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The Rainbow of Experiences, Critical Trust, and God

A Defense of Holistic Empiricism

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CHAPTER 9

EXPERIENCE OF THE NATURAL WORLD, CRITICAL TRUST, AND GOD

9.1 Sense Experience and the Natural World

9.1.1 *Science as the Vindication of Narrow Empiricism?*

The prestige of science is often used to buttress narrow empiricism. Of course, it is clearly circular to use SE to justify science and then use science to justify SE. However, it might be thought to be significant that the reliability of SE can be nicely incorporated into a coherent scientific (perhaps *scientistic*) worldview in such a way that the resulting worldview and its epistemological principles mutually support one another. At times, this circle formed by the deliverances of SE and the scientific theories seems to be such a self-sufficient and closed one that all else outside this circle is automatically discounted or thrown in doubt. For example, Gellner asserts that

science...is discontinuous with the notions of everyday life, and...science manifestly has much greater cognitive power...[So] we are not too sure of the status of anything within this ordinary world...science, may re-validate it—or not. In the meantime, we continue to live in the ordinary world...but...with a certain amount of *distrust*. (Gellner 1974, p. 198; my emphasis)

I argue below that a careful examination of the wonder of SE and our experience of the natural world does not support Gellner's contention.

9.1.2 *The Wonder and Fragility of Sense Experience*

SEs generate spontaneous and non-inferential epistemic seemings that are imbued with a sense of reality. Yet SE is far from infallible. As explained before, CTA allows for feedback sifting and, interestingly, the fallibility of SE is strikingly demonstrated by the systematic probing of our SEs in science. So we have the scientific distinction between primary and secondary qualities, the Copernican theory of astronomy, and the current theory of elementary particles. Critics of RE often emphasize the numerous conflicts among REs, and hence their fallibility. However, this problem is not unique to REs. By and large, scientific and philosophic criticisms of sense experience have discredited more and more the presumptive data provided by SE. For example, matter seems to our senses to be an extended, continuous substance; but

science tells us that it is made up of discrete protons and electrons. It provides a defeater of our common lumpish conception of matter. The scientific data, together with some plausible philosophic criticism, may also defeat *all* statements made about colors on the basis of sense experience.

As we argue, the model of mediated immediacy applies to ordinary SE. In one sense, the mind cannot wrap itself about its objects. Some mediating instrument—our mind/brain—is needed, but the computations are done with such lightning speed that the sensory act seems to be simple, unitary, and direct. Now, we know that our perceptual system builds up its own objects on the occasion of external stimuli and in accordance with principles immanent within itself. But how do we know the computations are done correctly? We can only trust. Critics of RE often look at aesthetic experience or RE as a projection of the human mind, but now it seems that the natural world is also a projection of the human mind. We cannot check whether this projection is objective, apart from first trusting it. But assuming the basic trust, when we look at our sense organs as cognitive machines, their ingenuity strikes us as wonderful. For example, David Marr's work on vision implies that the brain seems to have some *a priori* principles which guide its processing of the stimuli, and it seems to do the job perfectly well.

At the same time, the world of senses, considered as qualitative contents, is also a wonder. Cheryl Forbes tries to convey this sense of wonder in theistic language. (Atheists can ignore the references to God first and pay attention to the facts about our SE alone.) Forbes says, "God is enormously inventive. He took a few basic shapes, one and two-dimensional figures, and made the most of them—triangles, squares, rectangles, straight lines, parabolas, circles... Then God added light and color... There are just a few basic colors from which the almost limitless array of tints and shades come. Without light, shapes and colors would be meaningless... God has provided people who have captured light on canvas, Turner and Monet, for example; the shimmer and gleam evoke a poignancy that cannot be satisfied until we see Light itself" (Forbes 1986, pp. 165–6).

He is the "God of texture as well... rough, smooth, slippery, crinkled, soft, nubby... God also added scent to his creation. The earth itself, warmed by the sun, has a rich musky odor. The plants, vegetation, trees, and shrubs it nourishes... also have their own particular scent, ... [e.g.] a whiff of the sweet alyssum" (Forbes 1986, p. 166). Moreover, "the sounds of God are miracles in themselves... [e.g.] birds... many species must learn the songs anew every year... [There are also the] squirrels and chipmunks who play the continuo, woodpeckers who sit on drums, frogs on tuba and double bassoon, crickets working the violin, ducks and geese on trumpet, crows on trombone—all playing together harmoniously but without a visible conductor... We have the privilege of a free concert day after day... These concerts are acts of worship by God's creatures" (Forbes 1986, p. 167).

These are just basic facts about our senses, but when we ponder over them, we see that our sense experience is itself mysterious. For example, why should our brain be able to produce our high-tech color vision? The

senses are just delightful, rich, and also extravagant. If Lyons is right that a zombie can also have adequate sensory knowledge, then all these experiences, together with their qualitative contents, are unnecessary. So why should evolution produce them? The mystery here is the wonderful adaptability of our SE for aesthetic enjoyment of the world.

9.1.3 The Mystery of the Natural World

The more we seem to reach to the depth of matter, the more it seems that the world picture provided by sense experience is largely phenomenal and cannot be equated to the deep metaphysical truth about the natural world. Even scientists are forced to talk about the mystery of the natural world, as more and more exotic features of the quantum world are revealed. For example: "How is it that the mere counterfactual *possibility* of something happening—a thing which does *not* actually happen—can have a decisive influence upon what actually *does* happen?" (Penrose 1995, p. 419). This is not to deny the PFEF of SE, nor to deny the apparent reliability of SEs on some level of description. However, we need to keep in mind the limitations of sense experience as revealed by modern science when we compare SE with RE.

For example, both friends and critics of RE want to emphasize that human language is intrinsically inadequate for representing the ineffable reality of God. This is quite right, but it seems equally true to say that human language is intrinsically inadequate for representing the ineffable reality of the natural world. Does our SE have direct access to the essence of the physical world? Can we say that our scientific language is a *literal* description of the physical world? It seems, in both realms, we need to struggle with human language, which is basically a use of symbols. For example, George Lakoff thinks that cognitive science has shown that "thought is *largely unconscious, embodied, and metaphorical*... Where the old view saw thought as literal and consistent—a proper topic for logic—in the new view, thought is literal only in part. So-called 'abstract thought' is largely metaphorical" (Lakoff 2003, pp. 50–1). If we really think hard about questions regarding the nature of matter or energy, we may realize that the physical world seems equally mysterious and ineffable (to some extent). For example, what exactly is electric charge? Is this some physical stuff or just some dispositions? As Penrose points out, "questions about reality at its deepest levels such as 'what is an electron?' or 'why does space have just three dimensions?'" could even cause "embarrassment" for scientists (Penrose 2007, p. 1028).

The above problem is compounded by the fact that consciousness somehow emerges from matter (according to naturalism). As Penrose admits, "We simply do not know the nature of matter and the laws that govern it, to an extent that we shall need in order to understand what kind of organization it is, in the physical world, which gives rise to conscious beings... the more deeply we examine the nature of matter, the more elusive, mysterious, and mathematical, matter itself appears to be." Without minimizing

the mystery of divine reality, the holistic empiricist wants to point out that humans indeed live in a world of mysteries—physical, personal, moral, aesthetic, and divine. We need to recognize this common cognitive situation of humans in order to avoid unfair comparison of SE and RE.

