Dying To Be Born, and Being Born To Die: Cell Death As a Defining Pattern In Human Development and Death

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Full Text: One of natures most elegant synchronies occurs at the doorway of our two greatest life transitions-birth and death. More precisely, the gestation process shares many parallels with the dying process, both on a cellular and an organismic level. On an organismic level we can easily note that birth and death are our two most life changing transitions-they both involve a cessation of self the way we have known it and a journey into the unknown. Both involve cataclysmic physiological changes that permanently alter us. In the last fifty years in Western society, both birth and death have been largely relegated to hospitals, where the person undergoing this transition is frequently alone or in the hands of "experts". Their loved ones often are not blessed with bearing witness to these natural and powerful transformations. We can speculate that our lack of exposure to birth and death processes-the paucity of public support for holding and greeting a new baby, or holding and releasing a dying elder-can rob us of the spiritual growth opportunities we all need as part of our adult development. Fortunately, the synchronous rise of both the hospice and conscious birthing movements are starting to reverse this trend. If a more microscopic look at birth and death is explored clearly it is at the cellular level where the wonder and glory begin. Death programming in the cell is essential to both fetal development and to the dying process, both of which are manifestations of an ancient evolutionary story. With sex, birth, and death on a cellular level forming the basis of our life story, we can easily see how as organisms we keep returning in open-mouthed fascination to these same archetypal sagas throughout our lives. DEFINING DEATH ON A CELLULAR LEVEL We can define death by peering into the process of death within the cell. Basically, our bodies are composed of two kinds of cells, the first called germ or sex cells or gametes (sperm and eggs), and somatic cells. Neese and Williams (1994) describe somatic cells as previously independent cells which devote themselves to supplying nutrients and protection to germ cells. The entire human body, in this sense, is designed just to get our gametes into the next generation! Clark (1996) points out that somatic cells when they divide don't recombine their DNA like sex cells do, and that the only purpose of somatic cells is to optimize the survival and function of the "true guardians" of the DNA, the germ cells. Simplistically, when sex cells divide, they carry half the genetic information of the parent, each gamete holding a unique, tossed-up mix of half the parents DNA. When somatic cells divide they carry all of the parent cell DNA (excluding mutations, which are also called copying errors). Death can occur through two means-by accident, which is called necrosis, or through apoptosis, the developmental death of cells that aren't being used. Apoptosis could also be called cell suicide or senescence, a programmed sacrifice for the good of the organism, similar to death in old age. Both germ cells and somatic cells can die via necrosis, and have been doing so since the beginning of life. But apoptosis is a different story, and it is here where birth and death begin to dance together. Early life on the planet reproduced asexually (there were no sex cells), in much the same way that cloning occurs, creating offspring cells that are essentially the same as the parent. Our somatic cells use this same billion-year-old process-liver cells creating new liver cells to replace old ones, etc. Remember, mutation does account for the slow accumulation of differences between one generation and the next, and was previously thought to be the only way that evolutionary change occurred in somatic cells. When sexual reproduction arrived on the scene around a billion years ago and a billion years after life began (and was still largely single celled), genetic variability exploded onto the scene. By halving a cell's DNA and mixing it up with a different cell's halved DNA, evolution created a mechanism for rapid and profound adaptability to changing environments. Cellular and

organismic change could occur much more rapidly because there was so much more variation for natural selection to work with, species diversification mushroomed, and life began an epic journey of increasing complexity. Fascinatingly, this tremendous new invention called sexual reproduction created the need for apoptosis. Death as we know it was born. William Clark, in Sex and the Origins of Death, puts it this way: {Evolution's} drive toward ever-increasing {cell} size, and eventually multicellularity, led to the creation of extra-germinal (somatic) DNA. The advent of sex in reproduction made it necessary to destroy the somatic DNA at the end of each generation . . . Death may not be necessary for life, but programmed death is apparently necessary to realize the potential of sex as a part of reproduction. (Clark, 1966, p. 76) Dying To Be Born Why do somatic cells have to die? Why do organisms have to die? Apparently, because of sex and also because natural selection uses death as a way of shaping life, of keeping a glovelike fit between an organism and its environment. Charles Darwin (1859) popularized natural selection as a force that slowly caused evolution to occur over many generations, by causing less adapted organisms to leave fewer offspring or die before they reproduced. Little did he know that this same process also occurs on a cellular level on a moment to moment basis, in the developing fetus. Gerald Edelman (1987) won the Nobel Prize for his work in cell biology. His book, Neural Darwinism, proposed that the nervous system of the developing fetus operated via natural selection. This idea was quite heretical at the time, for everyone assumed that evolution could only occur over many, many generations of slow genetic drift caused by the less fit of a species dying off younger and faster. Edelman came on the scene and stated that the epigenetic development of the fetus, in response to both genetic cues and environmental cues, evolved on a cellular level right in the midst of a single lifetime. What blasphemy! To understand this process, we turn again to apoptosis. We tend to think of this kind of death as dying of natural causes in old age, but it is more aptly seen as cell suicide. What we now know is that all somatic cells carry within their genes a "death program," consisting of both death repressing and death promoting genes. This death programming is turned off in sex cells by death represser genes, and under certain circumstances it is turned off in somatic cells. For instance, tumor cells have found a way to turn death represser genes back on, or to mimic germ cells and turn death genes off. Also, T lymphocytes, a kind of immune cell, attack certain foreign invaders by turning on the invaders death program. The asexual reproduction of somatic cells goes on throughout our lives-first as a way for us to grow, and then as a means of replacing cells that die via apoptosis or necrosis. This constant churning out of new cells isn't done without a few occasional copying errors (mutations). Over time, these copying errors tend to accumulate and begin to interfere with the cell doing its job (being a good liver cell, or a good blood cell, for example). As this gradual toxic accumulation occurs, it trips the cells death program, and the death program instructs the cell to commit suicide. This is our most common old age death, the suicide of a sufficient number of cells in the body that then interfere with the continuance of life. Another process that trips the death program is when a cell fails to connect with other cells that would help it do its job, and here is where fetal development calls the shots. Very early in fetal development, embryonic cells exist in a state of totipotency. That is, the cells can become anything at first because their genome is open and all their genes are usable. As development progresses, they gradually shut down parts of their genome and therefore can only become certain cells-cells that are an expression of the remaining open genes. They travel from totipotency (I can be anything) to pluripotency (I am something in particular), and in the process they become mortal-their death program is one of the remaining open sets of genes. With their suicide programming intact, waiting to be tripped (or not) by events in the fetal environment, cell reproduction and migration roars ahead. There is evidence that embryonic cells differentiate via cues from their location-for instance, the cells at the head of the neural tube become the brain, and the cells at the base become the spinal cord (Larsen, 1998). Where a cell ends up in relation to other cells around it determines what it will become. Location also determines whether or not its' death program will be activated. Clark (1996) points out that in the fetus cell suicide plays a crucial role in the formation of the nervous system. If a nerve fiber fails to establish a connection with an appropriate cell (and less than half do), the neuron that sent it out must commit suicide. Death is a

