

Blessings From The Deep

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At a depth of 1.7 miles below the earth's surface, researchers have discovered a bacterium they branded *desulforudis audaxviator*. The noun *audaxviator* means audacious or daring wanderer. I shall him and his kind by that name—Daring Wanderer. It will be easier that way.

This find was surprising, because biologists, as late as the early 1970s, believed that “life is a surface phenomenon.” By the mid-90s, however, they came to understand that “genetically and metabolically diverse microbial communities existed under highly reducing [that is, limited or difficult] conditions in [earth's] deep subsurface Today we know that life in the deep subsurface is ubiquitous and comprises a large proportion of the biomass on Earth.” In point of fact, there is a whole army of Daring Wanderer's bacterial cousins thriving down there, down to at least six miles below the surface—and maybe some undiscovered ones deeper still.

My purpose in bringing all this up is to look at an aspect of God's planning, His providence, which we maybe have neglected a bit: The strange lifeforms He has apparently salted away, as if to protect them from the corrupting influence of man, hidden deep in the earth for use another day. Let us take a look today at some of these really amazing lifeforms and at the uses to which God may someday put them.

Let us dig in—and deeper. The deepest hole man has dug is the Kola Superdeep Borehole at the Kola Peninsula, just a short distance east of the Norwegian-Russian border. Its true vertical depth is 7.6 miles. The Kola project, abandoned in the early 1990s, was just one of what has become many where scientists collect data about the crust of the earth. They are seeking information mostly about earthquakes. Many such observatories are ships which drill holes deep in the seabed, like the Japanese vessel, Chikyu, capable of drilling 4.3 miles below the floor of deep ocean environments. Scientists have discovered viable life-forms—I do not mean fossils, but

actually *living* organisms—as deep as 3.1 miles below continents and 6.5 miles below the ocean’s surface.

Let me pause here to put things into perspective. A hole 7½ miles deep is deep. Yes, it is. But it is really just a pin prick when you consider that scientists measure the radius of the earth, from surface to center, to be just under 4,000 miles at the equator. The Kola Borehole is only about two-tenths of one percent of the distance from the surface to the earth’s center. That 7½ mile deep hole is about one-third of the way through the earth’s crust, which is 22 miles deep at that location. Below the relatively thin crust is the mantle, which continues for about 1,800 miles. The center is yet further away.

With that perspective in mind, it will serve us to look at biological life from a slightly different angle. Scientists call the zone of life on the earth, that is, where life exists, the biosphere. The biosphere is anywhere in the ground, in the sea, in the air, where there is life. In glaciers, there is life. That is part of the biosphere. In decaying radioactive matter, bacteria thrive, capable of withstanding up to 3,000 times more radiation than humans can take, actually breaking the material down to its basic elements. That too is part of the biosphere.

The trillions and trillions of bacteria living in the region about one mile to six miles below the earth’s surface occupy what biologists call the deep biosphere (or the deep subsurface). Please understand, we are not talking about sowbugs and angle worms. These live in the soils, maybe 5 to 10 inches down, in what scientists call the pedosphere. We are talking about lifeforms residing a mile or more below the surface. The volume of that deep biosphere is about 1.5 billion cubic miles. That is, there is a universe beginning about a mile under our feet, continuing for at least another five miles down, a universe teeming with an estimated 15% of all the life on the earth. That is a pretty large, though largely unseen, universe. Scientists call the organisms living in this space intraterrestrials.

What is it like in the space of the intraterrestrials?

1. Well, obviously: It is dark down there. The lack of sunlight means there is no photosynthesis. Without energy input from the sun, the subsurface environment has decided energy, oxygen, and nutrient limitations.

Lifeforms there generate energy chemically, through reduction-oxidation reactions, a number of biological-chemical processes subsurface microbes use in order to maintain life.

