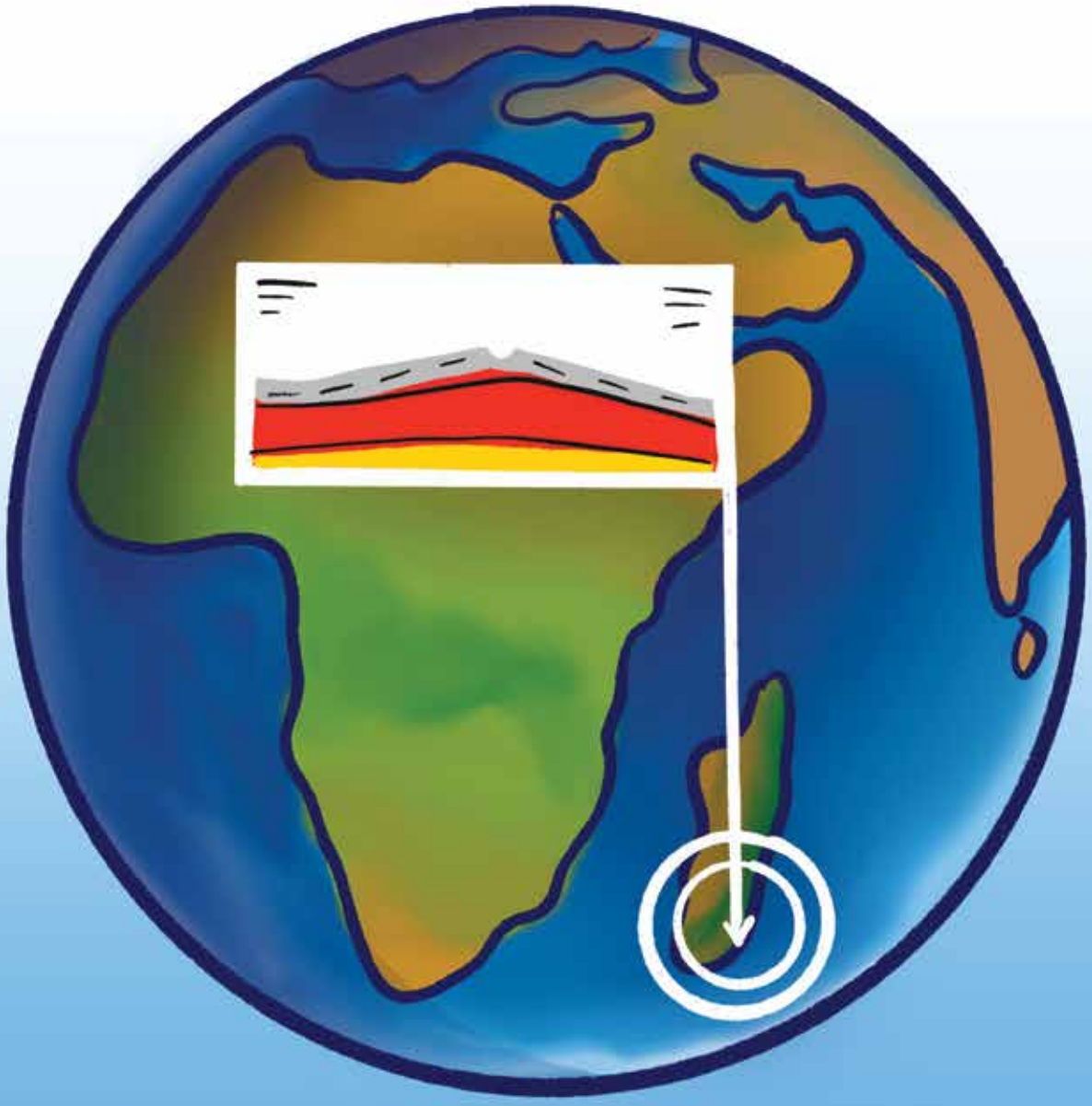
FICTION

# The Core Challenge

## SCIENCE FICTION — SEVENTH BEST ENTRY

**Pravin Gawali**



THE annual convention of Global Association of Geologists and Geophysicists (GAGG) was held in Navi Mumbai in the picturesque precincts of 'The Institute of Cosmic Sciences'. The meeting promised to be stormy and a cacophony of animated debate.

The latest issue of *Core...Mantle* had carried a research article that was brazenly a bizarre mix of solid science and obtuse fiction, consequently catching the attention of both the lay and scientific community. The article detailed the travels of a sophisticated contraption to the core of the earth piggy riding along the sludge of molten iron.

