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A Personal History of Earth Expansion

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My road to Earth expansion was short and idiosyncratic but it shaped the trajectory of my life. In the spring of 1974, I was reading a book by the Austrian scientist Wilhelm Reich (1897-1957) when, in a moment of insight, it occurred to me that Reich's theories implied (1) that the Earth pulsates—expands and contracts, (2) that expansion would explain continental drift, (3) that pulsation would cause (or was caused by) variations in gravity, and (4) that a reduction in gravity associated with Earth expansion may have led to the evolution of the giant dinosaurs.

At the time I was an undergraduate at Georgetown University studying history. I had a general knowledge of continental drift but very little interest in geology, and the only thing I knew about dinosaurs was that many were giants. I recall chuckling to myself after having my “epiphany” and thinking that the idea was crazy, but also resolving to do some research into the subject.

One of the first things I discovered about dinosaurs was that they first appeared about 250 million years, at nearly the same time that Pangaea began to break apart. This struck me as either a huge coincidence or else it meant that I might be on to something. I also discovered that all dinosaurs descended from small bipedal ancestors, another interesting fact that may have been related to a reduction in surface gravity.

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Before discussing my geological and paleontological research, I need to provide some background concerning how I ended up at Georgetown reading Wilhelm Reich in 1974.

Coming of age in 1960s America, I had many interests, including history and science. My interest in history probably stemmed from my father's experience as an infantryman in World War II. This was also the era of the first manned spaceflights culminating in the Apollo moon landing in 1969. I was a genuine space nut, which led to my lifelong interest in science. (I am currently the administrator of four space-related groups on Facebook, as well as a group devoted to Earth expansion.) My interest in spaceflight led to a lifelong fascination with gravity and especially what actually causes gravity. Because of my passion for spaceflight, I intended to study aerospace engineering with the hope of eventually becoming an astronaut. However, by the end of the 1960s the Vietnam War was dominating the news, so my interests drifted away from science back to history and international relations in particular. I was only in the top third of my high school class but I did very well on my college entrance exams, which is why I was admitted into the best international relations school in the country, the Georgetown University School of Foreign Service (SFS).

Although SFS is a training ground for future diplomats, I never intended to join the foreign service. During my final two years at Georgetown I took nothing but history classes. In short, I was (and still am) a history geek. Geology was at the bottom of my list of interests. However, I eventually came to discover that geology is the most fascinating history subject there is, and I eventually went back to school to study it. But I'm getting ahead of myself.

Wilhelm Reich and the Earth as an “Orgonotic System”

It is impossible in this short essay to write a comprehensive account of Wilhelm Reich's life and work, or to describe the details of his clinical and laboratory research.¹ The essential point is that there was a logical progression in his research that led him to his discoveries, which I took very seriously, and which led me to my “discovery” of Earth expansion.

Reich is most famous (or infamous, depending on one's point of view) for his discovery of “orgone energy,” which Reich originally

¹ For excellent accounts of Reich's life and work, see Sharaf (1983), Strick (2015), the Wilhelm Reich Trust website at wilhelmreichtrust.org/biography.html; and, of course, the many books written by Reich himself.

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believed to be a strictly biological energy but eventually concluded was a cosmic physical energy that pervades the universe.

In order to understand why I was reading Reich in 1974 and how it led to my “discovery” of Earth expansion, it will be necessary to discuss (as briefly as possible) his life and work. To do this, we must begin near the end of Reich’s life.

In the early 1950s, after the publication of several magazine articles¹ that accused Reich of fraud and quackery, the U.S. Food and Drug Administration (FDA) investigated Reich and especially his use of his “orgone accumulator” (ORAC) on cancer patients. Reich claimed that the ORAC—which was simply an empty box consisting of alternating layers of organic and metallic material—concentrated orgone energy and had positive therapeutic and other interesting effects.

Because Reich was treating patients with an unapproved device, the FDA ordered Reich to cease and desist. Reich refused, which led to a protracted legal battle that culminated in a Complaint for Injunction filed by the FDA in federal court in 1954. However, Reich refused to respond to the Complaint or to even appear in court on the grounds that scientific research should not be judged in courts-of-law. Consequently, the court held Reich in contempt and sentenced him to two years imprisonment (the maximum) in Lewisburg Penitentiary, a maximum security federal prison, where Reich died in 1957. Worse still, the court ordered the destruction of every publication that contained the word “orgone,” deeming them false advertising for the Orgone Accumulator. Since most of Reich’s English-language books had been published after he had begun his orgone research ca 1940, nearly all of his books and publications mentioned “orgone,” in the foreword if nowhere else. As a result, in 1956 and 1960 (after Reich’s death) the FDA seized and burned every book and publication written by Reich that it could find.²

Fast forward to the 1970s. Reich’s books had been out of circulation for more than a decade. Fortunately, times had changed and Reich’s books, republished by Farrar Straus & Giroux, began to appear again

¹ The articles were “*The New Cult of Sex and Anarchy*” and “*The Strange Case of Wilhelm Reich*”, written by freelance writer Mildred Edie Brady and published in “*The New Republic*” in 1947, which called on the FDA to investigate Reich. Also see Martin Gardner’s book “*Fads and Fallacies in the Name of Science: The curious theories of modern pseudoscientists and the strange, amusing and alarming cults that surround them*” (1952), which devotes an entire chapter to Reich, whom Gardner lumped together with flat earthers, Biblical creationists, Lysenko, Edgar Cayce, Immanuel Velikovsky, and L. Ron Hubbard, the founder of the “religion” of Scientology.

² For a complete account of this sad tale, see Greenfield (1974).

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in bookstores, where I discovered them. I don't recall how I learned about Wilhelm Reich, but what drew me to him initially were his ideas about sexuality and its primal role in the human affairs, which struck me as accurate and truthful (i.e., conformed with my own views on the subject).

During the early 1970s a new (republished) Reich volume seemed to appear in bookstores every month or so, and I eagerly bought and read all of them. The gradual reappearance of Reich's books, in roughly chronological sequence, allowed me to follow the development of his research. I have read all of Reich's books, some of them several times. However, it wasn't until I read one of Reich's last books, *Cosmic Superimposition*, published in 1951, that I had my epiphany about Earth expansion and the dinosaurs.

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Wilhelm Reich began his career as a psychoanalyst and he was admitted into Sigmund Freud's inner circle even before he had completed his medical studies at the University of Vienna in 1922. Reich soon emerged as Freud's most brilliant pupil. Freud said that Reich had "der beste Kopf" (the best head)¹ in the Vienna Psychoanalytic Society; some of Reich's jealous colleagues called him "Freud's pet."²

Like Freud, Reich believed that all neuroses had a sexual origin. Reich also agreed with Freud that the libido was not simply a concept but an actual biological energy, which, when repressed, becomes diverted into neurotic symptoms. Reich's therapeutic work revealed that all of the neurotic patients he treated suffered from what he called "orgastic impotence"—the inability to experience full orgasmic gratification during genital intercourse. Reich maintained that all neurotics suffered from orgastic impotence (not to be confused with erectile or ejaculatory impotence) and that the goal of therapy should be the restoration of orgastic potency.

In 1927, Reich published *Die Funktion des Orgasmus*³ in which he described his theory that the orgasm serves as a natural means of

¹ Sharaf (1983: 82)

² Sharaf (1983: 5)

³ *Die Funktion des Orgasmus* (1927) was eventually translated and republished in English as *Genitality in the Theory and Therapy of Neurosis* (1980) by Farrar Straus & Giroux (FS&G). It should not be confused with *The Function of the Orgasm, Volume 1 of the Discovery of the Orgone*, which is an entirely different book that was originally published in English in 1942 and republished by FS&G in 1973.

regulating and releasing the sexual energy that builds up naturally in humans. If the orgasm function is disturbed, as Reich found to be the case in all of his neurotic patients, then the biological sexual energy is never fully released; it continues to build up in the body and is diverted into neurotic symptoms, including “character armor,” which consists of mannerisms and behaviors anchored in the muscles that neurotics develop to ward off unwanted sexual urges.

