Molding the Self
and
The Common Cognitive Sources of Science and Religion

When we consider what religion is for mankind, and what science is, it is no exaggeration to say that the future course of history depends upon the decision of this generation as to the relations between them.

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June 18, 1999

An understanding of knowing is the key to seeing education as transformation. From a partial view of knowing stems not only an impoverished imagination of education but also the radical and misguided separation of science and spirituality. This separation has been an important factor in shaping Western culture for centuries, and more recently is reflected in higher education. When we have re-grounded both science and spirituality in the soil of experience, we will find ways of establishing the fruitful relationship between our intellectual and moral lives and appreciate the common cognitive source for both.

Epiphanic Knowing

Knowledge is an event not an object. Consider the following two examples.

A physics professor stands before his class with a pile of stones at his side. Talking and gesticulating to his students, he is seen to occasionally pick up a stone and throw it through the air. Sometimes he simply drops one to the floor, other times he tosses a stone straight up and catches it again. "Each of these motions is at root the same motion," he is heard saying. "Try to see it as Newton did when, in seeing the apple fall, he also saw the motion of the moon." Faces are blank. The students have perfectly good eyes, but they are not Newton's and do not see what the professor, judging from his enthusiasm, obviously does see and is so excited about. Another stone is selected. "Watch!" he cries, as he throws it high into the air. Then a single student in the back row, as if waking from a dream, yells out, "I saw it!" The professor pauses appreciatively. Now there are two who see.

Externally nothing essential was different in that particular stone's flight, but the student was ready to see something in it that she had not seen before. That moment is a moment of knowing, of cognition. What happened? An epiphany.

Consider a second example. Some years later one of the students in the above class, one who never did see what the old professor was driving at, joins the Navy. He is assigned to the ship's artillery on a rather outdated vessel, and has become an expert gunner's mate. In drills he performs perfectly, with machinelike precision. Before his command console in a darkened room, he sits awaiting his orders. Over his headset the coordinates of the target's position are called to him from a shipmate above deck. He quickly performs a series of arithmetical operations and adjusts several levers and dials as he has done a thousand times before, and then hits the fire button. A direct hit! He has thrown a "rock" at a target three miles distant from a moving battleship and hit it square. The old physics professor would be proud. Or would he? Has the gunner's mate "seen" the projectile's motion?

One day while the ship is docked, technicians come aboard and modernize the gunnery console. Now the target coordinates are sent directly into the fire control computer, and the gunnery mate merely sits to watch in case something goes wrong. The computer has been programmed to make the calculations, set the levers and fire the shell. The program once carried out by the gunnery mate is now carried out by the computer. It hits the target every time, too. Does the computer

see the flight of the projectile? Finally, imagine the professor performing exactly the same calculation. As he does so we notice a smile on his face. Is he seeing the trajectory even now?

Knowledge is an event, a mental occurrence. Teachers, at least good teachers, can tell when it's happening and when not. It is not invariably correlated with proper manipulation of equations, or with the perfect performance of a task. These can be done "mechanically" or mindlessly, either by humans or by machines.[1] The business of science is knowledge, not performance of a task.

Goethe and the apercu

In his extensive writings on science, the German poet Johann Wolfgang von Goethe recognized the knowledge-event as the central concern of science and gave it unique prominence in his natural scientific studies.[2] At points he called it by the French word apercu which literally means "perceived." To Soret in 1823 he wrote, "In science, however, is the treatment null, and all efficacy lies in the apercu."[3] The knowledge-event is experienced as a kind of seeing, a perceptual-intellectual encounter with natural law. For example, Goethe maintained that when seen fully, the laws of color were to be found in the phenomena of the red sunset and blue sky. He wrote:

> The highest thing would be to comprehend that everything factual is already theory. The blue of the heavens reveals to us the fundamental law of chromatics. One should only not seek anything behind the phenomena: they themselves are the theory.[4]

Rudolf Steiner, in his writings on Goethe's science, and also in his own epistemological writings, draws attention to the conceptual component present in the knowledge-event.

