GEOFIZZ

What on Earth is D"?

Studied in earnest for 50 years time
Is Earth's deep layer called Dee Double Prime.
Exotic hypotheses new papers chime,
But evasive big pictures halt reason or rhyme.

Even before the first nuclear bomb,
People like Gutenberg, Bullen, and Dahm
And probably others: Dick, Harry, and Tom
Proposed this new layer to address a qualm.

A birthplace of plumes and tomography lows?
A graveyard for slabs? Nobody knows.
A spectrum of models has been proposed;
Each replete with its own cons and pros.

Sitting atop the core-mantle boundary is D";
A review paper foundry.
Growth of the field should cause us to worry:
For NSF funds we are now forced to scurry.

Imagine a lithosphere, motley and muddled,
Flipped upside down, on the outer core, puddled.
Mountains turn core-ward, in hot iron, huddled.
Analogies like these leave students befuddled.

A discontinuity seems to be there, Turning
back waves from the top of the layer, But a
constant appearance for this jump is rare,
And as to its cause, well, we haven't a prayer.

Do reservoirs form in the lowermost mantle,
Bearing on numbers of Nusset or Prandtl?
What is it made of? Whose story will sell?
Phase change or chemistry? No way to tell!

To dispense with isotropy now's all the rage.
To favor complexity is fashionably sage.
The trick is to advocate turning the page,
Without causing your colleagues to howl
in rage.

It's too hard to say who is right or who's wrong,
So you too can sing a D" song
Like "ULVZ rife with scattering strong!"
But at the next meeting will YOU get the gong?

A strange seismic record is not to be feared,
Nor exotic new models collectively jeered.
'Cause given the credit for anything weird
Is D"—it's favorably cheered!

AGU recently made a big book[1]
About CMB research, but here is the hook:
Contrasting theories from many a cook
Show we're far from depicting D's look.

Do simple cartoons[2] give the best paradigm
For deep Earth behavior at this point in time?
One still has to ask as we finish this rhyme,
What on Earth is D"?!

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Notes and References

[1] *The Core-Mantle Boundary Region*, edited by M. Gurnis, M. E. Wysession, E. Knittle, and B. A. Buffett, 334 pp., American Geophysical Union, Washington, D.C., 1998.

[2] See Figure 1.

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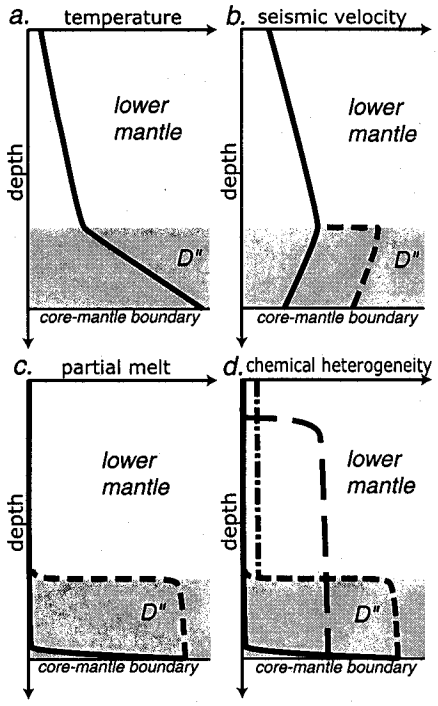

*Fig. 1. Depth profiles of various properties in the lower-most mantle. D" is shaded, and may represent the bottom 200–300 km of the mantle. This sits atop the Earth's core-mantle boundary, which resides at a depth of around 2890 km. a) D" may be defined in terms of the thermal boundary layer that is likely present at the base of the mantle. b) Seismic velocities have been modeled as continuous (solid line) as well as discontinuous (dashed line), with negative gradients due to the steep thermal boundary layer. c) The possibility of melt has been put forth for ultra-low velocity zones (ULVZ) [*Williams and Garnero, *1996] at the very base of the mantle (solid line), as well as throughout D" in the form of lamellae, or scatterers [e.g.,* Kendall and Silver, *1998;* Vidale and Hedlin, *1998]. d) ULVZ and/or D" might be chemically distinct (solid line and short-dashed line, respectively); alternatively, the lower third of the mantle may contain a unique chemistry (long-dashed line [*Kellogg *et al., 1999]), or small-scale scatterers distributed throughout the mantle may be present, with increased strength in D" [*Hedlin *et al., 1997].*

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