

THE MIRACLE OF LIFE: BABIES, WHIRLPOOLS, AND OTHER DISEQUILIBRIUM STRUCTURES.

Sermon written and read by Robert M. Thorson (profthorson@yahoo.com) on December 7, 2008 at Channing Memorial Church in Newport, Rhode Island.

READINGS:

Since the early days of biology, philosophers and scientists have noticed that living forms, in many seemingly mysterious ways, combine the stability of structure with the fluidity of change. Like whirlpools, they depend on a constant flow of matter through them; like flames, they transform the materials on which they feed to maintain their activities and to grow; but unlike whirlpools or flames, living structures also develop, reproduce, and evolve.

Fritjof Capra, *The Web of Life*.

Leonardo da Vinci believed “that the soul depends on the body for its activities.” In embryonic development, he wrote, the body “in due time awakens the soul that is to inhabit it.” And elsewhere, ... “The soul desires to dwell in the body because without the body it can neither act nor feel.”

Sherwin Nuland, *Leonardo da Vinci*

SERMON

Good Morning.

Giving this sermon is my small contribution toward our minister’s maternity leave. I chose my topic “The miracle of life” to honor Amy’s maternity and her husband Peter’s paternity, and to help us as a congregation prepare for the mysterious transformation about to take place in their lives and ours.

I appreciate the opportunity to share my thoughts with you this morning, and I hope that you find them worthwhile as well.

And now I begin.

Is our choir more than the sum of its voices?

Is our sanctuary more than the sum of its stones, and glass, and wood?

Is our congregation more than the sum of its individuals?

- I believe the answers are yes, yes, and yes.

All of these entities – songs, architecture, community – are what scientists call “emergent phenomena.”

They are beautiful complexities...or...more abstractly... higher levels of organization that emerge spontaneously from the flow of energy. Goldilocks would have appreciated this flux of energy... not too little, not too much, but juuuust right.

Mathematically, there’s no way to predict even the simplest emergent phenomena... such as a flock of birds... using linear equations based on the movements of individuals.

A new type math is required, one based on non-linear equations dealing with chaos, complexity, and catastrophe theory.

I refer to the good kind of chaos and catastrophe...for it is on the edge of chaos and at the cusp of catastrophe that beautiful complexities emerge from the equations.

And now I turn to what is arguably the most famous painting in the world... *The Mona Lisa* by Leonardo da Vinci, painted in Florence during the early 16th century.

Objectively, this is a portrait of Mona Lisa di Anton Maria Gherardini, then twenty-four years old, and...according to most scholars... almost certainly midway through her pregnancy.

One of these anatomists turned writers, Sherwood Nuland wrote: “Hers is the smile of inner satisfaction that the miracle of life is being created in her body.”

To repeat: “Hers is the smile of inner satisfaction that the miracle of life is being created in her body.”

Now ...I must ask you something about the physical painting:

Is the shape of Mona Lisa’s smile more than the sum of its pigments?

- I believe the answer is yes.

And now, a question about the female model:

Was her smile, in flesh and blood, more than the sum of its tissue?

- I believe the answer is yes.

And now... something about the baby growing in the womb of that smiling woman: Was that life more than the sum of its cells?

- I believe the answer is yes.

Finally, I must ask something about our minister, the Reverend Amy Bowden Freedman:

At her stage of imminent anticipation, is the life growing within her body today more than the sum of its biochemistry?

- I believe the answer is yes.

That makes me a believer in miracles. Me, card-carrying scientist and religious agnostic that I am.

I do not speak of magic... though many things do strike me as magical.
I do not speak of divine intervention, though many times I do get the sense that someone is looking out for me from behind the curtain.
I do not speak of the supernatural, a condition that I believe is impossible in this world. Instead, I speak of emergent phenomena, which are everywhere around us, reeling beyond the edge of stability but on this side of chaos.

My kind of miracle must meet four separate criteria.
It must be an event, rather than an object or a material. The event must be beautiful or good, for there is no such thing as a bad miracle.
The beautiful or good event must be astonishing, something that doesn't quite make logical sense.
Finally, the beautiful and astonishing event must be ineffable, something that we may be able to understand through our emotions but which we cannot adequately put into words or define with equations.
Perhaps that's why Leonardo's painting of the Mona Lisa says more about miracles than any words I might string together this morning.

Life...At every level from bacterial to Buddha... is an emergent phenomenon, so much more than the sum of egg, sperm, genetic software, and nutrition.

But what exactly... is... life?

This is a question that we geologists ponder scientifically. This is especially true for my colleagues who have pushed the limits of the fossil record back to the Archean Eon, nearly four billion years ago, when the most advanced life forms were certain strains of bacteria. It's also true for my colleagues who seek life on other planets, for example Mars.

A stone is not alive. Why not? A bacterium is fully alive. Why is this so? What's the difference?

We're not talking about the atoms or molecules involved, for the carbon atoms in a stone and those in a bacteria can freely change places without behaving any differently. What we're talking about is equilibrium.