9.2 Fusion of Experience of the Natural World with Religious/Theistic Experience

9.2.1 Sense of Cosmic Wonder

In Chapter 5, we discussed Wittgenstein's wonder at existence.¹ This experience is more widespread than we think. William James believes that "it is only familiarity that blunts it. Not only that anything should be, but that this very thing should be, is mysterious" (James 1916, pp. 39–40). Heidegger points out that this wonder at existence can arise in various situations: "In great desperation, for instance, when all weight tends to disappear from things and all meaning is obscured, then this question arises... In heart-felt joy this question is there because here all things are transformed and stand around us as newly born in such a way that they may almost be conceived as not being... The question is present in boredom where... a hard-ended ordinariness spreads a desolation in which we are indifferent to whether the being is or is not, and thus again the peculiar question begins to sound: why is there being at all and not rather a nothing?" (cited in Nichols 1991, p. 84).

As in the case of Wittgenstein, this experience of wonder is not entirely constrained by prior beliefs. It can happen to nonbelievers, such as J. J. C. Smart. As Evans points out, although Smart dismisses the cosmological argument, he "cannot quite let go of the experience that drives such arguments, and wonders if there is room in his naturalistic world view for 'genuine mysticism.' Such mysticism is one that Smart says he 'feels' with the question 'why is there anything at all?' even though it seems impossible that the question should ever have an answer... He finds himself still uneasy, wondering whether the feeling is one that he ought to 'cherish' or one 'to be explained psychologically'" (Evans 2010, p. 72).²

Another example is Paul Williams, the Buddhist scholar who was also a practicing Buddhist. Nevertheless, this sense of wonder continues to haunt him: "for me the question 'why is there something rather than nothing?' has become a bit like what Zen Buddhists call a koan. It is a constant niggling question that has worried and goaded me (often, I think, against my will) into a different level of understanding, a different vision, of the world and our place in it" (Williams 2002, p. 30). In the end, this experience and some other factors led him back to the Catholic faith.

This experience is also a noetic-qualitative complex. There are the unique feelings of wonder, awe, unsettlement, and so on in this kind of experience. The noetic content is vague, and often it may be nothing more than an

inchoate sense that the natural world is contingent and not self-sufficient, and that something transcendent may lie beyond it. At other times, after being steeped in the sense of contingency, there may emerge a strong intuition that something like God, the Necessary Being, *must* exist. For Evans, cosmic wonder is a theistic natural sign that mediates a "perception of the createdness of the natural world" (Evans 2010, p. 63). So in my terms, this can also be a proto-RE or even an implicit TE. I call it the experience of contingency.

I suspect that skeptics may charge that this experience is "odd." However, when we see that some of the sharpest intellects in the twentieth century (Wittgenstein, Heidegger, James, etc.) and even some of the staunchest atheists cherish this experience, isn't it rash to dismiss the experience out of hand? It is only odd in the naturalistic world, but quite natural in the theistic world. So the dismissal of these "odd" experiences is not neutral, but a paradigm-bound decision. As the "odd" experiences continue to accumulate (as will be shown throughout Part B), it is the naturalistic paradigm that needs to be questioned. Of course, for those who are totally immersed in the practical life of a technological society, the sense of wonder may diminish almost to the point of nonexistence. Nevertheless, Evans argues, "we must also consider the possibility that the concerns of 'real life' may be ones that immerse us in the relative and the superficial, concerns that lessen our ability to perceive what is really deep and profound about our lives and our world" (Evans 2010, p. 64). It is, indeed, a wonder that we can wonder about the world. There is not the slightest reason why the process of naturalistic evolution should throw up such a being as us.

9.2.2 Experience of Design

The sense of wonder, if coupled with a prior atheistic faith, may generate a sense of absurdity. However, it need not be, because our experience of the natural world also has positive aspects that suggest that the world is not absurd. For example, Lewis Thomas, a distinguished physician, seems to be a nonbeliever, but he "cannot make... peace with the randomness doctrine." This is not wishful thinking, but is based on his in-depth interaction with the natural world in science: "I do not know a place like this place is absurd, when it contains, in front of our eyes, so many billions of different forms of life, each one in its way absolutely perfect, all linked together to form what would surely seem to an outsider a huge spherical organism" (cited in Evans 2010, pp. 98–9). I call this the experience of design. I do regard the design argument as a powerful argument, but this is another big topic that cannot be dealt with in this book. However, even the greatest critic of the design argument, Hume, suggests the design of the world need not be an inferential belief, but a kind of sensation forced on us when we contemplate the wonder of the world.

The experience of design may only be a proto-RE, but in some cases it is fused with an explicit TE. James N. BeMiller, a scientist of the Whistler

Center for Carbohydrate Research in Purdue University, says, "I marvel at the beautifully ordered complexity and diversity of the universe as we know and understand it (from subatomic particles to complex, living, thinking organisms). When I contemplate the many, many marvels of nature (for example, how one of the enzymes involved in starch biosynthesis in both leaves and nonphotosynthetic storage tissue has the same catalytic unit in both tissues but different regulatory units because of different functions of the starch), I must conclude that God—the all-powerful, our Creator—is the greatest scientist of all" (Anderson 1998, p. 44).

9.2.3 Experience of Natural Beauty

The natural world can mediate a sense of transcendence in various ways. Consider the religious experience of Paul Hawker, in which the sense of natural beauty is most paramount. Once he was standing on the edge of the precipice: "It was as if I was standing on the clouds themselves, an angel in heaven. I watched the setting sun cast colors onto my clouds—pinks, then golds with purples out on the far edges. It was so beautiful I held my breath so as to capture the consummate peace of this exquisite moment... There was no great voice, no burning bush, but internally something 'clicked'. I had a deep, clear sense... that all before me had been created, and that this creation somehow accommodated me... A warm feeling grew inside me, a knowing that I was enjoyed as much as I was enjoying the moment" (Hawker 2000, p. 20).

However, at that time he was not "religious" at all, and so there was no conceptual framework for him to use to understand or express this experience. He kept this experience to myself. For Hawker, this was not only a momentary experience, because the sense of support has remained for years as a glowing coal deeply embedded in his soul. His mountain experiences were very much like, but even better than, sex! It was because, as he says, "nothing else had ever made me feel so alive, so good, so complete, so integrated, so whole" (Hawker 2000, p. 27). So his RE fulfills his existential quest for meaning and gives him a sense of wholeness.

9.2.4 Scientific Experience and Religious Experience: The Case of Albert Einstein

Below, let us analyze the scientific experience of Einstein (1879–1955) in relation to the rainbow of experiences.

1. Scientific Research and Cosmic Religious Feeling

Despite Einstein's negative views on organized religion, he did not reject religion as such. He probably returned to deep religiosity in the 1930s. He even believed that religion and science had complementary roles to play, as his famous aphorism showed: "Religion without science is blind. Science

without religion is lame." For him, the essence of religion was a cosmic religious feeling: "The individual feels the nothingness of human desires and aims and the sublimity and marvellous order which reveal themselves both in nature and in the world of thought. He looks upon individual existence as a sort of prison and wants to experience the universe as a single significant whole" (Einstein 1949, p. 26). This is akin to nature mysticism. Interestingly, Einstein believed that this kind of cosmic religious feeling could have a positive interaction with our scientific experience. On the one hand, science can engender this feeling. In fact, "it is the *most important* function of art and science to awaken this feeling and keep it alive in those who are capable of it" (Einstein 1949, p. 27; italics mine).

Moreover, "cosmic religious feeling is the strongest and noblest incitement to scientific research. Only those who realize the immense efforts and, above all, the devotion that pioneer work in theoretical science demands, can grasp the strength of the emotion out of which alone such work, remote as it is from the immediate realities of life, can issue. What a deep conviction of the *rationality of the universe* and what a yearning to understand, were it but a feeble reflection of *the mind revealed in this world*, Kepler and Newton must have had to enable them to spend years of solitary labour in disentangling the principles of celestial mechanics!... Only one who has devoted his life to similar ends can have a vivid realization of what has inspired these men and given them the strength to remain true to their purpose in spite of countless failures. It is cosmic religious feeling that gives a man strength of this sort" (Einstein 1949, p. 28; italics mine).