In addition to his therapeutic work, Reich was also very active politically in the Austrian Social Democrat party and later the German Communist Party. He recognized that psychoanalytic therapy was of limited value because it was affordable only by the middle and upper classes and was unavailable to the working class. Reich also realized that treating neuroses in individual patients was insufficient since the affliction was so widespread. Reich concluded that the prevention of neuroses was essential, which required the wholesale transformation of the prevailing social system and anti-sex morality in favor of a life-affirmative society that encouraged healthy sexuality rather than suppressing it. Reich’s left-wing activism put him at odds with the psychoanalytic society, whilst his association with bourgeois psychoanalysts angered the Communists. He was eventually expelled from both the International Psychoanalytic Society and the Communist Party.

In the wake of Hitler’s ascension to power, Reich emigrated from Germany to Denmark in April 1933 and eventually settled in Oslo, Norway, where he hoped to escape politics and pursue a quieter and less controversial life devoted to research. But controversy followed Reich wherever he went. For about four years Reich was able to work in Norway in relative peace, during which time he collaborated with many other researchers, especially in France, until a vicious politically-motivated newspaper campaign forced him to emigrate from Norway to the United States in August 1939. He sailed on the last ship to depart Oslo before the European war broke out.

Upon arriving in the United States, Reich settled in a suburb of New York City and began teaching at the New School for Social Research. For a few years, Reich was something of a celebrity in New York City and he attracted many prominent people as patients as well as many students, primarily MDs, who were interested in his work on character analysis. However, Reich’s primary interest during his years in Norway and the U.S. was not therapy but laboratory research.

It was in Norway during the 1930s that Reich performed his most important research and made his most significant discoveries. Reich’s interest in the bioenergetic aspects of sexuality led him to pursue two separate but related research programs: (1) bioelectricity and its

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relationship to pleasure and anxiety, and (2) microbiology, and in particular the study of pulsation in microorganisms.

“By 1934, the physiological emphasis of Reich’s therapeutic work was becoming increasingly important: the investigation of the streaming of energy (libido) in pleasure; the reverse movement of that energy in anxiety; and the muscular spasms which, along with the character armor, prevented the free emotional expression of the organism. But Reich was not content simply to progress further in his therapeutic technique. He also wished to prove his own concepts and, with them, Freud’s early hypothesis of the libido, in a demonstrable, quantitative way. He wanted to provide the biological foundation for psychoanalysis that Freud had predicted, even though Freud himself had abandoned his early efforts to link analysis with physiology.”¹

In 1934, Reich wrote two articles that served as the foundation for his subsequent research. In the first article, “*The Orgasm as an Electrophysiological Discharge*,” Reich described the orgasm as a four beat process: mechanical tension > bioelectric charge > bioelectric discharge > mechanical relaxation.

- (1) Mechanical tension (filling of the organs with fluid; tumescence, with increased turgor of the tissues generally).
- (2) Bioelectric charge (associated with the mechanical tension).
- (3) Bioelectric discharge (of the accumulated charge through spontaneous muscular contractions).
- (4) Mechanical relaxation (Detumescence: the flowing back of bodily fluids).

This paper was the basis for Reich’s bioelectrical experiments conducted in 1935 and 1936 and became the first chapter of his 1945 book *The Bioelectrical Investigation of Sexuality and Anxiety*. Using human subjects, Reich measured variations of electrical potential on the skin in response to the subjective feelings of pleasure and anxiety. Reich found that pleasurable sensations produced an increase in electrical potential and that anxiety produced the opposite effect. This research led Reich to conceive of pleasure and anxiety as antithetical biological processes, with pleasure being associated with an outward flow of fluid and bioelectric charge from the core to the periphery and anxiety with an inward flow. It also validated Reich’s belief that Freud’s libido was not just a hypothetical concept, but a real and measurable “electrical” energy.

¹ Sharaf (1983: 206-207).

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Reich's second 1934 article was "*The Basic Antithesis of Vegetative Life*," which drew on the work of Ludwig R. Müller (1870-1962), who was a pioneer of autonomic nervous system research. Unlike the central nervous system, which includes the brain and spinal cord and controls conscious behavior, the autonomic nervous system acts unconsciously and regulates basic functions such as heart rate, respiration, digestion, and sexual arousal. Müller divided the autonomic system into the parasympathetic and sympathetic divisions, which tend work in opposition to one another. Reich linked pleasurable sensations to the activation of the parasympathetic division, resulting in a slower heart rate, lower blood pressure, more relaxed respiration, and a general feeling of well being. The sympathetic division responds to dangerous or threatening situations, causing an increase in heart rate and blood pressure, rapid breathing, and the sensation of anxiety.

Increasingly, Reich came to see pulsation—expansion and contraction—as a fundamental characteristic of living organisms.

“By late 1935, Reich said he wondered whether the vegetative currents—movement both of fluid and bioelectric charge from the core of the organism to the periphery (expansion, pleasure) and back again (contraction, anxiety)—were more basic life functions. Could they be found not only in humans or vertebrates but also in less complex organisms? He wondered, he said, whether the four-beat orgasm formula—validated in the bioelectric experiments—might in fact be a more fundamental phenomena common to all living organisms.”¹

Following up on his bioelectrical experiments, Reich originally intended merely to expand the scope of studies from human subjects to microorganisms. In preparing for this new line of research, Reich purchased high-magnification microscopes, modern lab equipment, and amoebae cultures. When the cultures turned out to contain very few amoebae Reich asked a laboratory technician at Oslo University to prepare fresh cultures. The technician told Reich to soak dried hay or moss in water and within two weeks the amoebae would be plentiful. When Reich asked “Where do the amoebae come from?” the technician replied “spores.” (This of course was the accepted dogma at the time based on Louis Pasteur’s microbial research and his principle of *Omne vivum ex vivo*—“all life from life.”) But Reich was skeptical of this explanation so instead of simply waiting for the amoebae to appear he decided to observe the entire process himself.

What Reich saw in his microscope astonished him. Within a short time the hay swelled with water and its cellular structure began to

¹ Strick (2015: 73).

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break down. What had formerly been well-structured plant cells disintegrated into loose sacks enclosed by thin membranes and filled with tiny pulsating vesicles. These sacks of vesicles soon detached themselves from the hay and moved freely in the solution. Their internal structure became less vesicular until the sacks became indistinguishable from genuine amoebae. In later experiments, Reich employed time-lapse microcinematography to record the swelling and vesicular disintegration of the hay and the development of amoebae.

Mainstream biologists maintained that the samples Reich was studying were contaminated and that the amoebae were always there (as spores or cysts) or else were inadvertently introduced. They also attributed the movement that Reich observed to “Brownian motion.” Reich was aware of these objections and was scrupulous in the use of experimental controls. He also began experimenting with other materials, such as charcoal, clay, and iron filings, which were heated to incandescence before being introduced into media of various compositions and pH values. Although many experiments failed, Reich frequently observed the same phenomenon: within a few days small vesicles—which Reich eventually named *bions* after the Greek word for “life”—would appear and self-organize into pulsating sacks that eventually separated from the source material and developed into amoebae. Reich ultimately concluded that bions were transitional forms between non-living and living matter.¹

In January 1939, one of Reich’s assistants mistakenly took ocean sand rather than carbon from a jar on the laboratory shelf, heated it to incandescence, and plunged it into a liquid culture medium. Reich found that the bions produced from ocean sand, which he eventually named “sand packet”—or SAPA—bions, were larger but less motile than the bions produced from other sources. Reich also noticed that SAPA bions seemed to be surrounded by a bright bluish field. At first, Reich was not sure whether the field was real or merely an optical illusion, an artefact of high-magnification microscopy, but continued observations convinced him that the glowing field was real.

