Syllabus
Seismic boundary layers:

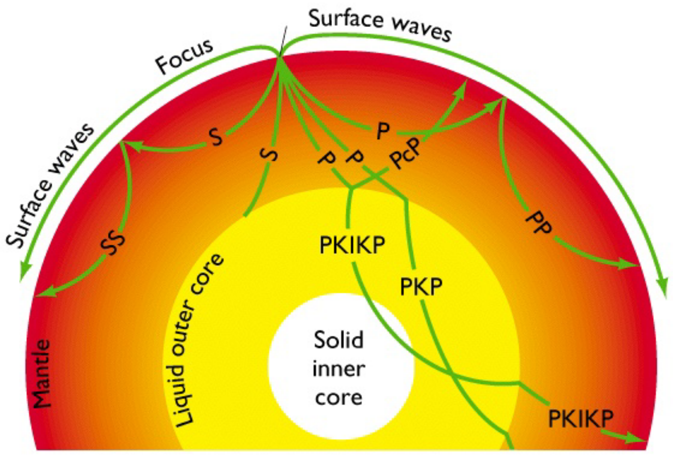
Anisotropy – VTI and azimuthal - For a crystal of a mineral variation in physical properties observed in different directions is anisotropy. Or: a condition in which properties of a medium (velocity, absorption, for example) depend on direction in the medium. The simplest physically realizable anisotropic system is hexagonal symmetry anisotropy, known as *transverse isotropy* (TI). Hexagonal symmetry has an axis of cylindrical symmetry, which implies that the properties of the medium in a given direction depend only on the angle between that direction and the symmetry axis direction. If the symmetry axis lies vertically the medium has transverse isotropy with a vertical axis of symmetry (VTI). If the medium exhibits direction dependence of the velocity in the horizontal surface the behaviour is called azimuthal anisotropy.

D” – lowest 200-300 km of the Earth’s mantle, after Bullen 1950, who divided the Earth in layers starting from A (crust) to F (inner core). Thermo-chemical transition zone between core and mantle.

Fresnel zone (*pronounced 'fre-nel' the "s" is silent*) – area around a seismic ‘ray’ that contributes to the wavelet (i.e., constructive interference of rays with a certain wavelength.)
The area that produces the reflection is known as the First Fresnel Zone: the reflecting zone in the subsurface insonified by the first quarter of a wavelength. If the wavelength is large then the zone over which the reflected returns come from is larger and the resolution is lower.
From radio sciences: The area around the visual line-of-sight that radio waves spread out into after they leave the antenna. This area must be clear or else signal strength will weaken.
(from http://www.webopedia.com/TERM/F/Fresnel_Zone.html)

HAL~ Hot Abyssal Layer. A layer postulated by Kellogg et al., 1999, that is thought to contain primordial mantle material: enriched layer in lower mantle (from 1500 km to CMB) with strong topography; density contrast +1% more than adiabatic; velocity contrast (S) –5%?

seismic phases – direct waves: P and S waves; depth phases: wave that travels to the surface first and then through the Earth (P or S); core phases: waves that travel through the core (P-waves in the outer core, P and S in the inner core), multiples: reverberations in one layer (could be Moho or whole mantle or whole Earth); conversions: P waves can convert into S waves (and vice versa) at discontinuities.
Nomenclature: K - transmission through core (P-waves)
c - reflection from core-mantle boundary (CMB) – P and S
I - transmission through inner core (P-wave)
i - reflection from inner core boundary (ICB) – P and S
J - transmission of S-wave through inner core



From Press and Siever,
Understanding Earth

Seismic array - numerous seismometers placed at discrete points in a well-defined configuration. Preferably the same kind of instruments.

Seismic array techniques - Seismic array analysis can be described by the same basic mathematical principles as those used for arrays of antennae used in radio astronomy or radar science and they have the same effect on seismology as the widespread use of powerful telescopes has on modern astronomy. One of the main advantages of seismic arrays, compared to single seismological stations, is the improvement of the signal to noise ratio (SNR) due to the summation of the individual recordings of the array stations.

Slowness vector, horizontal slowness, backazimuth – The propagation direction of elastic waves traveling in a spherical Earth and arriving at a seismological array can be described by two parameters a) vertical incident angle i. In practice not the incident angle i is used, but the inverse of the apparent velocity of the wave front across the array 1/v(app). This parameter is called (horizontal) slowness u:
u = 1/v(app)=*sin*i/v(0), with v(0) as the medium velocity beneath the array.
b) backazimuth Θ : angle of the wave front arriving at the array measured between north and the direction to the epicenter in degree.
Both parameters are combined in the slowness vector u.

Snell's Law - (Optics) when ray enters a medium, the entering ray and the refracted ray lie in the same plane as the normal to the surface and are on opposite sides of the normal, and their angles of incidence and refraction have sines that are in a constant ratio to each other. For seismology that means:
When the seismic ray enters a medium of higher velocity, the refraction angle is larger than the incidence angle and the sin of the angle over the velocity of the medium is a constant (ray parameter, related to horizontal slowness)

Triplication – rays with different slowness parameters and different times arrive at the same location. Example are core waves (PKP) where the waves with different turning depths (and therefore slownesses) arrive at the same station at different times – 4 branches in this example, PKPab,bc,cd,df.

Ultra-low velocity zones - These zones have extremely low seismic velocities, they are 5-40 km thick in certain spots on the core-mantle boundary.