your goals now? And there was nothing. Nothing" (Sandage 1990). Acknowledging that he had the "best astronomical job in the world," he still felt "empty, completely empty." He had apparently been so driven by the desire to become an astronomer that when he accomplished the task, he suddenly lost sight of his own reason for being. "That purpose had been in my life from age eight to twenty-six, and now the goal had been reached," he explains. "I had to reach for another goal, and there was nothing."

In attempting to define the nature of the crisis, he has described it as "the Outsider's problem" (Sandage 1990; Overbye 1991, 39). Here Sandage refers to a favorite book of his, published in 1956, called *The Outsider*. In it, author Colin Wilson examined the lives and works of modern artists and intellectuals, including Nietzsche, Van Gogh, and Dostoyevsky, all of whom expressed a deep alienation from the world. The "Outsider," Wilson wrote, is driven by the desire to "live life abundantly"; he is plagued by the ability "to see too much and too deep," unable to accept "unreality" in any form. The Outsider experiences life as "an acute and painful question that demands a solution before he can begin living" (Wilson 1956, 89, 102–6). For some individuals, this condition entailed an inability to accept anything as true that could not be reasoned about. Although Outsiders do not necessarily *prefer* unbelief, Wilson noted, the best they can do is wait for a revelation—to be overwhelmed by a reality beyond reason. At times they "experience moments of intense ecstasy and affirmation," feeling at one with the universe and that life has a purpose; but often they find themselves "dragged down by the 'trivialities of everydayness' (Heidegger's phrase) and the misery of unfulfillment" (Wilson 1985, 9). Van Gogh, for example, found some fulfillment by pressing his discipline to its "conclusion"; Nietzsche found a solution in the stark choice between "the 'Everlasting Yes' and the 'Everlasting No'" (Wilson 1985, 9). Both men's lives

ended in madness, Van Gogh's in suicide. For Wilson, both cases indicate how the Outsider ultimately reaches the limits of reason. The answer to the question of life ultimately requires an act of will. In other words, Wilson concluded, the Outsider's dilemma leads beyond philosophy to religion (Wilson 1956, 106).

In telling the story of how he addressed the question of purpose, Sandage, in effect, adds the story of the scientist to the account of the Outsider. He says he faced the Outsider's dilemma following graduation and, for years, sought "the justification to accept the opposite of Nietzsche's solution." It was, he adds, his "dark night of the soul" (Sandage 1990).

His reference to "the dark night" broadens Sandage's account of his religious quest to encompass sources from a religious tradition—effectively blending insights from modern existentialism with those of early modern mysticism. The image comes from sixteenth-century mystic and Carmelite friar St. John of the Cross, who used the "dark night" to characterize a critical period in the soul's journey to God (Kavanaugh 1987). In the dark night of the senses, the spiritual wayfarer confronts the limits of *religious* discipline. In a painful period of "purgation," she becomes keenly aware of her own imperfections. Drawn out of herself into the resulting darkness, the soul is shut off from the light of the senses, including the interior sense of the imagination. In this state of consciousness, God no longer communicates through discursive thought—through prayer or meditation—but directly in the spirit. In such an attitude of emptiness and *un*knowing—a state of purified contemplation—the chastened pilgrim is thrown back on an initial experience of mystery. God is rediscovered in "nothingness." From here, the soul matures in faith—which, John notes, is "foreign to all sense" (Welch 1990, 89–118).

For Sandage, these portrayals of existential angst and religious mysticism cast light on his own awareness of the "edge" of science. Despite the mystical experience of knowing the world through science, Sandage says he "found it impossible to answer the question 'Why?'" Nonetheless, the question, like any other, demanded an answer. "For some people, these questions don't mean anything," he says, "but for others it's like breathing" (Sandage 1990). He came to the wrenching conclusion that the answer could not be found through a scientific pursuit of the truth, the same reasoning process that had brought him, as a scientist, in touch with reality. He had reached the limits of *scientific* discipline. "The answer to the question, why," he says, "which I suppose down deep I was searching for in science, I realized itself *had* no answer in science. I forced myself to the statement that you're asking the wrong questions or demanding too much for a proof. Why don't you just begin to believe and see what happens?" (1990)

