Plume and Plate Tectonics @ 50 – K.R.Y. Simha, IISc, Bengaluru - 560 012

A rising plume of smoke, soot and vapor from chimneys and kilns shares many common features with a column of fire, ash and lava from volcanic eruptions. Heat and buoyancy drive fluids and solids to rise against gravity. This basic concept underpinning plume and plate tectonics(PPT), unfortunately however, was neither endorsed nor appreciated by geologists until only about fifty years ago. This is indeed amazing considering that several ancient civilizations long before Archimedes who built ships and monuments had an admirably clear appreciation of the *pentad* of elements: **e**arth, **a**ir, wate**r**, space=**t**ime and fire=**h**eat. Much later the gigantic minds of Newton, Pascal, Maxwell, Darwin, Planck, Curies, Einstein and Raman unveiled the subtle nature of heat, light and matter governing the motion of everything in this vast universe ranging from galaxies and stars down to subatomic particles like quarks and electrons. In all this grand celebration of unified theories and quantum mechanics, earth science was largely nurtured by a spirited team of field geologists, biologists, hydrologists, mineralogists, seismologists assisted by interested civil, mining and mechanical engineers.

It is even more ironical that Wegner's 1915 hypothesis of continental drift was both ignored and ridiculed by leading geologists delaying PPT by another fifty years! At long last during the 1960s there was abundant evidence and consensus that this solid earth is a cracked cauldron for boiling and melting rock and metal almost always on the verge of collapse. This moving mosaic of irregular polygonal plates carrying their cargo of continents and oceans is driven by mantle plumes gives the gist of PPT. This terrestrial idea has greatly magnified our vision of other planets in the solar system and beyond. Just as biology took off after unraveling the structure of DNA, post-PPT geology is increasingly invaded by physicists, mathematicians and chemists bringing in extremely sophisticated tools and techniques for linking PPT with petrology. Presently PPT models are widely extrapolated to understand the dynamics of planets, satellites, stars and even entire galaxies to explain the role of conduction, convection and radiation for moving matter from one configuration to another more stable one. All this new exciting activity calls for a major celebration to help motivate and inspire students and teachers to explore the elegant as well as the complex facets of PPT to prepare for *futuristic* planning of cities, bridges and reservoirs in the wake of unpredictable migration of plates and plumes.

The cessation of wars and conflict in the sixties rejuvenated creative artists and scientists to help launch ideas on a global scale. Like the Beatles and Apollo astronauts geologists Hess, Wilson, McKenzie and Morgan erected the first PPT pillars some 35 years after Wegener had perished in an expedition to Greenland. Coinciding with this PPT Golden Jubilee, it is appropriate to also congratulate ancient as well as the colonial geological tradition in India predating all other geological societies in the world. In this context, it is heartening to highlight the crucial contributions of Indian geoscience to mid-plate reservoir triggered seismicity (TRS) in the Koyna—Warna riverland. A special Golden Jubilee issue of 25 papers edited by GSI President Gupta gives a graphic account of drilling 15 kilometers of boreholes through the Deccan traps and into the basement. Along with Killari borehole data, there is a lot of scope for advancing PPT concepts to predict the stability of this region overlying a trinity of clashing cratons with their associated mobile belts.

In essence PPT is mainly concerned with the identification of relevant thermodynamic variables and material properties at all points of this 6371 km radius planet. The main variables including pressure, temperature and density at a given depth are controlled by germane properties such as bulk modulus, stress wave speeds, specific heat, thermal conductivity, viscosity. Applying the laws of mechanics and thermodynamics, non-dimensional parameters like Reynolds number, Rayleigh number aid estimating the flow of heat, mass and momentum carried by the plumes which in turn manifest along the plate boundaries. There also are other plumes responsible for mid-plate hot spots. Overall there is roughly a 70,000 km long effusion creating new material using plumes with a matching length of an absorbing subducting boundary back into the mantle.

There is an urgent need for an integrated PPT education in schools and colleges bringing field geologists, seismologists, hydrologists together with civil, mining and mechanical engineers to appreciate, comprehend and control mid-plate stability in the face of increasing demand for water, railways and urban habitats. Vulnerable regions spread over a million square kilometers demand a thorough PPT assessment for infrastructural planning and linking *futuristic* cities with high-speed railways, power lines and water supply. A myriad of subjects encompassing the mechanics of fluids, soils, solids, faults and fracture underlying PPT and migration of plates for a strategic design and deployment of sensors on land and deep inside boreholes

Corrigendum

In the March 2018 issue of the Journal of the Geological Society of India, an error has occurred in entering the the DOI numbers for the articles at page numbers: 263, 273, 281, 290 and 295. We request the authors/readers to make note of the change in the DOI numbers.

pp.263.	DOI: 10.1007/s12594-018-0849-2
pp.273.	DOI: 10.1007/s12594-018-0850-9
pp.281.	DOI: 10.1007/s12594-018-0851-8
pp.290.	DOI: 10.1007/s12594-018-0852-7
pp.295.	DOI: 10.1007/s12594-018-0853-6