Could Cosmic Rays Modulate Psychosocial and Cultural Genomics?

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Abstract

Do cosmic rays from outer space modulate psychosocial and cultural genomics? This is the basic question we attempt to answer in this contribution. We blend our current scientific understanding of cosmic rays with a vast but uncertain literature that has recently developed about it. This contribution illustrates an interesting integration of science fact and fiction to develop novel explanations for the how the creative human mind may operate in relation to cosmic rays.

Introduction

A Wikipedia search for Cosmic Rays yielded the following.

> In 1930, Bruno Rossi [No known relation to the current authors.] predicted a difference between the intensities of cosmic rays arriving from the east and the west that depends upon the charge of the primary particles—the so-called "east-west effect." Three independent experiments found that the intensity is, in fact, greater from the west, proving that most primaries are positive. During the years from 1930 to 1945, a wide variety of investigations confirmed that the primary cosmic rays are mostly protons, and the secondary radiation produced in the atmosphere is primarily electrons, photons and muons. In 1948, observations with nuclear emulsions carried by balloons to near the top of the atmosphere showed that approximately 10% of the primaries are helium nuclei (alpha particles) and 1% are heavier nuclei of the elements such as carbon, iron, and lead.

During a test of his equipment for measuring the east-west effect, Bruno Rossi observed that the rate of near-simultaneous discharges of two widely separated Geiger counters was larger than the expected accidental rate. In his report on the experiment, Bruno Rossi wrote "... it seems that once in a while the recording equipment is struck by very extensive showers of particles, which causes coincidences between the counters, even placed at large distances from one another." In 1937 Pierre Auger, unaware of Bruno Rossi's earlier report, detected the same phenomenon and investigated it in some detail. He concluded that high-energy primary cosmic-ray particles interact with air nuclei high in the atmosphere, initiating a cascade of secondary interactions that ultimately yield a shower of electrons, and photons that reach ground level (https://en.wikipedia.org/wiki/Cosmic_ray).

The consequences of such deep cosmic rays that penetrate the outer atmosphere of earth are typically illustrated in figure one.

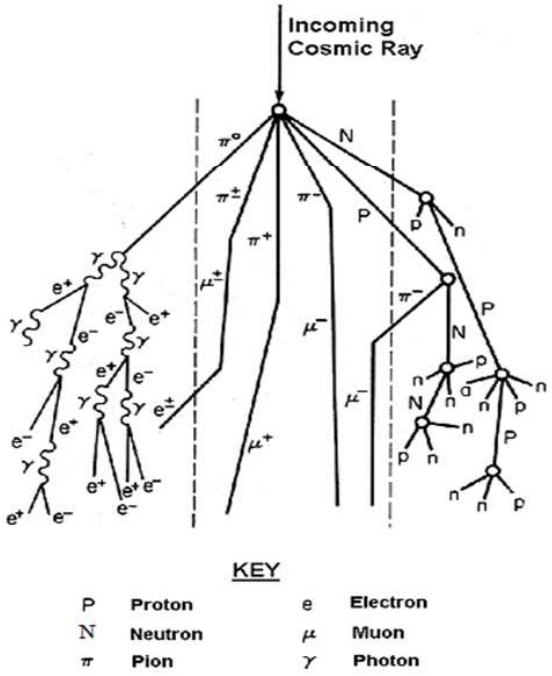

Fig. 1: A scientifc view of a Cosmic Ray Shower From Deep Space. The Incoming Cosmic Ray hits a molecule in the earths outer atmosphere and progresses to earth as suggested in figures 2 and 3.