> The percept is thus not something finished and self-contained, but only one side of the total reality. The other side is the concept. The act of knowing is the synthesis of percept and concept. Only the percept and concept together constitute the whole thing.[5]

In the example above, the students who did not see the lawful parabolic flight of the stone had a

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[1] John Searle makes a similar argument against the strong artificial intelligence position that computer programs can think. See his Minds, Brains, and Science (Cambridge, MA: Harvard University Press, 1984).

[2] Johann Wolfgang von Goethe, Scientific Writings, edited and translated by Douglas Miller, (Boston: Suhrkampf, 1988). See also David Seamon and Arthur Zajonc, Goethe's Way of Science, A Phenomenology of Nature (Albany, NY: SUNY Press, 1998), and Arthur G. Zajonc "Facts as Theory: Aspects of Goethe's Philosophy of Science," in Goethe and the Sciences: A Re-Appraisal, edited by Frederick Amrine, F. J. Zucker and H. Wheeler. (Dordrecht:, Reidel, 1987). This volume also contains an excellent bibliography on Goethe's scientific work by F. Amrine.

[3] Goethe, quoted in Rike Wankmueller, "Farbenlehre: Goethes Methode," Goethes Werke, Hamburger Ausgabe, Vol. 13, p. 616.

[4] Goethe, Werke, vol12, p. 432, No. 488, trans. F. Amrine.

[5] Rudolf Steiner, The Philosophy of Freedom. The Basis for a Modern World Conception, trans. by Michael Wilson, seventh English edition, (London: Rudolf Steiner Press, 1970), p. 70. Se also Steiner's A Theory of Knowledge Implicit in Goethe's World Conception, Third edition (New York: Anthroposophic Press, 1978)

perfectly good percept, but they lacked the concept to go with it. Newton in seeing the apple and the moon as particular expressions of a single law had discovered or intuited the concept that united them. Every scientific discovery, great or small, has this moment in which percept and concept join. Students can re-experience that moment of original discovery for themselves when they stand before a phenomenon and have their own apercu, their own knowledge-event. It is uniquely theirs, a personal knowledge, which they can lead others towards but which defies simplistic transference.

Although I can train you to a task, I cannot give you my epiphany, my "knowledge-event." I can try to lead you to your own epiphany (through repeated rock throwing, for example), but I cannot give you mine. I can give you a mathematical model of projectile motion (that is, the appropriate mathematical equations), and even teach you to use the model (that is to solve the equations), but this may well fail to provoke a knowledge-event for you unless you are mathematically sophisticated already. Goethe was correct, the knowledge-event, the apercu, is the essential core of the scientific enterprise, the one that ultimately animates the scientist. It is his or her "ultimate concern," to borrow a phrase from Paul Tillich

Every scientific discovery, then, is a perception of the sort described above, even if its range of validity may prove limited and, in the long run, is superceded by a more far-reaching vision. Likewise, every re-discovery by the student is a cherished moment in education, because in that experience the student relives the same knowledge-event first experienced by a Galileo, Newton, Bohr, or Einstein. In the knowledge-event one touches bedrock. To my mind, this is the reality for which realist philosophy yearns but misses. Unsatisfied with knowledge-as-event, the realist goes beyond the fact of cognitive experience to infer or construct a cause of the experience. Indeed the realist puts a hypothetical and usually mechanical model in place of the direct cognitive experience. When we seek something "behind the phenomena" we are often, Goethe says, "like children who, after peeping into a mirror, turn it round directly to see what is on the other side."[6] Unsatisfied with the knowledge-event, they replace their own experience (apercu) with what they consider a more objective reality.

In itself there is nothing wrong with representation. Every intelligent being constantly represents their experiences, thoughts, and insights to themselves and others through language and image. By analogy, model, and mathematics, that is, by every conceivable means at our disposal, we dress our own insights in the forms of the familiar. This is natural. When our partner in conversation lights up, we know that we have succeeded in conveying the essential idea through these means. They have come to "see" the thought and share our insight, even if they have not experienced it in the phenomenon as we have.

Yet confusions can arise, the model is reified, and a false transcendental realism is instantiated. Owen Barfield identifies the error as a form of idolatry. "But a representation, which is

[6] J. P. Eckermann, Conversations with Goethe, 18 February 1829, trans. Gisela C. O'Brien (N.Y.: Frederick Ungar Publishing, 1964), p. 147.

collectively mistaken for an ultimate—ought not to be called a representation. It is an idol."[7] When taken for the ultimate, then we look no further, but rather we rest content with the representation instead of using it as a springboard to a personal, epiphanic encounter.

