* Tetrode wire
  + Diameter: 0.0005 inches = 12.5 um
    - (Previously 0.001 inches = 25 um)
    - EEG Wire Diameter: 0.004 inches = 100 um
  + Thinner wire = higher impedance
* Tetrode Electroplating
  + Consider gold-plating wires to increase SNR/amplitude
    - <https://doi.org/10.1016/j.sna.2009.10.001>
    - [Microsoft Word - Low Impedance Plating.doc](http://redishlab.neuroscience.umn.edu/Papers/2009%20Ferguson%20Supplement%20-%20Low%20Impedance%20Plating.pdf)
  + Over-electroplating risks shorting
* Tetrode Integrity
  + Over-twisting: <https://doi.org/10.1016/j.jneumeth.2010.12.017>
    - This paper uses 0.001 inch. Need to twist more for thin wire
    - Corning Stirrer PC-353 at 3rd major tick (6th tick overall) is ~12.5 revs/s
  + Heat gun: <https://doi.org/10.3791/1098>
* Guide Tube
  + Steel vs. Polyimide
  + Steel
    - 304 Stainless Steep Tubing, McMaster
    - 0.018” OD (450 um)
    - 0.004” wall thickness (100 um)
    - 🡪 250 um ID
  + Polyimide: <https://doi.org/10.1016/j.jneumeth.2005.12.032>
    - TSP320450 Polymicro Technologies, Fused Silica Capillary Tubing, Polyimide Coated
    - 320 um ID
    - 435 um OD
* Turn Depth
  + 1 full turn = 282 um
  + 10 full turns (20 half-turns) might overshoot
    - Overshooting better than undershooting because right depth will be captured
* Reference vs. Ground
  + Desolder GND and REF: Yes
    - Strictly more information = good
    - Traces have lower background noise
  + <https://psychology.stackexchange.com/q/27986>
* Noise issues
  + [Causes of Noise in Electrophysiological Recordings - Plexon](https://plexon.com/blog-post/causes-of-noise-in-electrophysiological-recordings/)
* Sampling Frequency
  + Intan amplifier maximum: 30 kHz
  + Bandwidth limits: 0.1 Hz to 20 kHz
  + Maybe 20 kHz reduces static noise
* Impedance
  + Measure at 1 kHz, at maximum 2 kHz per Intan manual
  + Lower = better (less voltage loss 🡪 higher SNR)
* Spike amplitude
  + Ideally ~1 mV (1000 uV)
* Electrolytic Lesioning
  + 40 uA for 5 seconds
    - <https://doi.org/10.1038/s41467-020-18472-y>
  + Place stimulator in series with multimeter
* Old Dataset Voltage Scaling
  + DataWave Markus protocol range: +10 V to -10 V
    - False voltage range
  + Intan raw to uV: value \* 0.195 – 6389.76
  + Intan Joseph data range: -12778.74 uV to -0.78 uV
    - Range of 12777.96 uV ≈ 12.778 mV
    - True voltage range
  + Conversion factor (DataWave 🡪 Intan)
  + Markus data is not collected on Intan chip, but on the Datawave AM system
  + Recalculated Markus conversion factor
    - (Unknown) AM 3600 Amplifier gain
      * Possible gain factors: 10, 20, 50, 100, 200, 500, 1,000, 2,000, 5,000, 10,000, 20,000
        + 🡪 Possible corrective gain factors = 1/gain
        + 1/20k looks small
      * TETRODE protocol on AM machine: 5k Input Gain
      * [3600manual.pdf](https://www.a-msystems.com/pub/manuals/3600manual.pdf)
      * [Model 3600 16-Channel Extracellular Amplifier | A-M Systems](https://www.a-msystems.com/p-256-model-3600-16-channel-extracellular-amplifier.aspx)
    - (Known) AM to Datawave recording
      * Markus data is truly +/- 10 V
      * “Gain range +/- 10V” = unity gain (gain=1) with full range +/-10V
        + Full range checks out with AM 3600 spec sheet
      * A higher gain (2, 4, 8, etc.) would lower this range by ½, ¼, … Even if AM 3600 range was +/-11V it would most likely be unity gain
      * Data subdivsions appear to be 4.8 mV, agreeing with resolution in DataWave tutorials
    - DataWave clips the recording as it comes out
      * 🡪 No overshoot
      * 🡪 Explains why +/- 11V on AM output becomes +/- 10V on Datawave
* Left/Right distinction
  + Mouse Left = CA3o = CA1o
    - CA1o = channels 12-15
    - CA3o = channels 8-11
      * Ca3o is not recorded in the Markus dataset
  + Mouse Right = CA3 = CA1s
    - CA1s = channels 16-19
    - CA3 = channels 20-23
* Preprocessing
  + IBL-like destriping protocol currently used
    - Picks out many units, some of which are noise
  + Bandpass: 400 Hz - 8064 Hz
    - Markus uses these frequencies, however they can be changed
* Hippocampal Neurophysiology
  + <https://doi.org/10.1016/B978-0-12-813146-6.00005-9>