Conversion

At this critical juncture, Sandage drew upon additional resources to work through the seemingly stark boundaries between scientific reasoning and religious faith. Specifically, he makes clear that his decision "to believe and see what happens" involved "Pascal's wager." Referring to the seventeenth-century mathematician and pious Jansenist, Sandage indicates how Blaise Pascal provided a precedent for his own choice to believe. In characterizing his conversion, Pascal described a "night of fire" in which he experienced a sense of "certitude" and "peace" moving from the "god of the philosophers" to the "God of Abraham, Isaac and Jacob and Jesus Christ" (O'Connell 1997, 95–103). For Sandage, the way Pascal "thinks about his conversion, and then his belief—it is such a peaceful process. He finally willed himself to faith out of doubt" (Sandage 1990). Subsequently, Pascal advised those gripped by doubts and "held fast" by reason not to concentrate "on convincing yourself by multiplying proofs of God's existence." Instead, he recommended that, since we all *have* to make some choice in this regard, we should weigh the gains and loses and "wager" that God exists. There is everything to gain and nothing to lose. He offered assurances that, following "reasons of the heart" and acting as if one believed, would lead any skeptic to believe "quite naturally" (Pascal [1670] 1995, #418).

Sandage says he eventually followed this advice, struck as he was by the need to find a solution to the question of purpose—a solution opposite to Nietzsche's nihilism. This act of will, though needed to bring "peace to the soul," was nevertheless so thoroughly "foreign to the scientific method" that it seemed to require some additional psychic assurances. As part of his conversion process, therefore, Sandage drew parallels with scientific reasoning. "For me the rationale [for believing first before all the evidence is in] is similar to the geometric postulates of Euclid. The mathematician never asks for the *reality* of these postulates. He *begins* with them. He accepts the postulates and sees what follows from that" (Sandage 1990). In this case, Sandage's "postulates of life" included the need not only for purpose but for absolute foundations for morality and law. Having studied both ethics and law, he became dissatisfied with the relativism of the "secular humanist." He concluded that, "given that there *has* to be an absolute basis for ethics, given that there *has* to be a purpose, God exists. I can prove to myself that God exists if I'm willing to accept the postulates." This sort of reasoning, he notes, resembles the starting point for theological inquiry, described by St. Augustine among others, as "believing in order to understand." "Once I could convince myself that there had to be a purpose and a universal ground for morality," Sandage concludes, "I could accept the existence of God" (1990).

To follow Pascal's reasons of the heart, or to bow before the mystery, Sandage found additional support from natural theology. On the one hand,

he says, arguments from design have limited value. "Though I came to my first inklings of belief through observing the natural order—and I want to say that natural theology is *not* dead—it did not constitute a proof of God's existence for me." He was, instead, "prepared" to accept the inference of design in nature by his existential quest for purpose. On the other hand, he recalls attending a particular science writers' conference and being struck, "for the first time," by the "intricacies of the human body and the complicated control mechanisms of life." He began to question whether life could have happened "by pure chance as the biologists [tell us]." In some sense the "inklings" of design from astronomy became something of a revelation from biology because, at that point, a "door opened," he says, and he "gradually went through it" with "a different view of things." Again using the language of mystery, he concludes that "it seemed that the covering theory for the whole of the mystery is much more easily explained by a miraculous God than by nothing" (Sandage 1990).

Nevertheless, despite all these rationalizations, if you will, Sandage could not finally avoid the "leap of faith." Only an act of will brought peace to the soul. That experience, too, he says, was "an indefinable mystery—like listening to music." As a scientist, he adds, "I rebelled against it, but as a human being, I was drawn to it" (1990). Describing the moment of resignation and hope—of movement across the "abyss of reason"—Sandage declares that the decision finally "laid to rest twenty-five years of difficult struggle when I was unable to come to that conclusion. I had to *will* myself to faith." This step was not necessitated by any implications of Big-Bang cosmology or, more broadly, by the experience of beauty and truth in science. "Conversion for me was an answer to a series of problems that *had* no answer—at least, I finally came to realize, none within science itself. After forty-five years of rejecting the notion that there was another way to the truth besides reason, I had to *will* myself to faith. Then I could approach the question, 'Why?'" (1990).