After several weeks of observing SAPA bions under the microscope, Reich developed a severe case of conjunctivitis, also known as “pink eye,” which is commonly attributed to a viral or bacterial infection. After taking a break for several days so his eyes could recover, Reich tried looking at the bions with a monocular microscope using only one eye. “After about 1.5 hours, that one eye began to hurt and to display the same symptoms.” An assistant who was also studying SAPA bions

¹ See Reich (1938/1979). *Mainstream biochemists, e.g. Sydney Fox, eventually “discovered” bions and named them proteinoid microspheres. See Fox et al. (1959) and Fox and Dose (1977).*

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microscopically experienced similar eye pain. In February 1939, “Reich wrote excitedly in his diary that he was certain he was dealing with radiation and, thus, ‘A completely new world!’”¹

After emigrating from Norway to the United States in August 1939, Reich focused on investigating the bion radiation. Reich found that SAPA bion cultures fogged photographic plates and also caused inflammation when the test tube was placed on the skin, suggesting that the radiation was ultraviolet. Bion cultures could also kill bacteria and cancer cells. Reich’s experiments further revealed that organic and non-metallic material, such as cotton, wood, and plastic, would attract, absorb, and hold the radiation, while metallic materials would attract the radiation and quickly reflect it in both directions.

Hoping to isolate and concentrate the radiation, Reich constructed a modified Faraday cage consisting of alternating layers of organic and metallic material, with the inner walls lined with metal. Reich drilled a small hole in the side of the box in which he inserted a specially designed lens so he could observe the bion cultures inside the box. Reich found that the bion cultures grew more rapidly inside the box and that the radiation was more intense. The air inside the box also had a bluish tint and he reported observing flashes of light. But the most remarkable discovery was that radiation was present inside the box *even when the bion cultures were absent*. This led Reich to conclude that the radiation was not limited to bions but was ubiquitous in the atmosphere. The sexual energy that Reich had studied in the 1920s and 1930s was not simply biological but was actually physical.

Reich named this energy orgone, a combination of orgasm and bione (the German spelling of bion), and he named his modified Faraday cage the orgone energy accumulator (ORAC), which became his primary research tool during the 1940s. In a series of controlled experiments, Reich verified the energy in several ways, such as a constant temperature difference between the air above the ORAC and the surrounding air, a slower electroscopic discharge rate inside the ORAC than outside, and Geiger counter measurements that revealed heightened radiation levels inside the ORAC. The persistently higher temperature in the ORAC seemed to violate the Second Law of Thermodynamics, which indicated that orgone energy possessed unique properties that differentiated it from other forms of energy such as heat and electricity.

Reich also used the ORAC to test the effects of orgone radiation on cancer mice. “Because his results with cancer mice were so promising, Reich decided to test the effects of orgone radiation on humans. He constructed accumulators large enough for a person to sit in, and in

¹ Strick (2015: 273)

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1941 began experimental treatments with cancer patients.” Reich treated only terminal patients. “Over a period of time, the patients showed marked improvement: relief of pain, healthier blood condition, weight gain, and the shrinkage and elimination of tumors. Despite these positive results, the patients died [usually due to kidney or liver failure as those organs were overwhelmed by the disintegrating tumors], reinforcing Reich’s conviction that cancer is a bio-energetic shrinking following emotional resignation, and that the tumors themselves are not the disease, but merely a local manifestation of a deeper systemic disorder.”¹

In 1945, Reich moved from New York to Rangeley, Maine, where he built a new home and laboratory that he named Orgonon. As previously mentioned, Reich came under attack by Mildred Brady² in 1947, which ultimately led to his trial, imprisonment, and death in 1957. In the meantime, Reich continued his laboratory research and in the early 1950s began to apply his discoveries to the non-biological realm. For example, in 1951, Reich began his “Oranur” (orgone radiation against nuclear radiation) experiments, which he hoped might counteract the effects of nuclear radiation. However, the results were dramatically different than what he expected and nearly fatal. When he placed a 1-mg sample of radium inside a 20-layer ORAC, the orgone energy itself reacted violently and “ran amok.” Despite being more than 300 feet from the ORAC-enclosed radium sample, several laboratory workers, including Reich himself, became suddenly ill, suffering from nausea, severe chest pains, dizziness, and difficulty breathing. (Reich observed that the specific individual reactions seemed to depend on each person’s muscular armoring.) Reich immediately ceased the experiment and Orgonon was evacuated for several weeks until the effects of “deadly orgone” (DOR) had dissipated.³

Another series of experiments had a much happier outcome. The “Cloudbuster” was a device that Reich created to alter weather patterns by manipulating orgone energy in the atmosphere. The Cloudbuster was simply a collection of hollow metal pipes mounted on

¹ <https://www.wilhelmreichtrust.org/biography.html> (Viewed on December 14, 2019.). My bracketed addition.

² *Contrary to the tales perpetrated by Brady, Gardner, and others, Reich never claimed that the orgone accumulator could “cure cancer,” or “restore orgasmic potency.”*

³ *The New York Times and other newspapers reported this event but attributed it to fallout from an atom bomb test in Nevada, thousands of miles to the west. One newspaper printed a map showing the extent of the increased radioactivity. It was a long ellipse, extending eastward over the Atlantic, with Rangeley, Maine at the western end.*

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a flatbed truck (resembling an anti-aircraft gun) connected to metal cables that were dropped into bodies of water, which Reich had found strongly attracts and absorbs orgone. The Cloudbuster drew energy from the atmosphere into the water, which enabled Reich to create clouds and dissipate them depending on where he aimed the device.

“Reich used the Cloudbuster to conduct dozens of experiments involving what he called ‘Cosmic Orgone Engineering (C.O.R.E.).’ One of the most notable occurred in 1953. During a long drought that threatened the Maine blueberry crop, several farmers offered to pay Reich if he could bring rain to the parched region. The weather bureau had forecast no rain for several days when Reich began his cloudbusting operations. Ten hours later, a light rain began to fall. Over the next few days, close to two inches fell. The blueberry crop was saved, and in local newspaper articles the farmers credited Reich.”¹

The Oranur and Cloudbuster experiments demonstrated Reich’s increasing interest in the *physical* characteristics of orgone as opposed to its purely biological properties. Reich had come to the conclusion that the fundamental characteristic of living organisms was pulsation (expansion and contraction) and that the orgasm function—mechanical tension > bioenergetic charge > bioenergetic discharge > mechanical relaxation—was the underlying law that governed living matter, from the formation of bions and cell division, to the autonomic nervous system and sexuality. However, pulsation and the orgasm function seemed to be limited to the biological realm, whereas orgone energy was omnipresent in the atmosphere. Accordingly, Reich sought to identify a “common functioning principle” based on orgone energy that was operative in both the animate and inanimate worlds.

In 1950, Reich addressed this issue in *Cosmic Superimposition*. He ultimately concluded that the “common functioning principle” that linked the living and non-living realms was not the orgasm function, which is limited to living (animate) systems, but rather the “superimposition of orgone energy streams,” driven by the non-thermodynamic flow of orgone energy from lower to higher energy systems. This superimposition of energy streams is expressed as sexual attraction in the biological realm, the formation of high-energy (spiral) hurricanes in the meteorological realm, and formation of spiral galaxies in the cosmological realm. (Reich considered gravitational attraction to be “functionally identical” to orgonotic attraction.)

