

Fusion: Nature's Energy

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This article is the second of a series of eight articles on fusion power written by Tom Tamarkin and Pat Boone in their collaboration to speak to American citizens...in fact all citizens of the world...on the ill-fated history of fusion power development and the urgent need to resurrect and complete it. The articles were initially written by Mr. Tamarkin and were deemed too scientific and "heavy" for non-scientists. In February 2011 Mr. Tamarkin approached Mr. Boone who agreed to edit and personalize the originals and publish them in his weekly news columns in various media outlets. The articles are based on four years of intensive research and personal interviews with high-energy plasma & fusion scientists and visits to all the leading fusion laboratories.

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I hope you realize how special you are.

I do, when I speculate on this spinning ball we inhabit. You're aware, I trust, that our blessed Earth is a unique part of a finely tuned universe and is itself miraculously fine-tuned. As Albert Einstein mused, "This Earth is not an accident; that's **scientifically unthinkable.**"

All our latter-day space exploration has discovered not one other planet fabulously designed with conditions for the formation and development of human life. Mankind, through the attribute of intelligence and the ability to reason, is set apart from all other forms of life. Man controls his life apart from his surroundings, whereas all other forms of life must adapt to their surroundings and are controlled by them.

Fundamental to man's ability to control his life is access to energy.

- The more people that crowd onto this unique planet, the more energy must be developed and available. Energy is absolutely required for:
 - agriculture, in all forms, and production of potable water;
 - transportation;
 - production of virtually all goods required by humans;
 - provision for man's comfort and survival in all weather conditions.

However this planet came to be – whether the lately postulated "Big Bang" or the profound Genesis account of the Creator saying "Let there be ..." – we know the Earth has three sources of energy, resulting from two fundamental scientific processes. And these sources are atomic in nature.

Firstly, the Earth is unique in having life as we know it powered through photosynthesis, from energy

produced by the sun. This colossal energy within the sun is provided by the fusion of hydrogen into helium – and the associated release of energy. Many scientists describe the Earth as an organic battery, having been “charged” by the sun for as long as both have existed, in what we call the Solar System.

Secondly, the Earth is unique in the large amounts of fissionable heavy elements occurring in nature – like uranium and thorium. These elements are very rare elsewhere in the universe, where hydrogen and helium make up 99 percent of available elements.

Thirdly, the Earth is unique in the large amounts of “deuterons,” or heavy hydrogen atoms. Across the universe, approximately 2 in 100,000 hydrogen atoms are deuterons, but on Earth the ratio is 1 in 6,420. The Pacific Ocean alone contains 10 to the 41st power of these exceptional atoms.

Maybe you’re asking right about now ... “What’s this all about, Professor Pat?” I’ll tell you. It’s about human survival on this unique planet. I’ve been studying with a group of scientists and physicists about the three sources of energy on which our future depends. And only one is our ultimate hope.

The third choice, the one we’re familiar with, but the weakest one, is energy produced by chemical reactions that generate heat by “burning” hydrocarbon fossil fuels. These fuels were created through photosynthesis in combination with the processes of plant and animal life, from the energy provided by the sun. Though some scientists estimate the age of the rock we call Earth at 4.6 billion years –others warn us that the 400 year period we’re living in now will soon have depleted usable fossil-fuel reserves.

It’s absolutely imperative that, during whatever time we have left, man must use his intelligence and reasoning abilities to master the second and first choices of energy – because fossil fuels are finite and cannot be replaced or reproduced.

Beginning to get the picture?

The second – and interim – choice is energy produced by the atomic reaction of splitting heavy elements such as uranium, element 92, isotope 235, or thorium element number 90, isotope 232. This is almost “Greek” to me, not my training by a long shot, but I’m motivated to learn what I can, while we can.

Thorium 232 is relatively abundant on Earth. Uranium 235 is far less abundant. It’s estimated that there is enough usable thorium 232 on the Earth to provide the energy consumed by the United States, at current usage, for the next 1,000 years. But that’s just the U.S., a small part of this planet. And that is just to produce electricity. This does not include transportation and industrial energy requirements.