The Life of Faith

At this point, Sandage reveals that acting on the will to believe was still only an initial step in solving the Outsider's dilemma. Embracing religious faith as the answer to purpose entailed a fundamentally "different mindset"—including, it seemed, a different kind of knowledge. "I don't *know* that God exists in the same way I know there are galaxies and planets out there, or in the same way I know what makes the sun shine. I'm still not as convinced as I am about the charge of the electron" (Sandage 1990). A Pascalian sense of "certitude" did not provide "proof in the same degree of certainty that you can have in the physics lab." Religious knowledge seemed to involve *living* with mystery, which Sandage says he is "content" to do.

But the religious life also entailed *renaming* the mystery initially experienced darkly, as John of the Cross put it. Indeed, the insights of both

mysticism and existentialism suggest that moving beyond the abyss of reason required use of the imagination now reawakened in the light of faith. For Sandage, this renaming process involved drawing upon sources from a particular religious tradition, from Christianity, beginning with scripture and an understanding of faith described there. "In reading the Bible," he says, "I found peace. And I hoped it would be real. Now faith *is* that hope of Hebrews 11:1, the definition of faith that makes great sense to me: 'the assurance of things hoped for, the conviction of things not seen.'" With that biblical language and insight apparently jiving with his experience, he "willed [himself] a second time to go the next mile" (1990). He joined a faith community. He became a born-again Christian.

In this step, Sandage effectively followed Pascal's further "remedy" for unbelief, namely to "learn from those who were once bound like you and who now wager all they have" (Pascal [1670] 1995, #418). Sandage's conversion was, he says, ultimately enabled by the witness of "dedicated Christians" whom he admired for other reasons. "Knowing Christians who were also scientists whom I respected came as a surprise to me. It meant that it was possible to do science and have a faith" (Sandage 1990). And it was these people of faith and science who ultimately gave him the answer to the question of purpose. "And it was so simple. The answer struck home immediately. I just had to accept it. The answer is that the purpose of life is to glorify God" (Sandage 1990; Overbye 1991, 393). Everything followed from that, he adds, including "a mode of living that is not nihilistic" (Sandage 1990).

Sandage's passion for the truth led logically to an equally passionate faith commitment. "Faith means you have to go all the way," he says, "accept Christianity totally, or reject it totally" (1990). This kind of commitment entailed a strong view of the word of God, including an inclination to view the Bible as "inerrant." *Some* theory of interpretation or hermeneutic is necessary, he says, to reason through the "mire of faith"; and, in keeping with his "hunger for an absolute basis for living," he found himself forced into a "Fundamentalist-Evangelical mold" (Sandage 2002, 54–55; 1990). At the same time, however, Sandage confronted Christians for whom inerrancy meant young-Earth creationism. He rejected such literalism, demanding recognition of "the truth understood by scientists." He has adopted, he says, his own "great commission" of convincing strict creationists that their science is "dead wrong" and that to deny scientific truth means "significantly hurt[ing] the Christian cause" (Sandage 1990).

Sandage ultimately describes his life as "divided"—almost painfully so. In going the extra mile and converting to Christianity, he has experienced, he says, "even greater doubts." Not necessarily because "I am a scientist, but because I have a thinking brain and that brain has to think on reason" (Sandage 1990). When it comes to the central questions of the faith, such as the resurrection of the body, he is "content to live with the mystery"

(Sandage 2002, 55). At the same time, the life of faith has seemingly required an ongoing effort to "build bridges back to reason"—seeking some consonance if not integration between two modes of thought, two ways of knowing. This negotiation, if you will, has entailed further analogies to the life of science. "I consider it an experiment," he says of his life of faith and reason. "I'm an experimental scientist, and I decided, all right, let's take that [New Testament definition of faith] as your hypothesis. You always have to *believe* your hypothesis as the initial part of the scientific method, and then you try and disprove it. I'm still in that process" (Sandage 1990).

Most recently, Sandage has said that he views "science and theology [as] completely separate, except to solve the mystery of existence" (Sandage 2002, 55). To understand why there is something and not nothing requires the means to answer both how and why questions. For Sandage, these are quite distinct pathways. But perhaps it is in the *drive* to solve the mystery, entailing uncertainty and risk, that scientific and religious understanding meet. As Wilson suggested in his account of the Outsider's problem, one solution involved living life as "an experiment in living"—to some degree, *always* on the edge (Wilson 1956, 90).

