

Endmatter

AN ESSAY ON BEAUTY: SOME IMPLICATIONS OF BEAUTY IN THE NATURAL WORLD

by *Thomas K. Shotwell*

Abstract. The beauty of the universe presented by modern science under the positivist approach is regarded as sufficiently great that human contemplative capabilities are exceeded. An example of bottom-up viewing is presented and described as capable of producing levels of excitement best described as dangerous neurological storms. The existential quiescence resulting from apprehension of so much grandeur is discussed. It is suggested that our religious propensities need extensive rehabilitation and that appreciation of the beauty revealed by the positivists is likely to result in a cosmic paradigm shift that could destabilize traditional views of human identity.

Keywords: beauty; cosmology; evolution; logical positivism; positivism; reductionism.

If the magnificent sweep of life in this cosmos as seen through the eyes of positivistic science is such that we humans can safely apprehend only bits and pieces of it, and if even those limited apprehensions of which we are capable produce dangerous levels of central nervous system activity because of the inability of our primate brains to contemplate so much wondrous beauty, and if the stage upon which human life is played out is so stunningly grand that we cannot dwell upon its beauty at length without overstimulating our brains, then summarily dismissing the reductionist's view as inadequate may no longer be appropriate. Further, the fundamental questions of who, where, and what we are and the essence of our existence should be redefined in ways that are congruent with the best scientific knowledge available to us.

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To the extent that our religions have developed, or were invented, so as to provide an escape from the harshness of life on earth and/or to compel most people into altruistic behavior so as to make civilization possible, we probably should return to the beginning and explore the possibility of new systems of thought that take into consideration the beauty we now perceive. This paper suggests that modern reductionistic, positivistic science has revealed that the stage on which our lives are played out constitutes a grand edifice, a wondrous cosmos that we now, for the first time, begin to understand because of the information constructed piece by piece over the last century. We are today compelled to concede that the cosmos has been virtually invisible to all past generations. Such a concession includes numerous ramifications which, if true, demand that we consider the implications for our traditions, both sacred and profane.

BEAUTY FROM THE SCIENTIFIC PERSPECTIVE

The scientific revolution has unveiled, at least for those who are interested and willing to spend a few years learning, an entirely different world than anyone imagined a few decades ago. Because many people now recognize that the world is not at all what we had imagined it to be, the scholarly communities in the West and in parts of the East are listening to a cacophony of new ideas.

The search for greater understanding seems appropriate, but I am concerned that the feverish pursuit of completed knowledge, including the assumption of inherent purpose and meaning, has been motivated by deeply ingrained fears and hopes that are learned—fears and hopes that are neither justified by the nature of things nor intrinsic in the fabric of human intelligence. We seem to have been motivated by what is now clearly a terrible misapprehension of the cosmos, a misapprehension of its integrity, its justness, and above all, its beauty.

While going about their work, scientists have occasionally reported experiences of awe for the natural world, but they have said little about it.¹ Although traditionally, the perception of beauty has been understood to be the sole domain of humans, even a casual review of the behavior of our animal associates now reveals that beauty plays a significant role in the evolution of many species. For example, one can hardly deny that the female bird of paradise is lured by the colorful courtship display of the male. Numerous examples from other species can be given; yet, leading scientists, philosophers, and theologians have assigned the phenomenon of natural beauty little priority, probably because it remains such a difficult subject. Darwin

did mention grandeur in the closing lines of the *Origin*. Teilhard de Chardin not only focused on questions of directionality, on the past and future of things, but also perceived the complexity and the sacramentality of material nature per se.

