

«Здоровый и больной мозг: от молекулярной физиологии к патологии, клинике и лечению»

Наиль Бурнашев



III Современные методы исследования в нейронауках.

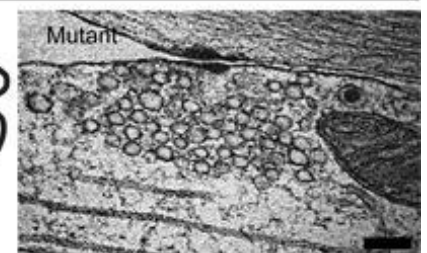
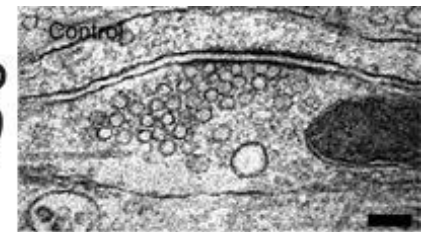
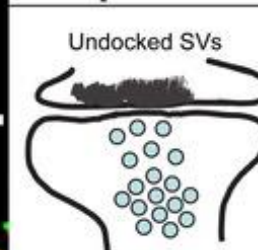
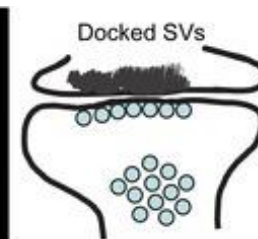
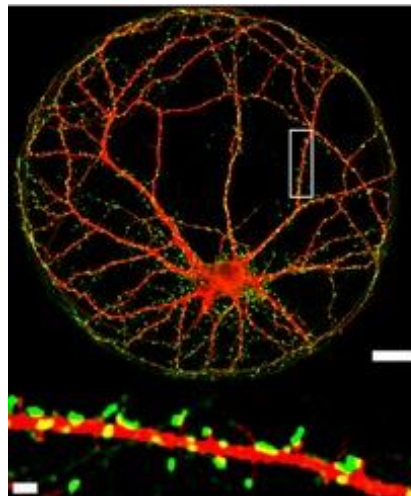
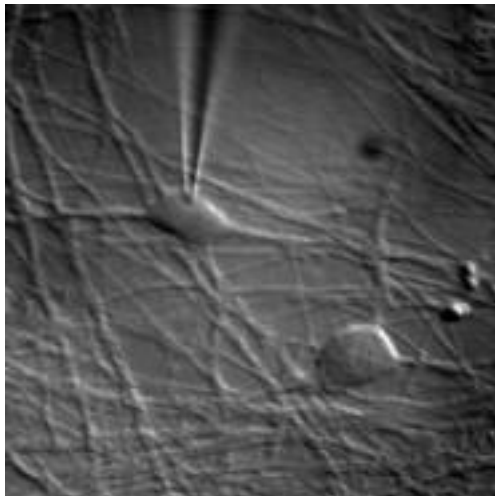
1. Электрофизиологические методы исследования мозга

2. Оптические методы исследования мозга

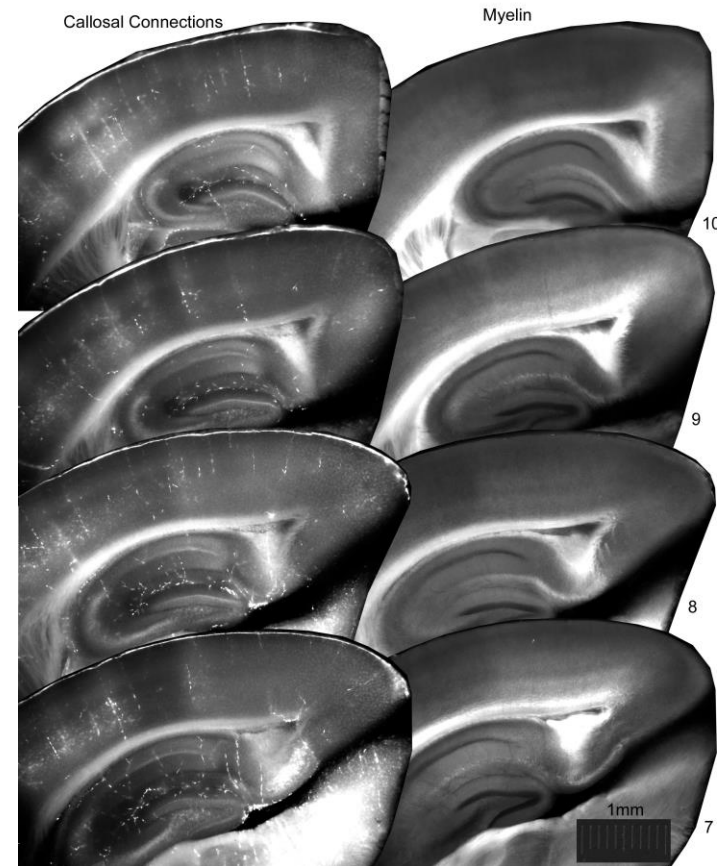
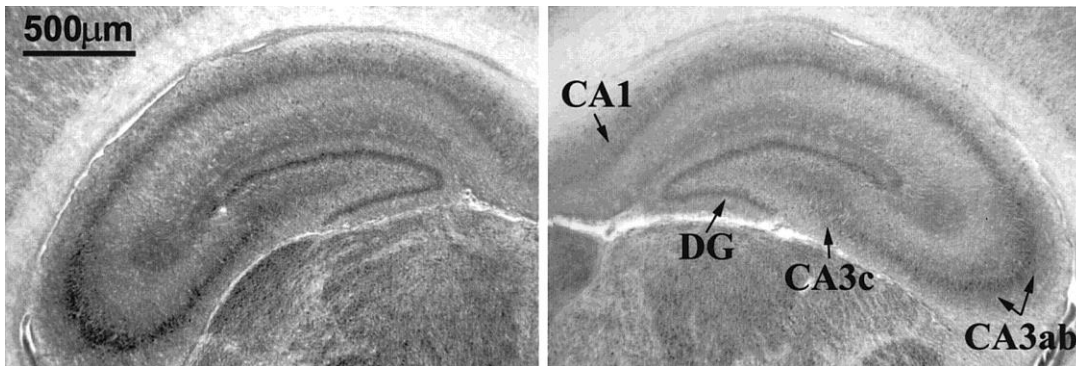
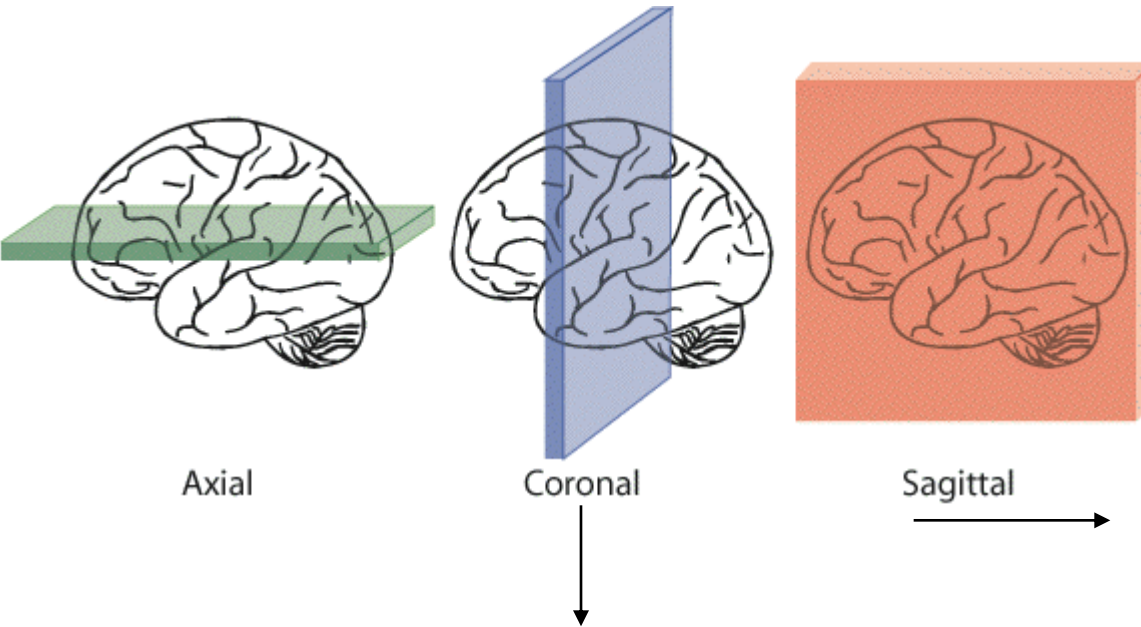
3. Животные модели патологий мозга

