The Wrath of Gaia Explained

Introduction

The author relates, "The Wrath of Gaia was an end of the world scenario I had been working on for many years. I wanted to write something that was totally original, yet believable. I also wanted to show what might occur, if say, a nuclear detonation occurred in precisely the wrong place.

"To this end, I used artistic licence, and invented the addition of a nuclear missile and storage facility to Bushehr atomic power plant. As far as I am aware, this does not exist in real life; apologies Iran; but it could.

"The other thing was, how do you blow up the world?

Given the catalyst of a nuclear strike on my version of Bushehr, and a large area of the Earth containing vast oil and gas reserves, that is situated on major tectonic fault lines, and has sea nearby, I choose to mix a cocktail. The ingredients are oil or gas from oilfields, magma from the Upper Mantle (asthenosphere), but the oxygenation/accelerant was always the problem. Yes, under extremes of temperature and pressure, water will break down into its constituent atoms, but it was the oxidising radical molecules that water naturally contains, that made me choose seawater as the accelerant.

"I spent years on research, before coming up with an explosive formula that would work; remember, this is a work of fiction.

"Then I needed means to explain what was occurring, so the Mexican scientists came into the book, and it all got very technical. I deleted much from the text of Book Three, but the basics are laid out below. Warning, this explanation is abridged, and does get quite technical."

Explanation

This is the scientific explanation delivered as a joint presentation by the scientists to the team. The statements are made by José - volcanology, Fernando - tectonics, and Ali – oil and oilfield composition, who between them had come up with the working hypothesis below, which is heavily researched, and based in science fact.

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Fernando began, "Ladies and gentlemen, as you may be aware, the Earth's crust is divided into many sections, which we call Plates. Some are massive and others relatively small. One of the smallest is the Arabian Plate. These plates make up the earth's crust, which in turn is composed of several layers, and below the bottom one lies a portion of the upper mantle called the asthenosphere. This is just below the lithosphere, a region that is involved with plate tectonic movements and isostatic adjustments. This is my area of expertise.

"In theory the crust and all layers below are solid rock until we reach areas near the earth's core. In practice what we find it that due to pressure and plate movements, much of the rock below the crust is in fact slightly viscous, but not technically liquid as such. Yet, over years it moves, and in rare cases, instead of the asthenosphere being hundreds of miles below the surface, it can become as close as a few miles only.

"It is impossible for a continental plate to rock from side to side, even a small one like the Arabian plate. Instead, what I have detected are huge swings in the density of the asthenosphere in specific places. Density is directly related to pressure from above, and below for that matter. In this case, we are looking at the earth's reaction to the large nuclear blast that occurred several weeks ago at Bushehr. In particular, I am focussed upon the reaction within the asthenosphere and adjacent strata.

"Let me put this simply. The more pressure within the asthenosphere, the higher the temperature of the nearby sections of rock, and the more fluid they become. This we caused below Bushehr, and know that when that side of the plate went down it did not move anything out of the way beneath, it simply compressed it. This has led in turn to higher temperatures and some molten rock, which should never exist.

"The rising plate is simply a reaction, but if you note the screen projection, you will immediately realise that the plate is not going to roll from one side to the other. It simply cannot do so. Instead, the

compressed area has expanded due to temperature and pressure building below. Yet, it is now held and being pressurised again by the Iranian edge descending, as it must do.

"I predict the plate edge will fall until it meets a full resistance made up of the pressure and temperature of the rocks below. In other words the magma that has just expanded and become more semi-liquid; will re-pressurise and take on a higher temperature and lower viscosity.

"If this were an isolated issue, then within a few weeks a volcano would blow, the pressure release, and the plate would settle much as before. It would become stable after several months. The new pressure area would perhaps cause the Plate to slowly change its course and bear down on Egypt, causing a potential ridge of hills where the Red Sea now is, but over thousands of years; we are talking of millimetres of movement per year.

"This would then open a area for expansion along the Continental fault between Saudi Arabia and Iran, which in turn would see some volcanic activity, many more earthquakes, but generally as the release of stress in the form of plumes of gas discharge and minor lava flows. Of these, the earthquakes would be the most serious concern.

"That is the standard model, but this is not what is going to happen in this instance. Doctor Estaves if you please…"

José stood and launched straight into his lecture, augmenting it with graphs, pictures, projections, and several handouts in English. "Friends, it is far worse than I feared. By now, you will have a basic understanding of what information we are working with, and yet there is so much more to appreciate. Let me begin by stating that as a direct result of what Fernando just explained to you, there is a large hot-spot of liquid magma settled in an area below Bushehr, and because of the trajectory of the missile strikes, it is overreaching to the southeast. This is spreading and currently includes Kangan, and also the tip of the United Arab Emirates.

"As the Continental plate buckles in descent, well, it has stopped going down and is now creating higher pressure and temperatures below Bushehr as Fernando explained. This is on a boundary of a Continental Plate, termed a transform fault, and sorry if I stress this fact, but this is especially important to our greater understanding.