2. Things are slow down there. Microbes conserve energy by slowing down. Daring Wanderer and his cousins would consider a snail to be hyper. The rate of metabolism of subsurface microbes is 10,000 to 1 million times slower than that of animals at the surface. One of my sources indicates how slow time moves for Daring Wanderer by stating that subsurface bacteria “may live for thousands of years before dividing and there is no known limit to their age.”
3. Then, of course, it is hot down there. Daring Wanderer lives up to his name; he lives in temperatures of about 140°F. And, it gets warmer as you wander lower.
4. As well, the pressure down there is far higher than anywhere at the surface. By convention, the pressure at sea level is called a standard atmosphere, 14.6 pounds per square inch. That figure measures how many pounds are pushing on each square inch of your head or shoulders—14.6 pounds. For every mile you descend below the surface, the pressure increases by 7,800 pounds per square inch. At a mile down, it is 531 standard atmospheres. By way of comparison, the pressure at the typical or average level of the sea floor is 375 standard atmospheres. Yet, some subsurface bacteria will not grow at all in pressures less than 500 standard atmospheres—that is a lot of pounds per square inch.
5. Finally, water down there can be highly acidic, with a pH of 0, or highly basic, with a pH of 13. Pure water has a pH of 7. By way of comparison, ultra-acidic soil (a scientific classification of soils) has a pH of 3.5, while a pH of 9 defines a highly alkaline soil. Yet, there are subsurface organisms living in punishing pH environments of 0 and 13.

All this explains why biologists call these intraterrestrials extremophiles—lifeforms capable of living in extreme conditions in terms of lack of sunlight, in terms of temperatures, pH levels, pressures, and radiation levels. Daring Wanderer is a great example: He survives “on chemical food sources derived from the radioactive decay of minerals in the surrounding rock.” In terms of

mass—and you understand this is only an educated estimate—the aggregate mass of microbes living in extreme conditions, for example, deep in the ground or in glaciers or volcanoes, may exceed the aggregate mass of all animal and plant life on the earth’s surface.

The *fact* of the *prevalence* of life led the Dutch biologist Baas Becking to say that “Everything is everywhere.” We cannot help but be impressed with God’s largess when we look at the deep subsurface, the bounty of life He has created and which He sustains and rules, all the way down there.

Of course, God’s Word does not mention Daring Wanderer or any of his trillions of cousins. People in antiquity lacked microscopes; unlike the stars in the sky which call attention to themselves and thereby attest to God’s glory, microbes are invisible to the naked eye. Out of sight; out of mind. But, there are a number of small animals the Israelites *could* see and which in some *general* ways resemble microbes. These animals may be symbols—more properly, emblems—of microbes in God’s Word. God’s Word shows ants, as an example, to be industrious workers, just like bacteria. In Scripture, bees and hornets, like microbes, appear in large, swarming colonies. When God sends locusts, there is usually a lot of them. Likewise, microbes are colonizing, community creatures—myriads of them.

Just as a general arms his troops with the tools needed to carry out a mission, for example, giving them night vision capabilities if the mission so demands, so God has provided each of His daring soldiers with what he needs in order to do His work, just as He “arms” hornets with stingers, grasshoppers with voracious appetites.

Well, the way that God “arms” His army of microbes is really interesting. His arsenal is made up of who-knows-how-many different types of genes and several remarkable methods of distributing them to His boots on—or under—the ground. Scientists call one of the several methods “horizontal gene transfer.” Humans and animals are able to vertically transfer genes through their reproductive processes. However, they do not have a natural, a God-given, means to transfer genes horizontally.

As a simple example, consider *E. coli*, which, incidentally, wanders around in your gut, not the subsurface. That is a lot closer to home, but the principle

of horizontal gene transfer is the same. Its genome contains about 5,000 genes, about 2,200 of which are considered core genes, those needed to carry on basic cellular functions. Biologists call the other 2,800 genes adaptive or accessory genes, those permitting the microbe to deal with a particular environment or an extreme situation.