default state for cells that fail to "web." What determines the web? Folk wisdom in the neurosciences states that neurons that fire together, wire together. In other words, we construct our nervous system via the way it gets used initially. Still more specifically, the experiences the fetus has in its womb environment influence how its nervous system constructs itself. If a neuron connects with another cell, it will receive chemical substances called growth factors from the target cell that in effect switch off its death program. The only way the death program would get tripped again is when mutations gradually accumulate, which tends to be around eighty or so years later. This kind of migratory life and death march in the fetus is not restricted to the nervous system. Our fingers and toes form by the death of the cells in between them. Immune cells are generated in excess, and only of they encounter foreign invaders will they receive growth factors which turn off their death programs. Clearly, death becomes us, even as we gestate before birth. CONSCIOUS EVOLUTION What implications can we derive from this for prenatal and perinatal psychology? For myself, I never teach birth psychology without death psychology. There is no birth without death. At the same time that I teach the benefits of conscious and loving conception, gestation, birth, and bonding, I also teach the power and grace of conscious dying. I teach students to facilitate a clients recovery of their historical dimension, which I call birth work, through tracking obstructed movement sequences and finding new movement possibilities. At the same time, I teach students to facilitate a clients death work, a bodily felt experience of letting go into the unknown, also called the ultimate dimension. In this way we make our life a whole, an oscillation between finding and releasing form, where beginnings and endings merge, where birth and death become one. Clinically, I watch for and coach a natural oscillation in my clients movement sequencing. This oscillation, I believe, represents our natural proclivity to move with what was and then move to dissolve what was. In this way the client uses body experiences to remember and acknowledge prenatal and perinatal trauma, while at the same time finding highly personal ways to move through and out of the traumas' negative imprints. We can use death to construct a new, more satisfying pattern, just like our cells do. In between birth and death, this material implies a level of cellular consciousness that we have only intuited before. And it certainly points out that evolution is not just some epochal unfolding that gradually changes dinosaurs into birds. It is alive and well in our wombs, ovaries, and testes, and it shaped us as we lay in our mothers wombs. As pointed out by Edelman (1987), Lipton (1998), and others, evolution doesn't just work via genes differential survival into the next generation. Evolution also uses current environments to influence whether or not certain genes turn on or off, death programming genes among them. Gestational evolution is a real and happening thing. On a nuts and bolts level it alerts us to the dangers of stressful or toxic fetal environments. It may help us to understand the origins of adult suicidal feelings, and to use death imagery more consciously with these clients. And at the same time, it may also awaken us to the possibility that we can direct our evolution more consciously, right as life begins. Lipton (1998) has enjoined us to contemplate the survival of the most loving. Now that we know that evolution occurs within our own bodies, perhaps we can use the power of love, alongside the power of movement and reproduction, as a means of consciously evolving. And being willing to die in small ways, to shape ourselves via letting go as much as efforting, will help us to access this power. Ultimately, our death will take us back into the ultimate dimension, into the mystery. Perhaps our comfort with the workings of this mystery may also dissolve the imprints of a traumatic gestation. By participating with the process of evolution as it unfolds, we embody the grace and glory that both birth and death point us towards. References REFERENCES Clark, W. R. (1996). Sex and the origins of death. New York, Oxford University Press. Darwin, C. (1859). in The portable darwin, Porter, D. and Graham, P., eds. New York, Penguin Books, 1993. Edehnan, G. (1987). Neural darwinism: The theory of neuronal group selection. New York, Basic Books. Larsen, W. (1998). Essentials of human embryology. New York, Churchill Livingston. Lipton, B. (1998). Nature, nurture, and the power of love. Journal of Prenatal and Perinatal Psychology and Health, 13(1), Fall 1998. Neese, R. and Williams, G. (1995). Why we get sick: The new science of darwinian medicine. New York, Vintage Books. AuthorAffiliation Christine Caldwell, Ph.D., LPC, ADTR AuthorAffiliation Christine Caldwell, Ph.D., LPC, ADTR, a somatic psychologist, is the founder and former

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