One way to avoid the error of transforming representations into idols is to value phenomena themselves more, and to devalue representations and models. By phenomena I do not mean raw sensation or sensa, but the thoughtful engagement with phenomena that leads to the knowledge-event, the union of percept with concept in the phenomenon (Newton's apple-moon experience is an example). Modern students of Goethe such as Holdrege, Edelglass and Bortoft have done much to develop a phenomena-based science of this type.[8]

Goethe suggested that certain phenomena were redolent with meaning, crying out to be seen. All the unessential, obscuring and contradictory elements that normally confuse us have been pared away so the primary phenomenon can appear to us in stark and often beautiful simplicity. In the process the intellect "fixes the empirically variable, excludes the accidental, separates the impure, unravels the tangled, and even discovers the unknown."[9] Goethe called these "archetypal phenomena." In them, phenomenon is theory. The archetypal phenomenon is a symbol in which one can see nature's patterns, her lawfulness. That which can never be truly visible can nonetheless be revealed through the archetypal phenomenon.

Molding the Self

As any science educator knows, students do not instantly "see" the pattern Galileo and Newton saw in projectile motion or the swinging pendulum. To move, in Goethe's language, from an initial encounter with "empirical phenomena" through experimentation with "scientific phenomena" to the culmination of "archetypal phenomena" requires discipline, and most of all, a cognitive maturation of the student. In one sense, the brute facts of nature are forever the same. But as Goethe rightly remarks, every fact is already theory; that is to say, facts can become theory if seen in the light of understanding. We bring ourselves to every observation and so initially see everything in the light of our habits of cognition. New epiphanies wait on the remolding of our cognitive capacities: we must learn to see anew. This requires patience and an intimacy with the object of study. Active engagement is essential, but also a proper reticence about applying preconceived notions to the novel. This is what Goethe meant by "delicate empiricism."

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[7] Owen Barfield, Saving the Appearances. A Study in Idolatry. (N.Y., Harcourt, Brace & World, no date), p. 62. See also Arthur Zajonc, Catching the Light, The Entwined History of Light and Mind (NY: Oxford University Press, 1995).

[8] Stephen Edelglass, Georg Maier, Hans Gebert and John Davy, The Marriage of Sense and Thought (Hudson, NY: Lindisfarne Book, 1997), Craig Holdrege, Genetics and the Manipulation of Life (Hudson, NY: Lindisfarne Books, 1996) and Henri Bortoft, The Wholeness of Nature (Hudson, NY: Lindisfarne Books, 1996).

[9] Goethe, Werke, vol. 13, p. 25.

> There is a delicate empiricism that makes itself utterly identical with the object, thereby becoming true theory. But this enhancement of our mental powers belongs to a highly evolved age.[10]

The "enhancement of our mental powers" of which Goethe writes is essential to the education of a scientist, and to his or her continued development. Goethe could be describing the marvels of recent research on neuroplasticity when, in a letter to F. H. Jacobi, he writes,

> To grasp the phenomena, to fix them to experiments, to arrange the experiences and know the possible modes of representation of them … demands a molding of man's poor ego, a transformation so great that I never should have believed it possible.[11]

"Molding of the ego," or, to use the German word, *Bildung*, is central to Goethe's understanding of science. The relationship between the observer and the observed is dynamic and inseparable.[12] For Goethe, every attentive investigation entails the subtle but significant transformation of self. "Every new object, well contemplated, opens up a new organ within us."[13] Scientific discovery presupposes such a transformation of self. Each epiphany waits on the "new organ" required for that specific knowledge. It is this that separates the unseeing novice from the insightful scientist. Goethe's approach to science emphasizes the perceptual encounter with the laws of nature and not their abstract or mechanical representation. Information can be found in books and databases, and the manipulation of equations is an important technical skill better done by software packages these days than by mathematicians. But the ability to "see" a law of nature is reserved for the human scientist. Here lies the thrill that makes it all worthwhile. If pedagogy would recognize the value of this view of science, then education would reconceive itself as transformation.