The stone is in equilibrium.
It can sit around for billions of years, doing absolutely nothing, yet remain the same, even as the electrons whirl and the protons vibrate.
The beautiful granite blocks are the constituent parts of our church and steeple. In turn, the stones have constituent parts called minerals...in this case pink orthoclase, bronze muscovite, and smoky gray quartz.
But the minerals within the granite do not interact.
In the aggregate, they can absorb and give off energy.

But under normal conditions, they are not being transformed into something more complex. They are in equilibrium.

But even the simplest living cell, a bacterium, is in disequilibrium.

It will die if the energy it depends on is unplugged.

It will die if the chemicals its needs are denied.

It will die if the genetic instructions for metabolism are corrupted.

All forms of life are far from disequilibrium with respect to their surroundings, especially we human beings. A seasonal migration of a flock of birds can fall apart, perhaps because of some environmental change like climate warming. An individual flock can fall apart, perhaps from a lightning strike or terrific storm. An individual bird can fall apart perhaps from fatigue, and simply drop from the sky. On the ground, its tissues can fall apart to rejoin the great swirl of carbon, oxygen, nitrogen, and phosphorus called life.

For such emergent phenomena to exist at all...at any level... there must be energy...a “force of life.” In turn, the force of life must draw energy away from something larger and more fundamental, the “force of nature” which is ultimately driven either by nuclear fusion in our sun or nuclear decay within the Earth interior.

The force of life I refer to is the self-organization of matter into what’s called a dissipative structure, a term coined by the Nobel prize-winning Ilya Prigogine [Eye-lah Prih gahh’ zzhin.]

I know that definition doesn’t help much. So instead of going into the science, I will turn to my favorite example of a dissipative structure, the whirlpool, a fluid vortex... also manifest as the dust devil, the tornado, the cyclone, and the hurricane.

To the ancient mariners who feared them, whirlpools seemed to arise out of nothingness, yet be alive with spirits. They were close to being correct.

Think about the whirlpool that shows up so mysteriously in your bathtub drain.

Opening the drain inaugurates the flow of gravitational potential energy from high to low, which is another way of saying from order to disorder.

If the flow of water entering the tub drain is too slow, the water will merely leak downward.

If it’s too large, there will be only plunging turbulence.

But within some critical range, a vortex will emerge mysteriously and maintain itself as a local island of order within the larger sea flowing toward the disorder demanded by gravity.

Here’s what happens mechanically.

Some slight irregularity causes more water to enter one side of the drain than the other.

This induces a small rotational component to the flow... which picks up angular momentum... which builds until the system reaches a condition in which ...the centrifugal force... the water pressure... and the downward drainage all balance

each other in a special type of transient equilibrium called steady state, one kept in place by negative feedback loops.

CHOIR MOVES INTO PLACE

Whirlpools ...are beautiful steady-state structures that come close to being alive...quite capable of moving here and there... of changing, expanding and contracting... of shirking off minor disruptions... of maintaining their stability... seemingly against the odds.

Like you, they can have long lives, provided that the flow of energy stays within the proper range... not too little, not too much... but juuuust right.

If you restrict the flow of energy to a whirlpool too much, it will disappear. This is analogous to having a choir singing along on key, but having the flow of energy through the lungs of the voices become too faint to hear.

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CHOIR SINGS: I recommend a beautiful evocative chorale (like "Carry the Flame") when, after perhaps ten bars of music, there is a gradual ppppp to complete silence, perhaps over five or ten bars. Stay standing.

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This is also analogous to cutting off the supply of food energy to a cell or to a human being. Death by starvation will be the result.

If you ramp up the flow of energy too greatly, the whirlpool will disappear. This is analogous to having a choir singing along on key, but being drowned out by a greater noise.

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CHOIR SINGS: Begin the same chorale in the same place for a few bars, when a loud cacophony drowns out the choir, which is not heard from again. Stay Standing (The cacophony could be whatever you like, perhaps you on the piano pounding handfuls of keys at all octaves, or members shouting).

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This is also analogous to an abrupt human death... caused by a temporary excess of energy, perhaps by a bomb, a bullet, an automobile crash, or an execution.

If you merely disturb the water above the drain, the whirlpool will remain, but is altered until it returns to normal. This is analogous to having a choir singing along on tempo and key followed by a temporary dislocation... then a return to normal.

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CHOIR SINGS: Ditto as above beginning the same piece of music for a few bars, but keep the song going while making changes, for example like moving up a key and then, in a second step, changing the tempo, but be sure to bring it back to the original key and tempo and sing a few bars before ending.

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This is also analogous to temporary dislocation in human lives, perhaps an illness or an acute interval of grief.

If you keep the flow of energy going, but create a local disruption large enough, you will effectively kill the whirlpool.

But another one is certain to return, a new individual is certain to take the place of the former one.

