wednesday, november 25

happy thanksgiving (if you are still here)

today:

    a bunch of stuff...

1. where do the systems we have been discussing deposit sediment?
2. what is the character of that sediment accumulation
3. then, a digression into resources...(in particular, hydrocarbons)
rivers & beaches
where do these systems accumulate sediment?
sedimentary basins

**fluvial** – channels & floodplain

**lacustrine** – lake bottom sediments (can be like small ocean)

**deltaic** – large accumulation @ shoreline

**margin** – transport of terrigenous sediment seaward

**deep ocean** – turbidity currents
global sediment thickness
sedimentology (a course in a slide)

**sediment:**

unconsolidated products of weathering and erosion

- gravel; sand; silt; mud
- transported by rivers, wind, glaciers, etc.

**sedimentary rock:**

produced by consolidation & cementation of sediment

*liothified*

3 primary types of sedimentary rock:

- **clastic:** made of *clasts* or rock fragments
- **biological:** associated with particles & processes created by organisms
- **chemical:** precipitated from chemical solution
fluvial basins

important fluvial basin components:

- **channels**: brading, meandering, bars, oxbows
- **floodplain**: splays; muds; swamps; levees; organic material (trees, shrubs, etc)

what is the character of the sediments in these environments?

- sediment size? range of sizes (*sorting*)? lateral & vertical extent?
fluvial environments
fluvial stratigraphy

**stratigraphy:** classification & interpretation of layered rocks (typically sedimentary rocks)
deltaic sedimentation

important delta environments:

- **distributary channels**: similar to fluvial channels
- **floodplains**: splay, marshes, inter-distributary bays, estuaries, etc.
- **topsets/foresets/bottomsets**: reflecting deceleration of flow towards ocean

what is the character of the sediments in these environments?
deltaic sedimentation
deltaic sedimentation
beach sedimentation

important beach environments:

- **shoreface**: increasingly fine-grained towards sea
- **foreshore**: highest wave energy
- **backshore**: high wave energy berms
- **beach ridges**: wind transport
- **lagoon**: much calmer, marshes, finer grained
shelf/slope sedimentation

what happens here depends a lot on sea level AND whether it is a leading (active) or trailing (passive) edge margin

major sedimentary environments:
  - **high sl shelf**: transport by waves & density currents (high sl)
  - **low sl shelf**: fluvial transport
  - **trailing edge slope**: can be progradning clinoforms

can be an important place for carbonate (biogenic sediment) accumulation
saller et al., 2004

steel, 2004
carbonate reefs
deep sea sedimentation

important environments:

**deep sea fans**: turbidite channels & floodplains

**deep sea oozes**: biogenic & chemical
deep sea fans

Savoye et al. (2000)

Pirmez (1995)
carbonate (calcareous) ooze
now: a digression

one of the primary resources that makes our society run is found in sedimentary rocks: **hydrocarbons**

in fact, both the *formation & storage* of hydrocarbons is due to various sedimentary rock formations:

- **organic material provides source:** dark (organic-rich), fine-grained rocks & carbonates
- **porous & permeable rocks are reservoirs:** sandstones, fractured & porous carbonate (remember chemical weathering)
  - **porous:** having holes of one kind or another
  - **permeable:** good for fluids flowing through...holes are big enough and connect

rivers & beaches both happen to make good source & reservoir

- **sources:** floodplains, lagoons, tidal flats...
- **reservoirs:** river channels, splays, beaches, shorefaces...
the ‘petroleum system’

**source** – organic material

**maturation** – heat & time (just like cooking a turkey)

**migration** – ever make vinaigrette?

**reservoir** – porous, accessible rock

**seal** – keep oil in reservoir

**trap** – leads to adequate (worth getting) accumulation
source rock

converting the products of photosynthesis into petroleum
algae creates best oil – easy to convert
dead, woody, plant material typically becomes coal
maturation

time (y axis) & heat (x axis)
migration
migra:on

note ‘quality’ of hydrocarbon depends on ultimate location
reservoir rocks

porosity & permeability

Steel, 2004
traps

structural (plate tectonics)

‘stratigraphic’
exploration

deep earth typically ‘imaged’ via reflection seismic techniques
production
production
production
and...

next week, final lectures on beaches & estuaries
final exam review: friday dec. 5\textsuperscript{th}
final exam: monday dec. 8\textsuperscript{th}; 2:30p

happy thanksgiving, again