Экспериментальные препараты

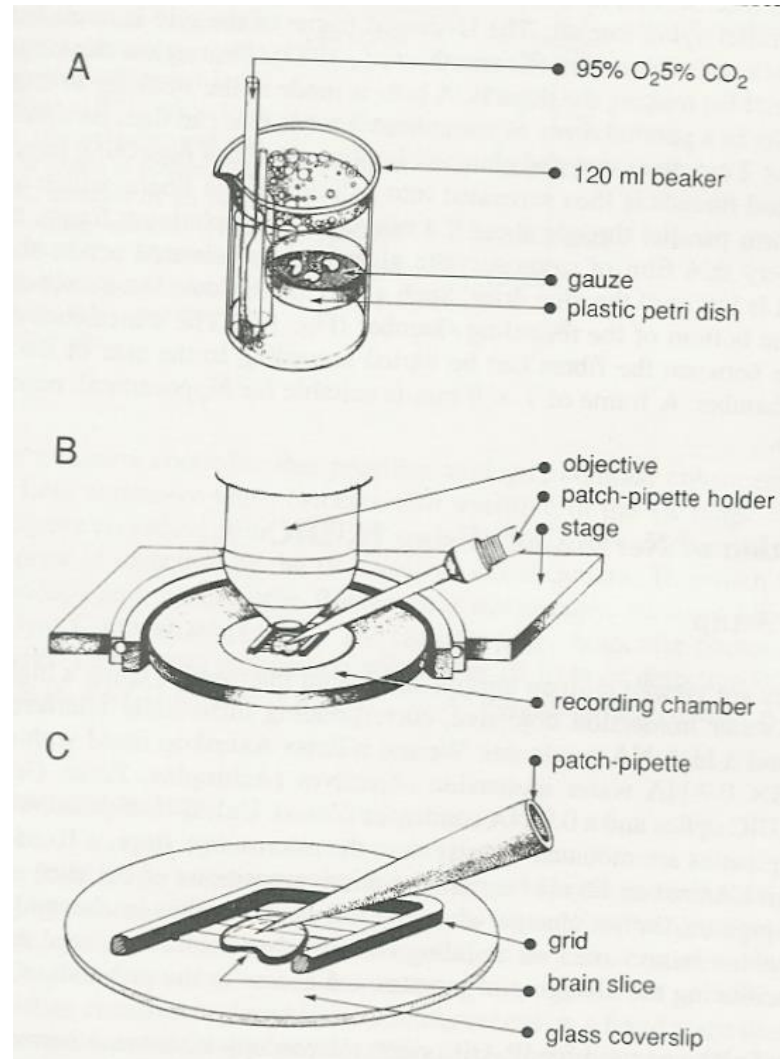
Клеточные культуры



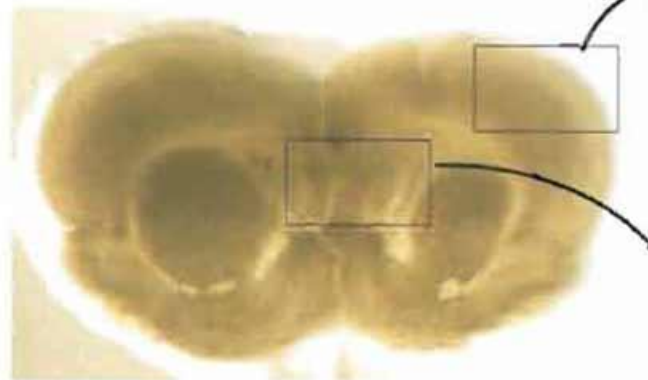
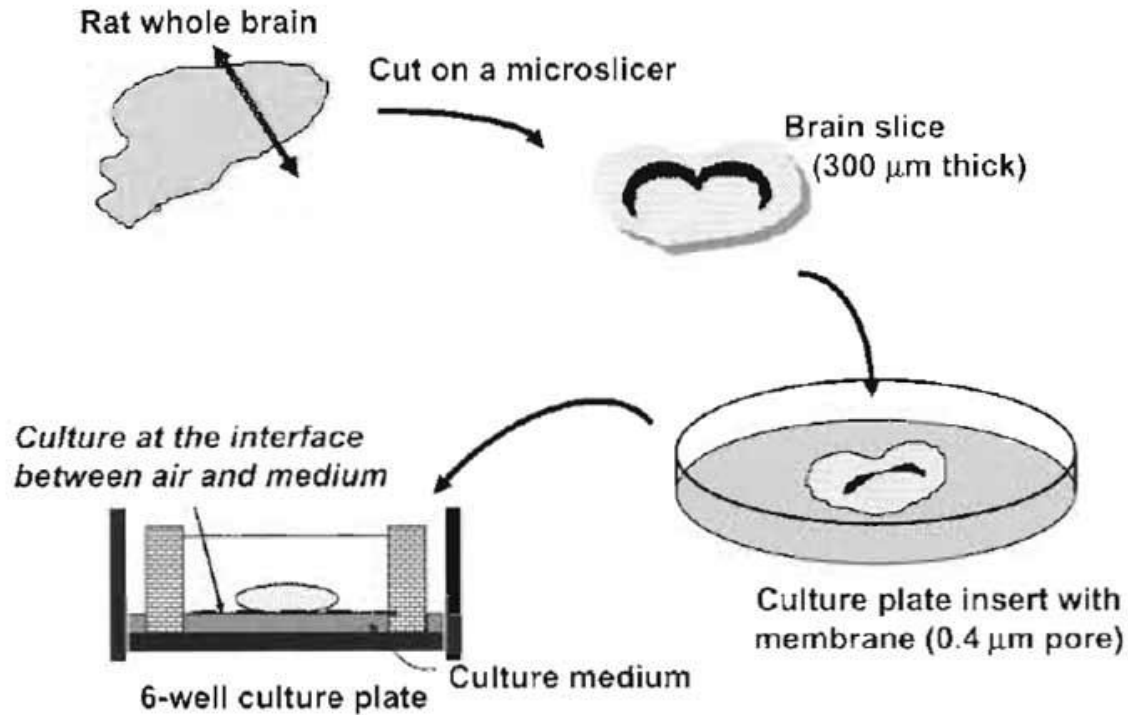
Срезы ткани мозга