¹ <https://www.wilhelmreichtrust.org/biography.html>

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In arriving at this conclusion, Reich considered but rejected the possibility that thunderstorms and earthquakes are orgastic discharges. Thunderstorms, he noted, lack an energetic core and a peripheral membrane and are not “organized” like living systems. It does not convulse but merely discharges accumulated charges. However, Reich realized that it was “more difficult to refute a functional identity between the orgastic discharge in a living organism (including cell division) and an earthquake.”

“We are dealing with an ‘orgonotic system’ in both cases; for the earth’s globe also possesses a core of energy, a membrane (the earth’s crust), and an orgone energy field, the “orgone envelope.” But does a planet convulse like a living organism? We must not mistake a dislocation of parts of a system for convulsion. The convulsion in a living organism is a total event that not only does not threaten the integrity of the system, it enhances its well-being and constitutes, as an integral physiological part of the whole, a basic function of the energy metabolism. No such function is discernible in the earthquake. It is more akin to the explosion of an overheated boiler than to an orgastic discharge. The analogy does not work. Thus, we must conclude that the orgastic convulsion is specific for the living domain only; that it differentiates the living from the non-living.”¹

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When I read this in 1974, it struck me as highly illogical. If, as Reich argued, the Earth is an “orgonotic system” with a core and membrane, then it should exhibit the same behavior as biological orgonotic systems, specifically pulsation (expansion and contraction); and it should be governed by the same natural laws as biological systems, specifically the four-beat orgasm function (mechanical tension > energetic charge > energetic discharge > mechanical relaxation). Moreover, it seemed to me that Reich had failed to take into account the vast difference of scale between organisms and the Earth, especially in the time dimension. Organisms can live for days, months or years, but the Earth is more than four billion years old. When compared to the enormous length of Earth history—“Deep Time”—a single earthquake, lasting a few seconds or minutes, or even a series of earthquakes over a period of days, weeks or months, are miniscule events. Accordingly, I concluded that if the Earth were governed by the same orgonomic laws as biological systems, then the pulsation seen

¹ Reich (1949/1951/1973: 178-179).

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in biological systems would require tens-of-millions of years to transpire in the Earth.

If the Earth is an organotic system governed by organomic laws, then it should pulsate—expand and contract—like an organism, but at a vastly slower rate. Moreover, if, as Reich believed, gravitational attraction is “functionally identical” to organotic attraction, then prior to an expansion episode, when the Earth was in a state of “mechanical tension,” there should be a buildup of gravitational “charge,” which would not only cause the Earth to contract but also cause an increase in surface gravity. The sudden release of that charge would result in an equally sudden decrease in surface gravity (a few million years or less) followed by the gradual expansion—“mechanical relaxation”—of the Earth over tens-of-millions of years.

This line of reasoning based on my reading of Reich, and the notion of a pulsating Earth, led directly to my epiphany: (1) the apparent *horizontal* displacement of the continents was actually caused by their *vertical* displacement on an expanding Earth; and (2) Earth expansion would be accompanied, as either a cause or an effect, by a significant reduction in surface gravity, which might explain the evolution of the giant dinosaurs.

After a couple of years of research, described below, I submitted a paper—“*Organomic Geophysics: The Earth as an Organotic System*”—to the *Journal of Organomy*, which had been established by Reich’s students after his death. In addition to making the case that Reich’s research implied that the Earth pulsates like a living organism, I also suggested that terra *anima* (from the Latin root that means “to breathe”) would be a more apt description of the Earth than terra *firma*.¹ My paper was never published.

Necessary Giants

Although Wilhelm Reich’s ideas led to my expansion epiphany, Reich’s knowledge of geology was superficial at best, as was mine when I read him, and he was probably unaware of Alfred Wegener and the Drift hypothesis. Reich wrote *Cosmic Superimposition* in 1950, when drift was at its nadir and almost universally rejected by American geologists. However, I read Reich after the “Revolution in Earth Science” in the 1960s, when drift was triumphant, so I was well acquainted with drift and Wegener.

¹ Erickson (1980). Cf. Lovelock (1979).

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Like many people who “discovered” Earth expansion,¹ I thought for a brief time that I was the only one who ever thought of it, but I was soon disabused of that notion when I came across Walter Sullivan’s 1974 book *Continents in Motion*, which included an entire chapter—entitled “The Balloon Hypothesis”—on Warren Carey and Earth expansion. This led me to search for more information about Carey. I discovered and purchased Carey’s 1976 book, *The Expanding Earth*, after reading a review of it in *Science* by the Lamont-Doherty geophysicist, J.R. Heirtzler.²

Reading Carey’s book led me to focus on dinosaurs. I decided that since Carey had already done so much work on expansion, I should concentrate on dinosaur evolution in “subgravity,” which was the term I used at the time instead of the more accurate term “reduced gravity.” In that regard, I believed for a long time that I was the first person to come up with that idea that dinosaurs evolved in reduced gravity.³ I therefore devoted myself to paleontology, relying especially on the books and papers written by Edwin Colbert, Alfred Romer, and Robert Bakker, who were among the leading dinosaur experts at the time.

That a reduction of gravity would lead to the evolution of giant land animals seemed obvious to me, but because giant dinosaurs were already so familiar to everyone, I decided that it would be futile to try to prove that they evolved in reduced gravity since no one—and least of all paleontologists—seemed to be bothered at all by the obvious physical problems associated with their gigantic size. Accordingly, I concentrated on dinosaur origins rather than gigantism.

One of the first things I learned was that all dinosaurs descended from bipedal ancestors. I also learned that the earliest dinosaurs from the Middle-Late Triassic were very slender and lightly built, and were quite unlike the ponderous and thick-boned reptiles that had formerly been dominant. All of this seemed very significant to me. I became particularly interested in the suppression of the advanced mammal-like synapsid reptiles by the comparatively “primitive” diapsid archosaurs (thecodonts and dinosaurs).

¹ Menard (1986) claimed that expansion was “discovered” independently no fewer than eight times up through about 1960.

² Heirtzler (1977).

³ I later learned about Ted Holden, whom I believe proposed the “dinosaurs-in-low-gravity” hypothesis at about the same time that it occurred to me. However, Holden did not link his theory to Earth expansion. I recently learned about Ludwig Kort, who, in a 1949 paper, may have been the first person to suggest that dinosaurs evolved in reduced gravity.

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(Synapsid and diapsid reptiles are two separate lines of reptiles¹ that diverged from a common ancestor during the Carboniferous, the former leading to mammals and the latter to dinosaurs and birds. Synapsid reptiles, which dominated terrestrial niches throughout the Permian and Early Triassic, were robust quadrupeds. They were also relatively advanced physiologically and ultimately gave rise to the first true mammals. In contrast, diapsid reptiles were primitive physiologically and were rare until the Middle Triassic.)

In 1975, *The Hot-Blooded Dinosaurs* by Adrian Desmond came out and I was very keen at first to prove that the evolution of dinosaur endothermy was somehow related to a gravity reduction. It was only later, after reading *On Growth and Form* by D'Arcy Wentworth Thompson, that I realized that natural selection in reduced gravity would actually favor low energy (cold blooded) animals over high energy (warm blooded) animals. "If gravity were halved," Thompson wrote, "we should get a lighter, slenderer, more active type, needing less heat, less heart, less lungs, less blood."² This belied the fundamental thesis of Desmond's book, which was based almost entirely on Robert Bakker's whiggish notion that warm-blooded animals are intrinsically superior to cold-blooded animals, a mistaken belief that the Triassic record disproves decisively.