Kepler's and Newton's achievements fascinated Einstein. Today we take their work for granted, but Einstein correctly pointed out that Newton's discovery was a kind of miracle, because the problem of "finding out the operative forces" in the universe was so immense: "To a mind less bold than Newton's it must have seemed hopeless, considering the immeasurable multifariness of the effects which the bodies of a universe seem to produce upon each other" (Einstein 1993, pp. 78–9). So why did they succeed? It was partly because their faith in cosmic order and the high value they placed on the discovery of this order, both inspired by their religious faith, provided the impetus for and sustained their scientific research. Einstein's comments on the pioneers of modern science have been confirmed by recent historical studies of the origin of modern science, which demolish the myth that modern science and religion have been locked in a fatal combat ever since the beginning of the scientific revolution. Here Einstein was also talking about his own scientific experience: his driving force was also to know the mind of God. As he told Buber: "what we strive for is just to draw His lines after Him... I want to know how God created this world... I want to know His thoughts, the rest are details" (cited in Clark 1973, p. 33.)

I also want to note that the emphasis of Einstein was on the unity of the rational order of the universe (which is the "reflection of the mind revealed in this world"), instead of on some kind of metaphysical unity. So Einstein was not a monist. Similarly, the following quote shows that

the cause of the scientist's rapture is the manifestation of superior intelligence in the world: "You will hardly find one among the profounder sort of scientific minds without a peculiar religious feeling of his own... His religious feeling takes the form of a rapturous amazement at the harmony of natural law, which reveals an intelligence of such superiority" (Einstein 1949, p. 28).

2. *Personal or Impersonal God*

Einstein was very fond of mentioning "God." However, there is a debate on what exactly Einstein's God refers to. On the one hand, in Einstein's mind, God must be the foundation of the unifying order of physical reality and its mathematical simplicity. This naturally suggests a personal God with immense intelligence. In fact, Einstein talks about the "humble attitude of mind towards the grandeur of reason incarnate in existence" (Einstein 1950, pp. 32-3).

On the other hand, Einstein urged religion "to give up the doctrine of a personal God" and promote "emancipation from the shackles of personal hopes and desires."³ However, when we look carefully at his criticisms, what he in fact rejected were the ideas of divine intervention in nature, and a religion based on fear and superstition. He denied that he was an atheist, and rejected the Freudian attack on God, because he thought belief in the personal God was at least better than the atheistic alternative (Goldman 1997, p. 5). Given his unambiguous affirmation of a God having reason and intelligence (these concepts are difficult to comprehend apart from a Mind), perhaps the most reasonable conclusion is that, although Einstein did not accept the full package of the personal God, his God was minimally personal (at least not impersonal).

3. *The Intelligibility of the World*

Einstein's reflection on the scientific enterprise also generated a sense of wonder. Although Einstein was very much against miracles, as violations of the natural order, he thought the intelligibility of the natural order itself was a miracle: the comprehensibility of the world was itself incomprehensible. Einstein mentioned this point in his letter to Solovine on January 1, 1951 (Einstein 1956, p. 102). Solovine's Machist reply to Einstein provoked another letter on March 30, 1952: "You find it surprising that I think of the comprehensibility of the world... as a miracle or an eternal mystery. But surely, a priori, one should expect the world to be chaotic, not to be grasped by thought in any way... the 'miracle'... becomes more and more evident as our knowledge develops... here is the weak point of... atheists... Curiously, we have to be resigned to recognizing the 'miracle' without having any legitimate way of getting any further. I have to add the last point explicitly, lest you think that weakened by age I have fallen into the hands of the priest" (Einstein 1956, p. 115).

So although Einstein instinctively felt that this problem showed the "weak point" of atheism, he did not want to draw an explicitly religious conclusion. But, of course, the comprehensibility of the world is only a miracle in a naturalistic world. If we assume theism, then this is something to be expected, and in fact this is exactly the pioneers' "deep conviction of the rationality of the universe," that Einstein himself refers to. The argument from intelligibility will be explored later.

For Einstein, scientific discovery was not a mechanistic process (Einstein 1949, p. 36). He was a scientific genius exactly because he could blend to an extraordinary degree those highly distilled powers of intellect, intuition, and imagination that are rarely combined in one mind. His discovery was heavily guided by considerations of beauty, the invariable, absolute, geometrical beauty of nature in particular. The starting point of his two theories of relativity "was not a positivist aggravation with experimental incongruities, but a burning desire to safeguard the beauty of nature and of laws which reflected that beauty... The simple beauty of Maxwell's equations was safeguarded by according to them the utmost generality, which in turn imposed a most specific singularity, the invariable constancy of the speed of light" (Jaki 1978, p. 188).

For Einstein, "genuine scientific knowledge about the cosmos was not sensory evidence, but a cosmic leap beyond the sensory. The scientific reliability of that leap filled him with the greatest wonder" (Jaki 1978, p. 192). His case also manifests the marvelous inventiveness of the human mind. The merging of aesthetic factors (beauty and symmetry) and philosophical insights with empirical considerations in scientific theorizing shows that aesthetic experience, intellectual experience, and scientific experience are closely linked, again manifesting the coherence of the rainbow of experiences.

4. *Einstein's Religious Experiences*

No doubt Einstein had some religious experiences, mainly in the forms of nature mysticism (but not the monistic type), experience of design, and aesthetic-TE. "The fairest thing we can experience is the mysterious. It is the fundamental emotion which stands at the cradle of true art and true science. He who knows it not and can no longer wonder, no longer feel amazement, is as good as dead, a snuffed-out candle. It was the experience of mystery... A knowledge of the existence of something we cannot penetrate, of the manifestations of the profoundest reason and the most radiant beauty... in this sense, and in this sense alone, I am a deeply religious man" (Einstein 1949, p. 5).

When Einstein encountered nature through his sense experiences and scientific pursuits, he was struck by feelings and experiences of wonder, mystery, beauty, sublimity, and intelligibility. The experience was at the same time intellectual, aesthetic, and religious. It seems that when Einstein explored the depth of the natural world, he saw the convergence of Truth and Beauty, and this suggested a Mysterious Source of all things. This was

perhaps an implicit experience of God as Incarnate Reason, which was never presented as an inference. Einstein talked about the sense of the religious (and not a religious belief) that depended on the experience of grasping the intricate world order. He mentioned feelings of awe. Those atheists who did not have this kind of experience were likened to people who "cannot hear the music of the spheres" (Goldman 1997, p. 5). All these are clearly experiential categories.

Einstein's unorthodox attitudes toward traditional religion help to show that his religious experiences were not constructed out of his prior religious indoctrination. They seemed to be a spontaneous response to the wonderful world he encountered through his scientific study. In fact, he often tried to dissociate himself from the idea of personal God, but apparently in the end he found the idea of God unavoidable.

5. Conclusion: Einstein and Spiritual Existence

Einstein himself was not an enemy of religion. Not only do religion and science not conflict, "religious feeling" in fact also goes hand in hand with "the profounder sort of scientific minds!" This picture seems very different from that portrayed by the atheist scientist Richard Dawkins.

