MRI physics

1) NMR property

* Hydrogen – 1p, 1e
  + (Low mass, small charge – electron stolen -> H+)
  + (H20 if confused)
* Magnetic moment
  + Spin – quantum property of elementary particle
  + Proton spinning -> current -> magnetic field
    - Magnetic field = magnetic moment
* Angular momentum
  + Mass is odd -> momentum
  + (even could balance out)

2) Alignment

* Strong Field -> alignment of axes (magnetic moment)
* Two states
  + Parallel (low)
  + Antiparallel (high)
  + Proportion depends on thermodynamic properties (amount of energy in system i.e. temperature)
* Net magnetization – sum of parallel, antiparallel
* Precession (angular momentum)
  + Frequency <- strength of field (Larmor freq.)

3) Excitation

* Longitudinal magnetization (M - net)
* Difference between anti/parallel = Larmor freq.
  + Introduce this energy -> flip from low to high energy
* 90 flip – two consequences
  + No longitudinal
  + Phase coherence -> Transverse magnetization
    - Signal! More explanation in the future

Bash

1) Strings

* 3 categories – strings (key strokes), integer (numbers), float (decimals)
* Bash – match string in path (to know what to do with it)
* Command
  + Separate command from options (-?) and arguments
    - Option = special type of argument
  + Still strings, kept separate by white space
  + Call command – bash look for argument
    - Keep looking till carriage return (enter)

2) Path – special strings

* Hierarchy of files
* Use “/” in string to denote path

3) Variables – double special string

* Assign string to hold information
  + Path, long string, integer, float
  + Syntax
    - Nate=awesome
    - Foo=`echo I dont have enough caffeine for this`
    - Calc=$((2\*4))
* Very useful for
  + reducing keystroke problems, typing, workflow
  + cd $workDir
* call for by “$”, constrain by “{}” (variable $at and $attack)

4) Problems

* White space and periods
* Hidden keystrokes – use Geany or script editor
  + (Cooper white space issues)

5) nested loops

For i in foo bar; do

For j in kill me; do

For (( j=1; j<=5; j++ )); do

echo

echo “nate is great”

MRI

* Vedder
  + Practice data
  + Individual folders
* dcm2nii
  + T1 – 2D -> 3D
  + EPI – 3D -> 4D