

***Toward a Fluid Dance in Seamless Dress: The Field of Pre- and Perinatal Development Challenges Researchers to Integrate Scientific and Spiritual Orientations**

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Abstract: None available.

Full Text: Headnote ABSTRACT: Under exploration is the response of humankind to mystery relative to the historically sharp distinction between scientific and spiritual ways of knowing. The evolving image of a dancer in a half-male/half-female costume serves as a metaphor for the rapport between these two basic research orientations, and for how they might be reconciled-in the interest of both research and the researcher. Findings from the highly interdisciplinary field of prenatal and perinatal development illustrate the need for an integrated approach to understanding "reality". As Sir Ian McKellan notes, "With the eclipse of God by the advent and ascension of reason and science, there is no seeming tolerance for the unexplained, which in earlier centuries would have been relegated to 'the work of God'. Religion is the answer given in various cultures to those vulnerable areas of life that are not understood, the so-called Divine Mysteries." There is a tango-dancer costume I have seen in which the wearer bears all evidence of being a man when seen from one perspective (sporting a dashing tux) and all evidence of being a woman when regarded from the opposite side (in her exotic red dress and stockings). I find this costume, and the dance made inside of it, a good working image for my understandings of the rapport between scientific and spiritual conceptual frameworks. Like a working title, a working image is a decent place to start, but it will likely need some added nuance, some tweaking, down the line. The response of humankind to mystery, it seems to me, lies at the heart of this age-old dance. How comfortable are people as individuals, and as a society, existing without "bottom line" explanations for who they are, how they are, why they are? Historically, the comforting notion of "God's doing" once explained the deeper mysteries of life, those gaps of phenomena left unexplained by science (hence the term, "God of the gaps"¹). However, as humankind progressed in its technology, education and sophistication, the large swaths of life unexplicated by medieval science became increasingly more difficult to discern; the "God-gap" narrowed with each growth-spurt of the upstart disciplines of empirical fact-finding and reality-defining, i.e., modern science. Whitehead's "God-shaped hole"² was getting backfilled by men and women in lab coats. What was happening to the experience of mystery in human life? Over the centuries since science sprouted the buds that now have become muscled, expert limbs, human beings have been deeply challenged either to embrace or abandon some primary and profound mysteries about themselves, their world, and their place in that world. "In mystery," said Matthew Arnold, "our soul abides."³ Arnold is a fitting man to quote, since he was a leading poet and critic during the same time that Darwin was writing *On the Origin of Species*, which of course became not only his own landmark work but, with *The Descent of Man*, established a primary foundation of the modern scientific understanding of the human animal which led to a century and a half of polarity between science and religion. Sadly, Darwin's evident internalization of that dichotomy, through which he felt he had to choose between a spiritual life and a scientific life, led him to write, twenty-five years later, that he had lost his enjoyment of the natural scenery, poetry, literature, and the music he once had loved: [M]y soul is too dried up to appreciate it as in old days. . . . I am a withered leaf for every subject except Science.⁴ Darwin felt he had become "a kind of machine for grinding general laws out of a large collection of facts."⁵ Darwin conjures for me the image of a man whose theory developed a potent and powerful life of its own, with which Darwin felt incapable of reconciling, throughout his later years, his growing ambivalence surrounding the subject of chance, God, and "this immense and wonderful universe."⁶ It is poignant to consider the limitations of thought from which Darwin despite all his brilliance and thoughtfulness seemingly suffered, in light of how some later theologians and