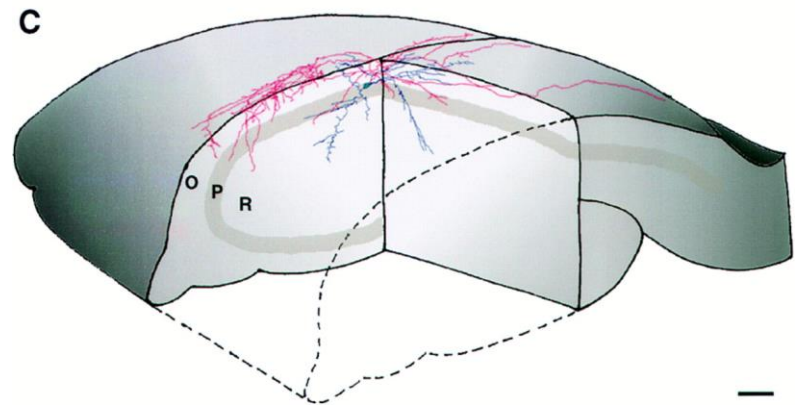
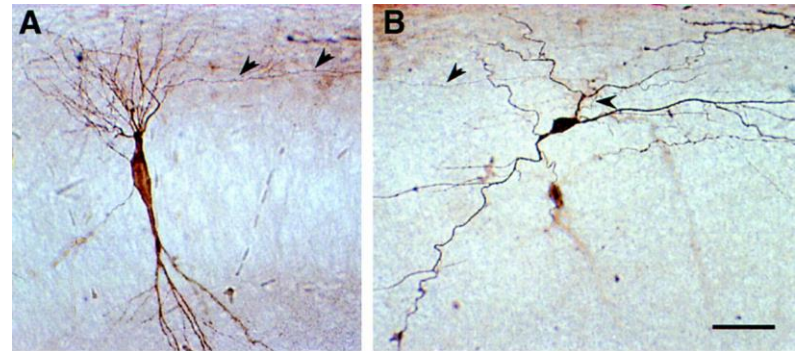
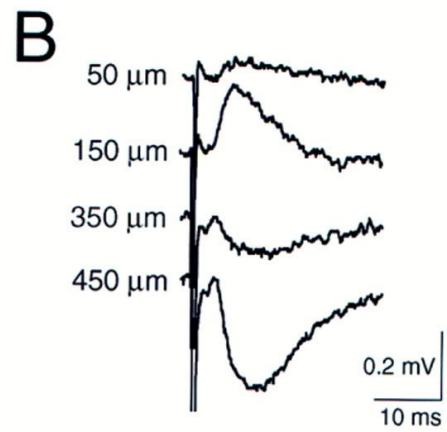
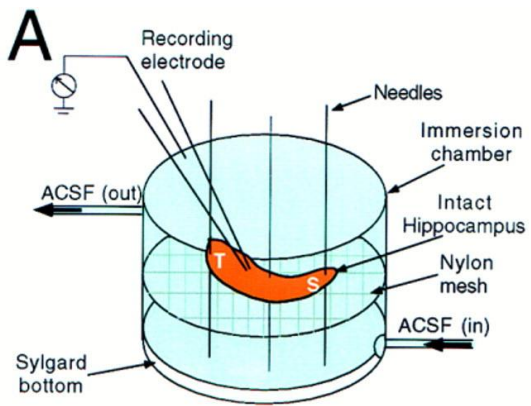
Срезы ткани мозга в эксперименте



