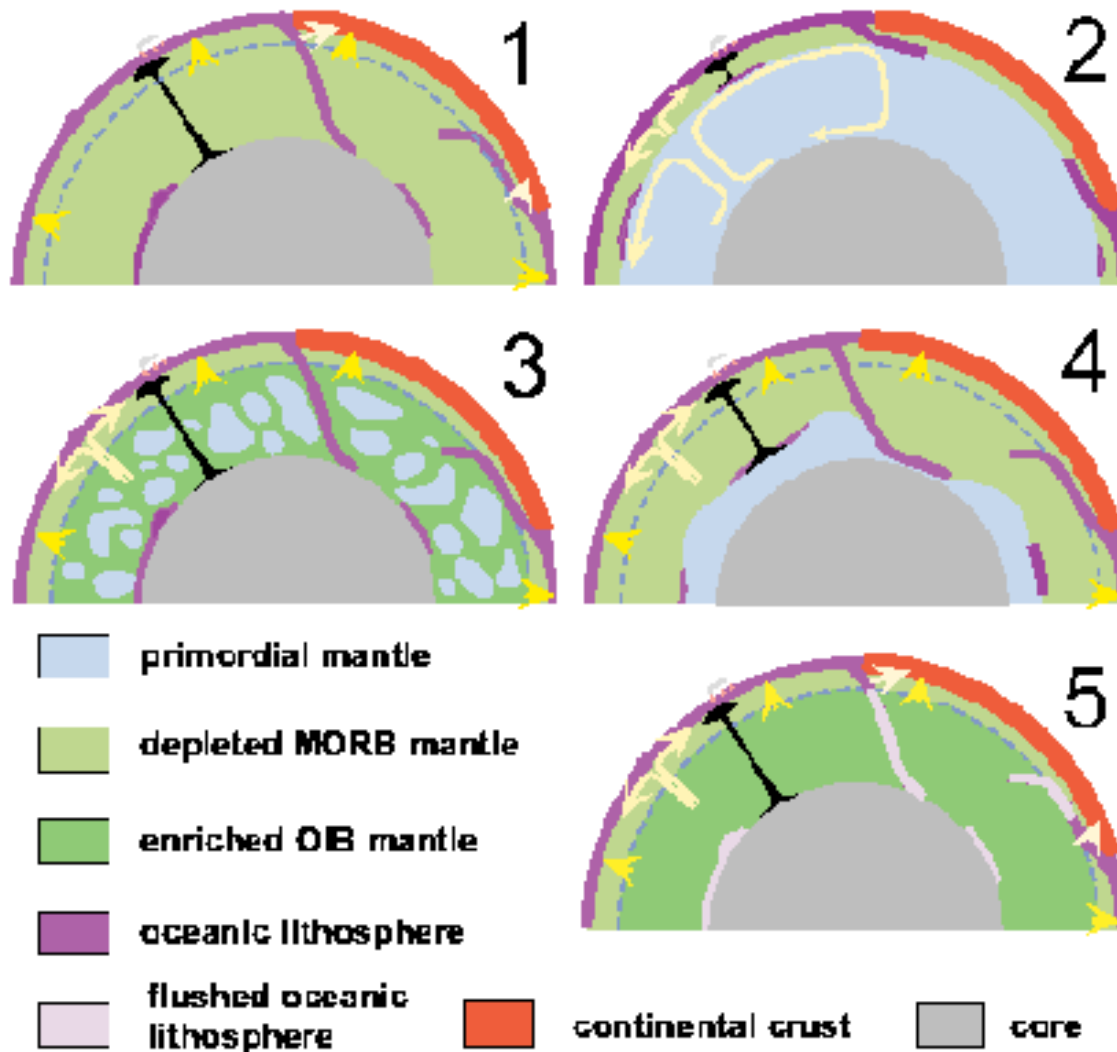


# Cooperative Institute for Deep Earth Research

<http://www.deep-earth.org/>

Presented by Barbara Romanowicz, UC Berkeley

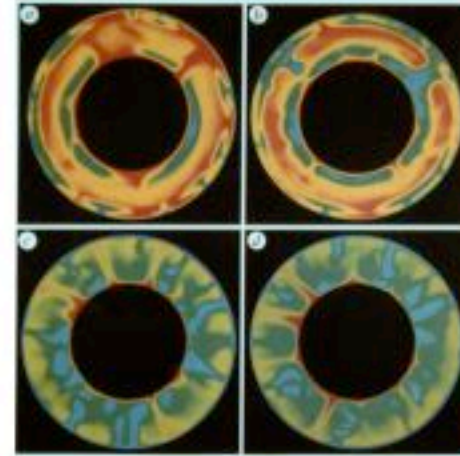


*(Albarède and van der Hilst, 1999)*

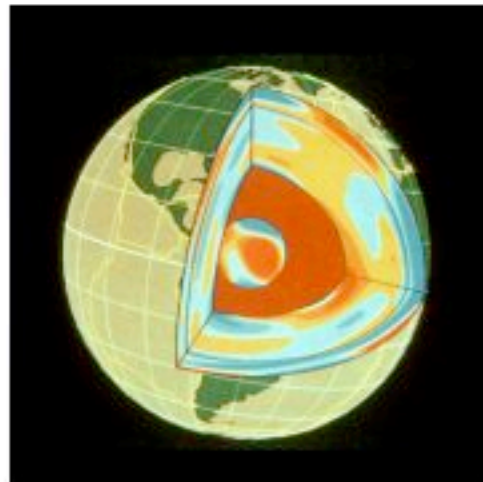
**Understanding the Earth's interior requires a synthesis of..**