"The boundaries of continental plates have a specific reaction not found anywhere else within the crust, because they are not faults, but fractures between different masses of rock that make up the plates of the earth's crust. You may consider them to be clean breaks that usually appear to be sealed because of the horizontal pressure applied by surrounding plates. We will return to this a little later.

"Normally volcanoes and related activity are the result of one of three types of force [3.11.1]. The most common is called Decompression Melting and is likely to occur in one of three ways: beneath oceanic ridges; at hot spots; and beneath continental rift valleys. You will notice we have two of these components in the same place.

"Magma, or highly viscous melted rock can also be caused by the intrusion of hotter magma—heat transfer; or by lowering the melting temperature, such as can be achieved by adding water or Carbon Dioxide—flux melting. It is our opinion that both of these types of magma are also being generated below and around Bushehr. This is unheard of and a new precedent is being set and activating as we speak here today.

"I will explain what has happened in plain terms, but please know it is extremely complicated to work out from our measuring devices and other data sources. Our theory is that the nuclear strike on Bushehr affected the rocks below as shown on the screen.

"The force of the gigantic explosion drove the surface rocks downwards with instantaneous force that drastically increased the pressure on the subterranean strata, and caused them to melt. The blast was so severe it caused pressure to be applied to the asthenosphere, thus bringing the entire plate into play. The outer planetary core below this layer also heated and pressurised … and to keep it simple, a new hot spot was created during the days following the blast. This new hot spot is now increasing pressure in turn on the rocks above, and by our readings, turning them into high temperature magma. Therefore, we also have intrusion of magma from the pressure and possible ruptures below, or Heat Transfer.

"Indications show the nuclear strike caused a series of fissures to appear, so water from the gulf has also been entering the substrata, and this will lower the melting point of the rock it permeates, so we have Flux Melting as well. Any nuclear debris will also be adding heat by decay wherever it resides, and some may have been blown deep into the underlying rock.

"We have already witnessed a series of volcanic eruptions and lava flows, but these are early indications of what is brewing deep within the earth. Our latest information signifies that the Arabian

plate will not dip any lower, indicating its downward force has been arrested and countered by increased pressure below, and this is now magnifying. The ground temperature is also increasing rapidly, and to the point that by tomorrow we expect tar macadam roads to begin melting.

"Were this not on a continental plate boundary, and not compromised further by the sea; then we would be looking at a volcanic field eruption, or a series of major volcanic eruptions along the magma flows. These would exceed anything ever recoded in our history, and make Krakatoa look like a Roman Candle.

"Unfortunately I wish this were so straightforward, but then there are also other natural forces and reactions to consider. Ali, please tell us what you discovered. Later I will speak again. Thank You."

Ali was straight into his delivery, "The gas we discovered bubbling up into the Gulf contained mainly water vapour and a little carbon dioxide. This would be normal for volcanic activity. There were trace elements of Sulphur, Chlorine, and Fluorine gases, and minute traces of others. José, Fernando, I have already made our full information available to you, and it is also loaded into the dedicated database here.

"The unexpected and most worrying aspect is that we also discovered areas where hydrocarbons were being released. Unlike the Caribbean, the Gulf oilfields have a hardy impermeable rock cover, so gas release other than from drilling is highly unusual.

"Hydrocarbons refer to many related compounds made up of hydrogen and carbon. They are scaled from 1 to 10 with the simplest and lightest being called methane, and we found a lot of methane when we did our survey [3.11.2]. Unfortunately, we also found traces of higher and heavier gases such as: alkanes, alkenes, and isomeric cycloalkanes, which are the main components of gasoline, naphtha, and jet fuel.

"This in turn means that the impervious rock above the Gulf oilfields have been breached in certain places, and not only will gases be coming up, but some sea-water will also be entering these fields because water is heavier than the gas. There will not be much due to associated underground pressures, but it is a slight consideration. Bear in mind any water will gravitate to the bottom of the well. Most of these oilfields are classified officially as gas fields."

Ali broke from his delivery, and with a lighter tone, asked a simple question, "What is an oilfield?"

The Mexican's kept schtum, and we offered suggestions, having never considered the question before. Dawn offered, "It is a well of oil or gas, or usually both, created by the fall of massive forests in prehistory. These became a soup of decay, but were covered by new rock, trapping them underground beneath a hard rock covering."

Ali continued to bait us, we were close, not quite understanding, although we laughed with release at more outrageous suggestions. I was privy to the answer, if only from Ali's recent report, but chose to play devil's advocate, "It is a big hole in the ground which is full of oil."

Ali enthused immediately, "Thanks Jack, that is completely the wrong answer I was looking for. An oilfield or gas field is actually composed of solid rock, but it is the nature of the rock that is important. Much of the Middle East oilfields are composed of a high proportion of porous rock; a bit like pumice if you like. The rest is permeable rock, meaning it is denser, but can trap oil and hydrocarbons if there is an impervious lid on top."