After a few months of research I began to write a book entitled *Necessary Giants*, which I originally envisaged as a combination of Carey's work on Earth expansion and my own dinosaur research. In writing that manuscript, I was still influenced by Reich and my theory of the Earth as an "orgonotic system." I argued in favor of a pulsating Earth—episodic expansion and contraction—and I attributed mountain-building (orogenesis) to contraction, a simplistic idea that I no longer endorse. I believed then that variable gravity was primary, and that the mass (and quantity of matter) of the Earth secondary, or at least derivative. I equated mass with the concentration of gravitational energy, and I thought that the quantity of matter was not necessarily equivalent to mass. In other words, at this time I was still thinking like a Reichian: gravitational energy primary, matter secondary. However, in writing *Necessary Giants* I did not describe how I came up with my theory and I did not mention Reich at all. I was bright enough to realize that citing him as my inspiration would make

¹ The synapsid/diapsid classification is based on skull structure. Synapsid skulls are characterized by a single diagnostic opening (fenestration) whereas diapsid skulls have two openings, which made the diapsid skull much lighter than the synapsid skull, indicative of the typically gracile dinosaur skeletons compared to the more robust therapsid skeletons.

² Thompson (1917/1966: 32).

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my controversial ideas even more controversial and therefore less palatable. Instead, I focused narrowly on the geological and paleontological evidence and did not address the cause of expansion.¹

In April 1982 I sent Warren Carey a copy of my manuscript.² Here is the essence of his reply:

“I doubt the validity of your conclusions. There has been increasing geophysical and cosmological evidence to support a slow but progressive decrease in the gravitational constant (and hence surface gravity acceleration) but I know of no evidence to suggest pulsation of gravity of the magnitude you propose. Although this is a negative argument and hence may be false, the probability is stacked against you. Gravity pulsation of this scale would certainly cause substantial pulsation in the radius of the earth, because 61% of the earth’s energy is stored in the form of gravitational elastic compression, so that every layer right down to the core would expand as gravity reduced, and in addition at every phase transition boundary there would be phase change to the lower density phase. There is a significant school of thought which believes there have been such pulsations of radius (Steiner, Milanovsky, et al.), but the arguments assume that orogenesis is a compressional phenomenon, which I deny.”³

I was surprised and disappointed by Carey’s response, especially since he had acknowledged in his book that the possibility that gravity was once as “low as that now pertaining on the surface of Mars [0.38 g], or even less, or similar variation in the other direction, is not excluded by any fact yet stated.”⁴

I also sent my manuscript to Nicholas Hotton, Curator of Vertebrate Paleontology at the Smithsonian Institution,⁵ who turned out to be

¹ *Philosophers of science distinguish between the “context of discovery” and the “context of justification”. There are no formal rules or procedures for making a scientific discovery. Indeed, discoveries are often based on intuition, a hunch or a guess, or even a dream. A classic example of this is August Kekulé’s discovery of the benzene ring structure, which he claimed came to him in a dream about snakes seizing their own tails. What is important in science is the context of justification, i.e. the scientific method based on logic and evidence, as described for example by Karl Popper.*

² *I also submitted a copy to the U.S. Copyright Office (Registration number TXu000092173, dated April 5 1982) in case I never finished or published the entire book, which I never did.*

³ *Letter from Carey to me dated October 8 1982.*

⁴ *Carey (1976: 447). My bracketed addition.*

⁵ *Hotton was co-editor with Sankar Chatterjee of the 1992 book *New Concepts in Global Tectonics*, which included a chapter by Owen, “Has the Earth increased in size?”*

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(002) 23 6985

"Ellenalla,"
24 Richardson Avenue,
Dunngrens,
Tasmania, 7005.
8th October, 1982.

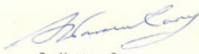
Mr. W. Erickson,
1530 North 12th Street, #702
Arlington, Virginia 22209, U.S.A.

Dear Mr. Erickson,

I apologise for the delay in answering your letter of April 5, enclosing a copy of your paper. I have only been able to scan this because the demands of correspondence from people I have not met, in many countries, in several languages, often with long manuscripts, greatly exceeds available time. I must give priority to the book I am editing which will saturate me for the rest of this year.

Meanwhile I did submit your manuscript to Dr. Banks who is a senior and very competent palaeontologist-stratigrapher, who has done a lot of editing and reviewing, and who I know would give a fair hearing to any ideas and arguments irrespective of whether they were orthodox. I enclose his comments.

I doubt the validity of your conclusions. There has been increasing geophysical and cosmological evidence to support a slow but progressive decrease in the gravitational constant (and hence surface gravity acceleration) but I know no evidence to suggest pulsation of gravity of the magnitude you propose. Although this is a negative argument and hence may be false, the probability is stacked against you. Gravity pulsation of this scale would certainly cause substantial pulsation in the radius of the earth, because 61% of the earth's energy is stored in the form of gravitational elastic compression, so that every layer right down to the core would expand as gravity reduced, and in addition at every phase transition boundary there would be phase change to the lower density phase. There is a significant school of thought which believes there have been such pulsations of radius (Steiner, Milanovsky, et al.), but the arguments assume that orogenesis is a compressional phenomenon, which I deny.

Yours sincerely,

S. Warren Carey

Carey's comments about my 1982 manuscript

much more receptive than Carey. Hotton invited me to visit him at the Smithsonian, where we spent a long and pleasant afternoon talking about dinosaurs, mammal-like reptiles, and Earth expansion.

In 1985 I wrote an article about Carey and expansion—"Rogue Scientist From Down Under"—that I actually sold to the now-defunct science magazine *Omni* for a whopping \$800. The money was nice but that didn't matter to me; all I cared about was getting published. After *Omni* accepted my final draft, I eagerly examined each month's issue looking for my article, but in vain and despite the editor's assurance that it would appear very soon. To my knowledge my Carey article was never published.

Meanwhile, I came across two books published in 1983 that had a major influence on my thinking. The first was *Atlas of continental displacement, 200 million years to the present* by H.G. Owen¹. What struck me most about Owen's book was not simply his beautiful and highly detailed maps that show the growth of the modern oceans on an expanding Earth, but Owen's affirmation of subduction.

"The oft quoted comment that all exponents of an expanding Earth deny the presence of subduction zones, or that subduction of oceanic crust has occurred, is obviously not correct in the case for global expansion discussed here. The continental margins of the Americas would certainly be overriding the older crustal areas of the eastern Pacific during the Mesozoic, by inference, and during the Cenozoic, by observable fact."²

¹ See also the chapter by Hugh Owen.

² Owen (1983: 23)

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This, of course, contradicted Carey's confident assertion that "subduction is a myth," so at first I dogmatically rejected it. However, as I discuss below I have since come around to agree wholeheartedly with Owen about the necessity of subduction on an expanding Earth.

The second book that had a big impact on me was *Wandering Continents and Spreading Sea Floors on an Expanding Earth* by the South African geologist Lester C. King, who was a former student of A.L. du Toit and a leading proponent of continental drift in the 1940s and 50s. Like Owen, King endorsed subduction, but "without any horizontal sea-floor spreading or conveyor belt convection but using vertical tectonics."¹ King also invoked vertical tectonics to explain the origin of mid-oceanic ridges, for which he used the idiosyncratic term *cymatogen*, loosely defined as crustal swelling or doming. "Vertical tectonics appear to dominate the structures of subductogens as they do those of cymatogens; the deep-sea trench as much as the mid-oceanic ridge."² However, quite apart from King's novel view of global tectonics, what really impressed me about King's book was his argument that ocean widening was not a smoothly continuous process, as both mainstream geologists and Carey believed, but was discontinuous and episodic.

