NATIONAL CATHOLIC REPORTER
Published on *National Catholic Reporter* (http://ncronline.org)

The paschal mystery: The creativity of emptiness

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In 2008 Catholic astronaut Heidemarie Stefnyshyn-Piper, while on an extravehicular walk outside the international space station, lost her $100,000 tool bag into the vacuum of space. It got a lot of press.

Well ? it?s actually not a pure vacuum. Even in the deepest outposts of space a few atoms float around together with photons of energy flying through at the speed of light continuously.

Scientists remind us there is also what?s called a ?quantum potential,? which exists at every point in the vacuum of our three-dimensional physical space. In it, under the proper conditions, matter and energy can literally materialize out of what we used to think of as absolutely nothing. The vacuum state is not truly empty but instead contains fleeting electromagnetic waves and particles that pop into and out of existence.

Scientists take this bizarre physical phenomenon quite seriously. It has actually been observed routinely in particle accelerators, but the conditions to create anything more than a scattering of subatomic particles would require extremely high energies and a control of the process far beyond any ability we now have.

Nevertheless, according to present mathematical models of physics, it is scientifically possible to create anything right out of the vacuum.

The fact that developments in science are often capricious and unpredictable has been evidenced as the classical notion of empty space has been updated.

?No point is more central than this, that empty space is not empty. It is the seat of the most violent physics,? said one of the world?s foremost physicists John A. Wheeler.

The quantum vacuum is thought of as a seething froth of real particle-virtual particle pairs going in and out of existence continuously and rapidly. Each of these strange pairs consists of a particle and its antiparticle, one of which has a negative energy and is thus called ?virtual.? The quantum vacuum is considered to be a dynamic condition of equilibrium in which this reversible process is occurring everywhere extremely quickly.

The appearance out of nothing of a particle happens because the probability for it exists. It?s a protean version of Murphy?s Law: If it can happen, it will.

The vacuum is also permeated by what is called a ?Higgs field,? named for physicist Peter Higgs. In the standard model of particle physics, which has mapped the subatomic world with remarkable success for over 30 years, the masses of all particles are generated as a result of their interactions with this field.

It?s posited that excitations of the Higgs field occur in the form of a particle known as the ?Higgs boson.? Detecting the Higgs boson, the only particle in the standard physics model that has not been observed experimentally, is one of the outstanding challenges in physics today. Scientists hope to detect the Higgs boson using the European Organization for Nuclear Research?s Large Hardon Collider (LHC) on the French-Swiss

border, which became operational in 2008. The LHC is the world?s most complex scientific instrument and its largest particle accelerator, colliding protons on protons at high energy to generate what physicists hope will be a number of new particles, including the Higgs boson.

We thus gain an appreciation for the amazing potentiality of nothingness.

And nothingness is everywhere. Over the past several decades, physicists have verified that the total mass of an atom is about one part in a million billion. In other words, each atom is 99.9999 percent empty. There?s not much matter in matter. And these are not esoteric distant objects; they?re the atoms we?re all made of.

No matter how solid it feels, there is almost nothing there. So, what is all the emptiness? No one really knows, though all life and matter emerge from this fecund creativity at the very heart of things.

Physicist Brian Swimme wrote: ?You are more fecund emptiness than you are created particles. We can see this by examining one of your atoms. If you take a single atom and make it as large as Yankee Stadium, it would consist almost entirely of empty space. The center of the atom, the nucleus, would be smaller than a baseball sitting out in center field. The other parts of the atom would be tiny gnats (electrons) buzzing about at an altitude higher than any pop fly Babe Ruth ever hit. And between the baseball and the gnats? Nothing. Emptiness. You are more emptiness than you are anything else.?

Catholicism has an ancient mystical tradition that speaks to this. Thomas Merton wrote: ?There is in all things an invisible fecundity, a dimmed light, a meek namelessness, a hidden wholeness. This mysterious unity and integrity is wisdom, the mother of us all.?

It?s Easter?s paschal mystery, too. Galaxies complexify when gigantic stars die and explode. Seeds must die in order for plants to grow. Old ideas and ways of living must go off to die for new structures and new life to be born. Life after death is about transformation and new life. We can trust death because we trust life. Out of the emptiness, everything emerges over and over again.

Source URL (retrieved on *09/03/2014 - 02:22*): http://ncronline.org/blogs/eco-catholic/paschal-mystery-creativity-emptiness