Indeed, such attention as has been given to the question of natural beauty by theologians is often critical. Langdon Gilkey, for example, has described Carl Sagan as no friend of religion (Gilkey 1990). And while Gilkey and I have arrived at the same conclusion about the implications of natural beauty, we came from opposite directions to get there, and we arrived with a profoundly different perception. He contends that attention to the natural beauty of the cosmos detracts from true religion, while I have concluded that it results in opening the way to a new understanding of what religion ought to be. I hold that beauty—the subject of this paper—and the insistence on hope and the search for purpose—the basis of most modern religions, especially Christianity—cannot really be separated. Therefore, the subject of religion is here unavoidable. If it is true that Neanderthals placed flowers on the graves of loved ones, that would suggest that humans have always been recognizable because their interest in beauty seemed greater than that of other species. Most civilizations have created great beauty. But without the detailed knowledge of the scientific revolution, Michelangelo or Goethe could not, and without it we today cannot fully grasp the majesty of the cosmos. One's ability to assimilate the nature of the cosmos is dependent upon the extent to which one has a command of the findings of physics, astronomy, astrophysics, chemistry, biology, and anthropology—in short, on the findings of modern science.

In the past, we created for ourselves a world with lots of ugly and little of beauty, a situation that also left us in desperate need of alternatives to a foul existence. We focused on the local, the now, and the specific, while ignoring the larger view. The religions we created were the result of our views. In his lifelong study of comparative mythology, Joseph Campbell seems to have made it clear enough that the religions of hunters and gatherers and the religions of those whose lives were in settled agricultural communities can be understood as spontaneous, metaphorical reflections on the structure of their worldviews and their intelligence. Their religions reflect their attempts to make sense of the cosmos. Because their lives were often similar, their religions were often similar. His work says little, however, about the suitability of these ancient metaphors for modern, scientifically literate humans. To my knowledge, Campbell did not address that issue, at least not directly.

My interest is only to communicate some of the apparent

possibilities and implications that can result from a good understanding of the scientific information now available about the cosmos. Although the personal experiences of grandeur in the example which follows are of a kind rarely discussed, many scientists apparently share the same perceptions and, to varying extents, the same view.

The modern scientific view of life begins with the smallest of things, subatomic units, and moves to the largest of things, the cosmos, and to the most immediate of things, the self. If this view is reasonably correct, it is of considerable importance. It is precisely the comprehensive modern scientific body of knowledge that makes possible our apprehension of our presence in an unbearably beautiful natural world, a world so overwhelming that fundamental questions are raised about that search for complete understanding which quite literally has characterized our species. This knowledge suggests that we can be existentially quiescent if we perceive the universe for what it really is. Beauty tranquilizes.

Because great minds have spoken so often of the importance of beauty, one suspects the idea of its sedative powers should not be described as something newly discovered. After all, when the great Chinese emperor faced death, it was the beauty of the nightingale's song that gave him the equanimity needed to live on with some dignity. The following personal experience may help to illustrate the results of bottom-up viewing. It is selected from literally dozens of such experiences. Some were spontaneous, apparently the result of a series of coincidences, while others were intentional, the simple result of methodically seeing things in terms of their origins. The spontaneous ones seem to leave a more lasting impression, probably because of the element of surprise.

BOTTOM-UP VIEWING—AN EXAMPLE

Through the rural community of Charles City in northern Iowa, where I lived from 1966 through 1970, a small river wound its way among parks, shops, and bars. The hulk of an old hydroelectric generator stood as a lonely sentinel, casting its shadow over the eight-foot-high dam built long ago to trap the river's energy. The lazy blue-green river trickled an inch or two deep over the fifty-yard-wide dam, except when the floods came. And natives saw their little river with its quaint electric generator as symbolic of the mix of semimodernity and quiet agrarian culture they pursued. They had an ongoing love affair with the river and had, from the beginning, constructed buildings dangerously close to the flood line.

The Melody Lounge had taken over one of these precariously perched old buildings, and the owners installed a large plate glass window in such a manner as to provide a scenic view of the river, the dam, and the hydroelectric plant. Thoughtful (and a few not-so-thoughtful) people could be found just about every evening sipping beer, watching go-go dancers, and musing about the soft summers and harsh winters so characteristic of the upper midwestern states. Once or twice each month I made it my duty to dwell upon the poetry at the Melody Lounge.