At the turn of this millennium, Einstein was chosen by *Time* to be the Person of the Century: "As the century's greatest thinker, as an immigrant who fled from oppression to freedom, as a political idealist, he best embodies what historians will regard as significant about the twentieth century. And as a philosopher with faith both in science and in the beauty of God's handiwork, he personifies the legacy that has been bequeathed to the next century" (Issacson 1999, p. 20). Einstein was familiar with the rainbow of experiences in his own life, and he advocated "a reverence for everything spiritual" (Einstein 1949, p. 91). Indeed, Einstein, as one of the most eminent scientists in human history, was a witness to the spiritual nature of human beings, rather than to narrow empiricism. He understood and respected the human search for meaning (Goldman 1997, pp. 109–10). For Einstein, what should guide our lives are not utilitarian ends (such as ease and happiness), but the transcendentals: "The ideals which have lighted me on my way and time after time given me new courage to face life cheerfully, have been Truth, Goodness, and Beauty" (Einstein 1949, p. 2).

He admitted that science was insufficient to guide our lives, because it could not satisfy the whole soul! (Goldman 1997, p. 108). The basic problem was that "science...cannot create ends and, even less, instill them in human beings; science, at most, can supply the means by which to attain certain ends. But the ends themselves are conceived by personalities with lofty ethical ideals" (Einstein 1993, p. 2). It seems that Einstein was, indeed sensitive to the rainbow of experiences. It is pretty ironic that, as a scientist, Einstein's attitude is so different from those narrow empiricists who dismiss our experiences of subjectivity, morality, and the transcendent—all in the name of science!

9.2.5 The Witness of Other Scientists

The vivid experiences of other famous scientists show that Einstein is not alone. For example, we can listen to Heisenberg:

When one reduces experimental results to formalized expressions...one has a feeling of having oneself invented these formulae...However, when one stumbles upon these very simple, great connections which are finally fixed into an axiomatic system the whole thing appears in a different light. Then our inner eye is suddenly opened to a connection which has always been there—also without us—and which is quite obviously not created by man. (quoted by Pedersen 1989, p. 133)

Here we find scientists having a feeling of awe and wonder before the beautiful and intelligible natural order, which is disclosed in the scientific experience. There is a sense that we are facing a mystery, a *Numen* that fascinates us. There is also the sense that "Reality is self-communicative, and scientific rationality is not a purely human product" (Pedersen 1989, p. 134). There is also the feeling that science is a *gift*, but

To receive something as a gift must be the prerogative of personal beings. To recognise a part of the outcome of science as a gift is, therefore, to admit that our relationship with nature has at least one feature in common with personal relationships, and that the knowing subject is more intimately connected with the known object than the metaphor of "finding" is able to convey. (Pedersen 1989, pp. 134–5)

There seems to be deeper dimensions of the scientific experience, which sometimes amount to an ecstatic experience or a mystical insight.

9.2.6 Convergence of Beauty and Intelligibility

I think the most important aspect of the depth dimension of scientific experience is the convergence of beauty and intelligibility. As the theoretical physicist Paul Davies says: "In some cases, when the road ahead may be unclear, mathematical beauty and elegance guide the way. It is something the physicist feels intuitively, a sort of irrational faith that nature prefers the beautiful to the ugly. So far this belief has been a reliable and powerful travelling companion" (Davies 1984, p. 53).

Examples include the "undoubted beauty of Euclidean geometry...[the] extraordinary elegance of Newtonian dynamics, with its deep and beautiful underlying symplectic geometry structure... [t]he mathematical form of Maxwell's electromagnetism...[the] supreme mathematical beauty of Einstein's general relativity...the extraordinary mathematical elegance of quantum-mechanical spin, of Dirac's relativistic wave equation, and of the path-integral formalism of QFT as developed by Feynman" (Penrose 2007, p. 1038).

So apparently "Beauty and Truth are intertwined, the beauty of a physical theory acting as a guide to its correctness in relation to the Physical World" (Penrose 2007, p. 1029). The implications of this convergence of beauty and truth will be explored below.

9.3 Coherence of Experience of the Natural World with Theistic Experience

9.3.1 The Reliability of Sense Experience

We have mentioned the a priori principles inbuilt into our brains. Can evolution provide an adequate explanation for this? True, correct perception would help survival, but is this a reason for us to *expect* the evolution of such intricate processing machinery equipped with correct a priori principles? I argue below that the evolutionary explanation is possible, but not a strong one.

It is interesting that, far from using Darwinism to support the reliability of SE, some people think that Darwinism may tend to throw doubt on it. Even committed evolutionary naturalist Patricia Churchland says, "There is a fatal tendency to think of the brain as essentially in the fact-finding business... [However,] looked at from an evolutionary point of view, the principal function of nervous systems is to get the body parts where they should be in order that the organism may survive... truth, whatever that is, definitely takes the hindmost" (cited in Fodor 1998, p. 191). Plantinga has also made an evolutionary argument against naturalism, which is widely discussed (Kvanvig 1996). Jerry Fodor has provided a critique of both Churchland and Plantinga, and argues that evolutionary theory does not throw doubt on SE or science (Fodor 1998, p. 190).

I do not intend to defend Plantinga's argument here. I want to argue for the more modest claim that the reliability of SE is more coherent with theism than naturalism. Here we can note that Fodor's position is that evolution is basically *neutral* about the reliability of our beliefs on the whole: "It is... the adaptivity of the beliefs, and not their truth per se, that evolution cares about... the fact that evolution chose us isn't, in and of itself, a reason for thinking that we're true believers. There is... no Darwinian reason for thinking that we're true believers. Or that we aren't... Darwin isn't in the epistemology business, and evolution doesn't care whether most of our beliefs are true... it just doesn't give a damn" (Fodor 1998, p. 201). In fact, Fodor has general doubts about whether Darwinian natural selection can satisfactorily explain the mind: "I'm not actually an adaptationist about the mind; I doubt... that Darwinism is true of the phylogeny of cognition... our kinds of minds are quite likely 'hopeful monsters,' which is why there are so few of them" (Fodor 1998, p. 190). However, none of these shakes Fodor's faith in scientism.

For the orthodox Darwinists, the appeal to hopeful monsters (which is fundamentally an appeal to gigantic good luck), of course, is hopeless. So Fodor's position lends support to my claim that even if the evolutionary explanation of the reliability of SE is possible, it does not give us a reason to expect it. On the other hand, the reliability of SE is to be expected if theism is true. In itself, this point is not too strong, but it can be added to the other points, which are more forceful. Anyway, we need to remember that it is a fallacy to argue from "Darwinism doesn't imply that most of our beliefs are false" to "it's therefore likely that most of our beliefs are true." Unfortunately, many Darwinists seem to presuppose this fallacious inference.

The basic weakness of evolutionary explanations of cognition stems from the fact that the Darwinist process cannot distinguish true believers from false believers, as long as both have adaptive behavior. So the Darwinists *always* need a further premise: given the behavioral success of some beliefs, it is much more likely that they are generally true than generally false. This premise has various degrees of plausibility, depending on the type of beliefs under consideration. For SEs about daily life, this premise is perhaps not obviously implausible (but can still be challenged by arguments). For other beliefs, such as necessary truths and mathematics, this premise will be less plausible or even wildly implausible. I'll come to the latter point below. Edward Stein compares natural selection to a porous filter because "selection cannot distinguish between knowledge and mere useful opinion... selection as a filter... is too porous to precipitate only true theories" (Stein 1990, p. 122).

The above point can be brought out by distinguishing these two claims:

1. The possession of generally reliable sense organs is a sufficient condition for adaptivity.
2. The possession of generally reliable sense organs is a necessary condition for adaptivity.

In general, it is difficult to establish a claim like (2), because there are so many ways to survive and to adapt to the environment. In particular, we can point to the existence of innumerable species of plants to refute (2). So it is a fallacy to infer from (1) to (2). But something close to (2) is needed for a strong evolutionary explanation of the reliability of SE.