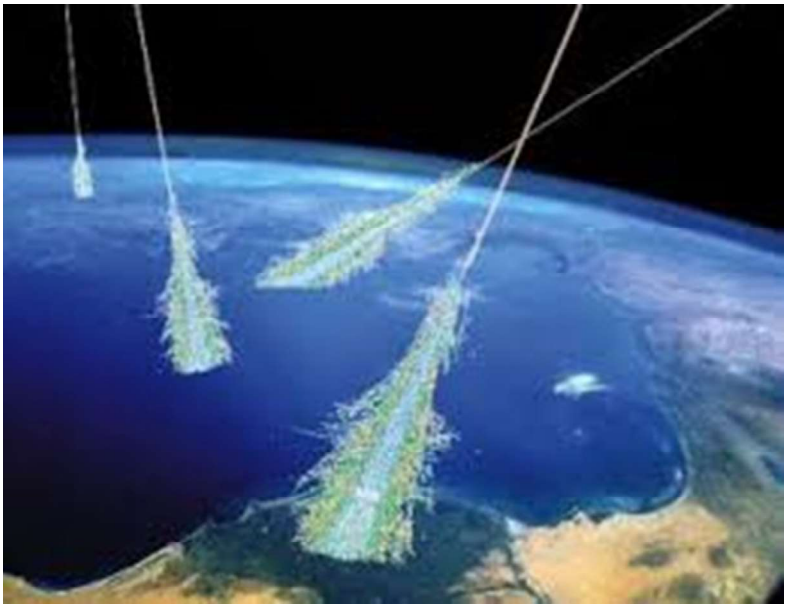

Fig. 2 An artistic conception of four Cosmic Rays showering earth from deep outer space in the night sky.

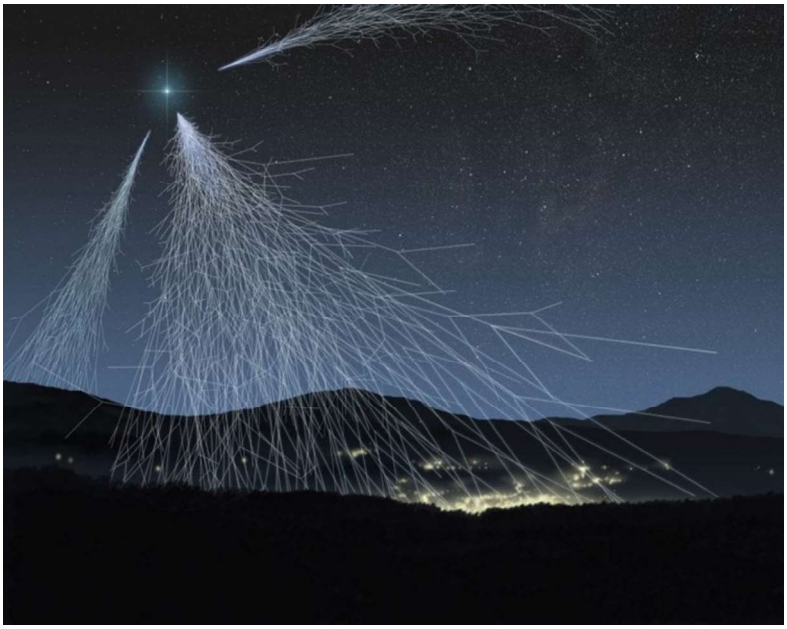

Fig. 3: Another artistic illustration of a Cosmic Ray Shower from outer space that shows the condition in the early evening around 10:00 pm when Frank Wilczek had his experience of "An Enchanting Experience."

These artistic illustrations of cosmic rays from deep outer space are the setting for our hypothetical speculation of what could have happened to the 2004 Noble Prize winner, Frank Wilczek, in the autobiographical portions of his recent book (Wilczek 2015), which we now quote here.

An Enchanted Evening

Up until 10:00 PM or so, the day in (summer, 1976), that would turn out to be the most productive in my scientific career seemed anything but promising. My very young daughter, Amity, had an ear infection, and all day long she was feverish, cranky, and needy…As the dark midwestern night set in, Amity at last fell into exhausted sleep, and then Betsy [my wife] too. They looked like angles of peace.

The alertness and energy that coping with a stream of little crises had called forth was still with me, after the crisis themselves had passed. Seeking an outlet, I decided, as I often do, to take a walk. The night was brilliantly clear; the sky radiant; the horizon sharp and distant; and even the ground, moonlit, seemed ethereal. With images of earthly angles lingering within me, and celestial spectacle surrounding me, I felt an unlikely elation. It was a time for big thoughts.

