Comment on Paul Tackley's review of P^3

by

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The review of *Plates, Plumes, and Paradigms* (P^3) by plume-enthusiast Paul Tackley is shallow. Most of the questions posed as challenges to non-plume alternatives in fact were answered, if not proved, within the P^3 papers. The remarks that "several chapters … offer useful neutral surveys," and a few chapters "argue in support of plumes," whilst dismissing the rest as nit-picking, misses the entire point of the book.

Numerical simulations can produce models based on parameters chosen to permit calculation of the desired plumes. Too often the evolutionary history, structure, and composition of the Earth is assumed to be as required for plumes (*e.g.*, mostly-unfractionated mantle, and deep heat sources), without regard to voluminous contrary data. It is assumed that the physical properties and behavior of this narrowly constrained Earth can be defined as those which require plumes: vigorous whole-mantle convection, low Rayleigh number, high global heatflow, low viscosity and low thermal diffusivity in the deep mantle, and so on.

The review does not mention the P^3 papers by Anderson and Natland, by Julian, and by Hofmeister and Criss that present powerful arguments against such must-have assumptions. Early plumological conjectures are not facts, including the one that all Pacific-plate hotspots "propagate at the same rate". Clouard and Bonneville, and Natland and Winterer, add in P^3 much disproof, supplementing that published previously by others, of this notion. That the geochemistry of oceanic islands and ridges accords with plumology is disputed by several P^3 papers. The suggestion that perhaps plate-dynamic considerations will ultimately be found to complicate the deep-plume explanations commonly regarded as proved, completely misses the point of the new, shallow-based theories.

All of us have, in varying degree, a confirmation bias, wherein we seek and find confirmatory evidence for what we already believe and ignore disconfirmatory evidence (cf. Michael Shermer, 2005, Science Friction, Henry Holt). This foible is antithetic to science but nevertheless operates throughout it. The rigid defense expressed in this review, with its obsolete rationales and apparent inability to see alternatives, of a paradigm that may have failed but on which careers have been based, illustrates what those who would make major advances are up against. How can we get plumophiles to discuss the evidence? P^3 at least makes it available to those who are interested.

I recall my pre-plate-tectonic years as a continental drifter, when most of the American geoscience community was impervious to the powerful evidence for drift because Gordon MacDonald and several others had proved, with elegant mathematics cantilevered from wrong assumptions, that crustal mobility was impossible. Only the overwhelming evidence that came rapidly from the oceans in the late 1960s broke that national confirmation-bias wall. But Gordon himself went to his grave, a few years ago, convinced that foolish plate tectonics would never have been proposed had more people understood his math.