The long summer days offered plenty of after-work daylight for sports, and four of us who worked in drug metabolism had grown to enjoy our vigorous, if somewhat amateurish, games of doubles tennis in the evenings. After long hours of laboratory tedium, we released a lot of our tensions through an almost frenetic series of tennis matches. Sometimes clownish, sometimes with startling precision, we attacked the balls and each other with gusto and good humor. One summer evening after several particularly vigorous games, dripping with sweat and our limbs weak from exertion, we agreed to have a beer or two at the Melody.

An unusually heavy rain had fallen steadily for two days, and the straw gold of a setting sun gently sifted through straggler clouds to illuminate the river. The quiet stream had been transformed by the rains into a tumultuous little Niagara, where murky water leaped angrily over the dam and exploded its surprising store of energy on stones placed by men whose lives had ended years before. I mused about the transitory nature of this life and, just for fun, silently enumerated the kinds of atoms and molecules I knew made up a flooded river. The hydrogen and oxygen of water were supplemented by myriads of other atoms swept from soils and rocks upstream, and as I sat in the quiet lounge, I recapitulated what I knew about the origin of the elements in the hearts of glowing stars and exploding suns of the Milky Way. Atoms don't just exist. They are the products of eons of evolution in the galaxy, products of chaos and pressure and time and space and whatever it is that we humans call natural law.

Very intentionally, I sat quietly sipping my beer and ruminating over what I knew about the sources of order, the nature of duration, of genetic explanation, of subatomic particles, of strong and weak forces, gravity, atoms, planets, and meandering streams. It was fun to stack it all up in my mind, building a structure from the presumed Big Bang, the origin of things, to the emergence of suns, quasars, black holes, elements, planets, and flowing streams. I let it build from the bottom up, edited it, worried over the numerous assumptions in

it, filled in the gaps where I had jumped over something, edited it all over again, looked, with the mind's eye, back at it all and examined it again and again. As I probed the chemistry and physics of this magnificent little capillary of the earth, I sat frozen in rapture over its great complexity and its stunning evolutionary history as if I had never seen a river before.

What we have discovered about the cosmos is far more important than we have generally recognized. Scientists, unlike physicians, normally spend their lives in intricate research on and meticulous analysis of one or two very specific phenomena. Physicians must study their patient quickly, make their decision on the basis of available knowledge, treat the patient, and live with the consequences—and do this several times every day. Scientists may work for a lifetime on a single tiny subject and never resolve it. Typically, we work more like airline pilots—living lives of boring data generation and laborious data analysis involving great monotony interspersed now and then, if we are lucky, with a few moments of great excitement. We count and classify and test and retest. Every answer we generate seems to bring a cargo of new and often inscrutable questions, each of which can consume a lifetime. As we have specialized and narrowed our fields of inquiry, we have, to a considerable extent, failed to recognize the as yet incomplete but grand edifice we have constructed piece by piece. Up close, it has been said, a magnificent violin concerto is the sound made by the scraping of the tails of horses on the guts of cats. The universe we inhabit is like that. The scraping of the tails of horses on the guts of cats can be a stunning experience!

I turned to Bernard Colvin, a colleague who sat beside me, and softly suggested that he take notice of the river because it was a particularly beautiful sight. Colvin was a biochemist who had been struggling with the entry of some of our new drug's metabolites into Krebs cycle, and he had been, for what seemed like months on end, collecting and analyzing bile, urine, and feces from the dosed turkeys we had stanchioned in the laboratory. He was a man of extraordinary scientific talent and had obtained his doctorate doing very similar metabolic work; but he was also a pragmatist in the best tradition of John Dewey. When he looked at the muddy river as I had suggested, he exclaimed, "Yeah, and if it gets any higher it will come right through that window!" Finished with his look and finished with me, he turned to call for another beer.