So "we cannot conclude that the origin of scientific methodology lies in its adaptive value to the human species.... The most we can conclude, on biological grounds, is that the features in question are not positively maladaptive... we need some independent means of determining which patterns are or are not adaptive—independent of whether or not they tend to survive" (Bradie 1990, p. 36). But there are general difficulties for us to do that: "The evolutionary history of the mind and its abilities is too little understood for any view to take independent comfort from the support of Darwinian lines of reasoning.... Reconstructing phylogenies is hard enough when the evidence is physical" (Bradie 1990, p. 37).

9.3.2 The Beauty of the Natural World

1. The Argument from Natural Beauty

F. R. Tennant (1956) formulates an aesthetic argument for theism that has been defended by Swinburne (1979) and Mark Wynn (1999). This is not supposed to be a proof. For example, Swinburne only claims that it is an inductive argument that raises the probability of theism. It is enough for our purpose to show that natural beauty on the whole is more coherent with theism than with naturalism.

Tennant avoids the discussions about human art works and focuses on the saturation of Nature with beauty. In contrast, man's productions (other than professed works of art) are aesthetically vile. Theism seems to be an obvious explanation of this fact: nature is expected to be beautiful if it is the work of the Divine Mind, and more particularly of a mind attuned to aesthetic kinds of fulfillment. So natural beauty is some evidence for theism.

Tennant anticipates an obvious rejoinder: the denial of the objectivity of aesthetic judgment. However, he claims that this controversial question is irrelevant to his argument: "For the doctrine that aesthetic value is constituted by feeling does not imply that the feeling is not objectively evoked, as if we could see beauty when and where we chose... Thus diverse theories as to the constitution of beauty may be said to have in common the implication that the ontal world is ultimately responsible for the evocation of aesthetic thrills and sentiments" (Tennant 1956, pp. 89–90). The idea is that even if aesthetic judgment is by nature subjective, for example, constituted by a form of human sensibility, we still need to explain the fact that various aspects of nature, though not objectively beautiful in themselves, can still evoke the proper aesthetic feelings from our human sensibility.

Let me distinguish four different world scenarios:

- W1. Aesthetic sensibility exists in the world, and the world is judged by that kind of aesthetic sensibility to be saturated with beauty.
- W2. Nothing like aesthetic sensibility exists in the world.
- W3. Aesthetic sensibility exists in the world, and the world is judged by that kind of aesthetic sensibility to be largely devoid of beauty.
- W4. Aesthetic sensibility exists in the world, and the world is judged by that kind of aesthetic sensibility to be largely ugly.

There is no assumption that aesthetic properties objectively belong to the world, though it is not denied, either. Both Tennant and Swinburne think that obviously W1 is a correct description of our actual world. Let us suppose this is right. Then the obvious question is why should W1 obtain, when all four world scenarios are possible.

Especially in the naturalistic world, objective aesthetic values are not likely to exist, and hence they cannot have causal effects on the world. It is *conceivable* that somehow W1 obtains, but there is no particular reason that this should happen, because W2 and W3 are equally likely, if not more likely. In a naturalistic world, nothing much depends on which scenario

obtains as far as survival is concerned. Suppose genuine aesthetic sensibility, which admits of rational discussions, is confined to the human species alone. Then W2 was the correct description of our world before the emergence of human beings. Aesthetic sensibility seems to be an accident that is largely epiphenomenal or redundant. Just remember the fact that millions of biological species (in fact, all except one) manage to survive pretty well without the blessing of aesthetic sensibility. So any evolutionary explanation that ties biological survival to aesthetic sensibility too strongly needs to explain another fact: the overwhelming majority of the biological organisms manage to go without the alleged survival advantage conferred by aesthetic sensibility completely. So it is most likely that aesthetic sensibility is a spandrel.

If evolutionists admit that aesthetic sensibility is a spandrel, say, the by-product of a beneficial mutation, then they should also admit they cannot predict the particular shape of this spandrel. Let us compare the existing world to a lock with a definite structure. Then the emergent key of aesthetic sensibility may fit the lock or not. Since the shape of the lock has been fixed before the appearance of the key, and the key is supposed to be generated by a random process (with absolutely no idea what the lock is like at all), it is quite improbable that such a key will fit the lock. After all, it stands to reason that there are vastly many more ways the key will not fit the lock than there are ways the key will fit the lock. So W3 seems more likely than W1.

It may look as if W4 should be less likely than the other scenarios, because living in an ugly world makes one's survival very unpleasant. But we cannot be sure of this judgment because the evolutionary psychologists have an impressive track record of creative theorizing. Suppose W4 were the actual world. Do you really think that it would be beyond the capacity of an E. O. Wilson or Robert Wright in W4 to produce an evolutionary explanation of the ugliness of that world? I guess not. I can imagine Wilson in W4 writing a book called *Biophobia*, which produces a selectionist explanation such as this: since the human species finds ugliness everywhere, it poses a challenge and provokes a desire to refashion our world into a beautiful world. This, in turn, will stimulate the development of our rational power and technology. Of course, if this explanation fails, there is always the possibility of a spandrel "explanation." After all, we have to live in this world, and hence sooner or later we have to get used to the ugliness that surrounds us. Once the feeling of discomfort is reduced to a tolerable level, I cannot see any substantial disadvantage incurred here, since this is not likely to affect our reproductive activities. Anyway, even if the experience of ugliness incurs a slight disadvantage, it is always possible that this will be more than compensated by the positive effects of the beneficial mutation that is supposed to produce the spandrel of aesthetic sensibility in the first place.

If you object that this is a just-so story without empirical corroboration, and hence has little intrinsic credibility, then you are objecting to one basic game rule of evolutionary psychology. I am, in fact, sympathetic to this objection, but I do not want to assume this at this stage of the argument.

The reason is that without rejecting the current practice of evolutionary psychology and disputing the evolutionary explanations currently offered for W1, I can still argue for my favored conclusion. My strategy is to assume the success of the naturalistic project of evolutionary psychology. Then I argue that exactly because it is successful (maybe too successful), all scenarios from W1 to W4 are equally likely, and hence evolutionary naturalism does not lead us to expect one over the others.

So my conclusion is that, from the naturalistic perspective, there is no particular reason that W1 should obtain rather than W2 to W4. However, the theist has much more reason to expect W1, rather than the others. So the obtaining of W1 is better explained by theism than by naturalism. In Swinburne's words, "God has reason, apparently overriding reason, for making, not merely any orderly world...but a beautiful world...also...he would seem to have overriding reason not to make a basically ugly world beyond the powers of creatures to improve...A priori, however, there is no particular reason for expecting a basically beautiful rather than a basically ugly world. In consequence, if the world is beautiful, that fact would be evidence for God's existence" (Swinburne 1979, p. 150). This seems to be a plausible argument.

2. The Hypothesis of Biophilia

Currently one of most popular naturalistic explanations of aesthetic experience is offered by E. O. Wilson in his book *Biophilia*, which argues that our felt affinity for the natural environment is explicable in terms of the role such an environment played in our evolution. For example, Robert Hinde notes that not only aesthetic experience, but also "mystical experiences are often triggered by natural beauty," and that "people prefer natural to artificial landscapes." His explanation is that "the appeal of some natural landscapes...is due to mechanisms developed early in the evolution of our species...Among landscapes, savannah is particularly attractive...Savannah was almost certainly the environment of early human evolution, and certain characteristic features of savannah would have provided conditions conducive to survival, such as vantage points and hiding places" (Hinde 1999, pp. 187-8).