scientists, via a process view of theology, would come to regard evolution as inherently and deeply imbued with the Divine.⁷ Paleontologist and Jesuit priest Pierre Teilhard de Chardin, who some say predicted the "technological evolution" of the internet decades prior to its emergence, believed that all things, living or not, contain the seeds of life and consciousness. For Chardin matter in all forms was imbued with a divine force. Evolution was both a scientific and a holy process, steeped in what he called "orthogenesis," the divine, evolutionary drive of all things, living and not, toward increased complexity and consciousness.⁸ By contrast, in her explication of the relationship between and within the world of spirit and the world of matter-particularly technological creations-and a spiritualized idea of evolution, Jennifer Cobb suggests that: Darwin was so wedded to the idea of a wholly deterministic God that he was blinded to the glimmers of theological purpose in his own discoveries. The idea that there could be a divine force that necessarily coexisted with random chance simply escaped him.⁹ Science (the masculine half of the tango costume, concerned with objective facts, quantitative measurement, and products) traditionally does not truck with mystery. It is theology, literature, poetry, artdisciplines that deal in the realm of the soul and spirit (the feminine half of the costume, concerned with subjective experience, qualitative inquiry, and process)-whose core is woven through with the glistening threads of life's mysteries. I see Darwin as hollowed out by his discipline, trapped in an all-masculine tango suit, suffering the effects of soulless science. Had he fallen prey to what Ian Barbour so lyrically terms "the liberal myth of progress through science"?¹⁰ As Cobb points out: [S]cience without soul cannot lead to deep connection. As we pursue the material and the quantifiable, we become externally identified and, by extension, greatly reduce our ability to join center to center with others. We can see this approach in abundance in the world around us. In our struggle to find meaning in one of the most powerful consumer cultures ever to erupt on the planet, we fill our lives with things, and our isolation and loneliness only grow.¹¹ (It is ironic, but not surprising, that the observations that led Darwin to his landmark theory were carried out largely in environs whose indigenous human inhabitants, given their more "primitive," concrete conceptualizations of reality, which included the imaginative as well as the logical, likely did not experience the hobbling psyche/soma split that evolution doctrine helped carve into Western consciousness.) Today's techno-researchers in the tradition of Darwin may be seen cruising on browsers instead of *The Beagle*, at risk of losing their own deep connection to that mysterious source that animates a full and quenching life. Cobb quotes philosopher Walker Percy: Every advance in our objective understanding of the Cosmos and its technological control further distances the self from the Cosmos precisely in the degree of the advance-so that in the end the self becomes a spacebound ghost which roams the very Cosmos it understands perfectly.¹² If, indeed, it is in mystery that our soul abides, then our soul is gasping for air in its cramped quarters. Related to this "disappearing mystery" problem with science and, more insidiously, with the more overarching "scientific-revolution mentality" that permeates more disciplines than the physical sciences-indeed, right into the lay mainstream-is what I call the "disappearing miracle" problem. Cobb raises this as an issue in the field of artificial intelligence (AI) and computational emergence: We have a tendency to explain away computational novelty because we can look back at the digital record and see how it happened. We tell ourselves that no matter how complex the resulting computation, it is still a string of code. There is no inherent mystery there, no element that makes the whole greater than the sum of its parts. No mystery, no emergence, no novelty.¹³ It seems to me that this principle has been hard at work in the establishment of the "brainism" so rampant today. In place of God, in the eyes of many scientists-and laypeople as well-the Almighty Brain has been exalted: neuroscience as the new religion of the fashionably informed. An almost palpable group sigh of relief has uttered forth from the science-drunk masses with each of the relatively recent, sizable advances in neuroscience, such as the discovery of key neurotransmitters, the dissection of personality, the wholesale dismantling of melancholic experience by SSRIs. As Tom Wolfe puts it in the title of an essay about neuroscience as science's strategic high ground, "Sorry, But Your Soul Just Died."¹⁴ By all outward accounts in the current, media-driven, Western perception of humankind, sociobiologist Edward O. Wilson was correct in his chilling assertion that "the mind will be precisely explained as an