The basic problem is simple: The Higgs particle, in that model, likes to couple we heavy particles, … Higgs particles would be produced …

That was my first important realization of the night.

I couldn't do an accurate calculation in my head, though it seemed OK from rough estimates. . . It was clear to me, right away, that this was the dominant way Higgs particles would couple to stable matter. It opened a promising window into the unknown.

That was my second important realization of the night.

… An especially interesting possibility is to have some extra symmetry that gets broken spontaneously. This can lead to the existence of new massless particles – a spectacular possibility!

That was my third important realization that night.
… Instantons break symmetry in particularly interesting ways, and I thought it would be fun to bring those in… I dimly perceived that the particle would otherwise have been massless, according to my third realization, would instead get a tiny mass, and would have other interesting properties.

That was my fourth important realization of the night, and it brought me home. (Wilczek, 2015 Pp. 269-271, italics added here).

We now speculate that these four important realizations were the consequence of the cosmic ray shower that entered Wilczek's head, brain and neurons on that "enchanting evening." This speculation could, of course, be immediately attacked by the authorities who routinely emphasize the destructive potential of cosmic rays on humans emphasized by Wikipedia as follows.

Health threat from cosmic rays

Galactic cosmic rays are one of the most important barriers standing in the way of plans for interplanetary travel by crewed spacecraft. Cosmic rays also pose a threat to electronics placed aboard outgoing probes. In 2010, a malfunction aboard the Voyager-2 Space Probe was credited to a single flipped bit, probably caused by a cosmic ray. Strategies such as physical or magnetic shielding for spacecraft have been considered in order to minimize the damage to electronics and human beings caused by cosmic rays. (https://en.wikipedia.org/wiki/Cosmic_ray).

While we certainly accept these very real dangers from cosmic rays, we must also accept that their effects on humans are *indiscriminate*: they are forces of nature that do not decide whether they have harmful or helpful effects when they strike an individual's DNA or natural neuronal networks of the brain. The entire ethos of Darwinian effects on gene expression is also *indiscriminate*: there is no bias either way – they can be harmful or helpful (Gell-Mann, 1994).

Are Cosmic Rays the Source of Life, Free Will and Consciousness Itself?

This contribution to the question about cosmic rays modulating psychosocial and cultural genomics remain open at this time. It only becomes more pressing as we advance into a foreseeable future that includes human traveling through outer space. We propose and illustrate here a new possible explanation of certain unexplainable creative processes may be taking place all around us as we go about our normal daily activities totally unaware of the indiscriminate effects of cosmic rays on our cognition. These indiscriminate effects can be harmful or helpful. When they are harmful, we call them "cognitive errors." When they are original, we consider them to be possible new insights. However, this begs the question, "*What is the source of these indiscriminate effects on the same neural networks of the brain?*" In brief, we propose that these conceptions of cognitive errors, so-called "free will" and perhaps perceptions of consciousness itself may be found in cosmic rays.

In fig. 4 we illustrate the evolution four fundamental forces of nature.