These accessory genes *never* become a part of the bacterium's DNA, but float around his protoplasm. When he dies, the DNA returns to the environment, but the adaptive genes float around in what one writer calls a "genetic ocean." This metaphorical ocean is vast and really churning. Through one of the three types of horizontal gene transfer, another microbe—and it does not have to be another *E. coli* but could be one of a different species—passing by may absorb that accessory gene into its protoplasm, thereby gaining the benefits of that gene, gaining the ability to do what God created that gene to do.

This is just one type of horizontal gene transfer, and this "gene swapping," if you will, happens all the time. Indeed, mathematical models suggest that one type of horizontal gene transfer occurs septillion times per second worldwide. That is the number one followed by 24 zeros, a huge number of transactions that the General—God—is overseeing every second.

So, here is what I think happened. At creation, God created a lot of different types of genes. I could not guess how many types; I do not think we have any idea. For instance, He created a gene capable of reducing a natural substance similar to the synthetic one we created later on, called nylon. By the word *reducing*, I mean breaking down complex substances like hydrocarbons to simple elements like hydrogen, nitrogen, sulfur, oxygen.

What eventually happened? Half a century ago, thousands of years after Creation Week, you understand, scientists came to understand that a synthetic, man-made fiber—nylon—prevalent in the 1940s, was actually being decomposed by certain species of bacteria in waste dumps. They were surprised because they had always assumed that nothing could break down nylon. In about a decade or a little longer, certain microbial species had taken hold of this gene which God created millennia before and, through mutation, used it to enable them to decompose nylon. This kind of thing happens all the time in the world occupied by Daring Wanderer.

Make no mistake about it: This is not evolution. I want to be clear about that. A bacterium never grows legs and becomes a dog, never turns into another species. Nothing like that. Rather, at creation, God made a lot of types of gene. One of those types could decompose what we later came to call nylon. Through horizontal gene transfer, God moves genes around from bacterium to bacterium. Through that process, bacteria come to possess new capabilities; in this case, the “nylon-eating” gene enabled the bacterium to successfully tackle the nylon problem. Scientists call this bioremediation, “the process whereby microbes break down a pollutant in an environment and clean it up without the use of external intervention.”

Other species of microbes, with another set of tools (that is, genes) from God’s arsenal, set about successfully breaking down nuclear waste when uranium began leaking from storage canisters at the Oak Ridge National Laboratories decades ago, in the early 1940s, when the United States was working to develop the atomic bomb. There are many other examples of bioremediation.

In Jeremiah 31, God alludes in general to the deep biosphere and the wanderers He has placed there—at least for now.

Jeremiah 31:37 “If heaven above can be measured, and the foundations of the earth searched out beneath, I will also cast off all the seed of Israel for all that they have done,” says the Lord.

Here, God asserts the degree of His commitment to redeem national Israel. He, the covenant-keeping God, is saying it is as impossible for Him to disavow His plan to redeem, to restore, Israel, as it is for men to explore the foundations of the earth, or to trek through outer space. The noun *foundations* is not metaphorical, but probably refers, at least at one level, to the many layers of sediments God uses to support the earth. These foundations are therefore part of the *deep* of which we are here speaking. I have already mentioned some of the reasons why the deep is so hard to explore: The temperatures and pressures involved. To explore that area, we must traverse distances of the order of 1,000 to 4,000 miles through dirt and rock. And, all we have done so far is dig a hole not eight miles down—and that, by the way, with a great deal of difficulty.

Mankind finds extraterrestrial space above as challenging to explore, as unwelcoming and foreboding, as the deep subsurface below. Both seem to be among those “secret things” which belong to God; He has not chosen to open them widely to man’s exploration. That said, we should not expect to find a vast amount of information about either area—space of the deep subsurface—in the Scriptures. However, Psalm 24 seems to be one of those places which sheds some light on the dark but not so lonely deep, this universe wherein dwells Daring Wanderer.

Psalm 24:1 The earth is the Lord’s, and all its fullness, the world and those who dwell therein.