"I have collected and collated gas samples from North Pars, Kangan, and South Pars; all of which are gas fields under the Gulf Sea. In the former, many temperatures were above the boiling point of water, even having travelled upwards through the water beneath.

"Now, if I were to take a bowl of crude oil and put it in my oven, I would expect it to catch fire at about 230° C, at sea level, or one unit of atmospheric pressure. Crude oil is considered to burn naturally between the range of 135 ° Celsius to 275 ° Celsius, depending upon composition. It can of course burn far hotter and above 1,600 Celsius when under pressure, such as when refined, and used within the internal combustion engine.

"To burn, like virtually everything else on this planet, we need to supply it with oxygen; something that is usually not present, nor appropriate, in oil and gas fields for obvious reasons. If the crude oil and gases cannot burn, then they will still change state due to the effects of rising temperature and pressure. Depending upon the constitution of the oil and the rocks trapping it, the gases will compound and get heavier.

"By this I mean to say they will generally become more explosive in nature."

Ali had finished his delivery and left us to fully absorb the impact of what he had said. Jack spoke into the uncertainty, "José, what is the temperature of magma, lava, whatever?"

José answered from memory, "To become molten rock of high viscosity, the minimum temperature is considered to be 650 degrees Celsius. This is not precise, because it depends upon the actual constituency of the rock. However, at these temperatures you have what we term Rhyolitic magma with a temperature range of roughly 650 to 800 degrees Celsius. These would normally be rocks from the existing crust containing many other chemicals, or ingredients if you prefer. There would likely be a high crystalline content also, and this is a specific sub-category of vulcanology within itself, and one I am expert in.

"The next band is called Andesitic magma after the Andes where it is most commonly found. The only other places on earth where it is common are at continental plate boundaries, and a few areas of special circumstances. Andesitic magma is an intermediate form of magma, and when found outside of the Andes chain, is usually caused by a mixing of Basaltic and Rhyolitic magma, at a continental Plate boundary in this instance. Temperatures are roughly 800 to 1, 000 degrees Centigrade, and contain fewer silicates than the previous type. This is often grey in colour, as with the Canary Islands off northwest Africa; or say, Tahiti. This in turn means that in our vacation world, the associated beaches will have black sand.

"Basic volcanic magma is called Basaltic Magma, and is normally found deep within the crust. It contains few gases, lower silica, and in its pure form is never crystalline. Temperature range is from 1, 000 degrees upwards, normally peaking at 1, 200 degrees before reaching the surface. There is no limit to how hot this can become if well trapped. Remember, the higher the temperature, the lower the viscosity, and the higher the pressure beneath ground.

"Ladies and Gentlemen, the forces we are dealing with are primordial, and difficult to measure, let alone form a working hypothesis from. We need more time to fully understand what these primitive forces of nature are about. I'd like to speak to all the scientists now, supplement our knowledge pool. Jack, can we use this room as a meeting point, other activity on the Bridge is distracting."

The meeting adjourned, while smaller cliques swapped information and continued their pursuit of the truth. Jack asked the Core to instigate temperature and density research of the substrata below the Arabian Plate, beginning with the Gulf hot spot. It was to be as deep as possible, and as detailed as time would allow.

"Guardian, this will take days. You should deploy physical probes."

Jack called Kay to his day room, and they set about the task. They didn't even know probes existed, but were presented with details for a range of standard survey drones and drilling, subterranean probes. They picked the model best suited, set parameters, and launched several, aiming for specific points. They would also give extra information, such as pressure.

Jack asked for the results to be presented separately, and also be included in their onboard working hypothesis. He was not sure of what value this would be, but others were busy, and he was not. Jack had time to think, to act proactively in support of the greater team.

Some hours later, he received the initial feedback from their probes, but one more probe deployment was essential for a full projection. Kay and Jack responded immediately to the Core's request, and waited impatiently, scrutinising the whole region in detail. After thirty-five minutes, they got the first prognosis, which was abysmal. Jack spent another fifteen minutes making it into a small presentation. This mainly entailed colour-coding temperature bands within a 3-D model of the related earth strata, especially concerning oil and magma. Kay and n'Gnung worked with him, and they discussed the implications briefly, before promulgating the conjecture.

Calling an emergency meeting in the new operations room, Jack and Kay presented the latest prognosis from the Core. The results were displayed on the main screen; all watched as disbelief turned to terror on the faces around.

Some tried to speak, before others muttered of impossibility. But, there it was, and there it remained—the end of the world as they knew it.

n'Gnung copied the projection to every workstation and waited while people spent minutes, then tens of minutes trying to disprove what the Core had construed. Ali was aghast and after absorbing the horror to come, became hyperactive as he related this new theory to the volcanologists' latest findings, and those of his own. Across the room, the Mexican's were doing exactly the same correlations with their models; José occasionally surfacing to look around with unseeing eyes.

In time the ghoul, the metaphysical essence that personified The Wrath of Gaia settled amongst them all, and persisted.

The only question left unresolved was not if, but when?