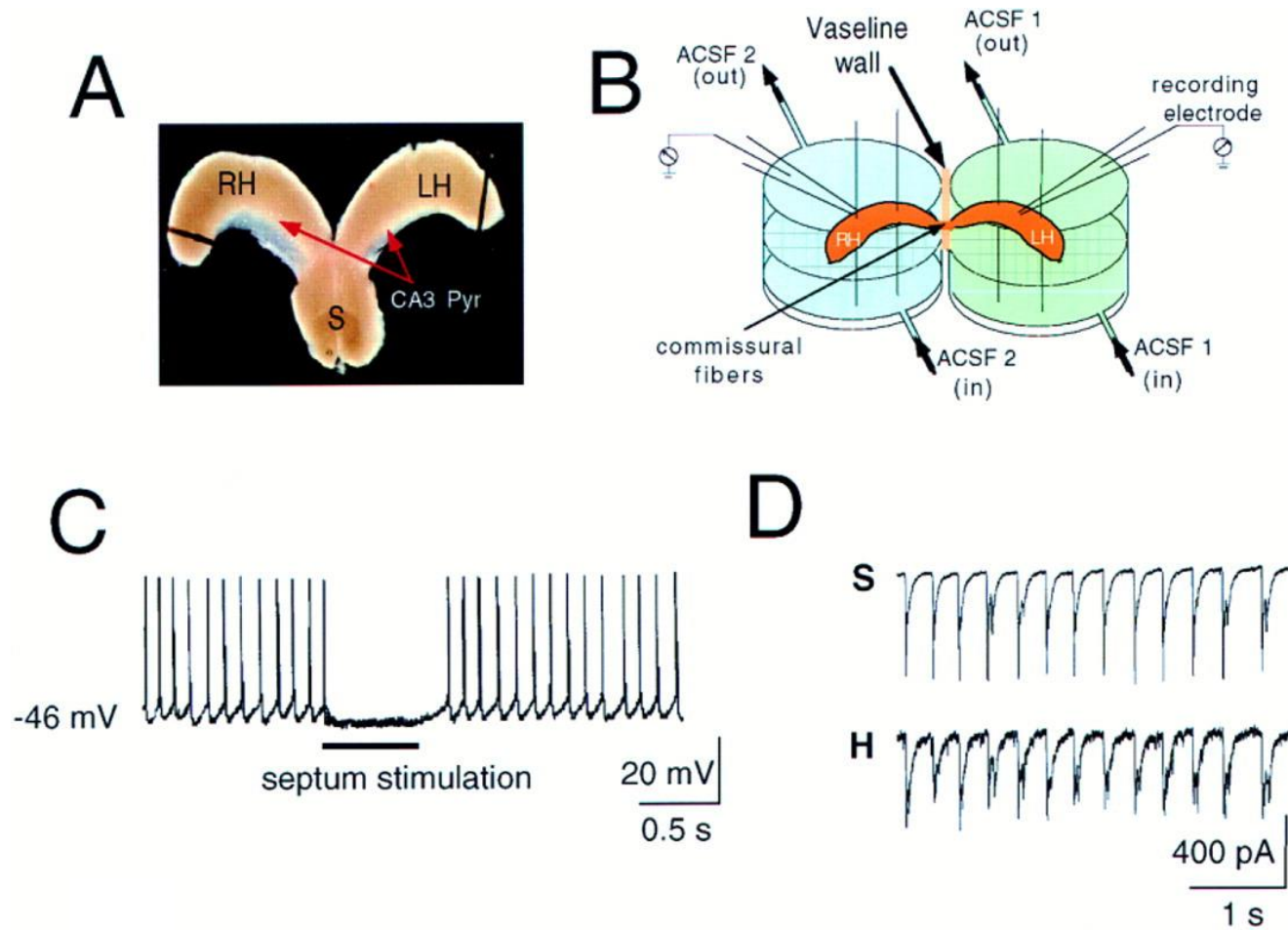
Органотипические срезы ткани мозга



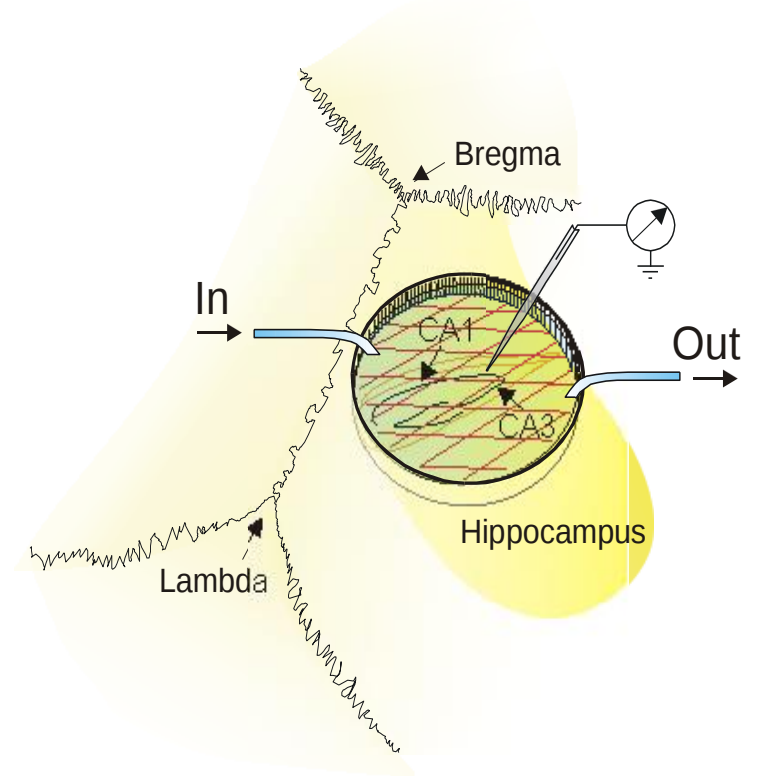
Изолированный гиппокамп



Изолированный гиппокамп

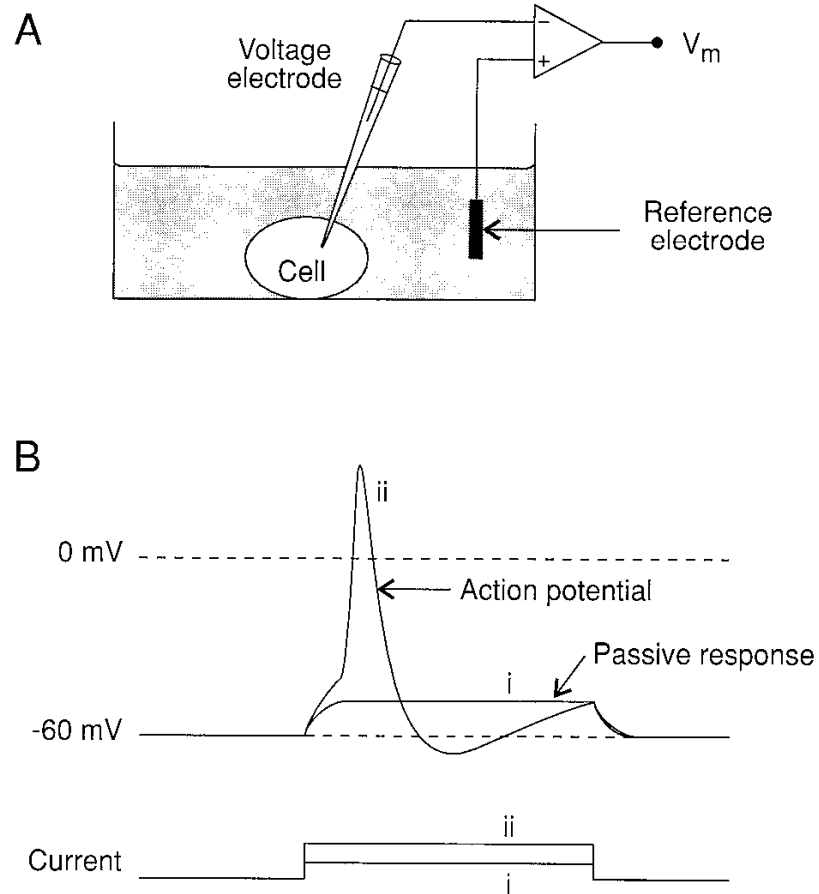


Регистрация *in vivo*

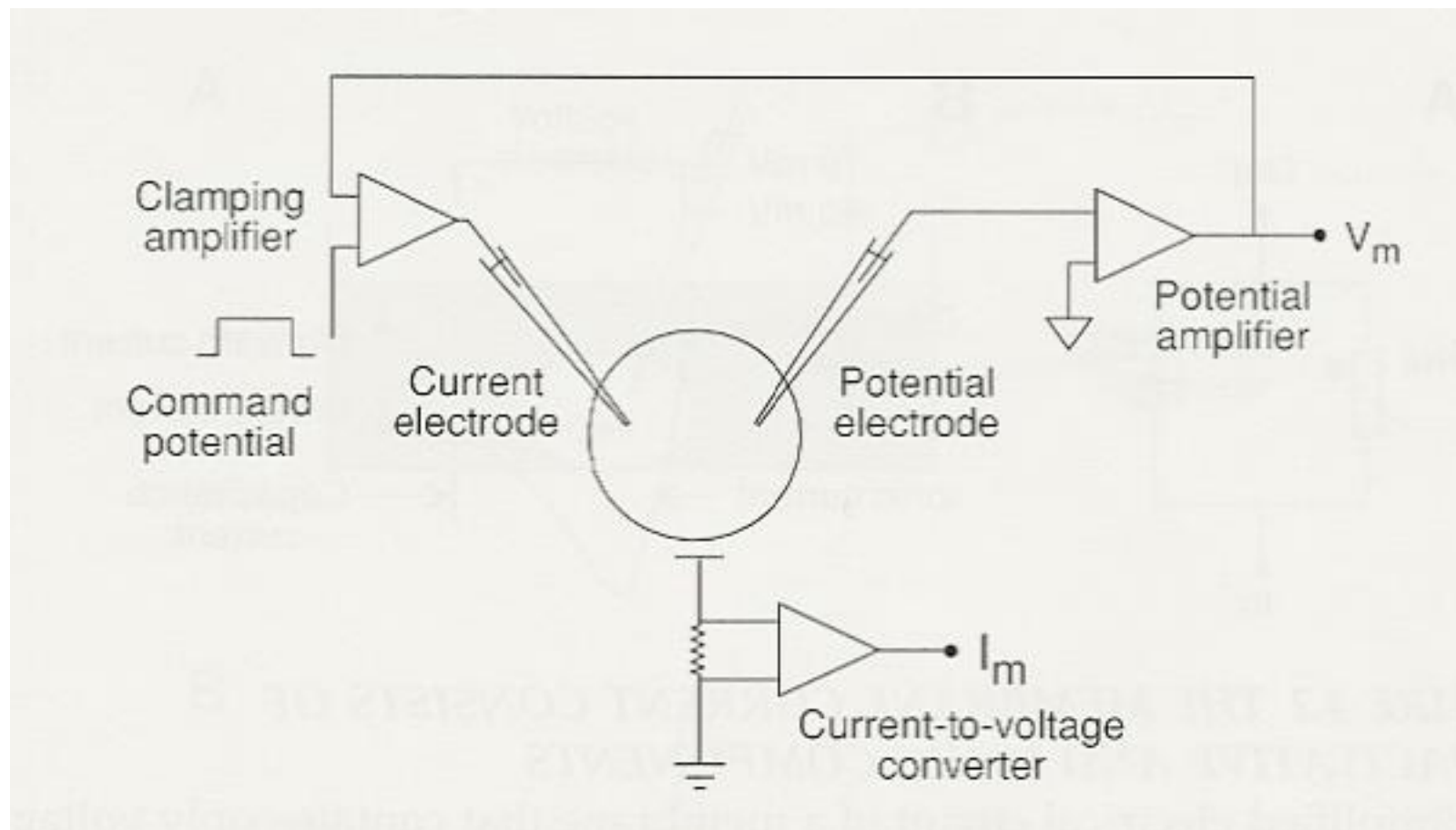


Измерение потенциалов и токов

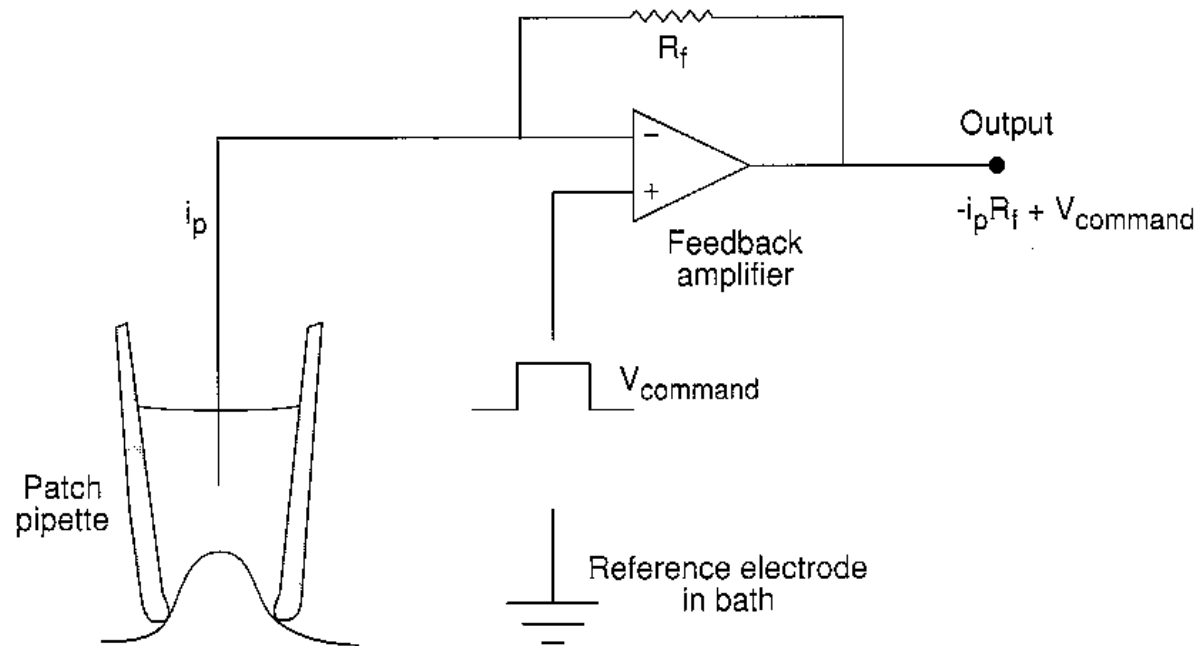