"[S]ea-floor spreading and Plate Tectonics became popular concepts immediately upon the acceptance of continental drift, which was already proven by geological data. But, following du Toit, geologists had been careful to relate continental drift to late Mesozoic tectonic activity, which was episodic. The neotectonicists disregarded this point and thought of Plate Tectonics as a general and continuous process of lateral change. They postulated average rates of horizontal movement in the several oceans – averaged over the past 100 million years. In geology, time is long and tectonic averages mean little. Tectonic happenings (both vertical and horizontal) are episodic and not infrequently of global extent, with long quiet intermissions during which wide planations developed upon the lands and ample depositions took place within the oceanic basins."³

Averages, wrote King, "mean very little in geology. Most geological processes take place briefly when definite physico-chemical boundaries are passed"⁴

More significantly from my point of view, King also argued that drift (and expansion) was restricted for the most part to the Mesozoic era.

¹ King (1983: 70)

² *Ibid.*

³ *Op. cit.* (120)

⁴ *Op. cit.* (42)

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In King's estimation, "the hypothesis of continuous seafloor spreading from Jurassic to recent is not tenable." Results from the Deep Sea Drilling Project indicated "that the ocean basins have not grown slowly through geologic time, but that there were Mesozoic phases of great activity and rapid ocean widening, followed by long intervals of quiet widespread deposition [...] through the early Cenozoic."¹ Indeed, "the more the geology of Cenozoic time is examined, the more reason appears for regarding the horizontal drift function as dominant mainly in late Mesozoic time, and the present configuration of continents as having been then designed with but little alteration during the Cenozoic era."²

King's argument that Earth expansion was episodic and largely confined to the Mesozoic conformed very nicely with my own notion of a sudden decrease in surface gravity in the Mid-to-Late Triassic followed by expansion during the remainder of the Mesozoic.³

Back to School

Although I was gainfully employed and well-compensated as a software engineer during the 1980s, my real interests lay elsewhere. So in the summer of 1988 at the age of 35 I quit my job and moved to Tucson where I enrolled as an undergraduate in the Department of Geoscience at the University of Arizona (UofA). After I received my degree in the spring of 1992, I entered the UofA graduate program with the intention of earning a PhD in metamorphic petrology.

At the UofA, I had the privilege of studying under several brilliant geoscientists including Bill Dickinson, Clem Chase, George Gehrels, Jon Patchett, Vic Baker, and Peter Coney. The UofA was and still is a citadel of plate tectonics, so at first I kept my heretical views to myself and focused on the coursework. However, I eventually opened up to some of my professors and was pleasantly surprised to discover that most of them were quite open-minded about expansion even though none of them believed in it. In general but with some exceptions, I found the graduate teaching assistants and untenured assistant professors to be the least tolerant of heterodox ideas. For example, in a tectonics seminar, and in reply to some know-it-all grad student who claimed that Earth expansion was "physically impossible," Peter Coney, who was no expansionist, winked at me and said, "if something happened, it's probably possible."

¹ *Op. cit.* (142)

² *Op. cit.* (45)

³ See *Erickson (1988)* for more detail on King's arguments.

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During the 1990 summer break I put together “*On the Origin of Dinosaurs and Mammals*,” which I extracted from my *Necessary Giants* manuscript. My dinosaur research led me to three conclusions, the latter two I consider original discoveries that no one had proposed before.

1. Based on the allometric skeletal scaling principles alone, I argued that a 20% reduction in surface gravity would result in an order of magnitude increase in the maximum size and mass of land animals.
2. Based on the biomechanical research of Alexander (1982), Margaria (1976) and others who studied animal locomotion, and the fact that the speed at which animals shift to higher gaits is largely governed by gravity as expressed in the Froude Number,¹ I argued that a gravity reduction would have favored animals that adopted a bipedal hopping gait. Obligatory bipedality in dinosaur lineages developed as a result of the adoption of a bipedal hopping gait by juvenile archosaurs. Since bipedal hopping requires precise dynamic balance at all times, selection pressures would have favored animals whose center-of-mass was located in the pelvis, and the development of long hindlimbs that moved in a vertical (parasagittal) plane. This led to the “fully erect” limb architecture that is a characteristic of all primitive dinosaurs and distinguishes them from advanced thecodonts, which possessed a “semi-erect” limb architecture and were only habitual or facultative bipeds.²
3. In the competition for niches during the Middle and Late Triassic, a gravity reduction would have favored low-metabolism animals over high-metabolism animals. Bipedal hopping is a relatively low-energy gait because it is powered by elastic storage and rebound rather than metabolism (as seen in modern kangaroos), thus allowing the relatively low-energy bipedal dinosaurs to move about quickly and effortlessly and enabling them to suppress the physiologically more advanced but less agile therapsids and protomammals. This would account for the displacement of the Permo-Triassic fauna dominated by endothermic (warm-blooded) synapsid reptiles by a new fauna dominated by ectothermic (cold-blooded) diapsid reptiles, which were certainly no more advanced physiologically than modern

¹ Froude number = v^2/lg , where v^2 is velocity squared, l = leg length, and g = gravity. All else being equal, a decrease in g will increase the Froude number. Human bipeds will shift from walking to running when the Froude number is greater than one. On the lunar surface, where gravity is only one-sixth that of Earth, the Apollo astronauts bypassed running altogether and naturally shifted from walking to a skipping or hopping gait at relatively low speeds.

² See Erickson (1989) for a summary of this argument.

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crocodiles. The fact that some Jurassic and Cretaceous dinosaurs may have developed an endothermic physiology has no bearing on the faunal transition that occurred during the Triassic.¹

In 1991, I submitted this paper to three academic journals—*Evolution*, *The Journal of Vertebrate Paleontology*, and *The Journal of Theoretical Biology*—but it was rejected by all three. One reviewer, a physicist, dismissed it as “rediculous” [*sic*].

Back to Work

By 1996 I had completed all of the coursework needed for my PhD but I ran out of money and energy so I left school and went back to work as a software engineer, which has provided me with a decent income without requiring me to work too hard and, more importantly, has afforded me plenty of time to pursue my passion for Earth science.

It was in the late 90s and the following decade that I met (online) Stephen Hurrell, James Maxlow, and John Eichler.² Although I don't recall the exact circumstances, I think I contacted Stephen after I discovered his 1994 book *Dinosaurs and the Expanding Earth*. I recall sending Stephen an e-mail telling him that he had “scooped me” and congratulating him on his excellent book, which has done much to publicize the expansion hypothesis and make the case that dinosaurs evolved in reduced gravity.

I also don't recall how James Maxlow and I became acquainted but in 2006 he sent me an autographed copy of his first book, *Terra non Firma Earth*. We have since had a very fruitful correspondence. Continuing a research tradition begun by Hilgenberg in the 1930s, and advanced by Carey in the 1950s and Klaus Vogel in the 1980s, James's small-earth modeling has advanced our knowledge of Earth history, and in particular the history of the Pacific and the circum-Pacific continents. James's modeling demonstrates that on expanding Earth Australia and Laurentia (North America) were contiguous throughout the Precambrian, a remarkable discovery/prediction that has largely been confirmed by mainstream (non-Expansionist) geologists, who, despite their belief in the willy-nilly and random movement of continents on a globe of present radius, have proposed various paleogeographical models (SWEAT, AUSWUS, AUSMEX)³

¹ Erickson (1990).

² See also the chapters by Stephen Hurrell, James Maxlow and John Eichler.

³ Proposed respectively by Moores (1991), Burrett and Berry (2000) and Wingate et al. (2002).

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that link Australia to Laurentia during the Meso- and Neoproterozoic, thus validating James's modeling.

I met John Eichler through James. I recall e-mailing James that I believed that the cause of expansion would probably require a new theory of gravity. In reply James told me about John and his theory that solar plasma would provide the Earth with a virtually limitless source of new mass, which would be necessary if the Earth has actually expanded.