epiphenomenon of the neural machinery of the brain."¹⁵ Nothing more, nothing less? It seems that at the turn of the millennium, a person can browse the local bookstore for any number of expert explanations for how human beings are products of their genes. Don't worry about free will, though-"it's alive and well, and probably genetic," according to geneticist Dean Hamer.¹⁶ In the past generation, science has even offered up, in the form of memes, a sociobiological explanation for the kinds of uplifting ideas, behaviors, and human creations that might once have been attributed to expressions of culture, or even (how quaint!) divine inspiration. Wolfe points out Wilson's assertion that all branches of intellectual knowledge will eventually come together under the umbrella of biology, no doubt ushering in a hormones-and-tissue-based Theory of Everything. Muses Wolfe: If Wilson is right, what interests me is not so much what happens when all knowledge flows together as what people will do with it once every nanometer and every action and reaction of the human brain has been calibrated and made manifest in predictable human formulas.¹⁷ I wish to be clear that I do not doubt that virtually every emotion can be mapped on the brain, that tweaking the vigor of my endorphin receptors will put a more enduring smile on my face, that genes can explain why a given pair of twins separated at birth entered different seminaries in the same year after having both married women named Doris, prefer cuffless pants, and share the same nervous habit of tugging on their prematurely gray sideburns.¹⁸ What rankles me is the effect that such scientific advances have on the general perception of how human beings tick (more like a Swiss watch than a Swiss watchmaker), as well as unequivocal announcements of these newly discovered phenomena as being the defining factors at work in human beings, absent any hint of anything left unquantifiable. The prevailing mechanistic, reductionist portrait of the human being makes miracles vanish in broad, sweeping headlines. Let me also say that I am casting into bold relief a line in the sand that may not in actuality be as definite as I characterize it: not all neurologists, I am sure, believe that the density, sensitivity, and plasticity of neurotransmitters are the sole definers of human psychic lives. What trickles down to the popular media, however, via announcements of Scientific Breakthrough Discoveries is that this is very close to the case. Understanding more acutely some workings of the human mystery does not necessarily reduce its majesty-but in the binary, black-and-white collective consciousness, that is exactly what tends to happen to the perception of the mystery. I should define my terms, for the sake of clarity. By "mystery," or "miracle," or that "thing left unquantifiable," what do I mean? I mean that swell of heart-squeezing something that overtakes a parent who hears his or her baby's heartbeat for the first time; that something that presses itself into the awareness of a listener when notes on a page are sung by a vocalist of particular luminance; that something that rises from somewhere deep inside to form goosebumps on the skin and moistness in the eyes when one gazes at a pink/orange fireball of sun disappearing behind a cloud-meringue horizon and is filled with an inexplicable gratefulness for the truth-telling courage of Copernicus. The direct experience of a whole being greater than the sum of its component parts, of emergent novelty working its evolutionary magic. My guess is that the something is a glimmer of our connection with that process of divinely imbued unfolding, of our connection with everything that has gone before us-including invaluable scientific discoveries-and everything that is to come. It is a flickering, peripheral glimpse of our sacred place in the unbroken web of creation articulated by process theology; not a static gap of yet-to-be-discovered knowledge, related to God simply by virtue of that "information gap," but a dynamic reality synapse, divine in its own right.

LIFE'S BEGINNINGS: FORMULAIC OR MIRACULOUS? Turning to my own disciplinary field, I see the "vanishing miracle" on display in the oxymoronic phrase used daily by obstetricians, "an uneventful pregnancy." My conscientious obstetrician colleagues might roll their eyes, pleading the need for an expedient shorthand, but I find the term telling. That anyone could ever describe the breathtaking series of miraculous processes that is fetal development as "uneventful" belies, in my view, a particular deficit of perspective: the feminine half of the tango costume, left at home in the corner of the downstairs closet, under the box of "Xmas" decorations. My field, Prenatal and Perinatal Development, studies the stuff of which one of the primary science/religion debates is made: How does life begin? By what forces is the very genesis of self governed? This highly interdisciplinary field is itself an