Измерение мембранного потенциала



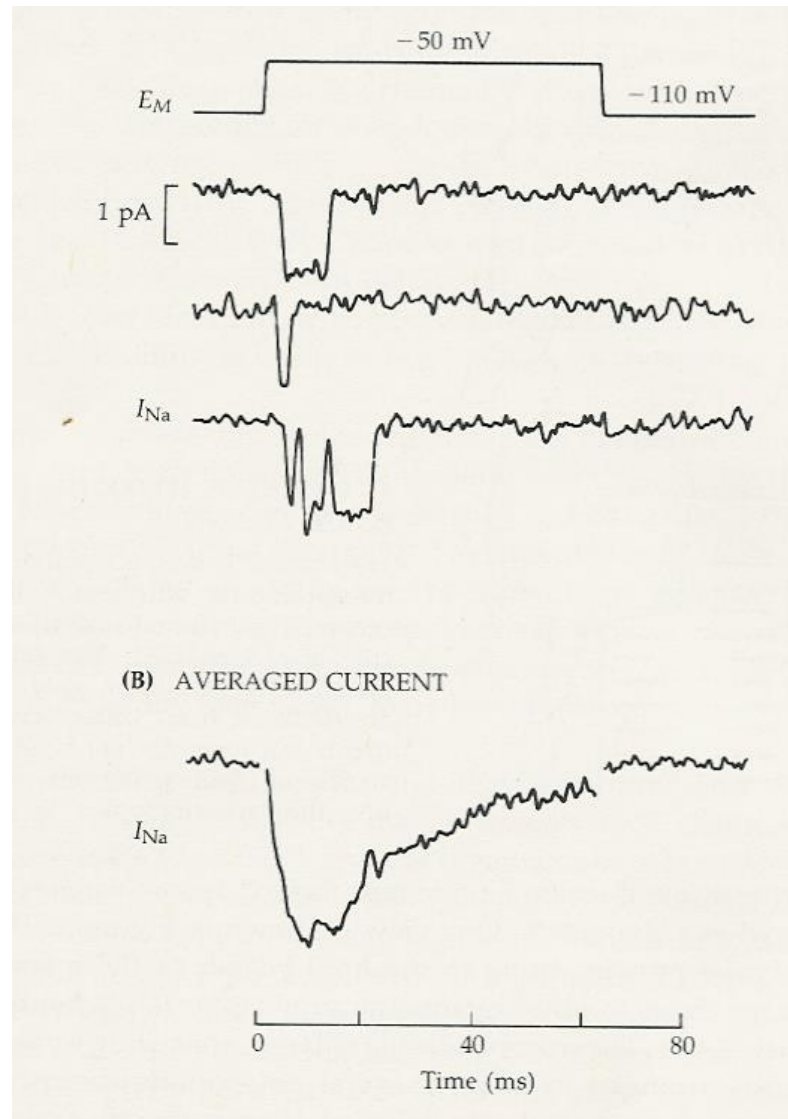
Метод фиксации потенциала



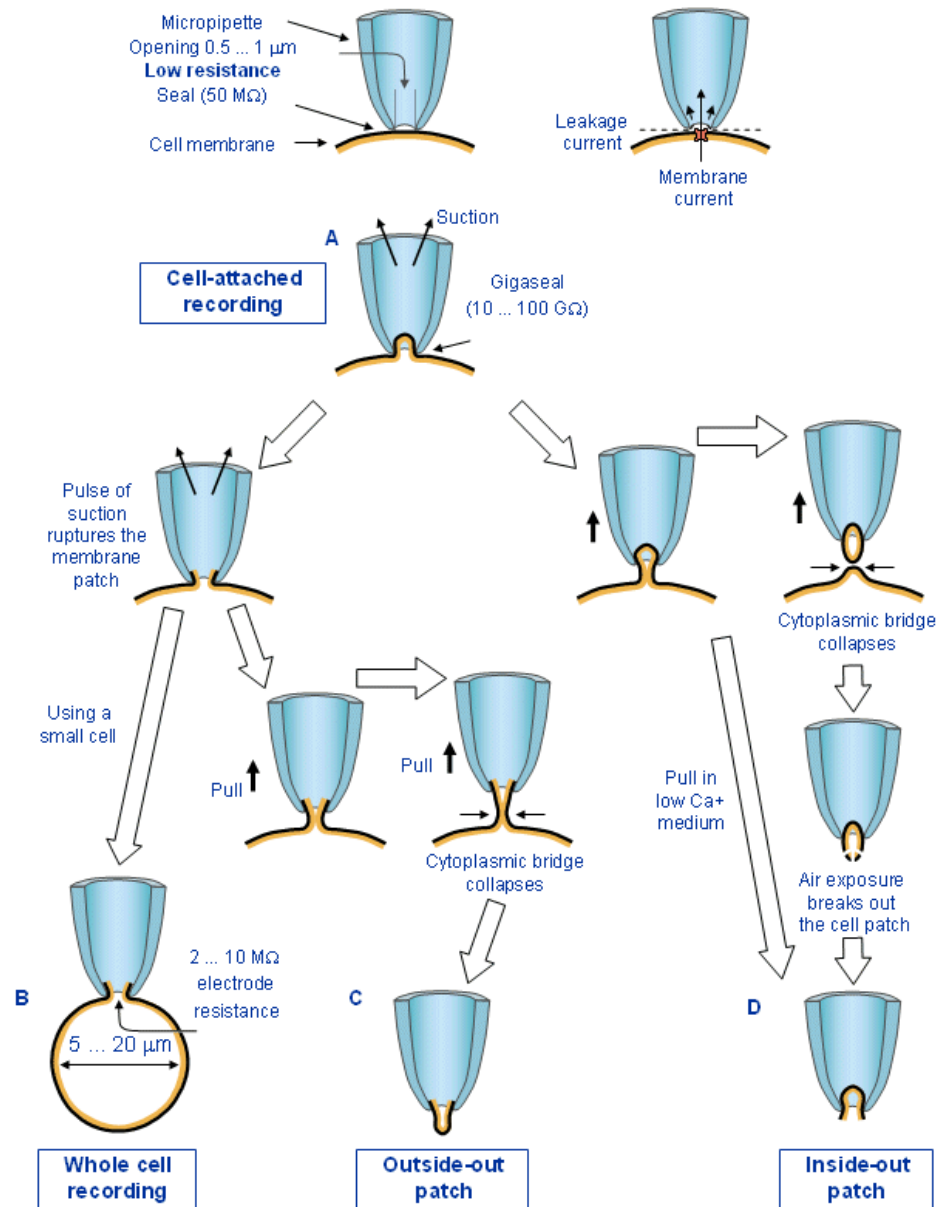
Cxema patch clamp



Patch clamp регистрация



Конфигурации patch clamp





The Nobel Prize in
Physiology or Medicine
1991

"for their discoveries concerning the function
of single ion channels in cells"