Annoyed that I had communicated so poorly and resigned to enjoy my view alone, I leaned back to relax and soak up more of the spectacle that lay before me. I guess several minutes passed—I sort of

lost track of the time—but before long my attention to the intricacies of the physical world was broken by a booming male voice over a speaker announcing, “It’s dance time!” Our little group of four to six, depending on the kind of problems we faced, had for several months been engaged in uncovering the pathways for metabolism of 3,5-dinitrosalicylic acid, 5-nitrofurfurilidene hydrazide, a compound remarkable for its usefulness in preventing an invariably lethal disease transmitted from turkey to turkey through their unsavory habit of eating earthworms. Studies on thousands of turkeys had revealed not only that a few pinches of the new drug in a ton of turkey feed were quite enough to prevent the disease and even to cure sick birds, but also that, for reasons we could not explain, treated birds grew 5 to 10 percent faster while eating about 8 percent less feed than perfectly healthy, untreated birds.

We imagined the growth came about because of some hidden antibacterial activity, or perhaps some impact on hormonal control of the growth process. Oliver Peterson, our vice president of research, had challenged us to find out what was happening so that we could convert that new knowledge into useful products. Reports went out every week on the status of our findings. Antibacterial activity proved to be too trivial to account for any growth, and the metabolic charts on the lab walls grew inch by inch as we added still another confirmed energy transfer pathway. It was slow, methodical, and tedious work, but it was happening. We imagined only time could stop us. Not being myself a formally trained biochemist, I was surprised at the near perfect match between human metabolism and that of the turkey. We almost daily compared where we were to where others had been while studying human metabolism. Another colleague, Joe Morrison, had taken me aside and given me a short course on energy transfer systems. After all, it seemed that if we were to discover how turkeys grew faster while eating less feed, we would have to trace it through in the metabolic energy transfer mechanisms of the turkey.

Behind me, the music and the dancer swept away my thoughts of water, minerals, and the evolution of matter and planets. I sat awhile intently peering out the window in hopes it would all come back. The violent muddy river churned on, oblivious of my frustration, and lashed away at the obstacles in its own path. As I finally pushed back from the window, the angle of my vantage point changed a bit, and the dancer behind me became fully reflected in the window, superimposed, as it were, on the river view I had found so fascinating. Mental closeness to a roaring river and all it signifies had been a thrilling and rhapsodic experience of seemingly endless fascination, but now

the experience changed by several orders of magnitude. Now, just as the reflection from the glass had superimposed the dancer on the river, my mind superimposed the myriad bits of knowledge that I had collected about the evolution of life, about the biochemistry of energy transfer systems, and about vertebrate evolution, onto the grand view of the inorganic world I had just assembled. Involuntarily, I assembled my knowledge of the living world onto my knowledge of the nonliving world. This was no dream; it was the assemblage of what science has revealed. There was nothing metaphoric or metaphysical about it. In seconds the grand edifice, from bottom to top, was complete. Dumbfounded at the scope of my knowledge, I sat stunned and unable to breathe while tears poured down my face.

Years of teaching general biology, botany, and zoology, and of working with laboratory researchers, had given me a commanding view of life, an intellectual confidence about the nature of things, and a level of conviction sufficient that I knew I would never again experience life in the simple and traditional ways of most Westerners. Wolfgang Pauli had introduced me to the world of life and Julian Huxley and J. B. S. Haldane were among those who had ushered me upon the way, but I never bargained for this. The process by which I had erected a grand edifice of the evolutionary history of a muddy river by assembling each understanding, bit by bit, into a whole had taken over and assimilated just about everything I knew into a colossal view of physics, astronomy, inorganic and organic chemistry, biochemistry, biology, philosophy, and mind—a great panoramic view of unbearable grandeur. The scantily dressed dancer became a technicolor display of the biochemical intricacies we had labored over so hard. She became an apparition of the history of sidereal time. As Richard Dawkins² might put it today, “Oh what wonders the blind watchmaker hath wrought!” As I watched her vertebrate muscles smoothly bound and rebound, and as her magnificent nervous system directed the shifting of her body in rhythmic perfection with the music, I realized I was seeing an almost surreal depiction of all the knowledge many, many years of study had given me. I was standing on the shoulders of ten thousand giants!

