1 To-read

• other models of P-units:

Bastian 1981a Electrolocation I. How the electroreceptors of Apteronotus albifrons code for moving objects and other electrical stimuli

Benda abd Herz 2003 Benda et al. 2005 Chacron et al 2001, 2005 Kreiman et al. 2000 Ludtke and Nelson 2006 Nelson et al. 1997 Ratman and Nelson 2000 Wessel et al 1996 Xu et al 1996

2 Introduction

2.1 Apteronotus leptorynchus

- to mention: size range, tank conditions,
- continuous sinusoidal electric organ discharge EOD with near constant amplitude and frequency (Moortgat et al. 1998)

2.2 general P-unit notes

- most abundant tuberous receptor
- spikes in probabilistic manner to upward phase of eod
- important characterization P-value probability of spiking per EOD cycle estimated as p-unit frequency divided by eod frequency typical values 0.1-0.6 (Bastian 1981a, Xu et al 1997)
- rapidly adapting (Benda et al 2005, Xu et al. 1996) often studied with SAMs or RAMs
- $\bullet\,$ can predict up to 80% of the AM using reverse correlation and coherence but no obvious decoding mechanism

2.3 Coding

2.4 nerve recordings

• sample descriptions in: Hernriettes phd, Gussin 2007,

3 Paper

3.1 Limits of linear rate coding of dynamic stimuli by electroreceptor afferents

Daniel Gussin, Jan Benda, Leonard Maler, 2007, J neurophysiol

P-units may code for the intensity and slope of the stimulus and if the higher neuronal structures can separate these two parts they can detect the very weak signals they use in their behavior.

3.1.1 Introduction

• definition of neural code needs map between external signal and resulting spike trains AND demonstration that downstream neural circuits can interpret this mapping and therefore direct behavioral output.

original code often assumed to be linear rate coding needs only temporal summation over some time window to decode

linear code breaks down for dynamic signals and neurons with time-dependent conductances (adapting currents)!

then more sophisticated methods like spike-triggered stimulus averages (STA) are used to estimate the linear encoding of signals but no obvious decoding mechanisms are implied.