Erwin Neher

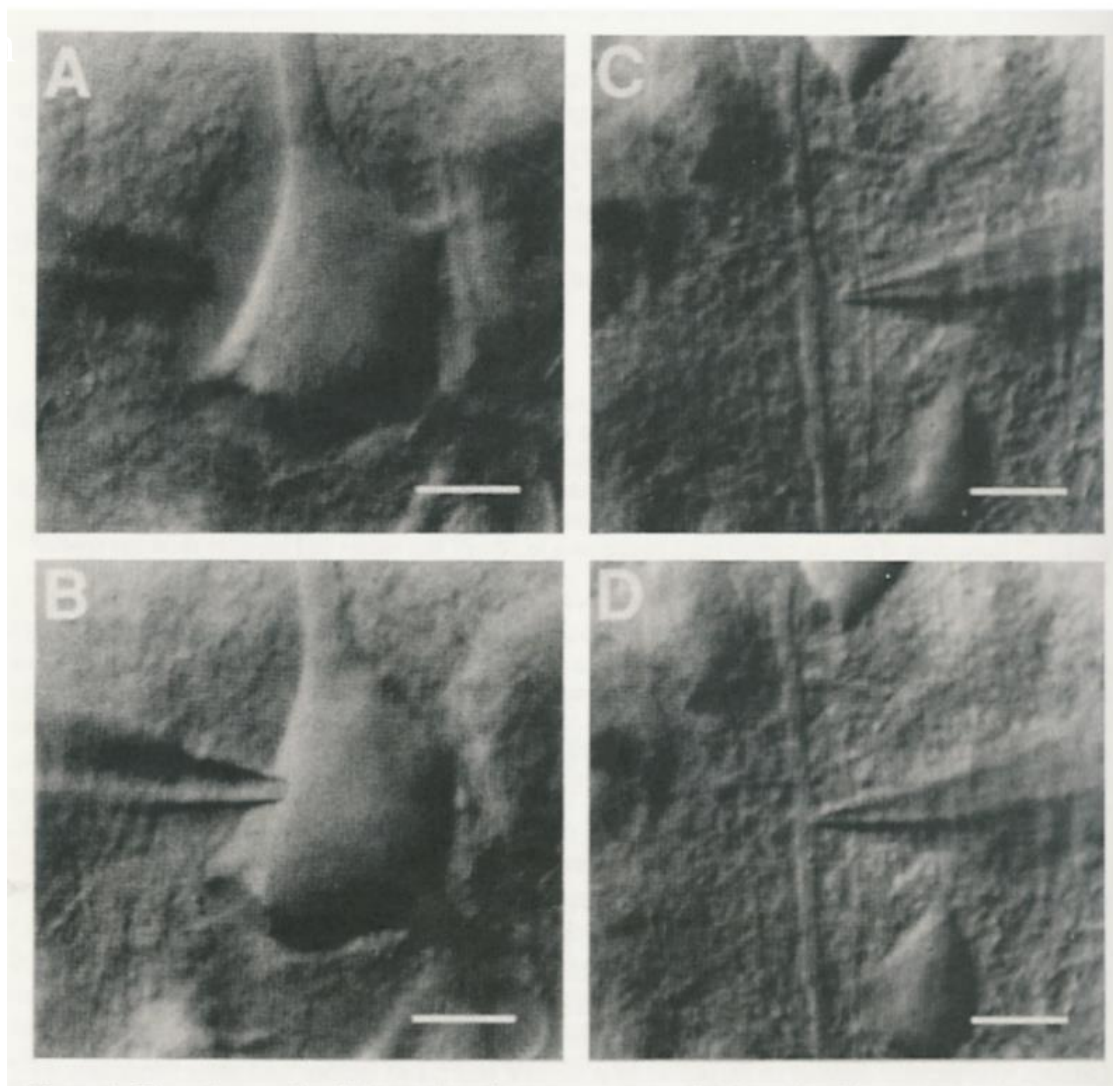


Bert Sakmann

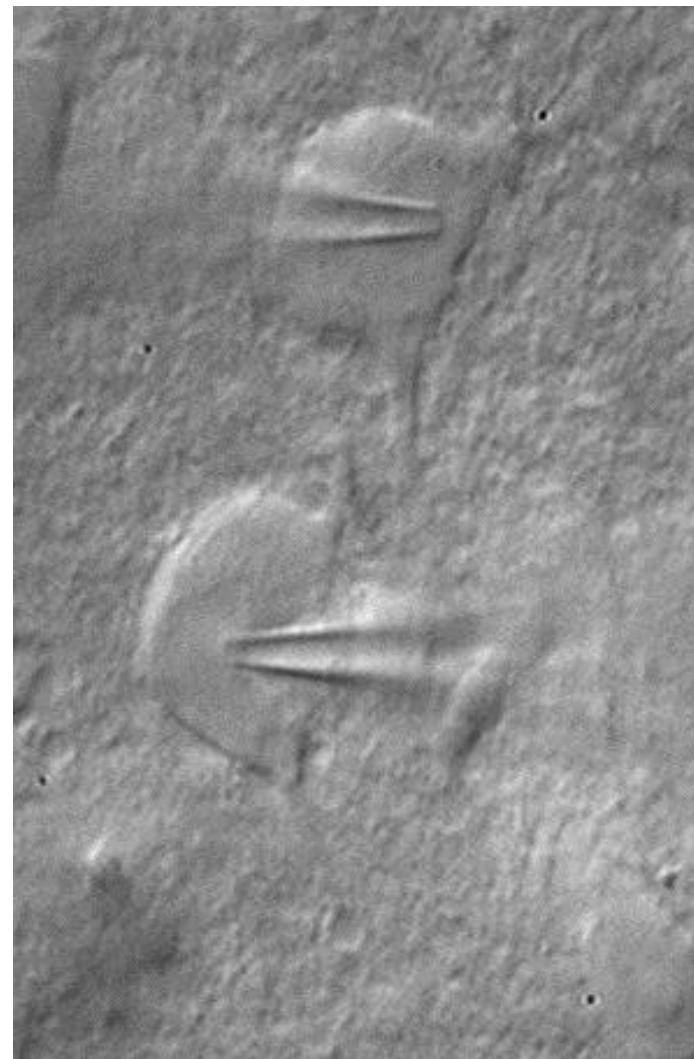
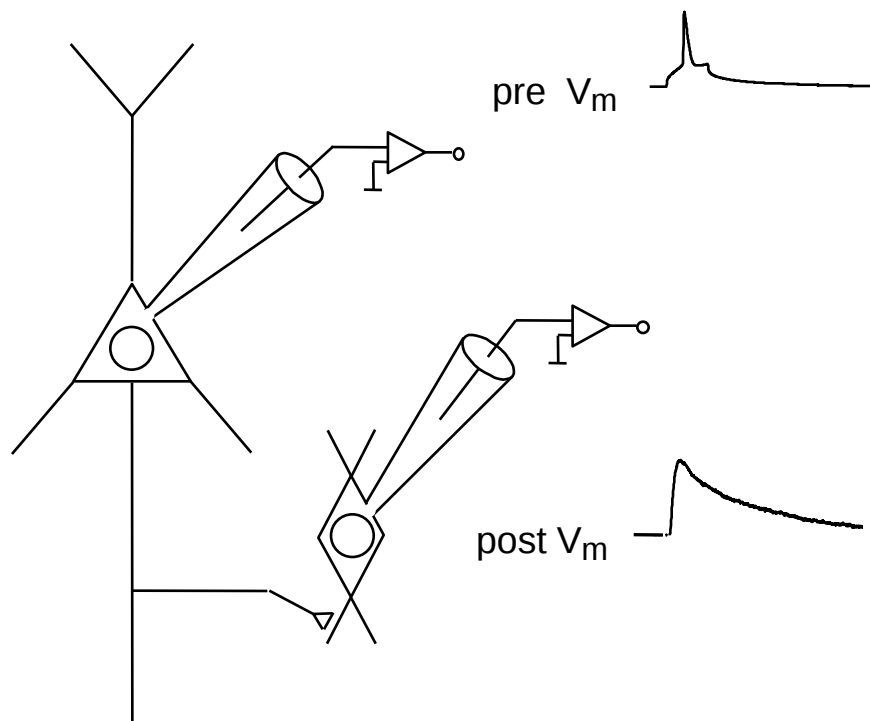