I believe that John's theory¹ is the best and most plausible solution to the "mass and mechanism" problem that has been proposed so far. I have done some back-of-the-envelope calculations indicating that the Sun emits the equivalent of *one Earth mass every ten million years* through coronal mass ejections (CMEs). And since the Earth is the only "rocky" planet that has a strong magnetic field, i.e., the nearest planetary magnet, it would attract much of that CME mass toward itself. It also turns out that ice, granite, and mantle minerals, especially perovskite, which is the most abundant mantle mineral, are excellent proton conductors. This means that the Earth is largely transparent to protons, which, drawn by the earth's magnetic field, probably accumulate at the core-mantle boundary and possibly feed the outer core, which may be a dense plasma, as Owen² has suggested, and not liquid nickel-iron, as is generally believed. John's solar plasma theory would also provide a source of mantle water produced by the interaction of protons (hydrogen ions) with the abundant oxygen in silicate minerals. That the solar wind can produce hydroxyl and water on the moon by scavenging oxygen from silicate minerals is now widely accepted.³

Concluding Remarks

It is impossible in this short essay to discuss the many geological problems that the expansion hypothesis may help to solve, so I will simply list a few that are of particular interest to me, and then conclude with a discussion of two topics of more general relevance to both proponents *and* opponents of the expansion hypothesis.

- **The Relief of Surface Curvature** (RSC) is a tectonic process that does not occur on an Earth of fixed-radius.⁴ It offers a novel

¹ Eichler (2011).

² Erickson (1990) *On the Origin of Dinosaurs and Mammals*, posted online in 2001 at <http://www.frontier-knowledge.com/earth>.

³ E.g. Managadze, et al. (2015) and Orlando, et al. (2018).

⁴ Cf. Turcotte and Oxburgh (1973) who discuss "membrane stresses due to

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alternative to conventional theories of mountain building and orogenesis. As the Earth expands its curvature will decrease. However, this will not occur uniformly, especially in rigid cratonic shields, which will maintain their old curvature initially and then slowly collapse to adjust to the new curvature, causing near-surface compression and extension at depth. A prime example of this may be the Sevier-Laramide orogenies (Late Jurassic through Eocene) in western North America, which show a transition over time from “thin-skinned” (Sevier style) thrusting of the uppermost sedimentary layers to “thick-skinned” (Laramide style) basement-cored uplifts. RSC also offers a plausible solution to the age-old “granite space problem,” the origin of Large Igneous Provinces, and “depth-dependent extension,” a problem that baffles geologists.¹ As discussed below, it is also likely that subduction of thin oceanic lithosphere is related to this process.

- **Stagnant Lid tectonics** and the nature of the pre-expansion, pre-plate tectonic and Precambrian Earth, when it was entirely enclosed by continental crust that evolved from a thick and highly enriched mafic protocrust of Archean age. Regarding this topic, I highly recommend the 21st Century papers written by the late and great Warren B. Hamilton.² Despite his fervent opposition to expansion, Hamilton’s vision of the Precambrian Earth is entirely concordant with the Expansionist conception of a smaller Earth entirely covered by felsic continental crust.
- **The Origin of Plate Tectonics** on an expanding Earth in the Neoproterozoic.
- **The History of the Pacific**, the oldest ocean, which probably originated when Australia separated from Laurentia (North America) about 700 million years ago. Related to this separation, there is good isotopic evidence that much of the western Pacific, including the enormous Ontong Java Plateau³, is underlain by highly attenuated continental crust that was buried in the Cretaceous beneath the basaltic outpourings of Large Igneous

changes in the radii of curvature” related to the oblate shape of the Earth and its effect on plates that move from one hemisphere to the other across the equatorial bulge. The authors conclude that “The membrane stresses due to the movement of the lithosphere over the surface of the non-spherical Earth are sufficient to fracture the lithosphere.”

¹ E.g. Reston (2007) and Huisman and Beaumont (2014).

² Hamilton (2019) and references therein.

³ E.g. Ishikawa et al. (2011).

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Provinces, which caused the Precambrian continental crust to sink below sea level and has concealed the crust's true age.

- **The Mythical Supercontinent Cycle**, which is possible only on an Earth of fixed radius and impossible on an expanding Earth.
- **The Myth of India as an island continent** that allegedly drifted in splendid isolation for tens-of-millions of years until it slammed into Asia.

The Necessity of Subduction on an Expanding Earth

On an Earth of fixed radius, subduction is necessary to preserve a constant surface area by eliminating (subducting) lithosphere at precisely the same rate that new lithosphere is formed at spreading ridges. Obviously, this requirement does not apply to an expanding Earth and for that reason some Expansionists continue to reject subduction. Unfortunately, those Expansionists fail to realize that subduction is also necessary on an expanding Earth, but that it serves an entirely different purpose than it does on a constant-sized Earth.

There is abundant evidence that Earth expansion has occurred primarily in the southern hemisphere. In the absence of antipodal subduction in the northern hemisphere, the non-radial expansion of the southern hemisphere would cause the Earth to become pear shaped. Subduction—the overlapping of two tectonic plates with one plate sinking back into the mantle—serves to flatten the “neck” of the pear and thereby maintains the Earth's spherical shape. Subduction simply “relieves surface curvature,” but in the oceans and not on the continents.

For many years I agreed with Carey (1976) that subduction “is a myth that exists only in the minds of its creators.” However, the geological and geophysical evidence for subduction is overwhelming and undeniable and, consequently, I came to realize that Carey was wrong to reject subduction. Indeed, subduction is not only real but it is also a necessary consequence of asymmetrical Earth expansion. The only way that the Earth could expand without subduction is if the expansion were perfectly radial and symmetrical. In this regard I am in complete agreement with Owen (2012: 80): “subduction is essential to preserve the sphericity of the Earth.”

When Carey published his scathing critique of subduction in his 1976 book the geological evidence at the time supported him. Subduction zones were originally assumed to be compressional features but many turned out to be extensional. Additionally, many trenches were empty when they were expected to be full of sediments

scraped off the subducting slab. According to Menard, “the most troublesome aspect of the sea-floor spreading hypothesis was the absence of direct evidence of convergence. There was no problem if the Earth was expanding, but if it was not, enormous areas of old oceanic crust had to be plunging into the mantle along the line of oceanic trenches. It was generally expected that the sediment in trenches would show signs of this violent phenomena, but none could be found.” In trench after trench, the sediments turned out to be completely undisturbed; and there were no outcrops from the subducted plates. Menard and Maurice Ewing were mystified by all this. “Neither of us believed for a moment in an expanding earth, so we were left with a puzzle.”¹ However, Warren Hamilton² and others subsequently explained these apparent anomalies and also demonstrated that the original ideas about subduction were overly simplistic. Subducting slabs are not driven into the mantle by horizontal convergence but rather sink passively under their own mass, which causes the subduction “hinge” to roll back toward the subducting plate and generates extensional forces in both the fore-and back-arc regions, thus creating the conditions necessary for arc volcanism. Moreover, subduction zones have proven to be highly varied. Doglioni *et al.* (2007) identified no fewer than fourteen types of subduction zones that vary based on subduction rate, convergence rate, and hinge rollback rate. Some subduction zones are compressional, others are extensional, and still others are neither.³ The absence or presence of “accretionary wedges” depends largely on whether the subduction zone is near a continental source that can provide abundant sediments, or in mid-ocean, where sediments are sparse, and also whether the subduction polarity is westward (very little accretion) or eastward (much accretion). Thus, subduction is not a global process as original believed but a regional process controlled by local conditions.

Many expansion critics⁴ perpetuate the myth that all Expansionists reject subduction and make the specious argument that the reality of subduction somehow refutes the expansion hypothesis. One critic actually calls Expansionists “subduction denialists,”⁵ a loaded term that subtly equates Expansionists with Holocaust Deniers. These criticisms are unfounded and reveal a fundamental ignorance of current expansion theory. To put these criticisms to rest, recalcitrant

¹ Menard (1986: 283-284).