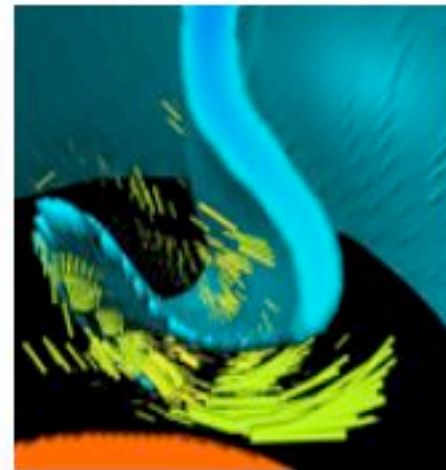
**Chemistry and Mineral Physics,**



**Geodynamics,**



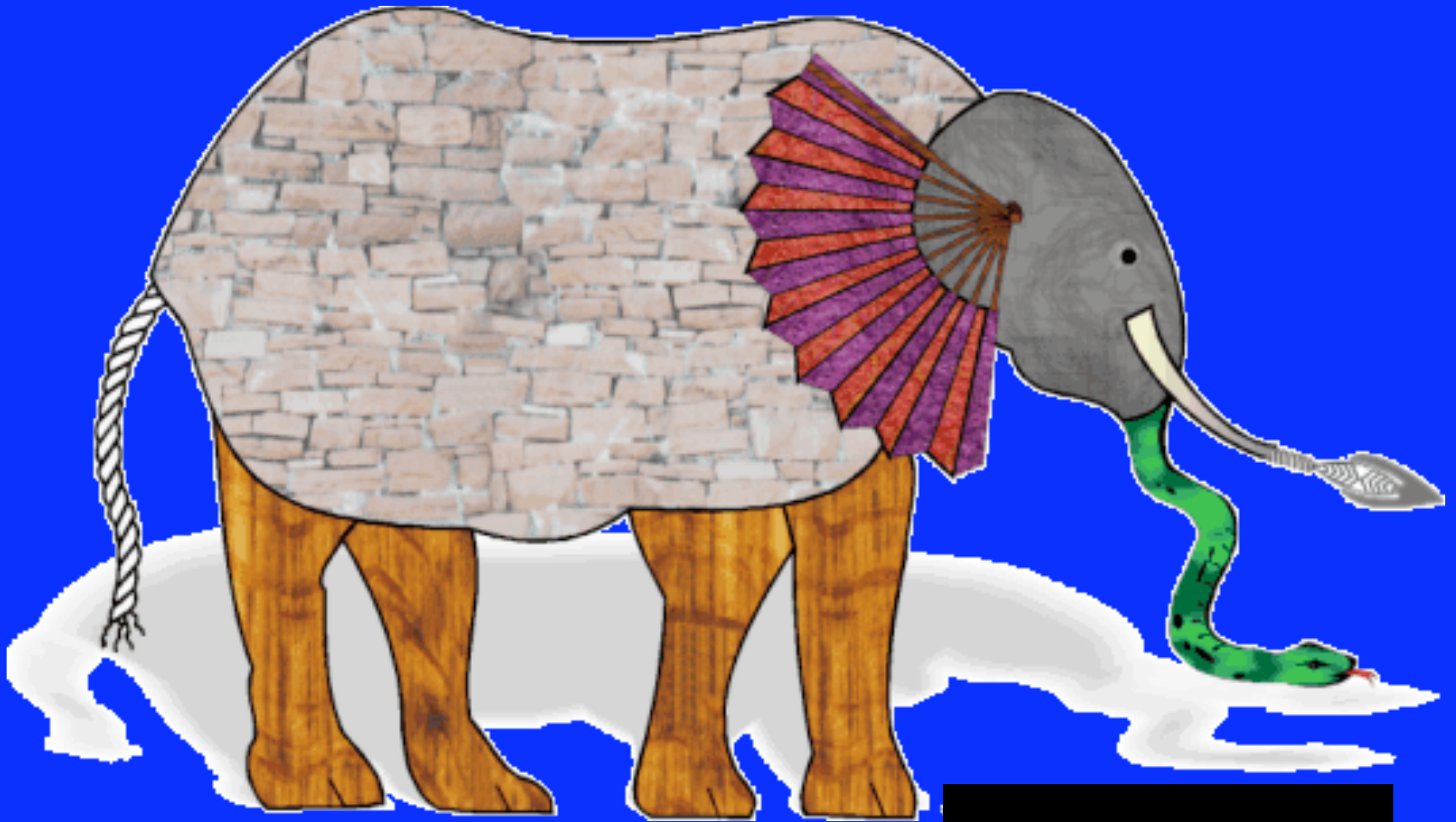
**Seismology,**



**Rheology and Material Properties,**

*Courtesy of  
M. Wyession*

# "Blind men and the elephant"



*Recognizing the need for more effective communication and understanding between the different disciplines, CIDER's goal is to provide:*

- An intellectual framework for integrated multi-disciplinary research in the geosciences
- The necessary complement to growing infrastructure for data gathering and distribution
- Across-disciplinary educational environment to prepare the next generation of earth scientists

# CIDER: A "research incubator":

- *Working model:* KITP (Kavli Institute for Theoretical Physics, UC Santa Barbara)
  - Programs on particular themes last 4-6 months
  - typically start with 1-2 weeks tutorials
  - Framework for informal interactions
  - at any given time ~20 participants
  - each participant commits to stay at least 3 weeks.
- *Adapt this model* to the unique needs of Geosciences