Bert
Sakmann

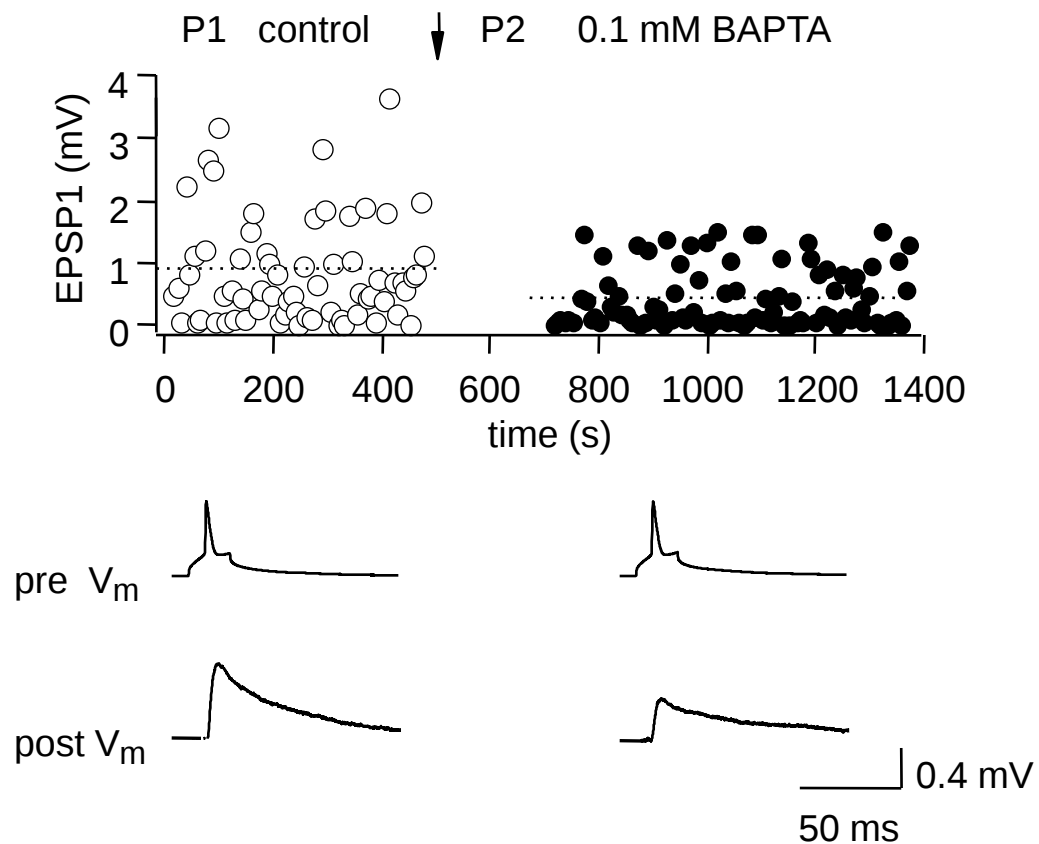
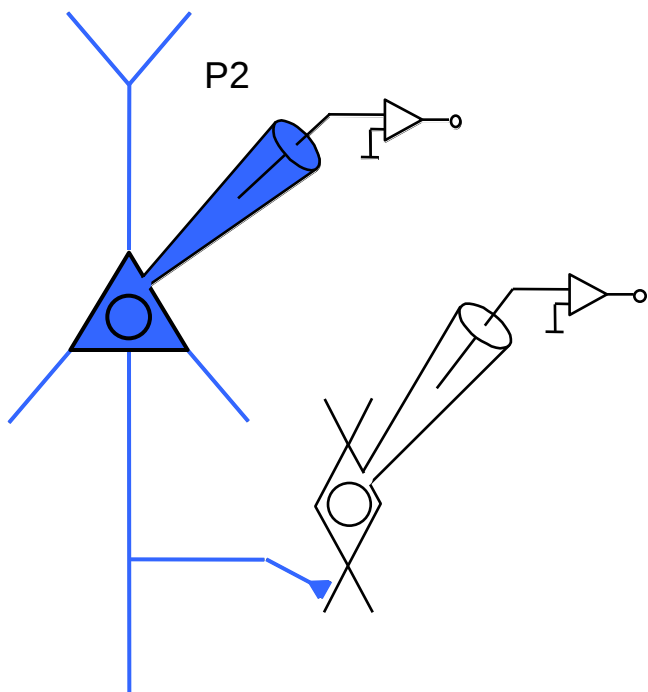
Регистрация сигналов в срезе мозга