Once we appreciate knowing as personal epiphany, the way is opened up for a reconciliation between facts and values, between science and spirituality.

False Dichotomy

On a train returning from Marburg to Goettingen in January of 1938, a conversation took place between the mathematician Guenter Howe and the physicist Carl Friedrich von Weizsaecker.[14] Seven years earlier, on February 14, 1931, Howe had been "converted to theology" at Karl Barth's Hamburg lecture Die Not der Evangelischen Kirche. On the train back from a scientific meeting, Howe and von Weizsaecker hatched an idea that would bear many fruits. It was not, however, until ten years later after the Second World War had concluded, and

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[10] Goethe, Maximen…, no. 509, *HA,* XII:435.

[11] J. W. von Goethe, Briefwechsel zwischen Goethe und F. H. Jacobi, ed. M. Jacobi (Leipzig: Weidmann, 1846), p. 198.

[12] See F. Amrine, "The Metamorphosis of the Scientist," in Goethe's Way of Science.

[13] Goethe, *HA,* XIII:38.

[14] Harold Nebelsick, Theology and Science in Mutual Modification, (N.Y.: Oxford University Press, 1981), Chapter 5, and Guenter Howe, Die Christenheit der Atomzeitalter, (Stuttgart: Ernst Klett Verlag, 1970) from the foreword by Carl Friedrich von Weizsaecker, p. 7.

in the shadow of the first use of nuclear weapons, that Howe was able to realize the idea by convening the first of the "Goettingen Conversations" between prominent scientists and theologians. Physicists of the stature of von Weizsaecker, Heisenberg and Jordan were there, but the theologians Howe most urgently sought to bring into the conversations refused to meet. Ironically, Karl Barth, Howe's "theological father" and the foremost Protestant theologian of the period, declined to attend. Barth and his disciples, ever distrustful of any alliance between secular, scientific knowledge and Protestant theology, consistently shunned the meetings. For twelve years the meetings continued nonetheless, addressing the moral issues raised by modern science and technology. While distrust between religion and science dates to Luther and earlier, Barth's more recent influential stance still largely dominates contemporary attitudes.

In his recent book, Rocks of Ages, Stephen Jay Gould reiterates and reworks Barth's so-called "neo-Orthodox" position, renaming it the "Principle of NOMA – Non-Overlapping Magisteria."[15] Gould sees no viable way for religion and science to be unified or synthesized, but he also thinks that they need not conflict because they are concerned with two entirely different domains of life. He writes,

> Science tries to document the factual character of the natural world and to develop theories that coordinate and explain these facts. Religion, on the other hand, operates in the equally important, but utterly different, realm of human purposes, meanings, and values… [16]

The rift between science and Western religion has been well explored by others, and I too have examined it elsewhere.[17] As the phrase "justification by grace through faith" implies, within the Protestant tradition faith is viewed as the core principle required for salvation, not knowledge born of experience and reason. Experience and reason are considered as proper to the domain of the secular intellect only. However, in the West, as in Asia, an important countervailing tradition has always existed which rejects this harsh division. In it knowledge and liberation have been seen as interdependent instead of adversarial.

If we turn to Asia, then the (to us) obvious dichotomy of religious faith and scientific knowledge is largely lacking. Asian religion is less about faith and more about spiritual practice and inquiry. For example, in his introduction to the proceedings of the fourth Mind and Life Dialogue, the Dalai Lama remarked that "not so long ago many people viewed common science's objective knowledge and the subjective understanding of [Buddhist] inner science as mutually exclusive. But a combination of these two can provide the complete conditions for

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[15] Stephen Jay Gould, Rocks of Ages, Science and Religion in the Fullness of Life (NY: Ballantine Publishing, 1999). See also Chet Raymo, Skeptics and True Believers, The Exhilarating Connection Between Science and Religion, (NY: Walker and Co., 1998), and E.O. Wilson's Consilience, The Unity of Knowledge, (NY: Vintage, 1998).

[16] Gould, p.4.

