2.1: Observation and Mindset

“It is no exaggeration to say that well developed habits of observation are more important in research than large accumulations of academic learning…” — W.I.B. Beveridge

**Main point:** you tend to see what you know
- observation (in individuals) involves a lot of construction
  - based on knowledge to interpret sensory input
  - tend to perceive what we expect to perceive (based on mindset)
- observation (in science) is similar –
  - based on theories to interpret data, to say what is, isn’t important
  - expected result: null hypothesis (based on theory)

**Reasons for failures of insight**
1. Gripped by flawed beliefs —> need to be open-minded; consider other possibilities
2. Lack of experience —> need to learn patterns (by years of study)
3. Passive stance —> need to question existing knowledge; do this strategically
4. Concrete reasoning style —> need to be comfortable with speculation, playing

**Mindset** – a set of expectations about the world – a way of looking at it (not just set of beliefs)
- can be useful to “fill in” gaps, but can also create problems:

  1: **confirmation bias** - evidence that supports current mindset is not questioned
     - evidence that does not fit simply “bounces off”

  2: **distortion of evidence** (theory-ladenness of facts; of perception)
   - **no completely objective reality** – a product of reality plus the observer
     - observation (in individuals) involves a lot of construction
     - tend to perceive what we expect to perceive
     - big problem when especially when input is ambiguous
     - tend to emphasize particular things, others recede to background
     - always know what to look for, but also watch for other things
       - keep an open mind – change your mindset when needed
       - never let exceptions pass unnoticed (cf. Darwin)

3: **mindsets tend to resist change**
- Mindset is essential; however, make sure to be **flexible**:
  - find out what mindset you’re using (e.g. try to be explicit)
  - use different ones whenever possible (e.g. look at from opponent’s side)
- realize that impressions (hypotheses) often formed on very little evidence
- often result of forcing – e.g. severe time deadlines
  - not all info can be adequately processed
- once set, ego often keeps it there
  - relative inability of older researchers to accept new discoveries
To improve decision-making / analysis, improve along two dimensions:
  o first dimension: reduce the number of errors - critical thinking
    § psychological dimension: critical vs gullible
      • willingness to embrace a belief
  o second dimension: increase the amount of insight
    § psychological dimension: open-minded vs closed-minded
      • willingness to let go of a belief (consider other beliefs)
      • not: open-minded vs critical

Deadlines for submitting critique sections
  - Question 1: Oct 19
  - Question 2: Oct 26
  - Question 3: Nov 02
  - Question 4: Nov 09
  - Question 5: Nov 16
  - Critique: Nov 30

Real-World Segment: Life in Grad School (link to MIT tech report – resources page)
1. a lot of work. Only do it if you’re really motivated
   - not for someone who wants to make a lot of money
   - if you’re not sure, may want to take some time off, get experience
2. third year (or fourth if you’re taking time off) is the critical year
   - marks, lab experience, etc.
   - also gives you time to check out different schools, different advisors)
3. what to expect (roles, lifestyle); what to watch out for
   - a lot of work; only do it if you’re really motivated
   - opportunity to define who you are (in regards to research)
4. how to find a graduate school that works (see “how to be a good grad student”)
   - look at match of interests with advisor
   - look at funding opportunities
5. how to find an advisor
   - thesis advisor the single most important choice; more than thesis topic
6. how to network (find “cool people”) - see MIT paper – Getting Connected
   - informal advisors, other students
   - the most visible people aren’t necessarily the ones who are leading the field