However, the splitting apart of elements in a man-induced atomic reaction is contrary to nature and the way our universe was formed. Regardless if you believe the creation was created by the hand of God or a random “Big Bang” event, the Jewish and Christian scientists I am learning from have shown me this creation of the universe and our blessed Earth came to be through the fusion process. The creation is a

process of building by combining elements, not splitting them apart.

The splitting of atoms results in many problems such as nuclear radiation, long-term dangerous radioactive waste, melt downs of fuel cores (as in Chernobyl) and the ominous uses of atomic energy to wage war and annihilation.

So what's our answer ... our only answer?

The first choice and long term our only hope is energy produced by the process of nuclear fusion, wherein two light element atoms are fused into a slightly heavier atom, along with a corresponding release of dynamic energy. To scientists (and I'm not one), a well-known and understood example is the fusion reaction of D (hydrogen 2) + T (hydrogen 3) > He4 (helium) + 17.6 MeV (energy units) + n (neutron). There are many other fusion reactions, each having distinct advantages and disadvantages.

This appears to be the very process, the "big bang" if you will, by which God initiated – or created – everything we know.

This is also the fundamental process of the sun, which is generating the energy giving us life right now.

Here's the main point: Our earth has enough heavy hydrogen (deuterium) to power the entire world's energy literally for eternity.

So controlled nuclear fusion is nature's first choice for energy, because:

- it follows the laws of the creation of the universe;
- it has none of the negative aspects associated with fission, or the splitting of atoms;
- it is virtually an unlimited source of inexpensive power (once it's developed and running), capable of supplying 100 percent of the Earth's annual – and ongoing – energy requirements.

A final thought. Animals and humans were given different natures, in Hebrew "Nefesh" and "Neshamah." Nefesh is the animal instinct toward survival, comfort and reproduction. Neshamah is the higher nature, a reflection of God Himself, that sees the bigger picture and realizes how interconnected – and interdependent – we all are. Actually, we humans have both natures, often in conflict with each other.

An interesting philosophical and moral parallel can be seen here. Today we have nuclear fission power based on the splitting apart of atoms. That is relatively easy to do and this form of energy was first "invented" during World-War II through the "Manhattan Project" to produce the atomic bomb; a device meant to destroy property and even human lives. Fusion is an elemental atomic building process as opposed to an atomic deconstruction process. It is the bringing together of two atoms to form a new heavier atom along with the release of energy. It is much easier to destroy things including human relationships than to build new things and maintain human relationships.

Fusion is very difficult to do. It involves tremendous scientific understanding and yet to be made discoveries. But it is critical that people work together and make these discoveries to develop fusion energy as a commercialized power source before we allow our planet's energy supply to run dry.

As the renowned scientist/author Dr. Gerald Schroeder observes, "When the two natures are in sync, great goals can be reached."

That's my hope in writing this column.



Tom Tamarkin is the founder & CEO of USCL and EnergyCite®. In the 1970s Tom was an undergraduate student at Northern Arizona University majoring in physics with a dual minor of chemistry and applied mathematics. Tom is credited with inventing the electrical utility smart grid-Smart Meter in 1991...well before the concept of the smart grid became popular. In 1992, Public Power Magazine published an article which has become the basis for the "smart meter" which is now the corner stone of the current U.S. Department of Energy utility stimulus grants program with emphasis on energy conservation and awareness. Tom holds six granted patents on the smart meter system and has numerous patents pending. Tom lives with his wife of 30 years, Emily, in Carmichael, California.



Pat Boone is a legendary Hollywood icon in the performing arts who traces his ancestry to the American pioneer, Daniel Boone. Pat has sold over 45 million albums, had 38 top 40 hits, and starred in more than 12 Hollywood motion pictures. Pat graduated from Columbia University in New York City, magna cum laude in 1958. Pat is well-known for his old-fashioned values, which contributed to his fame and popularity in the early days of the rock & roll era to the present. Today he is still active on television and in the motivational speaking circuit. Pat has spent the last few years writing columns and books and runs his own record label named Lion & Lamb. Pat's first book, "Twixt Twelve and Twenty," Prentice Hall, was a number 1 Best Seller in America. Pat lives with his wife of 60 years, Shirley, in Beverly Hills, California.