The subsurface is part of the earth, part of its fullness. The microbiota dwelling there are also His. They dwell “therein.” References to God as “the Lord of all the earth,” or “the Lord of the whole earth” appear in Joshua 3:11; Joshua 3:13; Psalm 97:5; Micah 4:13; and Zechariah 6:5. The formula, “Lord, how excellent is Your name in all the earth,” appears in Psalm 8:1 and 9, the last verse. In II Chronicles 16:9, God notifies us that His eyes “run to and fro throughout the whole earth.” In Isaiah 40:12, we learn that God is able to calculate “the dust of the earth in a measure.” In other passages, the Hebrew word underlying the noun *dust* there refers to ore, minerals. God measures ores deep in the earth.

There is no doubt at all, then, that God is sovereign over *all* the earth—every part thereof. Does He provide any indication that that hegemony includes the deep biosphere?

Psalm 135:6 Whatever the Lord pleases He does, in heaven and in earth, in the seas and in all deep places.

Four places—heaven, earth (which is one merism), seas, deep places (another merism). Focusing on the second merism, it is important to note that the Hebrew noun translated “deep places” is a different one from the word translated “sea.” However, it is the same word translated “deep” in Genesis 1:2: “and darkness was on the face of the deep.” In verse 6 God is *distinguishing* between “the seas,” filled with water, and the “deep places,” which are in this context apparently filled with rocks and dirt. It is noteworthy that, in Deuteronomy 33:13, *Moses, in his prophecy about the*

tribe of Joseph, uses the same word when he mentions “the deep lying beneath.” Combined with the term “lying” (or “couching” in the King James Version), it probably refers to mineral wealth lying deep in the ground, a blessing Joseph has enjoyed.

In this passage, the psalmist is saying that God rules in heaven and earth, seas and deep places—four distinct places. Remember, God has no trouble seeing these areas. In Psalm 139:11-12, we learn that to God, “the night shines as the day; the darkness and the light are both alike to You.” The light-dark dichotomy does not affect God. The darkness is not dark to Him. *He is able to peel through, like a medical imaging device can do, able to penetrate, deep down through each layer of darkness, to see what man cannot see—as if it is in broad daylight. That may give insight to Psalm 74:12, a passage you all know well, where the psalmist writes that God works salvation “in the midst of the earth.” The Common English Bible interprets that to mean, “in the heart of the earth.”* Of course, God is obviously not offering spiritual salvation to bacteria, but, as part of His creation, He is certainly using them in working out His plan of salvation.

In Psalm 95, we see another catalog of four places:

Psalm 95:3-5 For the Lord is the great God, and the great King above all gods. In His hand [that is, under His control or governance] are the deep places of the earth; the heights of the hills are His also. The sea is His, for He made it; and His hands formed the dry land.

Again, four distinct places: Deep places, hills, sea, dry land. The term “deep places” is not just another reference to the oceans. Here, the Hebrew uses a different word for “deep places” than the word appearing in Psalm 135:6. Indeed, it is so different that it appears nowhere else in God’s Word. Elliott’s *Commentary for English Readers* suggests that this word comes from a root meaning “‘to search,’ perhaps by digging. Hence either ‘mines’ or ‘mineral wealth.’” Regarding this passage, Barnes’ comments:

The primary idea is that of searching by boring or digging; and the allusion here is to the parts of the earth which could be explored only by digging—as in mining, or sinking shafts in the earth. The meaning is, that all those places

which lie beyond the ordinary power of observation in man are in the hand of God. He knows them as clearly as those which are most plain to human view; He possesses or owns them as His own as really as He does those which are on the surface of the ground.

It is clear that God is sovereign over the deep biosphere as well as the earth's surface. As I wind down, let us talk about *why* God salted away these remarkable creatures where He did, in the deep subsurface where mankind cannot easily study them—and really cannot get to them very well. It is as if He is protecting them from us, preserving them.