Pursued by Mystery

Still, Sandage acknowledges that the religious route means too much of a leap for many of his colleagues. "Those [scientists] that are content in every part of their being to live as materialistic reductionalists (*as we all do as scientists in the laboratory, which is the place of the practice of our craft*) will never admit to a mystery of the design they see, always putting off by one step at a time, awaiting a reductionalist explanation for the present unknown" (Sandage 1985, 53). For Sandage, the limits of scientific reasoning in face of the unknown had become painfully clear. Confronted with the question of purpose, he simply could "not believe that the materialist-reductionalist philosophy, so necessary to pursue the scientific method (and, to repeat, the method which all scientists must master and practice with all their might and skill in the laboratory) can explain everything" (Sandage 1985, 54). After all, he adds, "the laws of physics themselves are mysteries" (Sandage 1990). For his agnostic colleagues, he retains the hope that "having been forced via the route of Pascal in his need for purpose to come to the abyss of reason, scientists can, with Anselm and Augustine, 'believe in order to understand' what they see, rather than 'understand in order to believe'" (Sandage 1985, 54).

The fact that Sandage can, in some sense, only *hope* for this change of mind and heart points to one final disjunction between scientific and religious consciousness. In Sandage's words, "I don't think you'll find God unless you *seek* God; and for me seeking God involved the question of *why*

rather than simply how, what and when, which is all that science is about" (Sandage 1990). What would he say, then, to colleagues committed to a materialist-reductionist mindset who perhaps acknowledge the limits of reason but are yet unable to adopt another mode of thought (in Outsider's terms: those unsatisfied with unbelief but unable to accept an answer they cannot fully reason about)? From his own experience, Sandage's conversion entailed *some* rationale, some connection with the scientific understanding. As he says: "In my case I thought I saw the other side of the abyss, so I was leaping from reason to faith believing there was another side." Still, the desire for purpose, for the answer to the question why, must be there. If so, then "I would say, all right, you've reached the zero stage of conversion. If the problem is so gnawing at your soul, then you will take the second step. But if the hounds of heaven are not chasing you, then you'll never be converted" (1990).

At this final stage in his story, Sandage invokes the poetic imagination to sum up his encounter with mystery and to explain his conversion. In one interview, he paused to remember the opening lines of one of his favorite poems:

> I fled Him, down the nights and down the days;
> I fled Him, down the arches of the years;
> I fled Him, down the labyrinthine ways
> Of my own mind; . . .

"Do you know that poem, *The Hound of Heaven*?" he asks. It is the most famous poem by one eminent Outsider of Victorian England: turn-of-the-century English poet, drifter, drug addict, and literary critic Francis Thompson. Thompson's epic poem, published in 1881, depicts a pilgrimage in reverse: the flight of a troubled soul from a persistent God in hot pursuit. The poem depicts conversion as the result not so much of a process of searching but of being chased. In one sense, the poem echoes John of the Cross's theme of the human heart exhausting itself in the pursuit of temporal fulfillment; but in contrast to the penitent soul of the dark night, Thompson's wayfarer is not passively attentive but ardently aloof. He flees his Maker's loving pursuit in various directions, including ways that approximate the scientific quest.

> Across the margent of the world I fled,
> And troubled the gold gateways of the stars,
> Smiting for shelter on their clanged bars; . . .
> I in their delicate fellowship was one—
> Drew the bolt of Nature's secrecies.
> *I* knew all the swift importings
> On the willful face of skies;

> I knew how the clouds arise
> Spumèd of the wild sea-snortings; . . .

The narrator also seeks refuge in the marvelous, if ephemeral, beauty of the physical world, getting lost in the rhythm and flow of nature, looking for some mystical union with the cosmos. Ultimately, he finds no satisfaction there.

> I triumphed and I saddened with all weather,
> Heaven and I wept together,
> And its sweet tears were salt with mortal mine;
> Against the red throb of its sunset-heart
> I laid my own to beat,
> And share commingling heat;
> But not by that, by that, was eased my human smart.

As a whole, the poem recapitulates Sandage's entire story. Each stanza seems to trace the stages of his own spiritual journey: from boyhood fascination to scientific consciousness to religious faith. For Sandage, "The Hound of Heaven" seems to express one final, surprising truth: the mystery of existence involved not so much seeking but being sought; not so much searching but being found. Pascal articulated this spiritual paradox when he prayerfully wrote, "Be comforted. You would not be seeking Me if you had not found Me." For his part, Sandage concludes, "I don't think it's up to the individual. I think all you can do is sit and wait and God will chase you. I think those people who are converted do so in spite of themselves. That's one of the mysteries" (Sandage 1990).