# CIDER ACTIVITIES SO FAR

- **CIDER Community Workshop:**
  - Marconi Center, CA, May 24-29, 2003
  - 77 participants from 43 institutions (US and foreign)
  - goal: define the scope and format of CIDER
- **CIDER'04 Summer Program (4 weeks)**  
07/12-08/06/04
- **CIDER'06 Summer Program (3 weeks)**  
07/17-08/06/06
- **CIDER'08 Summer Program (7 weeks)**  
06/23-08/08/08
  - *Held at KITP, Kohn Hall, UCSB campus*
  - *funded by NSF/CSEDI, infrastructure provided by KITP*

## CIDER'04 Summer Program: "Relating seismological and geochemical heterogeneity in the mantle"

- 4 weeks: July 12 - Aug 6, 2004, at KITP
- Organizing team: L. Kellogg, B. Romanowicz, A. Dziewonski, S. Hart
- first two weeks "lectures and tutorials": 10 lecturers, 30 junior participants (5 from Europe)
  - Buffett, DePaolo, Dziewonski, Hart, Kavner, Kellogg, Lithgow-Bertelloni, Masters, Romanowicz, Stixrude
- last two weeks "workshop" (12 junior and 12 senior participants)
- Workshop focused on recent discovery of the post-perovskite Transition as well as mixing in the mantle. e.g. Lay et al. (2005);