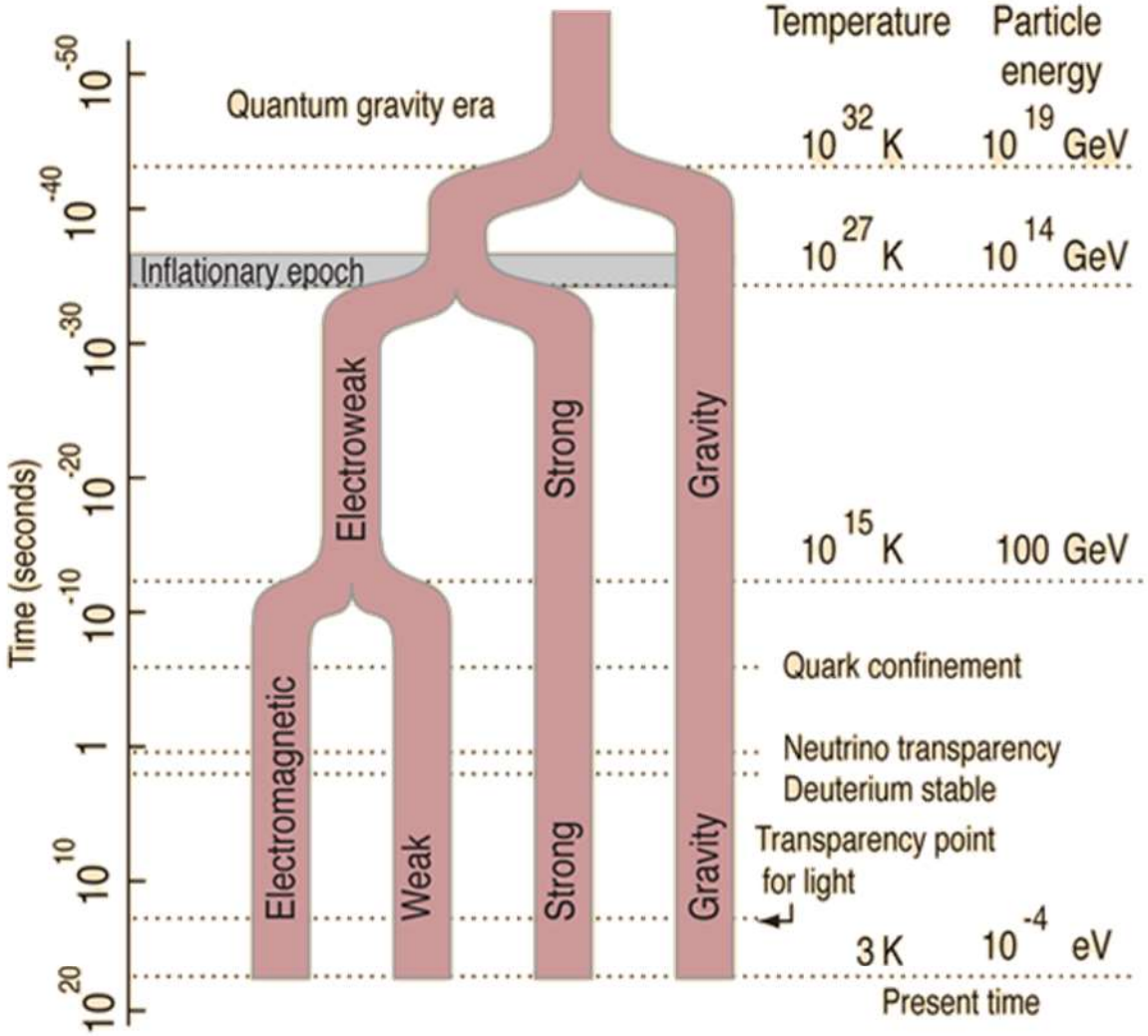

Fig. 4: The evolution of the four fundamental forces of nature since its origin in the big bang to the present time (Nave, 2019).

Wilczek has stated that life itself depended on the evolution of the weak force as follows.
Quantum chromodynamics (QCD) governs the basic dynamics that build protons, neutrons, and the other hadrons out of quarks and gluons, and the forces that bind together nuclei – the so-called strong force. Quantum electrodynamics (QED) runs the worlds of light, atoms, and chemistry…

Neither of these two great theories, however, incorporates processes whereby protons transform into neutrons, and vice versa. Yet such transformations occur. How can we account for them? To explain these events, physicists had to define one more force in addition to those of gravity, electromagnetism, and the strong force.

This new addition, this fourth force, is called the weak force. The weak force completes our current picture of physics: The Core.

Life on earth is powered by a tiny fraction of the energy released from the Sun, captured as sunlight. The Sun derives its power by burning protons into neutrons, releasing energy. *The weak force, in this very specific sense, makes life possible…*

That transformation is accompained by the emission of an electron *e* and an antineutrino *v*. So, our basic, quark-level interaction is realized as:

$$n \rightarrow p + e + \nu$$

This slow decay (lifetime fifteen minutes) is the fate of [free] isolated neutrons. (They are stabilized only when bound inside nuclei). This slow delay of free neutrons is illustrated in the figure below by two independent methods of measurement.