The idea, though conceived by many in the past, was the brainchild, in its latest avatar, of an incorrigible and irreverent Indian scientist, Prof. Taxila, known more for her ability to think out of the box than for sensationalism. She was respected by her peers, deified by students and adored by the public. Her science was never cut off from the practicalities and needs of the populace. She had made available many useful solutions to problems faced by the common folk. Thus, her word was not to be ignored.

Prof. Taxila was basically interested in studies related to the interior of earth and devoted more time to know about the intriguing dynamics of cataclysmic earthquakes and spectacular volcanoes. She was captivated by the hot and sizzling magma that made its journey from the centre of the earth to its surface. She was also mesmerized by the pace and progress made in space studies. The earthlings knew more about the outermost environs of cosmos than about their own planet and what lay within it. She was amazed at this extravagant ignorance even at the end of the 23rd century.

As expected the meeting was truly stormy and a legion of ideas flew thick and fast. There were serious objections and mundane hackles raised from many quarters. A sizeable chunk downright ridiculed the notion of being able to reach the core. Many others supported the effort but cautioned about practical difficulties and questioned the feasibility of existing technology to surmount the many bottlenecks in trying to pierce the underbelly of planet earth.

However, some scientists offered rational solutions and viable alternatives. Predictably, the information media lapped up the proceedings and sensationalized the whole thing bringing it on the radar screen of the Ministry of Science and Technology. The Ministry immediately summoned all the relevant players to a brainstorming session after the end of the convention.

"Prof. Taxila, please explain your recent paper and its significance," the Minister for Planetary Sciences was polite in demanding an explanation.

"Mr Minister, all of us are aware about the on-going planetary missions and the knowledge that they enhanced about our world and its origin. But, there is no comparable effort directed towards garnering accurate and relevant information about the interior of the earth. The vast region that makes up the crust, mantle and core needs to be earnestly explored since it holds many secrets," Prof. Taxila explained.

"What sort of knowledge is locked in there?" questioned the Minister.

"Well, we do not know about the exact nature of the physical, biological and chemical realm of the interior. It is all shrouded in mystery and whatever little is known has been inferred from indirect geophysical methods like gravity, seismics and magnetics. We believe the core-mantle boundary is supposedly the seat of magnetic field generation. We can learn more about its perpetually changing pattern. Also, the device will have the ability to trap magmatic material at different depths and bring it back to surface. The study of this material will help us identify chemical and biological entities present at great depths, like the thermophiles, if any," she concluded.

"And how do you propose to do the travelling to the centre of the earth, and also, how will you collect the data?" demanded the Minister.

"Theoretically it is very simple. We will send a device having communication capabilities by opening up a crack in the surface and pouring in a vast amount of molten iron. The weight of this huge quantity of molten liquid will lacerate the earth for more than 3000 kilometres and take the device through this journey down to the centre of the earth. Along the descent it will beam back the data in the form of encoded seismic waves."

"It sounds very simple. But, what are the costs and technological requirements involved in this ambitious endeavour?" the Minister was curious.

"Mr Minister we have just a three point wish list. Number one is to create a self-propagating crack; second is a million tons of molten iron; and the third is an intelligent device to record and transmit data. If we are able to take care of these three factors then we will be pretty well sitting at the center of the earth very soon."

"This is easier said than done," persisted the Minister with his doubts.

"Yes. I agree with you partially Mr Minister. In terms of technology, we seem wanting. But the experimental work carried out by us and many other groups all over the world has proved one point. The travel through the crust, mantle and core is an achievable possibility and it has to be physically tried on earth someday or the other. The planetary missions were all mind experiments that were initially executed theoretically and then later on tried in laboratories on an experimental basis. Their actual execution in real life situations came much much later. We too have to go by that paradigm," Taxila pleaded with the Minister.

"But this will involve huge investment," the Minister enumerated a very significant hurdle.

"The cost would be comparable to what we have spent on planetary missions over the years. The total expenditure could not be more than a few thousand crore rupees. But the benefits may far outweigh the costs. For example the magnetic field has been steadily decreasing over the past couple of centuries and research carried out is strongly pointing towards an imminent magnetic reversal. This feature can be physically verified at

the core-mantle boundary and will help to take all possible corrective measures. The research will have global impact and the entire humankind will benefit from it," she pointed out.