Plausible as it sounds, this theory of biophilia, in fact, can only explain severely limited aspects of our aesthetic experience, and has been sharply criticized by Wynn and O'Hear (2008). Let us first list out various things we find beautiful in the natural world:

- B1. The beauty of the basic natural laws.
- B2. The beauty of the microscopic structure of a physical thing that can only be revealed under the microscope, for example, snowflakes, the double helix of DNA molecules.
- B3. The beauty of the visible forms of animals and plants.
- B4. The beauty of the visible forms of things that we can come into contact with, for example, mountains, savannah.

- B5. The beauty of the visible forms of things that we cannot come into contact with, for example, the starry sky, the rainbow.
- B6. The beauty of the visible forms of things that are too large or too distant for us to perceive in ordinary situations, for example, the blue planet earth as seen from a satellite, the Andromeda as seen by the telescope.

It is obvious that the biophilia hypothesis is basically inapplicable to B1, B2, B5, and B6. These counterexamples are enough to demonstrate its fundamental inadequacy. The only realms to which it may be applicable are B3 and B4. Critics may challenge that aesthetic experiences such as B5 may be biologically useful. For instance, the beauty of the starry heaven will induce an interest in the stars, which has been useful for purposes of gauging the approach of dawn. This response is weak because "it does not identify...clearly a vital connection between some feature of the world and our prospects of survival" (Wynn 1999, p. 32). I would add that the interest in the movement of the stars is more a scientific interest, than an aesthetic interest. It is quite conceivable that a Kepler or Tycho can maintain a keen scientific interest in the movement of the stars with a view to finding out their underlying patterns without the slightest aesthetic appreciation of the starry sky.

Consider aesthetic experiences such as B3. It might be suggested that we find cockroaches ugly because this will cause us to hate them and to exterminate them. This may be beneficial for our survival. However, it is difficult to see how the beauty or ugliness of flowers, for example, are in any obvious sense related to our survival. Moreover, we in fact find some dangerous predators of human beings beautiful, for example, lions and tigers (we even love to wear their skins!).

Consider aesthetic experiences such as B4. It has to be pointed out that some dangerous places, such as a desert, may also possess sublime beauty. Lakes are beautiful and look peaceful, but we can drown in them if we do not stay away. Isn't it more fitting for lakes to repel us so that we are kept safe? As Wynn points out: "we have a tendency to value aesthetically landscapes which are basically hostile to human well-being, or at any rate far removed qualitatively from the savannah type of natural environment...our appreciation of them [desert and ice landscapes] is not easily related to any drive for self-preservation" (Wynn 1999, p. 32). My feeling is that all these discussions seem largely irrelevant, because it is difficult to believe that the degree of survival-conduciveness is the key to the treasure house of aesthetic experiences!

In any case, evolutionary psychology's biological approach to aesthetic experience has not met with any consensus. Many critics point out that this biological approach is fundamentally flawed, because it has ignored the cultural influence on our aesthetic judgments and the human capacity for creativity. Charles Jencks once attended a lecture by Wilson, and he afterwards wrote a satirical response. His conclusion is that "all periods hunt for new beauty; all art at least partly focuses on the expressive plane...There will always be a key part of the expressive language that is emergent, new,

novel...and it will never be reducible to hard or soft-wiring within *Homo sapiens*. Every good artist has known this truth: that creativity concerns moves made within the language of art, independent of the neurocircuitry that responds to it...we must acknowledge the deep truth of emergence and limited creativity...we can never reduce behavior to nature, nurture or their combination" (Jencks 2000, pp. 52–3).

In view of all these criticisms, Wynn's conclusion seems to be sound: "Tennant's argument remains, in large part, cogent...evolutionary mechanisms seem to offer at most a partial explanation of...our aesthetic appreciation of the natural world" (Wynn 1999, p. 33).

9.3.3 The Argument from Intelligibility

Let us consider why the world is intelligible. Wigner talks of the existence of science as a puzzle: "Surely, our science was not necessary to assure man's survival in the Darwinian sense. No other animal has developed a science even vaguely similar to ours—it is not needed for survival" (cited in Elvee 1982, p. 123). Furthermore, the development of science, in particular physics, is miraculous:

every step in its development shows that the preceding theory was valid only approximately, and valid approximately only under certain conditions. Newton's theory is valid with a high accuracy if only gravitational forces play a role, all pre-quantum theories are valid only for macroscopic bodies and for these only under certain conditions. It is *lucky* that such special conditions exist under which simplified approximate theories present a wonderfully good approximation.... General relativity would not have been invented, not even by Einstein, had the original theory of gravitation not existed.... it was a wonderful *gift* to be provided with situations in which the laws of nature in very simplified form were excellent approximations. (in Elvee 1982, p.124; italics mine)

In a similar vein, Benjamin Wilker and Jonathan Witt argue that we cannot take the periodic table for granted, but without something like this, the development of chemistry is basically impossible: "The periodic table itself is a masterpiece of order, precision and intellectual beauty, and order that appears designed for both life and discovery...in the way the order of the elements has wrung from great scientific minds their best efforts and only then yielded up its secrets, the genius of the elements would seem also to have had in mind not merely life, but specifically the development of human genius" (Wilker and Witt 2006, p. 27). So one condition for the intelligibility of the world is the specific forms they take.

Moreover, our intellectual capacity, which is another condition for the intelligibility of the world, is also surprising. Putnam has pointed out the *prima facie* implausibility of evolutionary explanations of our intellectual abilities:

our intellectual abilities were, according to evolutionists, essentially as they are today....According to the current scientific view, all this latent intelligence (for

learning calculus and physics) was the result of natural selection.... We are, on this view, computing machines programmed by blind evolution—computing machines programmed by a fool! For evolution *is* a fool as far as knowing about calculus, or proving theorems, or making up physical theories, or inventing telephones is concerned.... selection pressure would naturally weed out members of the different humanoid species who could not learn to hunt deer, use stone axes and spears...But there was no selection pressure for being able to make up scientific theories—that was not something *any* member of the several humanoid species did *then*. So that a device molded by selection pressure to do the one thing should be able to do the other is quite a miracle—exactly as if we set a fool (who knew about hunting with stone axes and spears) to program a computer and he programmed it so that it could *also* discover the theory of relativity. (Putnam 1990, pp. 158–9)

Perhaps evolutionists can appeal to Stephen Jay Gould's famous idea of spandrels. Gould himself believes that "if any organ is...replete with spandrels the human brain must be our finest candidate...the nonadaptationist principle of spandrels may still dominate human nature...Many, if not most, universal behaviors are probably spandrels, often coopted later in human history for important secondary functions. The human brain is the most complicated device for reasoning and calculating, and for expressing emotion...most of our mental properties and potentials may be spandrels—that is, nonadaptive side consequences of building a device with such structural complexity" (Gould 2000, p. 124).

However, Putnam is critical of this kind of appeal to "concomitant variation": "Nature—which imposed the constraints on how neural connections could be manufactured and installed—does not even have the pseudo-'intelligence' that selection pressure does;...nature has no *ends*, and does not simulate having any.... So it is as if selection pressure—the fool that programmed us—had to operate subject to constraints imposed by a *moron*. And it just happened that the moron imposed such lucky constraints that the only way the fool could program us involved making us intelligent enough to do mathematics, discover general relativity, and so on!... 'concomitant variation' is just a fancy name for *coincidence*" (Putnam 1990, p. 159). It seems to me that "spandrel" is another fancy name that has gained respectability.

Steven Mithen has tried to explain how the capacity for scientific thinking has developed in the evolutionary history. He argues that our ancestors needed to employ the key elements of scientific thinking for their survival. These elements are detailed and extensive observation of the natural world; the generation of hypotheses that have the potential for falsification; a concern with causation; the use of tools to extend human perception and cognition, tools which may be no more complex than a pencil and paper (or calculator, computer, telescope, or microscope); the use of metaphor and analogy to facilitate scientific thought and to aid communication (Mithen 2002, p. 24).