excellent example of the need to bridge scientific and spiritual ways of inquiring, as it encompasses such topics as the bio-behavioral aspects of embryonic and fetal development, including unfolding neurological function and the expanding boundaries of memory; the first stirrings of consciousness (and thus psychic life) in the fetus; the effects of maternal emotions, mental states, and behavior on fetal development and birth outcomes; and the effects of cultural attitudes, norms, and mythology on the experiences of pregnancy and birth. The foundational questions for me are these: Can those early shaping forces be captured in theories, measured and replicated? or are more unfathomable, intangible, ineffable influences at work in the creation of each human being than can be defined by even the most progressive research? (Perhaps the answers to both questions might, paradoxically, be "yes." I wish to perform this inquiry in the tango costume.) The more I partake of the science/spirit interface, the more I have had to consider the unexpected possibility that a theological orientation could be equally appropriate as a scientific one for my inquiry into the myriad influences on the development of the fetus. Yet, I am so excited by recent advances in the understanding of the significant role of maternal stress on fetal development and birth outcomes that I invited Curt Sandman, a leading neuropsychology researcher in this area, onto my doctoral committee. He and other groups have found that, for example, chronic stress in a pregnant mother leads (statistically, of course-not for each individual woman) to a host of negative outcomes, including preterm labor,¹⁹ low birth weight, and irritable, temperamental babies.²⁰ Presumably, the chronic activation of the pregnant mother's stress axis, and the ensuing soup of stress hormones (which in excess will cross the placental barrier and impact the baby's developing system), results in adaptive changes in the baby's development on a cellular level. For instance, if a mother is constantly filled with anxiety, the "message" communicated to her baby is that the fetal child is in an unsafe environment (regardless of whether or not this is objectively true). The baby's cells will actually mutate (adapt) to prepare it for the unsafe environment into which it perceives that it will be born.²¹ Sandman sees fetuses of stressed mothers developing better coping and survival skills, e.g., the ability to detect minute changes in the environment.²² These fetuses also suffer decreased sensitivity in neural chemical receptors that modulate, for example, the experiences of pleasure and reward.²³ This makes sense: in a dangerous environment, stopping to smell the roses could leave one vulnerable to attack. These observations could well correlate with the hypervigilance, hyperarousal and tendency toward depression we see in those with prenatal trauma.²⁴ I am particularly intrigued by the finding of Sandman and his colleagues that it isn't just any kind of stress associated with these outcomes but, rather, pregnancy-related fears and anxieties.²⁵ What is it about those pregnancy-related anxieties that would differentiate them from, say, work-related stresses? And could this realm of findings ultimately share a common thread with research which has found an association between un-wantedness of the pregnancy and subsequent adult onset of schizophrenia in the offspring?²⁶ And how about other findings about the developmental sequelae of unwantedness? It has been found that babies whose conceptions weren't planned-whose mothers received the same quality of prenatal medical care as had the mothers of the planned babies-were 2.4 times more likely to die within the first 28 days of life than those babies whose conceptions had been planned.²⁷ At three months, planned infants showed higher levels of cognitive capacity and attachment to their mothers than did unplanned infants.²⁸ What is one to make of such pre- and perinatal connections as that between traumatic birth procedures and subsequent suicide?²⁹ Bertil Jacobson has done fascinating research in Sweden on this topic, reporting a decade ago the significant correlation between the type of birth or prenatal trauma a person suffered and the method that person later used in suicide or suicide attempts. For instance, prenatal oxygen deprivation (fetal distress) correlated with suffocation or strangulation; "mechanical" trauma, such as the use of forceps, was associated with attempts to self-destruct with instruments such as guns; drug addiction was associated with opiate and/or barbiturate medication having been given to mothers during labor.³⁰ I will venture even further out on that science/spirit limb (on which science is generally regarded as the more "solid, stable" research discipline, located as it is right next to the trunk of objective reality, with the "softer," more phenomenological, introspective, or even mystical ways of knowing way "out there" at the thinning edges) and