[17] John Dillenberger, Protestant Theology and Natural Science, (Westport, Conn.: Greenwood Press, 1977);

obtaining real human happiness."[18] The Dalai Lama did not contrast science and faith, but inner and outer sciences. Why, and what kind of combination is reasonable? In Tibetan Buddhism the central project of liberation is assisted by genuine knowledge because through insight one is released from attachment, which is understood as the source of suffering. Therefore knowledge and reason are highly prized. In the Ninth Chapter of Shantideva's book Guide to the Bodhisattva Way of Life we read, "This entire preparation the Sage [Buddha] taught for the sake of wisdom. Thus one wishing to bring an end to suffering should develop wisdom."[19] For this reason Buddhist monastic life often emphasizes scholarship and an exacting study of the mind through highly trained introspective methods and vigorous philosophical disputation. Wisdom is sought because it relieves suffering and hence leads to liberation.

One comparable example in the West is Christian Gnosticism. The very word *gnosis* means knowledge, or, better, wisdom. However, in the case of the Gnostic religion, one seeks knowledge of the divine rather than the mundane world. Within that system, wisdom is viewed as essential to the project of redemption.[20] In one form or another this tradition has survived in the West until this day, for example in Christian mysticism, Jewish cabalism, theosophy and anthroposophy. In each of these, experience and reflection are embraced as contributing significantly to human spiritual development.

In the Gnostic and Buddhist religions, therefore, knowledge is not set apart from religion, rather it is seen as essential to it. Viewed from this vantage-point, Barth and Gould's position of NOMA is an artifact of a particular and peculiarly narrow conception of knowledge and of religion as well. In addition, if religion rejects knowledge as improper to its domain (or if others box it in), then it cannot have a legitimate place in public higher education. The university should remain committed to the large project of inquiry and creative expression, free of dogma.

Other cogent reasons exist to doubt the compartmentalization of facts and values advocated by Barth and Gould. Pre-existing facts are not offered up by nature to the passive, neutral mind of the savant. Nor is science fundamentally about documenting "the factual character of the natural world." Cameras, video equipment, and computer databases document the world, but they are all blind. Knowledge is never simply given. Knowing is embedded in the much larger context of the prior education and the current intentions of the knower. Likewise education is a worthy enterprise *not* primarily because of the information transmitted, but rather because of the transformation it effects in the student. Learning-to-know entails a profound transformation of the human being, one that enables us to reach far beyond documentation to cognition. Recall that the word *theory* stems from the Greek, meaning "to behold." We must learn to "see" the so-called factual character of nature, and to think about nature in formal theoretical ways. Already this is a moral act. In Western medicine, for example, the physician is trained to "see" the patient (briefly) within a tightly prescribed conceptual framework. Recently, through the development of relationship-centered care and alternative medicine some of the

[18] Francisco J. Varela, Sleeping, Dreaming, and Dying, (Boston: Wisdom Publications, 1997), p.1.
[19] In Transcendent Wisdom, H.H. the Dalai Lama, trans, ed. by B. Alan Wallace (Ithaca, NY: Snow Lion Publications, 1988).
[20] Hans Jonas, The Gnostic Religion, 2nd ed., (Boston: Beacon Press, 1958), especially pp.34-37.

de-humanizing aspects of modern medicine have been mitigated. These modalities shift the way doctors see patients.

Scientific education is a powerful force that shapes the mind, heart, and actions of those it educates. Through it we are taught to "value" one aspect of nature's infinitely varied offering, to "value" one kind of questioning, and to accept one kind of answer, namely quantitative. If we accept the constraints then we are granted a potent tool for mastery over matter and energy. But we should remain mindful of the particular stance we have assumed. Scientific objectivity is not achieved by denying the fact that one has a stance. Science does not provide a "view from nowhere." Objectivity is only achieved by becoming conscious of one's stance. In this view science is value-laden, and conversely religion should be deeply concerned with knowing. The neat division Barth and Gould thrust on us is the offspring of a narrow view of knowledge and values. If religion and science are to find a right relationship to each other, it will not be through NOMA, but by recognizing that they both have their roots in experience raised to the level of cognition, that is to say, to epiphanic knowing.

The Religious Experience

The foundation of every religion is not faith but original spiritual experience.[21] The prophets of the Old Testament, as well as the disciples in the New Testament, speak incessantly of the experience of Jahve or Christ. The root origin of Islam, Buddhism and all religions is located in religious experience, not theological speculation or blind faith. In our own lives today, I would suggest it is not otherwise. The contemplative tradition is at the heart, not at the margin of religion. When it is missing then religion becomes ungrounded dogmatics, just as science becomes untested assertions when sundered from experiment.