Almost twenty years later the memories remain vivid and hauntingly beautiful. Now, somehow, Loren Eiseley's sad story about human loneliness³ no longer has any bite. It is another true but unimportant story that fades into trivia in the presence of the overwhelming beauty of a gargantuan, purposeless, meaningless universe driven to complexity by chaos. In this view it doesn't matter whether there is a god hiding in the celestial bushes or not. Within this new

world we are free, profoundly and utterly free, in the midst of awesome beauty.

Suddenly I began to breathe, but the pounding of my heart and my clear inability to control what was happening in my mind frightened me so completely that I turned away to escape. Moments later I looked back, and again the grandeur of the view quickly caused so much excitement that I could not continue. I was forced to turn away again and again. Each time I turned away the neurological storms in my brain subsided, and each time I looked back they grew again, although not quite to the same heights as before. Gradually the conceptual cascades and the emotional furor subsided. After a few minutes I recovered, told my friends good night, and started home.

A FIFTEEN-BILLION-YEAR BOTTOM-UP VIEW

With apologies to Michael Polanyi and Karl Popper, I insist it is not a detraction from positivism to assemble its various findings in the mind's eye so as to visualize the overall nature of the cosmos—just as it is not a detraction from cartography to assemble many little maps into a big one. Thus, the long battle over the adequacy of positivism may need to be considered in a new light.

The scientific view described herein begins with the origin of energy, matter, space, and time and sees the present universe as the result of billions of years of interactions between energy, matter, and space. Then it moves to the view that, absurd or not, what exists is awesomely complex and beautiful beyond contemplation. It does not ignore human degradation but places life in a cosmic perspective and has nothing to say about how to cope with our own existence. Philosophy and art may still be the best ways to cope, but the result will surely be different.

SOME CONCLUSIONS

All of this might amount to so much babble if the beauty of the cosmos were within our ability to grasp, to understand, and to appreciate. But it isn't. As I sat in the Melody Lounge contemplating the universe, I was not able to bear the grandeur. As my scattered knowledge of the universe came together in my mind like some map-maker's dream, I repeatedly turned away from the view of the muddy river to allow the excitement to subside because I feared to do otherwise would cost me my sanity—if not my life. The wondrous beauty I perceived triggered no fear of the universe. Quite the contrary. I felt warm and close and a part of the grandeur. To describe the

experience as one of “awe” is utterly incorrect, if awe implies fear or self-abnegative reverence. The only fear was that the sustained heavy electrical storms in my brain would exceed my neurological limits. I was frightened about the possibility of being dangerously overexcited. Nothing about the experience seemed to suggest that I was in any way experiencing self-abnegation. Indeed, inasmuch as the various experiences increased my confidence in my own adequacy, my own understanding of who and what I am, the opposite of self-abnegation was the result.

So just what happens when one comes to the realization that one’s existence occurs in the midst of unbearable grandeur? The first effect of this new worldview seems to be to remove the burning need for a full and closed account of the nature and origin of everything. Beauty has a sedative and exhilarating effect. Rather than being horrified, I walked away from the Melody Lounge elated. Traditional wisdom holds that loss of confidence in the world’s teleological myths results in intellectual and moral anarchy with its associated social chaos—in short, the end of civilization. If this is correct, then of course those who share the positivists’ fifteen-billion-year nonteleological view would do well to tell no one about it. But can it be ethical to tell no one about something of great beauty? The burning existential need for inherent meaningfulness in the universe disappears under the tranquilizing and exhilarating power of beauty. The calm search for understanding and the unfathomable beauty of what we do understand may be quite sufficient as civilizing influences.

Becoming aware of overwhelming beauty may cause one to desire to share the view with others; however, as I found with my biochemist friend Bernard Colvin at the Melody Lounge, one cannot direct attention to a particular wondrous landscape and reasonably expect many others to immediately perceive grandeur. Where I saw beauty, Colvin saw an ugly, muddy, dangerously flooded river. Nevertheless, this view of life is not personal; it can be observed by others and need not remain an aesthetic perception available only to the few. It is only required that deeply informed beholders view the cosmos from the bottom up, i.e., from the earliest to the most recent, from the simple to the complex, and on a grand scale. And while the effort needed to develop the necessary understandings may seem heroic today, future generations may find mastery of the sciences to be an easy matter.