The Minister agreed with the assessment of Prof. Taxila and her team and promised to render all possible assistance to see it through. The approval and sanction for the project soon came through and the whole project assumed an exalted aura and air of the erstwhile 'Manhattan Project' dedicated to manufacturing the atom bomb in the early twentieth century.

For the team put in charge to execute the migration of the contraption to the core it was their one big chance to fame and glory. The scale and magnitude of the project were so vast as to overwhelm the lesser mortals. But Prof. Taxila and her colleagues were a team possessed.

Her first task was to find the right area susceptible for penetrating the earth. Being a volcanologist she was well aware of regions on earth from where the magma from the mantle rises up. Her best bet was the midoceanic regions. These are areas where the two continental/oceanic plates move away from each other creating an opening right up to the mantle. These regions are characterized by excessive volcanic activity.

Prof. Taxila reckoned that molten magma poured at such places will need minimum energy to keep itself hot (the ambient heat of the magma will keep it energized) and the cracks already developed will imperceptibly guide it downwards. The team also banked on the idea that this arrangement will help do away, to a greater extent, with cracking the earth with explosives.

What Prof. Taxila and her team were trying to achieve was the reverse of a volcano. Magma rises through natural cracks, and manifests itself in the form of volcanic eruption, because it is lighter than the surrounding rocks. The Professor was now trying to replicate the same process, but in a reverse order. She wanted to send a high-density material capable of descending down under its own weight and gravity.

The task of gathering huge quantity of iron was assigned to different ministries of Indian and foreign governments. Several tons of radioactive material was also required to melt this iron and to keep it in molten state. At the same time a global network of observatories was established to receive the data emitted by the device chugging along with the molten iron. Since this data would be encoded in seismic signals the existing chain of seismic observatory network doubled up as receiving stations for this endeavour as well. Of course they had to be equipped with special receiving devices.

Finally, the D-day arrived. Madagascar, being close to midoceanic region in the Indian Ocean, was selected for logistical help of supplying the molten iron material to be poured in the massive cracks. Many oil rigs from adjoining areas were moved closer to the area of operation in the region. Research vessels and naval units were also stationed close by.

Many heads-of-state had gathered to witness the spectacle from close quarters. The Indian contingent was proudly at the forefront taking care of all the necessary exigencies. They were in fact the *de facto* hosts. They were, however, anxious, uncertain and fearful of the outcome. They were going into an uncharted territory and had no idea of things to expect.

The vast quantity of iron had been heated up and transported via a massive conveyer belt to the area that unfurled directly over the midoceanic opening. It had been mixed thoroughly with radioactive minerals to keep them hot and plastic. But, instead of one probe, many more devices made of diamond as semiconductor material were inserted in this sludge expecting to take about a week to reach the core.

During its descent the probes would be sending signals encoded in seismic waveform to be decoded at the seismic observatories. Just as it is necessary to send the satellites with a certain escape velocity to breach the gravitational pull of the earth, so is the case with blasting a path within the interior realm of the earth.

Complex mathematical equations were worked out and the force with which the molten iron was to be inserted within the earth was determined through simulation as well. Various engineering tools were used for the purpose and the task was accomplished without major hiccups. The descent of the molten iron started with a bang shaking the adjoining earth and violently disturbing the vast ambient water body.

But the descent of the probes was an anticlimactic event for the non-scientists. Their expectation was a visual spectacle just like the one witnessed during satellite launches. However, during this expedition nothing was visible, except the visuals sent by the cameras stationed at strategic points near the extensional plate margin.

All the drama that was being enacted was taking place below the seafloor and the scientists were tracking it down by geophysical instruments. There was jubilation all around the world when the first signals from the 'core' probes started arriving at the seismic observatories spread across the globe.

The probes were steadily but surely descending down the crust and mantle. There was a small deviation at about five kilometre below the surface, which the geologists and geophysicists understood as the Moho discontinuity forcing a smile on their faces. It was a confirmation that all was going well and that they were not too far away from the mark regarding the interior structure of the earth.

The entire world exulted on this achievement and many heads-of-states congratulated the scientists, singling out Prof. Taxila for the breathtaking magnitude of her dream to reach the very heart of the earth.

She was happy and basked in the glory along with her colleagues and fellow scientists. But, she knew that the work had just about begun. The probe will be continuously emitting data which had to be decoded to understand the real nature of the world below her feet. It will also be bringing magmatic material that had to be scanned for characterizing various chemical and biological entities. She and her colleagues will have no respite for the coming years. The exploration had just begun!

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