1. First, just like the locust and hornet, microbes may play a part in the *judgments* God sends on the earth during the Day of the Lord. With genomes quite different from ours, some of these wanderers may prove to be extremely “medically challenging,” to our doctors. Microbes may be responsible, for example, for some of the plagues of the Seven Bowls, especially the first three, involving loathsome sores, the death of all sea life, and the rivers turning to blood. You will find those plagues documented at Revelation 16:1-7. This use of microbes is consonant with the *severity* of God on His enemies.
2. But, as a second point, and one I want to stress, like so many of God's creations, God may have multipurposed microbiota. After the Day of the Lord, Christ could “rearm” the destructive microbes with a new toolset—new genes—and they could begin doing *positive* things in the Millennium, exhibiting the goodness of God. Consider two possibilities, though there are a number of others:
 1. Using Isaiah 11:6 as a starting point, God might use microbes to alter the digestive systems of carnivorous animals, like lions and leopards, such that they are willing and able to thrive on vegetation rather than flesh. At the time of the Flood, God may have hidden in the deep biosphere the bacteria, or at least the gene, responsible for making the pre-Flood cats herbivorous. There, a preserved remnant of bacteria might be waiting for God to release them on the world at the start of the Millennium. God can release deep subsurface bacteria using subduction zones, volcanic action, and earthquakes.

2. Second, undoubtedly, God will use bacteria as agents in bioremediation, which I defined earlier.
 1. He will certainly use bacteria to clean up polluted surface and ground waters as well as compromised aquifers further down.
 2. There probably will be, as well, radiation hanging around after the wars. Some may just “blow away” into space. Heavier waste materials residing in damaged storage facilities or stored in subterranean and suboceanic vaults, perhaps comprised by earthquakes, God might just give to the wanderers to dispose of.
 3. Then there is the trash—and trash and more trash. The Destroyer, fearing the time that Christ will destroy him, has for millennia taught that God cannot and will not destroy him. Not only do the Catholics and many Protestants teach this lie, but in the past Satan deceived the elect herself into believing that God could not destroy spiritual material. Through the grace of God, we know better now.

Satan has misled man for years, telling him that he has the power to build a society which God cannot destroy, which is impervious to His judgment. This was the thinking which lay behind the building of the Tower of Babel—that it would outlast the judgment of a second flood. On another level, Satan teaches man that he has created substances which just will not rot, which are indestructible. This too is a lie, and one which has fostered a wrong-headed environmentalism. I ask you, can man fabricate anything, materially or societally, that God cannot destroy? To believe that man can do that is perhaps the height of presumption. Arrogance! Yet, environmentalists teach that our landfills are replete with trash which will *never* decay. And now, whole governmental agencies, an army of wrong-headed, miseducated bureaucrats having police powers, enforce policies based on that lie. Remember that inane plastic straw business a few years back? The lie of indestructibility—

like its counterpart, the lie of the immortal soul—is a limitation man has placed on God, and a limitation which simply does not exist in reality.

I submit to you that God has an army of bacteria, and an arsenal of genes, capable of decomposing *anything*, and they will do so during the Millennium. He has kept that army away from the corrupting hands of Satan-inspired men. That army is ready for deployment on demand during the Day of the Lord and during the Millennium. At the end of the thousand years, *all* the remnants of this current evil world will be decomposed, reduced to basic elements. God will not just bury it. Using microbes, He will chemically reduce or “dissolve” the radioactive waste, the chemical warfare waste, the aluminum, the plastics, the so-called “miracle fabrics.” You name it. Whatever!

Both spiritually and physically, Christ—and His Bride—will have a lot of work to do in the Millennium. When Christ resurrects billions of people in the second resurrection, He will resurrect them into a pristine world, what He called paradise when He talked with the thief on the cross, a world like Eden, as fresh as it was on the seventh day of Creation. In Isaiah 40, God reminds us of how busy Christ will be after He returns to the earth:

Isaiah 40:10 Behold, the Lord God shall come with a strong hand, and His arm shall rule for Him; behold, His reward is with Him, and His work before Him.