ask what should be made of research that found, by separately hypnotizing and interviewing pairs of mothers and their teen or pre-teen children about events during pregnancy that had never been discussed with the children, that the amount of agreement between mothers and children about those events-i.e., the existence and accuracy of memories held by the children of those events, including such minutiae as the color and print of a dress worn in the second trimester-was astoundingly high?³¹ While there are studies suggesting that one likely common denominator in many processes of prenatally programmed vulnerability is abnormalities in the developing neuroendocrine axis³²-which would be consistent with many undesirable outcomes following chronically stressed pregnancies-and there are biochemical explanations for memory,³³ I think that a hormone-dependent explanation of maternal-fetal influence is simply another twig on the brainism tree. In turn, I believe that the "brainism" phenomenon will one day soon back embryology into a corner, because of the question (among others) of "when does mind begin?" How many functioning neurons or axons or dendrites do we need before mind suddenly appears? It seems to me a thorny question to have to debate, and I second biologist Sewall Wright's notion (in specific reference to embryology) that "the emergence of even the simplest mind from no mind seems to me utterly incomprehensible."³⁴ That necessarily removes mind from the sole domain of the brain, leaving somewhat of a yes-a mystery. While the "brainism" framework has no room for a whole array of currently documented phenomena of mind without (or rather, before) brain,³⁵ a process theory embraces them, without having to revert to a wholesale dualistic framework. Beyond that, a process theology welcomes in the features of experience that have no corollary in science, but that are profoundly relevant to the processes of conception, pregnancy, and birth: the role of story and ritual; the noncognitive functions of religious models in evoking attitudes and encouraging personal transformation; the very notion of these basic life processes as sacred, and the type of personal involvement characteristic of religious faith. Just as I would hope that one day a heightened consciousness about creating and birthing children will be, "religion is a way of life."³⁶

THE HUMAN ROLE IN EVOLUTION I find the research of Robert Jahn and Brenda Dunne at the Princeton Engineering Anomalies Research Laboratory (PEAR) to be very exciting. For the past thirty years, PEAR scientists have conducted tightly controlled studies which show that digital machines can be directly influenced by our intentions and consciousness. For example, a random event generator (REG) left unattended will produce a roughly equal distribution of Os and Is, consistent with the statistical expectation. However, when an operator (or even an inexperienced volunteer) is put in front of the machine and asked to "intend" either more Os or more Is to be produced, a small but tangible effect on the stream of digital information is produced. While these effects have historically been referred to as "anomalies," Jahn and Dunne write: [T]he empirical case is already strong enough to warrant reexamination of the prevailing position of science on the role of consciousness in the establishment of physical reality, with the goal of generalizing its theoretical concepts and formalisms to accommodate such consciousness-related effects as normal, rather than anomalous phenomena.³⁷ As a scholar who is devoted to the idea that the consciousness of a pregnant mother (as well as, to a lesser extent, that of other close persons) has a profound effect upon the psyche and soma of her developing child, I am used to holding some of the most radical views among my lay and scholarly peers. Suddenly, in light of mind-matter research such as this from PEAR, my ideas seem positively quaint. Here before me is a gift of interdisciplinarity, a compelling-though still far from mainstream-new platform on which to build a case for an expanded vision of progressive prenatal care: if machines can be affected by a person's intention,³⁸ how much more can a developing fetus be influenced by the consciousness of its mother and father? (And besides, in the current mechanistic, "brainist" climate, isn't the entrenched, prevailing view of the fetus pretty much one of a machine-under-construction?) Let me entertain for a moment the possibility that-through her peaceful, loving consciousness of welcome, safety and support for its highest unfolding of self-a pregnant mother can, even subtly, influence her developing baby toward a more secure, grounded, and "wired-for-love-rather-than-fear" experience of self. That this is the case has been supported by both NIH-funded, mainstream research,³⁹ as well as by "softer" research,⁴⁰ through which it has been shown that the