I think this argument is woefully inadequate, because it has only scratched the surface of the problem. What he talks about are very elementary or low-level cognitive tasks, and it is relatively easy for us to envisage how they evolved. The progress he surveys is also minimal when compared to the achievements of modern science in recent centuries! With only those capacities, it is very likely to expect very meager output from our science. It is hard to believe that what suffices for farming (one of the evolutionary contexts that Mithen appeals to) will inevitably lead to modern science. Many deep factors that make possible the development of modern science are not even mentioned, for example, our penchant for the deep explanations, the mysterious capacity for mathematics. In some sense, intelligence certainly has survival value, but this point in itself is not a satisfactory enough explanation of science:

intelligence, in the sense of the ability to use language, manipulate tools, and so on, is not enough to enable a species to do science. It also has to have the right set of *prejudices*.... Suppose we have evolved...a firm prejudice against the unobservable.... Then we...could hunt deer...and so forth....Such a race...would not develop geometry, beyond the Egyptian level of practical land measurement, because the notion of a straight line with no thickness at all, or the notion of a point with no dimension at all, would make no sense to it. It would never speculate about atoms swarming in the void...it would never develop physics or mathematics! (Putnam 1990, p. 161)

Perhaps it is all a matter of good luck? But this is not true to the achievement of modern science: "Maybe what happens is that we just test one scientific hypothesis after another until by trial and error we come to the right one.... indeed, the history of science does not support the view that it was all trial and error...There does not seem to be anything common to all the good theories that scientists succeeded in producing except this: each was suggested by some line of thinking that seemed *reasonable*...Science is arrived at by...plausible reasoning that is often subjective, often controversial, but that, nevertheless, comes up with truths and approximate truths far more often than any trial-and error procedure could be expected to do" (Putnam 1990, p. 161).

Eugene Wigner, after surveying the development of modern physics, is deeply impressed by "the two miracles of the existence of laws of nature and of the human mind's capacity to divine them" (Wigner 1967, pp. 229–30). It is because "physics...would not be possible without a constant recurrence of miracles...[It is] surprising how readily the wonderful gift contained in the empirical law of epistemology was taken for granted. The ability of the human mind to form a string of 1000 conclusions and still remain 'right,' which was mentioned before, is a similar gift" (Wigner 1967, pp. 232–3). His conclusion is that "fundamentally, we do not know why our theories work so well... The miracle of the appropriateness of the language of mathematics for the formulation of the laws of physics is a wonderful gift which we neither understand nor deserve" (Wigner 1967, p. 237). Is the attribution of all these "miracles" to luck really plausible?

In addition to, Putnam's emphasis on our explanatory "prejudices" and plausible reasoning, let us contemplate the role of mathematics. In the realm of theoretical physics, the mathematical systems we use are so obviously human constructions (they are not determined by inputs from the world) that it is surprising that they seem to work so well. This prompts the remark about this "unreasonable effectiveness of mathematics" by a Nobel laureate, Eugene Wigner. Isn't it surprising that the evolutionary process did throw up human beings with such apparently useless (in the primitive jungles) capacities?

Michael Ruse (2003), a staunch evolutionary naturalist, tries to provide some answers to these puzzling questions. He believes that much of our cognitive machinery consists of innate dispositions: the "rules of mathematics and logic, the basic beliefs about causality and the like, the epistemic values...at some level are ingrained in our biology" (Ruse 2003, pp. 121–2). Of course, the general evolutionary strategy is to tie our cognitive capacity to survival. Quine has done that concerning induction: "Creatures inveterately wrong in their inductions have a pathetic but praiseworthy tendency to die before reproducing their kind" (Quine 1969, p. 126).

Ruse has tried to apply the same strategy to our mathematical and logical reasoning: "an intelligent primate that could see that three oranges were more than two oranges, or that thought that where two tigers were seen to enter a cave and but one emerged was a place of danger, or that simplicity is a virtue when a lion approaches, was ahead of a primate that did and thought none of these things. The proto-human who saw beaten down grass and blood stains and heard growls and who yet said, 'Tigers, just a theory not a fact', was less biologically fit than the proto-human who started running" (Ruse 2003, pp. 123–4).

But of course, the problem is how to traverse the almost *infinite* gap between the elementary capacity for counting oranges and tigers to mathematics that deal with the infinite or the infinitesimal (like transfinite arithmetic or calculus), not to mention Reimannian Geometry and the like. As J. W. Smith points out: "evolutionary considerations do not show that the world must be so mathematically accessible that its secrets can be reaped in a great and rich harvest which presumably contemporary mathematical physics has yielded. The world must encapsulate 'learnable' patterns...but this fact is consistent only with a very crude and basic mathematical accessibility of the world" (Smith 1988, p. 188). In fact, Ruse is aware of the limitations of the explanation he gives. He knows that it at most explains "the basic tools for building science," and the problem still remains of why, from these humble beginnings, the most sophisticated edifices of science can be built up. He himself raises these questions: how can biology lead to such insights as Fermat's Last Theorem, let alone its proof? "Why is it that one can peer so far into the mysteries of nature, given the rather crude principles that selection throws up? How can elementary principles of reasoning lead to higher mathematics...or to the understanding of the largest and smallest elements of possible experience?" (Ruse 2003, p. 130).

The best answer he comes up with is this: "it is generally not a good policy to assume that because we find something implausible natural selection will be likewise handicapped... science is built up from humble beginnings with initially simple tools, and you are stuck with this fact whether or not you think that it points to bigger things" (Ruse 2003, pp. 123–4). This is puzzling, but it is "simply something that the Darwinian has to accept as a given" (Ruse 2003, p. 130). In the end, he admits that mathematical beliefs are not necessary for survival at all: "whether on Andromeda, say, things would all be the same as here on earth seems to be speculative... Not that the Andromedans would have $2+2=5$,... but that they might not think in such mathematical terms at all... I do not think that the Darwinian can throw much light on some of the ultimate metaphysical questions" (Ruse 2003, p. 132). I think we do not need to consider such a distant place as the Andromeda. Plenty of biological organisms on earth illustrate the same point. Ruse's discussions suggest, and he effectively admits above, that evolution cannot answer the question about the intelligibility of the world. Ruse seems open to the possibility of a religious explanation, and admits "perhaps religion can say something useful here." But he does not develop the point.

Now suppose our mathematical reasoning is grounded biologically in some kind of epigenetic rule or algorithm that was selected for by evolution. However, Penrose says: "there can have been no selective advantage to our remote ancestors for an ability to reason about very abstractly defined infinite sets, and infinite sets of infinite sets, etc. Those ancestors were concerned with... such things as the... design of mammoth traps" (Penrose 1995, p. 148).

The power of this algorithm to solve *unforeseen problems* is just astounding: "The algorithm would have to have encompassed... the potential for making precise discriminations, distinguishing valid from invalid arguments in all the, then, yet-to-be-discovered areas of mathematical activity that nowadays occupy the pages of mathematical research journals." The basic problem is: "How could the blind processes of natural selection, geared only to promote the survival of our remote ancestors, have been able to 'foresee' that such-and-such an unknowably sound computational procedure would be able to resolve obscure mathematical issues that had no relevance whatsoever to those survival issues?" (Penrose 1995, pp. 149–50).