² Hamilton (1979).

³ Doglioni *et al.* (2007).

⁴ E.g. Sudiro (2014).

⁵ Romans (2008).

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Expansionists must abandon their irrational rejection of subduction and recognize that subduction is as necessary on an asymmetrically expanding Earth as it is on an Earth of constant radius.

Plate Tectonics on an Expanding Earth

There is a widely held misconception that Earth expansion and plate tectonics are mutually exclusive theories of the Earth; that if one is true the other is necessarily false. Indeed, most histories of Earth science, including those of Le Grand (1988) and Frankel (2012), cast them as “competing” paradigms. While it is true that expansion and Wegener’s drift theory offered alternative explanations for continental displacement, Wegenerian drift is not the same thing as plate tectonics. Wegener proposed that the continents plowed through the ocean floor, and one of the primary criticisms of his drift theory was that it lacked a plausible mechanism. In contrast, plate tectonics is not concerned at all with mechanisms; it is a purely kinematic *description* of rigid plate movement. According to Dan McKenzie, who was one of the creators of plate tectonics, “The great success of plate tectonics came about because it separated the problem of the kinematic motions from that of the driving mechanism.”

“The principal difference between plate tectonics and the earlier concepts of sea floor spreading and continental drift lies in the explicit recognition of the importance of rigidity. Continental drift was not concerned with processes beneath the sea, and though the reconstructions of Wegener, Du Toit, and others depended on the continents forming rigid spherical caps, this was not recognized. Hess’ concept of sea floor spreading was principally concerned with the driving mechanism or the form of mantle convection. Neither can be directly observed, and neither are needed to produce a kinematic description of the observed surface motions. This separation of the kinematics from the dynamics was not made before plate tectonics was proposed, and it enormously simplified the whole subject.”¹

It is precisely because plate tectonics is a purely kinematic theory that it was accepted so quickly in the late 1960s. In other words, plate tectonics “solved” the mechanism problem by ignoring it.

When plate tectonics was proposed in the 1960s, it was generally believed that mantle convection was the primary driver of plate motion.² However, within a decade convection had become *passé* and

¹ McKenzie (1977).

² In Blackett, Bullard and Runcorn (eds. 1965) *roughly half of the papers and*

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a growing consensus had emerged that plate motion was actually driven by plate body forces, i.e. a combination of ridge push and slab pull (subduction), with slab pull being the primary driver.¹

Geologist Robert Stern has long favored a redefinition of “plate tectonics to include a dynamic explanation” that he describes as

“A theory of global tectonics powered by subduction in which the lithosphere is divided into a mosaic of strong lithospheric plates, which move on and sink into weaker ductile asthenosphere. Three types of localized plate boundaries form the interconnected global network: new oceanic plate material is created by seafloor spreading at mid-ocean ridges, old oceanic lithosphere sinks at subduction zones, and two plates slide past each other along transform faults. The negative buoyancy of old dense oceanic lithosphere, which sinks in subduction zones, mostly powers plate movements.” The role of the subduction process and subduction zones is thus integral in this redefinition, and a strong case could be made that ‘subduction tectonics’ is a more accurate and thus better name for modern-style global plate tectonics.²

Thus, Stern wishes to elevate plate tectonics from a purely kinematic theory, as it was originally conceived, into a geodynamic theory that he calls subduction tectonics.

The fact that plate tectonics can accommodate these two completely different geodynamic models—convection currents on the one hand and slab pull on the other—reveals just how flexible plate tectonics is. More importantly, it demonstrates that there is nothing in plate tectonics—as a kinematic theory—that is incompatible with Earth expansion, or vice versa.

Plate tectonic theory holds that the Earth is covered by several large (and many small) lithospheric plates, which are rigid and are circumscribed by three types of plate boundaries: (1) divergent boundaries, where plates are created and move apart; (2) convergent boundaries, where plates move together and are either subducted or deformed; and (3) transform boundaries, where plates slide past each other. On an Earth of fixed radius, the rate of plate creation at divergent boundaries must equal to the rate of plate destruction at convergent boundaries. However, there is nothing implicit in plate

pages were devoted to mantle convection.

¹ Forsyth and Uyeda (1975) was a hugely important and influential paper. It redirected mainstream geologists away from mantle convection currents, which had dominated mobilist thinking ever since Holmes first proposed convection in 1929, and toward plate body forces, e.g. slab pull, as the primary geodynamic driver of plate motion.

² Stern and Gerya (2018:175).

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tectonics *sensu stricto* that requires this equivalence or that rules out the possibility that the plate creation rate may be greater than plate destruction rate, which would result in Earth expansion, or, for that matter, that the creation rate is less than the destruction rate, which would result in contraction.

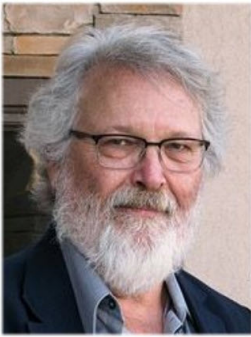
Most geologists believe that with respect to Earth expansion the burden of proof lies with Expansionists. However, I maintain that the burden of proof actually lies with those who believe that the Earth's size has remained constant. After all, the constant-radius hypothesis requires that the rate of plate creation and the rate of plate destruction has remained precisely equal over the past four billion years, whereas the expansion hypothesis is under no such constraint. Indeed, if expansion has been episodic, as I believe, then there must have been periods when the creation rate (C) exceeded the destruction rate (D), periods when the two rates were equal, and possibly periods when the creation rate was less than the destruction rate. For convenience, these three modes of plate tectonics may be referred to as Expanding Plate Tectonics ($C/D > 1$), Steady-State Plate Tectonics ($C/D = 1$), and Contracting Plate Tectonics ($C/D < 1$).

In my view, the notion that the creation/destruction ratio is variable is much more plausible than the conventional belief that the ratio has remained absolutely constant (and that the creation rate and destruction rate have remained equal) throughout Earth history. It is also difficult to conceive how subduction, which is highly varied tectonically and is largely confined to the Pacific rim, could have created the beautifully symmetrical pattern of ocean widening in the Atlantic, Indian, and Southern Oceans. Casting further doubt on the "subduction tectonics" model, it turns out that "the energy required to pull the plates is far higher than the strength that plates can afford under extension."¹

A much simpler explanation is that Earth expansion stretched, attenuated, and eventually ruptured the Precambrian continental lithosphere that formerly covered the entire globe, which created the first basaltic oceans during the Neoproterozoic, thus making plate tectonics possible, and that subduction, far from being the primary driver of global tectonics, is simply a regional process that relieves surface curvature and maintains the sphericity of the Earth.

¹ Doglioni et al. (2007: 167)

About the Contributor



William “Bill” Erickson is a semi-retired software engineer who spends much of his free time reading geology papers and writing a book entitled *The Unfinished Revolution: Plate Tectonics on an Expanding Earth*. A *magna cum laude* graduate of the University of Arizona with a B.Sc. in geoscience, Bill has been avid student of geology and Earth expansion for the past 45 years and has written several papers on the subject. He also has a deep and abiding interest in the history and philosophy of science. Bill lives with his wife, mother-in-law, and their two dogs (Jake and Lobo) in the Great Smoky Mountains of Henderson County, North Carolina.

This essay was first published as a chapter in the 2020 book, *The Hidden History of Earth Expansion*, which is widely available from good bookshops in both Hardback and Paperback editions, as well as a Google eBook.

The Hidden History of Earth Expansion presents the personal histories of some of the most well-known researchers into Earth expansion in 14 original essays. In addition to furnishing us with their personal histories, as they strived to explore the seemingly overwhelming evidence for confirmation of Earth expansion, the authors' highlight areas where further research is required.

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