## CIDER'06 Summer Program:

### *"The nature and dynamics of the earth's transition zone: a multidisciplinary approach"*

- 3 weeks: July 16-Aug 06, 2006, with -overlapping:
  - two weeks "tutorial" : 35 grad. Students and post-doc's
  - two weeks "workshop": 30 junior and senior scientists
- *Instructors:* T. Duffy, A. Dziewonski, J. Eiler, M. Hirschmann, L. Kellogg, M. Hirschmann, S. Hart, P. van Keken, Cin-Ty Lee, A. Levander, C. Lithgow-Bertelloni G. Masters, S. Mukhopadhtay, B. Romanowicz , A. Sheehan, L. Stixrude
- Workshop themes:
  - "The transition zone: slabs' purgatory"
  - "Seismic velocity gradients across the transition zone"
  - "Mantle potential temperature"
  - "Mixing- aka Progress towards chaos"
- <http://www.deep-earth.org/summer06.html>

## CIDER'08 Summer Program: *"Boundary Layers in the Earth"*

- 7 weeks: June 23 - August 10, 2008
- *First three weeks "KITP mode":*
  - Overlap with two other KITP programs:
    - "Dyamos"
    - "Climate Physics"
- *Middle two weeks: tutorial program for 35 graduate students and post-docs.*

*Instructors:* Buffett, Dziewonski, Hart, Kavner, Kellogg, CT Lee, J. Li, Liebermann, Manga, Masters, Mukhopadhyay, Romanowicz, Tromp, VanKeken

Hosted VLAB short course (Wentzcovitch)

- *Last 2 weeks: workshop - focused on the following themes:*
  - Inner Core Boundary structure and dynamics
  - the Lithosphere Asthenosphere Boundary
  - Towards a new paradigm for global mantle dynamics
  - Mixing in the mantle





# CIDER Products

- Presentations at AGU
- Papers published as a result of CIDER interactions
- Proposals written to CSEDI - and some funded!
- Students have gone on to post-doc and faculty positions

# CIDER Future Plans

- Community Workshop: May 17-20 2009 at Marconi Center (CA)
  - Expand CIDER activities beyond summer programs?
  - Consider longer term relationship with KITP versus our own home?
  - Consolidate/define relationship with Compres, CIG and other infrastructure programs
- CIDER proposal to be submitted to NSF/CSEDI in Fall'09
- Summer 2010 program in Santa Barbara (proposal to KITP accepted)

Summer'2010 CIDER Program:  
*"Fluids and volatiles in the Earth's mantle  
and core"*

- June 6- July 18<sup>th</sup>, 2010
- 2 weeks of tutorial program (June 27-July 11), overlapping with workshop (July 4-July 18).
- Theme: "Fluids and volatiles in the Earth's mantle and core"
- Overlaps with KITP program on "The Physics of Glasses"
- Followed by 2010 SEDI Meeting (July 19-24, 2010, Santa Barbara).



# Possible relations with *CIG*

- Tutorials within *CIDER* summer programs
- Science and technical workshops within *CIDER* framework
- .....

# CIDER STEERING COMMITTEE 2003-2007

- :
- D. DePaolo UC Berkeley Geochem.
- A. Dziewonski (chair) Harvard Seismology
- S. Hart WHOI/MIT Geochem.
- R. Jeanloz UC Berkeley Mineral Phys.
- L. Kellogg UCD Geodynamics
- D. Kent Rutgers Geomagnetism
- M. Manga UC Berkeley Geodynamics
- G. Masters UCSD Seismology
- P. Olson Johns Hopkins Geodynamics
- B. Romanowicz UC Berkeley Seismology
- L. Stixrude U. Michigan Mineral Phys.
- E. Stolper Caltech Geochem.
- D. Weidner SUNY Mineral Phys.

# CIDER STEERING COMMITTEE 2008-

- :
- C. Constable UCSD Geomagnetism
- D. DePaolo UC Berkeley Geochemistry
- T. Duffy Princeton Mineral Phys.
- A. Dziewonski Harvard Seismology
- S. Hart WHOI/MIT Geochem.
- M. Hirschmann U. Minn. Min. Phys/Geoch.
- L. Kellogg (Chair) UCD Geodynamics
- C.T. Lee Rice Geochemistry
- M. Manga UC Berkeley Geodynamics
- G. Masters UCSD Seismology
- B. Romanowicz UC Berkeley Seismology
- L. Stixrude U. Michigan Mineral Phys.