Furthermore, it is even more surprising that considerations of elegance and beauty in mathematics work quite well. The most impressive example is Einstein's general relativity, which, according to Roger Penrose, shows the deep underlying unity between mathematics and the workings of the world: "When Einstein's theory was first put forward, there was really no need for it on observational grounds... In the early years after Einstein's theory was put forward, there were only a few effects that supported it, and the increase in precision over Newton's scheme was marginal... now, nearly 80 years after the theory was first produced, its overall precision has grown to something like ten million times greater. Einstein was not just 'noticing patterns'

in the behaviour of physical objects. He was uncovering a profound mathematical substructure that was already hidden" (Penrose 1995, p. 415).

Even the atheist Nicholas Maxwell wonders at the mysterious problem of the unreasonable effectiveness of mathematics: "One especially mysterious feature of scientific discovery is the way in which mathematical ideas, developed, it would seem, independently of theoretical physics, nevertheless subsequently turn out to be exactly what is needed in order to delineate some aspect of physical phenomena. Thus Menaechmus, in 350 BC, invents the idea of conic sections... [e.g.] the circle, the hyperbola, the ellipse, and the parabola. Over 1,000 years later, Kepler discovers that the planets move in ellipses round the sun, while Galileo discovers that terrestrial projectiles move along parabolas. Again, Gauss and Riemann, in the nineteenth century, develop the idea of curved non-Euclidean or Riemannian space. Yet again, the mathematician David Hilbert develops the idea of 'Hilbert space', a 'space' of functions, a purely mathematical notion. Subsequently, it turns out that it is just this that is needed in order to formulate quantum theory. It almost seems that the minds of mathematicians and the nature of physical reality are mysteriously in harmony with one another" (Maxwell 1998, p. 74).

Penrose also dwells on this mystery: "More remarkable is the subtlety of the mathematics that seems to be involved in Nature's laws, and the habit that such mathematics seems to have in finding applications in areas far removed from its original purpose... [e.g.] calculus of Newton and Leibniz" (Penrose 2007, p. 1016). So "despite our distance from our intended goal, we have come to a remarkably impressive understanding of the operations of the universe at the deepest levels that we know" (Penrose 2007, p. 1034). But when we look back, we find that the magic of mathematics has played an indispensable role in this "miraculous" road to reality.

The theoretical physicist Polkinghorne argues that this surprising fact "finds coherent explanation in terms of natural theology" (Polkinghorne 1991, p. 28). Maxwell recognizes that theism can provide an answer: "if God exists, we can understand why the physical universe is comprehensible to us" (Maxwell 1998, p. 206). In the end, Maxwell is not a theist, because of the problem of evil, but his discussions suggest that the argument from intelligibility has independent force.

Putnam's "view is that the success of science cannot be anything but a puzzle as long as we view concepts and objects as radically independent" (Putnam 1990, p. 162). Putnam's solution is to assert that reality is partly constituted by *our* concepts. This seems counterintuitive. The theist seems able to offer a more natural explanation of this puzzle: the rapport of the mind with nature is due to the fact that both were derived from the same source, the Prime Reason, that is, God. This accounts for the surprising intelligibility of the world, while at the same time saves the strong realist intuition that reality is independent of *our* concepts. On the other hand, it can also accommodate the antirealist insight that reality and concepts are not ultimately separable: but the concepts in question are those of God, rather than ours.

9.3.4 The Multiple Convergence of Truth, Beauty, and Intelligibility

Let us summarize the data:

- e_1 Our SE is reliable.
- e_2 Our SE is adaptable for the enjoyment of aesthetic experience.
- e_3 The natural world is beautiful at many levels.
- e_4 The beauty of natural laws is one important truth-indicator.
- e_5 Our cognitive capacities and dispositions are adaptable for significant scientific discovery of the truths of the natural world.
- e_6 The form of the natural laws is adaptable for our scientific discovery.

I want to emphasize that the above data, from the naturalistic perspective, are independent of one another. Evolutionary naturalism perhaps has some reason (however slight) to expect e_1 , but beyond that, to put it mildly, the natural world wonderfully exceeds all reasonable expectations. The beauty of the world, and our aesthetic experience of it, seem something extraneous to our survival. Moreover, our senses seem wonderfully equipped for aesthetic experience beyond expectation from the very beginning. A black-white vision can provide discriminative information relevant to our survival and the high-tech color vision that we possess is not necessary at all, not to mention the qualitative aspects of our SE. The beauty at the level of natural law and the beauty of physical forms in nature (microscopic and macroscopic) are also independent. There is no particular reason the laws have to be beautiful or elegant. The convergence of Truth and Beauty in our world is, itself, a mystery.

Another mystery is the convergence of cosmic rationality and human rationality. Even if humans have reliable sense organs or some elementary capacity for counting, there is no reason to expect that organisms that emerge from the struggle for survival in primitive jungles, or whatever evolutionary context, will develop sophisticated capacities for mathematics, logic, plausible reasoning, and a penchant for depth explanation. Moreover, even if humans do develop these capacities and dispositions accidentally, the universe has to “cooperate”—the natural laws may be too deep or complicated for us to grasp. But contrarily, the laws are not only intelligible to us, but, as Wigner suggests, the form of the basic laws is such that it can be approximated in successive stages by simpler laws, which are much easier for us to discover. So the deep truth of the natural world seems adaptable for our science before we emerge on the scene. All these, I suggest, are conundrums in the naturalistic world. The problem is aggravated by the “miraculous” coordination of several realms.

Roger Penrose has a keen awareness of the magnitude of the problems here, although he does not adopt the theistic solution. He considers these three worlds: the world of our consciousness, the physical world, and the Platonic world of mathematical forms. The mystery is manifold: first, the “mystery of why such precise and profoundly mathematical laws play such

an important role in the behaviour of the physical world. Somehow the very world of physical reality seems almost mysteriously to emerge out of the Platonic world of mathematics.” The second mystery is “how it is that perceiving beings can arise from out of the physical world. How is it that subtly organized material objects can mysteriously conjure up mental entities from out of its material substance? ... [There is also the] mystery of how it is that mentality is able seemingly to ‘create’ mathematical concepts out of some kind of mental model. These apparently vague, unreliable, and often inappropriate mental tools... appear nevertheless mysteriously able... to conjure up abstract mathematical forms” (Penrose 1995, pp. 413–4).

In a later book, Penrose continues to contemplate these mysteries: “Why... each of three worlds—Platonic-mathematical, physical, and mental—has its own kind of reality and where each is (deeply and mysteriously) founded in the one that precedes it... where each seems to be able to encompass the succeeding one in its entirety, while itself seeming to depend only upon a small part of its predecessor?” (Penrose 2007, p. 1029).

Penrose believes that there is a deeper truth: “No doubt there are not really three worlds but *one*, the true nature of which we do not even glimpse at present” (Penrose 1995, p. 420). My proposal is that to solve the problem of coordination, we need to have a unitary source that has access to all three worlds and also the power to shape the natural world and the mental world. It seems that only God can do that. Moreover, the convergence of Truth and Beauty, and the convergence of cosmic rationality and human rationality, are to be expected on theism. In light of H_0 , it can be seen to be part of God’s purpose: our relationship with him is partly realized by rational pursuit of an understanding of this created world and our aesthetic enjoyment of the world as a wonderful gift from God. All the pieces of data and their coordination can be explained. Hence, it seems to me $P(e_1.e_2...e_6/H_0)$ is greater than $P(e_1.e_2...e_6/H_n)$, and these data relatively confirm theism.

9.4 Conclusion

Narrow empiricists believe that SE and science are on their side. In this chapter, I pointed out that from the intrinsic features of SE to the deliverances of SE about the natural world, we are everywhere confronted by “mystery,” which also seems to point to a transcendent realm. SE is, in fact, the friend of the CTA.