Conclusion

For Sandage, the desire to know why could not be ignored. On one level, it compelled him to become a scientist. But the effort to learn how the world works led to an "abyss of reason" requiring a "leap of faith." In describing his conversion, Sandage ends up where he began. He confesses, cautiously, that "the search for something bigger outside myself, for the meaning of the world outside my own existence, was there from the beginning of what I can remember." He speaks carefully about this, the core of the mystery, again seemingly caught between the worlds of religious faith and scientific reason. "It's difficult to put into words. To say, 'to be one with God' seems arrogant or flippant." In conversation, he pauses here, once again suggesting something of the essential difference, but also an essential sympathy, between scientific and religious understanding. "I wanted to *participate* in the mystery," he concludes, "rather than merely walk through it like a tourist, merely observing" (Sandage 1990).

NOTE

1. Recently, cosmologists Paul J. Steinhardt and Neil Turok have drawn upon string theory to reconceive a cyclical view of the cosmos. The theory has generated considerable interest, though the jury is still out. An observational cosmologist like Sandage might wonder what the observational evidence might be to support the theory. See Okie 2002.

REFERENCES

Croswell, Ken. 1993. "The Constant Hubble War." *New Scientist* (13 February): 22–23.
———. 2001. *The Universe at Midnight: Observations Illuminating the Cosmos.* New York: Free Press.
Durbin, William A., producer. 1985. "Christianity Challenges the University." News segment aired on *The 700 Club* television program, 10 April.
Ferguson, Kitty. 1999. *Measuring the Universe: Our Historic Quest to Chart the Horizons of Space and Time*. New York: Walker and Company.
Ferris, Timothy. 1998. *The Whole Shebang: A State-of-the-Universe(s) Report.* New York: Touchstone.
Golden, Frederic. 1997. "Astronomy's Feisty Old Man." *Astronomy* 25 (December): 54–59.
Gregson, Vernon, ed. 1988. *The Desires of the Human Heart: An Introduction to the Theology of Bernard Lonergan*. New York/Mahwah: Paulist Press.
Kavanaugh, Kieran, ed. 1987. *John of the Cross: Selected Writings*. New York/Mahwah: Paulist Press.
Lightman, Alan, and Roberta Brewer, eds. 1990. *Origins: The Lives and Worlds of Modern Cosmologists*. Cambridge: Harvard Univ. Press.
O'Connell, Marvin R. 1997. *Blaise Pascal: Reasons of the Heart.* Grand Rapids, Mich.: Wm. B. Eerdmans.
Okie, Susan. 2002. "New Theory of Universe Goes Beyond the Bang." *The Washington Post*, 13 May, A06.
Overbye, Dennis. 1991. *Lonely Hearts of the Cosmos: The Story of the Quest for the Secret of the Universe.* New York: HarperCollins.
Panek, Richard. 1999. "The Loneliness of the Long-Distance Cosmologist." *The New York Times Magazine* (25 July): 22–25.
Pascal, Blaise. [1670] 1995. *Pensées*. Trans. A. J. Krailsheimer. Rev. ed. London: Penguin.
Sandage, Allan. 1985. "A Scientist Reflects on Religious Belief." *Truth: An International, Inter-disciplinary Journal of Christian Thought* 1: 53–54.
———. 1987. "Cosmology: The Quest to Understand the Creation and Expansion of the Universe." In *Universe*, ed. Byron Preiss, 248–62. New York: Bantam.
———. 1990. Unpublished interview with William A. Durbin. Baltimore, Md., 5 May.
———. 2002. Interview with Philip Clayton. In *Science and the Spiritual Quest: New Essays by Leading Scientists*, ed. W. Mark Richardson, Robert John Russell, Philip Clayton, and Kirk Wegter-McNelly, 52–55. London: Routledge.
Thompson, Francis. [1881] 1986. *The Hound of Heaven*. Harrisburg, Pa.: Morehouse.
Welch, John. 1990. *When Gods Die: An Introduction to John of the Cross*. New York: Paulist.
Wilson, Colin. 1956. *The Outsider*. Boston: Houghton Mifflin.
———. 1985. *The Essential Colin Wilson*. London: Harrap Limited.
[News item]. 1974. "The Infinite Universe." *Time* 129, No. 27 (30 December): 60.