Mythology, Joseph Campbell has observed somewhere, is a metaphoric reflection of the psychological posture of the species. Nothing in the preceding pages suggests Campbell was in any way wrong on this point. The account suggests, in fact, that the

psychological state of the human species can be modified if the stage upon which we live is seen from a new perspective. The first time I jokingly reminded a friend that a violin concerto is the scraping of the tails of horses on the guts of cats, the response was outrage at such a “degrading” observation. Others have noted that such an observation is the epitome of reductionist science and constitutes sufficient reason to abhor what science is all about. Diamonds, science says, are just compressed soot; rocks are just mixtures of toxic elements; soil is just the debris of decaying life-forms mixed with particles of rock; green plants are just chemical systems that convert radiant energy into chemical energy; animals are just plants that kill to obtain energy; humans are just complex biochemical machines; etc., ad nauseam.

All that is true and quite wonderful. We are biochemical machines. There is no longer a great mystery about our origins, about our biochemistry, or about our identity. Science has stripped away the mystery, and, in doing so, has revealed a majestic specter that no previous generation could have imagined, much less admired. The overall worldview of modern science is indeed sublime, but few in the humanities have any inkling of its grandeur. The psychological posture of our species will change if the perspective changes. Meanwhile, many have become increasingly distracted by the misfit between science and the psychologies and mythologies of the ancient religions to which various societies cling. The result seems apocalyptic for some, and there is growing concern that civilization itself may suffer from too many broken lives in each generation.

But having seen the universe through the eyes of science, we can now employ symbols and metaphors—the stuff of religion—to teach a worldview superior to any that have gone before. The question is whether or not we can and should do so in an organized manner. When William Blake wrote “Tiger, Tiger” he was wrestling with one of the deepest contradictions inherent in the creation myths, the coexistence of beauty and violence. One can only speculate about what might be written by today’s romanticists if they could see this world of tigers, humans, and quasars through the eyes of the modern scientist. Nevertheless, society is not waiting for our response. Teaching of the new view is already under way, as can be seen in scientific presentations on television and in modern literature. We haven’t thought much about it, and, in the end, the resultant worldview may not be called a religion. It surely is not teleological and cannot become so without losing its identity. In any case, careful, comprehensive rehabilitation of our religious propensities would seem to be in order. We truly need a new map of knowledge. Although logical

positivism lacks the philosophical underpinnings necessary for a fully acceptable map, the positivists' view of how to approach knowing has been stunningly successful. It may spread and last a hundred thousand years, or it may disappear, as Robert Heilbroner has predicted.⁴ It seems we have far more to fear from each other than from the cosmos.

NOTES

1. As a rule, albeit an unwritten rule, scientists are forbidden to discuss the social and aesthetic implications of their findings. It is a taboo considered necessary to maintain the integrity of free inquiry. A single modest statement is tolerated by refereed scientific journals. Carl Sagan's book *Cosmos*, and the television series by the same name, clearly violate this taboo, and he has been roundly criticized for having indulged repeatedly in activities designed to "popularize" science. For a more recent example of the restraint customarily exercised by the scientific community, see Odenwald 1990, 25-45. Odenwald only once commented on the beauty of the view, saying, "modern definitions of space, time, and matter are far more sublime than our ancestors could have imagined."

2. Dawkins's 1986 book has been disturbing to many. He has been accused (Stove 1992) of both moral and intellectual mischief. A clearer case of conflicting intellectual paradigms can hardly be imagined. Another Huxley versus Wilberforce debate may be on the horizon.

3. Eiseley was reacting to discovery of the mental capabilities of the porpoise while recognizing that we will never be able to communicate with them (Eiseley 1960).

4. Heilbroner (1980, 1991) originally suggested an authoritarian clergy to be the only viable form of government for the future, but his 1991 edition of the same book seems more open to alternatives.

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