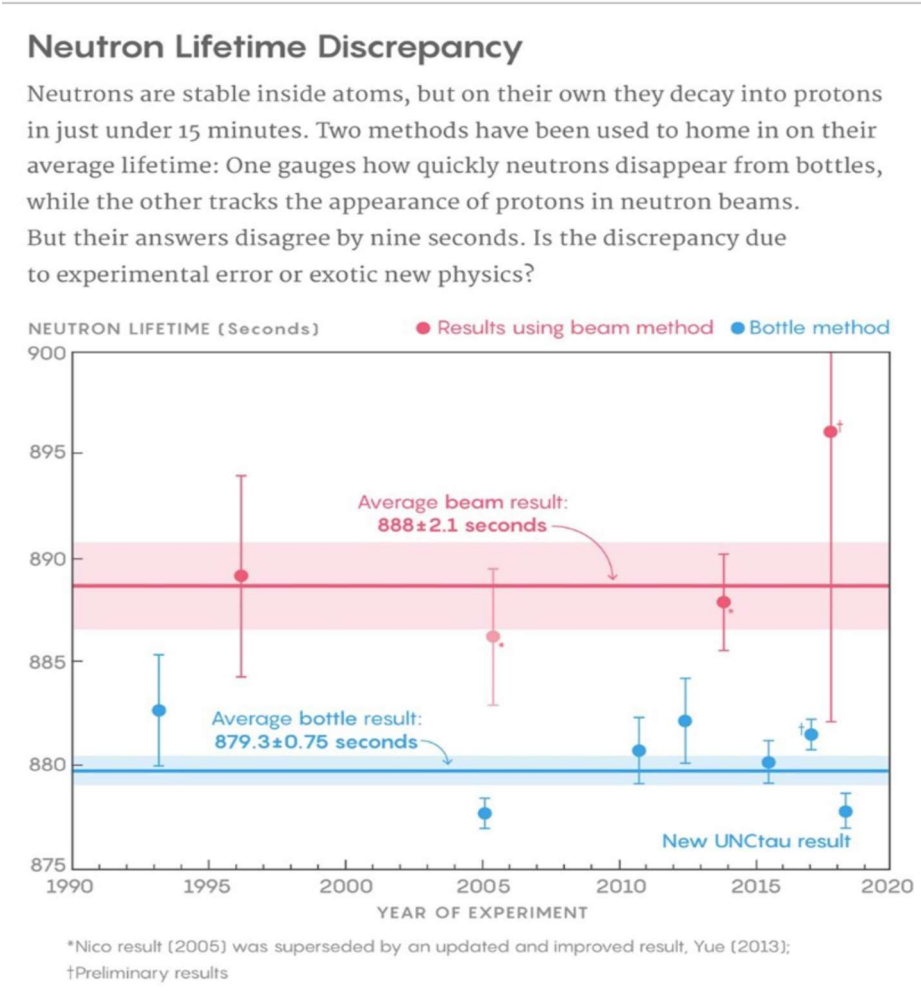

Fig. 5: The free neutron has a lifetime of just under 15 minutes when measured independently by two methods.

The relevance of this measurement for human experience was discovered by Rossi (1991), who reported it as "*The 20 Minute Break: Using the New Science of Ultradian Rhythms.*" This was later adapted by Hill & Rossi (2017) to a more generalized psychotherapeutic context.

Summary

This contribution to the question of whether cosmic rays could modulate psychosocial and cultural genomics opens a new chapter in our investigation of the forefront of current research. Many of its principal proposals remain open for further research into the mysteries of human experience. Relating the positive effects of cosmic rays on the human condition is still very difficult because this is probably the first contribution to the subject. Most of the existing scientific literature still reports the destructive effects of cosmic rays on human experience because these of the alarm we all experience in our initial encounter as we approach outer space travel. There are compensations for this, however. Not least among these compensations are the new insights they provoke into the still unanswered questions about the details of the human condition at the present time.

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