Ultimate knowledge of Nature is as impossible as ultimate knowledge of God. Still, a thrown stone can be understood in at least one dimension of its being, its kinematic dimension. Surely the richness and variety of the divine suggest that we may gain a partial view of it as well. This is not to compromise the infinite, but only to suggest that even infinity is approached through the finite.

Paul Tillich, as well as the two Niebuhrs, granted enormous importance to symbol in the practice of religion. In the "two-realm theory of truth" common to neo-Orthodoxy there is no apparent link between human experience and the divine. As Paul Tillich puts it in his article on religious symbol, "Unconditioned transcendence as such is not perceptible. If it is to be perceived—and it must be so in religion—it can be done only in mythical conceptions."[22] The transcendent must be part of human experience, but Tillich recognize the central mediating role played by the symbolic or representational elements of religion. Like archetypal phenomena they can lead to

[21] For one argument for inclusion of religious experience in theological discourse, see Richard Swinburne, "The Evidential Value of Religious Experience," in The Sciences and Theology in the Twentieth Century, edited by A.R. Peacocke (Notre Dame, Indiana: University of Notre Dame Press, 1981).

[22] Paul Tillich, "The Religious Symbol," Daedalus, 87 (1958), pp. 3-21.

an epiphanic encounter.

In the epiphanic encounter – where knowledge is experienced – we find the common cognitive source for both science and religion. When shaped and used in one way it becomes science, when taken in another way it becomes religion.

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Already in the early nineteenth century, Ralph Waldo Emerson felt that science was making profound demands on religion. In a manner analogous to my own, Emerson neither rejected science, nor even compartmentalized science and religion in "non-overlappiing magisteria." Rather Emerson sought to spiritualize science and to lead religion back to knowledge or *gnosis*. He felt the world changing.

> The venerable and beautiful traditions in which we were educated are losing their hold on human belief, day by day; a restlessness and dissatisfaction in the religious world marks that we are in a moment of transition… The old forms rattle, and the new delay to appear. We are born too late for the old and too early for the new faith.

What might be the shape and character of the "new faith?" Emerson does not reduce spirit to matter, or religion to conventional science, but quite the contrary. He wishes to so elevate science that it can learn to know, in the sense of epiphanic seeing, in the realm of the moral and spiritual as well as the natural. No wonder that Emerson considered Goethe his model of the poet-savant, and first practitioner of the "new faith." As Emerson asks in the opening lines of his essay "Nature," "Why should not we also enjoy an original relation to the universe? Why should not we have a poetry and philosophy of insight and not of tradition, and a religion by revelation to us, and not the history of theirs?"[23] Elsewhere Emerson states his view on the future of religion emphatically,

> The religion which is to guide and fulfil the present and coming ages, whatever else it be, must be intellectual. The scientific mind must have a faith which is science… There will be a new church founded on moral science; at first cold and naked, a babe in a manger again, the algebra and mathematics of ethical law, the church of men to come, without shawms, or psaltery, or sackbut; but it will have heaven and earth for its beams and rafters; science for symbol and illustration; it will fast enough gather beauty, music picture and poetry. Was never stoicism so stern and exigent as this shall be.[24]

The future of religion will, according to Emerson, be asked to re-integrate knowing as an essential part of itself, a knowing based not only in the sacred scriptures of ancient prophets and teachers, but one that is continuously enlivened by the fresh cognitive encounter with the divine. This is was Emerson means by a "faith which is science."

The alternative to NOMA that I propose takes experiential knowing as the basis for both

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[23] Emerson, "Nature," in Selected Essays, ed. Larzer Ziff (NY: Penguin, 1982), p. 35.

[24] Emerson, Complete Works, vol. X, pp. 217-18, and vol. VI, pp. 240-41.

scientific and spiritual insight. It views the human being as capable of gradually extending the range of his or her cognitive capacities through a process of self-development – education as transformation. It recognizes the moral dimensions of science, and the cognitive sources of religion. The university of the future should embrace this expansive view of learning and knowing, which entails an expansive view of ourselves and our world as well.

REFERENCES