attitudes and feeling states of the pregnant mother and her partner carry lifelong implications for her child. What a powerfully emergent process, through which we, as "created co-creators,"⁴¹ can participate in the ever-escalating complexity, the ever-higher-reaching consciousness of Teilhard's holy and scientific evolution!⁴² Here I reach back to Lamarck—a biologist before his time, dismissed then, but increasingly relevant now—and the significant role in evolution which he assigned to an organism's own efforts and interior life, the "within of things," and more recently to biologist Alister Hardy's contention that modern biology has privileged the mechanical role of external forces, acting on random mutations, over that of internal drives, including the "psychic life" of the organism, which he sees as a "most powerful creative element in evolution."⁴³ In applying these notions, I am casting a pregnant mother in the paradoxical role of both external influence as well as part of the internal experience of the fetus. As Cobb points out, this kind of recursive circuit undermines everything classical about physics and biology; when something can be both its own cause and effect, this portends a revolution in rationality.⁴⁴ One of the revolutionaries, from the decidedly rear-guard field of biology, is cell biologist Bruce Lipton, whose work on inflammation as a Pathology Fellow at Stanford University's School of Medicine has yielded subversive information on the molecular nature of consciousness and human evolution. His focus, like that of researchers in so many scientific disciplines, is on the communication of information and its impact on the organism. His findings on "adaptive mutation" primarily with work on bacteria, which will mutate genes to accommodate environmental stresses—support Lamarck's views of an organism's role in its evolution. If bacteria can do that, humans can do it infinitely better. It is fundamental to survival. . . . Adaptive mutation recognizes that it isn't just the environment that produced the change, but it's the organism's perception of the environment that determines the type of change that unfolds. This is extremely important, especially in humans. Lower animals have little room for interpretation. When you get to higher organisms, which have more awareness, a learning bias can insert itself between the real environment and the organism. This bias becomes our perceptions. . . . In prenatal development, the perceptions and beliefs of the fetus are really the same perceptions and beliefs as the mother—and there are very good reasons for it. When you're developing a new organism, it has to survive in the world that it's coming into. . . . The fate of a child is impacted by the mother's perceptions of her environment. If we recognize this we can find ways to increase the experiences which give rise to more healthy offspring.⁴⁵ So that we might assist life, in theologian John Cobb's words, as it "exert[s] its gentle pressure everywhere, encouraging each thing to become more than it is."⁴⁶ An emergent process, creation unfolding, not reducible to formulae: a mystery. "Mystery" brings me back to the tango man/woman. To extend perilously my working metaphorical tango image, perhaps beneath the masculine half of the costume the wearer sports a silky underthing, and beneath the feminine half, some Calvin jockeys, and so on, and so on: an infinitely layered event of polarities. The "two halves" of this one person will have exactly the same objective experience on a given evening, but—based upon which of the two halves through which the wearer is regarding a particular moment—may perceive and report them in very different ways, using different terms and perspectives. Will not both be valid? Will not both be valuable to a holistic understanding of the experience? Such wide-ranging findings as are brought to bear in a broad understanding of pre- and perinatal development mandate that we keep dancing the entire floor in our tango suits, that we remain alert to findings which might be more readily noticed from a more "spiritual" or a more "scientific" orientation. I find myself having to qualify those differentiations with quotation marks as I become increasingly steeped in an ever more integrated view of science and spirit. The separation between the two is ultimately an artificial and arbitrary one, although prevalent and seductive. The deeper one delves into the historical trajectories of scientific and spiritual ways of knowing, the harder it is to draw that line between them. Rather, it becomes more of a permeable membrane, through which orientations and insights can flow back and forth. The seam of the tango costume. What if, instead of two halves of a costume with a seam down the middle, we were to imagine all the colors and textures of both aspects of that costume captured in a variegated thread; and what if, with that long, single strand of multi-hued, multi-textured fiber, there was knitted together a wondrous cape for a researcher to don? And from

inside that cape the seeker of knowledge will embrace stories and statistics, images and empirical data, and will ever retain a sense of awe for the continuous unfolding of creation, in all its forms. And, above all, this seeker will have the power to regard something yet unexplained, something yet a mystery, and say—simply, and without a trace of defeat or antagonism—"I wonder." Footnote * This article was first published in *The Journal of Faith and Science Exchange*, Volume IV (2000), and is reprinted by permission of the Boston Theological Institute.