This is analogous to having a choir in the process of singing one piece of music when, after a major intrusion, another piece of music, hopefully an even more beautiful one is the next thing we hear.

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CHOIR SINGS: The choir begins with the same song as before when, abruptly and coinciding with some major disturbance (for example everyone falls down; or they spin around; or they walk away and come back, etc.) they stop singing. When they get back into position you begin with a new, and hopefully even more beautiful chorale, keep it up for a few bars, and then end beautifully.

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This is analogous to one human generation giving birth to another. For this to happen, the genetic instructions for being a human whirlpool must be passed from parents to children before the big disturbance –called death – arrives.

Each of us entered the world as a new and unique whirlpool of self-organized chemistry. Each of us will leave this world as pile of the same chemicals, but with the self-organizing force flamed out. Our charge is to “carry the flame” as long as possible.

CHOIR RETURNS

This brings me to a discussion of higher levels of emergence, those at even higher levels than our complicated bodies.

When Ralph Waldo Emerson used the pronoun... “I” ...he was referring not to his foot, or his arm, or his leg or his body.

He was talking about his mind, his consciousness, or, in philosophical terms, his soul. I fully agree. I am not my material body. I am my immaterial consciousness. Take away my arms and legs and I am still me. Take away my consciousness and I am no more.

I am certainly not my brain... those three pounds of gray pudding arranged like a parfait ...in which my human brain is layered upon my reptilian brain, and that upon my fish brain, and that upon my worm brain, and so forth.

These layers of soft tissue are composed of complicated nucleated cells called neurons, each powered by a faint electric field fed by the breakdown of sugars in the presence of oxygen and regulated by the rules of organic chemistry.

But if I am not my body or my brain, then what or who ... pray tell... is the real me? Just as the whirlpool emerges from the flow of water, the real me... the conscious me... emerges from the flow of electrical energy in my brain.

Quoting one of my favorite authors, E.O. Wilson, I am... “a self-organizing republic of scenarios that individually germinate, grow, evolve, disappear, and occasionally linger to spawn additional thought and physical activity.” [unquote]

Think of this way. My body uses food to produce electrical power in my head. This is used to put on a networking drama inside my head...

My skull is the stage.

The various parts of my brain ...my cerebral cortex and hippocampus for example...are stage left and stage right...

My billions of neurons are the power cords, lamps and microphones.

My thoughts and memories are the actors who come and go in costume.

The real me... the self... the ego...the I, I, I ... is both the star of the show...the central character with whom the others interact... and the director, who invisibly calls the shots without knowing it.

We need our bodies to give us power. Otherwise it's like putting on a production during a power outage with no cords or lamps.

Conversely, our bodies need our conscious minds to regulate sensory responses in order to stay alive. Otherwise, what's the point.

Hence, my body and I are a team of two....the material one supporting the immaterial me.

I believe -- but cannot prove -- that there is one level of emergence above the real me, the real you, and the real everyone on earth.

For this level, Ralph Waldo Emerson used the word “oversoul.”

My mother uses the word “heaven” to describe this level...one beyond the pale... beyond what our biological senses and deepest thoughts are capable of detecting.

Perhaps there is a beautiful, self-organizing whirlpool of souls swirling somewhere out there in the cosmos. I simply don't know. But I have the hope that if immaterial radio waves can resonate, then so too can human wants and desires.

And now, a three-point review, couched in religious terminology.

Number 1. Life is a struggle. Indeed it is. As with whirlpools, we are islands or order drawing strength from the great sea of energy flowing toward disorder.

To my mind, it's better to have lived and died... to have struggled as a dissipative structure in steady state... than to have remained forever at the more fundamental level of a stone. One type of existence is not necessarily better than the other. One is simply more complex. It's hierarchically higher.

Number 2. There is rest for the weary. Indeed, there is. We live our lives like whirlpools ...in a condition far from the quiet comfort of equilibrium, far from the placid condition of still water.

Every day, we must work – both individually and as a religious community -- to hold ourselves upAgainst the physical gravity that draws us downward...

Against the social gravity that draws us away from the right thing to do....

Against the injury and illness that threaten the physiological machines we need to remain conscious...

Against the lack of food... lack of fuel... and lack of love that we all need in order to have the strength to get out of bed each day.

How nice it will be to feel the kind of equilibrium that stones must feel, resting in the earth without a fear in the world.

Number 3. Life is a miracle. Indeed. Every Sunday we read this in unison during our time of sharing. Indeed, during the course of geological history atoms emerged into molecules, then into autocatalytic chemical loops... then into organelles... then into cells, then into organs... then into organisms... which... one day, and probably by accident... gave rise to the "miracle of consciousness."

Leonardo da Vinci captured the miracle of life in the knowing smile on a pregnant woman, the Mona Lisa.

I've seen that same smile in Amy's face.

I look forward to the human emergence of her newborn baby that ...within a month...will enter this world and our congregation.

Indeed... Life is a miracle.

Thank you for listening.

Amen.