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1 Barbour, p. 73, for example. 2 Cobb, p. 53. English philosopher Alfred North Whitehead, father of process philosophy, after devoting much of his professional energy to devising a metaphilosophy of mathematics based on logic, ultimately concluded that logic could not fully explain the fundamental nature of reality, and that our world ultimately contained a nonlogical element, which he called a "God-shaped hole." 3 Arnold. 4 Quoted in Barbour, p. 59. Note Darwin's grammatical deification of science, with the capital "S." 5 Ibid. 6 Ibid. 7 Process thought views reality as a dynamic web of interconnected events, with nature characterized by change, chance, and novelty as well as order. God interacts reciprocally with the world, an influence on all events though never the sole cause of any event. Every new event is the joint product of the entity's past, its own action, and the action of God. Thus, creation is a long, incomplete, continuously unfolding process, all forms of which are seen as divinely persuaded. 8 Cobb, pp. 82-83. 9 Ibid., p. 39. 10 Barbour, p. 86. 11 Cobb, p. 94. 12 Ibid., p. 197. 13 Ibid., p. 171. 14 Wolfe, "Sorry, But Your Soul Just Died," p. 89. 15 Wilson, quoted in Barbour, p. 80. 16 Hamer, p. 314. 17 Wolfe, "Digibable, Fairy Dust, and the Human Anthill," p. 87. 18 This whimsically fabricated, hypothetical example of twins' similarities pales in comparison to the many astonishing actual accounts that have emerged in the identicaltwins-separated-at-birth literature. In one famous example, the "Jim Twins," among the first group of identical twins reared apart studied by the Minnesota Center for Twin and Adoption Research, met after 39 years and discovered that they both drove the same model of blue Cheverolet, chain-smoked Salems, chewed their fingernails, owned dogs named Toy, and took vacations to the same stretch of beach in Florida (Tellegen et al.). More recent findings go on to suggest a genetic basis for such seemingly volitional tendencies as novelty-seeking and religiousness (Bouchard et al.). As compelling as this body of research is regarding the inviolable predetermination of genetics, I would point to the equally compelling existence of countless raised-together identical twins whopresumably through conscious choice, yes, free will-cultivate and pursue individual and very different identities. 19 Preterm labor, or short gestational age, is the principle determinant of low birth weight—a phenomenon of largely unknown etiology—which in turn carries with it many long-term developmental risk factors, and has more recently been identified as a potent risk factor for cardiovascular disease, hypertension, and type II diabetes. It is stunning to note that in the United States, with our considerable technological and medical prowess, neither the low birth weight rate nor the preterm delivery rate has improved in the past quarter century. 20 Rini et al. 21 Lipton. 22 Sandman et al. 23 Insel et al.; Sandman and Yessaian. 24 Janus. 25 Rini et al. 26 Myhrman et al. 27 Bustan and Coker. 28 Roe and Drivas. 29 Salk et al. 30 Jacobson et al. 31 Cheek. 32 Clark; Wadhwa et al. 33 Anokhin; Chapouthier and Ungerer. I believe, however, that an in-utero memory of an ex-utero circumstance would severely strain a biochemical explanation; this phenomenon falls more likely in the realm of telepathy and other non-local phenomena. 34 Barbour, p. 236. 35 Cheek; Sonne; Wade. 36 Barbour, p. 236; emphasis in the original. 37 Jahn and Dunne, p. 148. Similar mind-matter interaction effects have been repeatedly observed in nearly five hundred dice and RNG experiments for more than five decades. A 1987 meta-analysis of 832 RNG studies conducted by sixty-eight investigators, including 597 experimental and 235 control studies (of which just 258 of the experimental and 127 of the controls were part of PEAR's ongoing investigation) found that experimental results produced odds against chance beyond a trillion to one, while control results were well within chance levels with odds of two to one. "The assertion that other labs have not obtained Jahn's results is a commonly repeated skeptical mantra, but it is also false. . . . Jahn's results are entirely consistent with a larger body of

evidence collected by more than seventy investigators, and overall there is no question that replication has been achieved. If anything, Jahn's results are somewhat smaller in magnitude than those reported by others" (Radin, p. 225). 38 Psychologist William Braud has done extensive mind-matter interaction studies within the human realm, in which subjects influenced various physiological systems of distant individuals through mental intention; see Radin, p. 225. 39 Bustan and Coker; Insel et al.; Sandman et al.; Wadhwa. 40 Montemurro; Sonne; Verny and Kelly; Verny and Weintraub; Zimberoff and Hartman. 41 Hefner, ch. 3. 42 Cobb, p. 81. 43 Barbour, p. 223. 44 Cobb, p. 61. 45 Lipton, p. 6; emphasis added. 46 Cobb, p. 56. REFERENCES REFERENCES

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