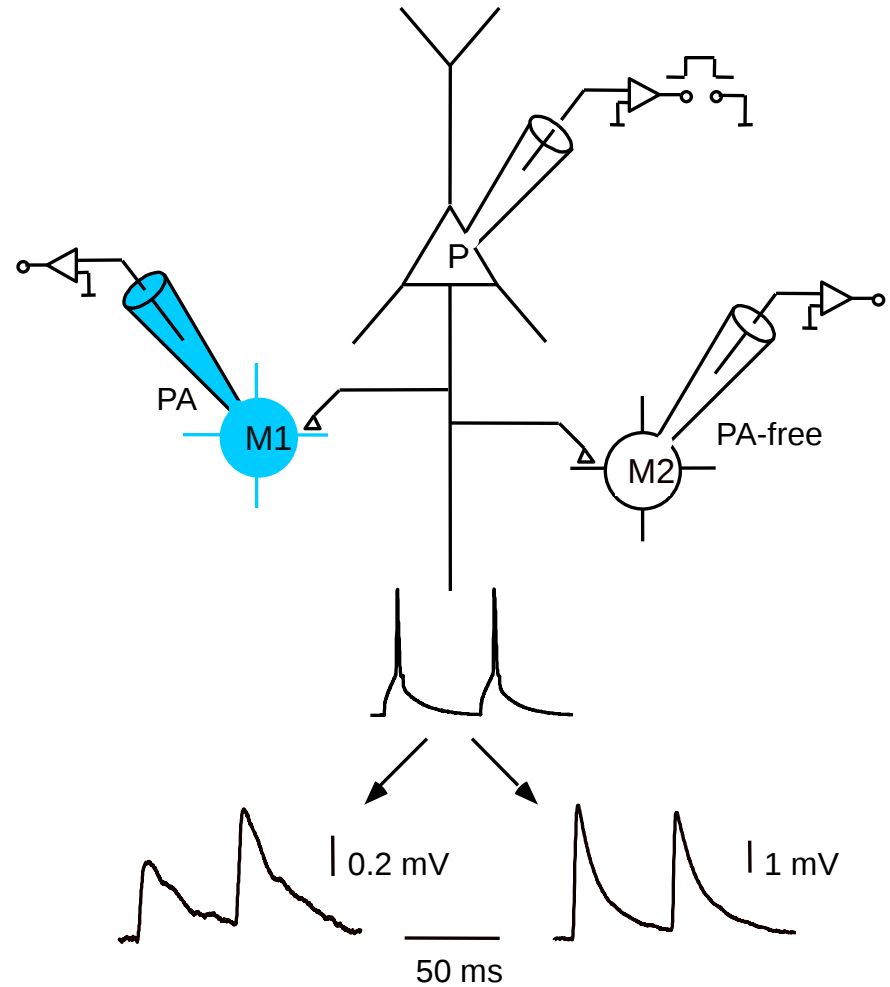
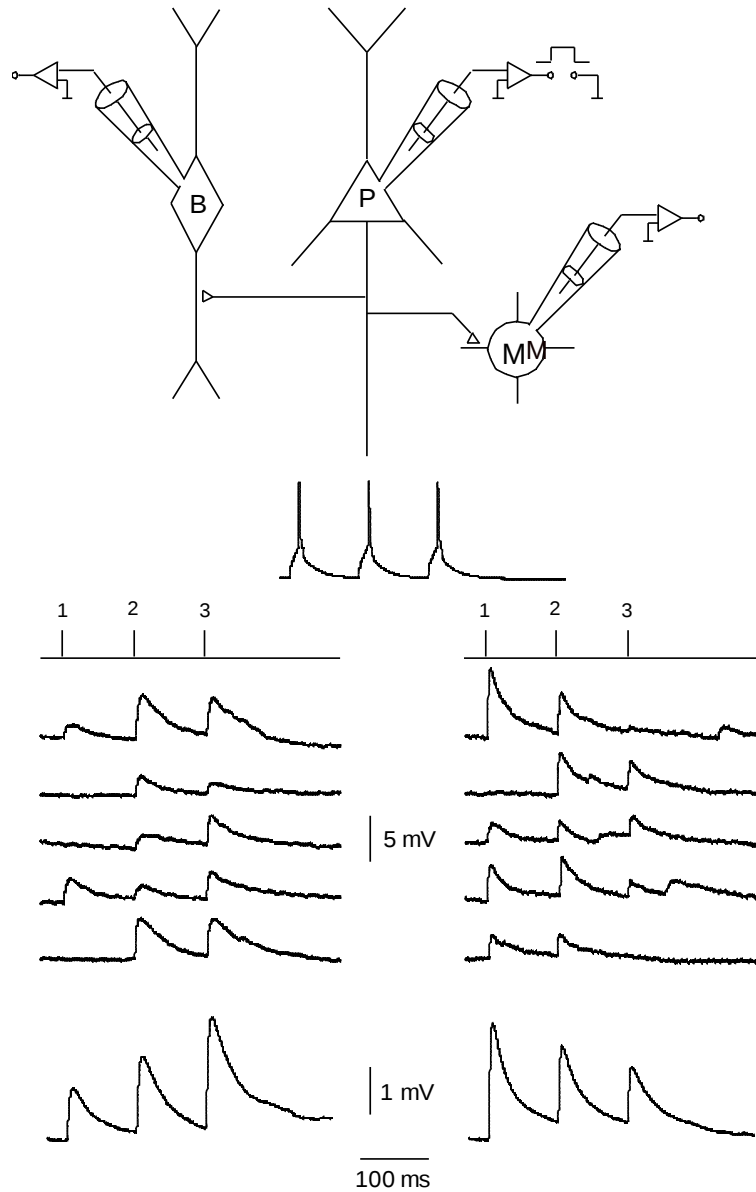
Whole cell регистрация одновременно от двух синаптически связанных нейронов



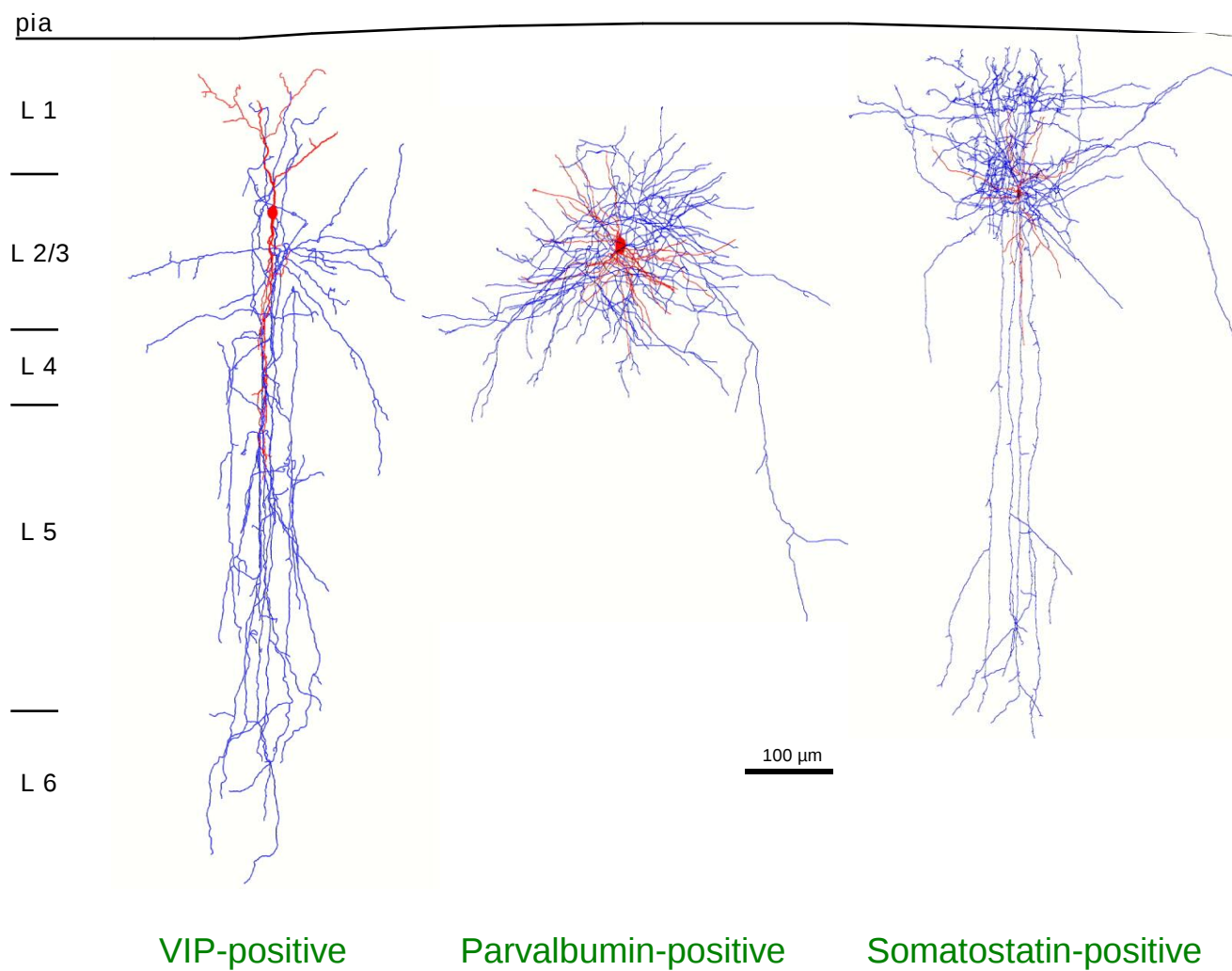
Манипуляция внутриклеточным содержанием



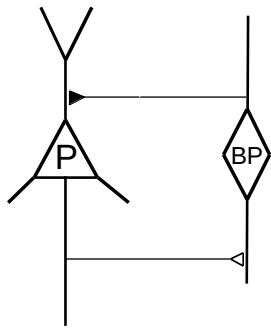
Патерн синаптической пластичности



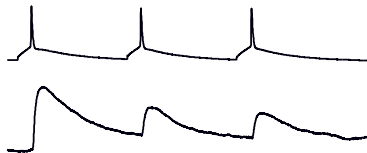
Реконструкция морфологии



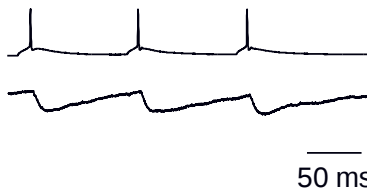
Синаптические контакты



P->BP

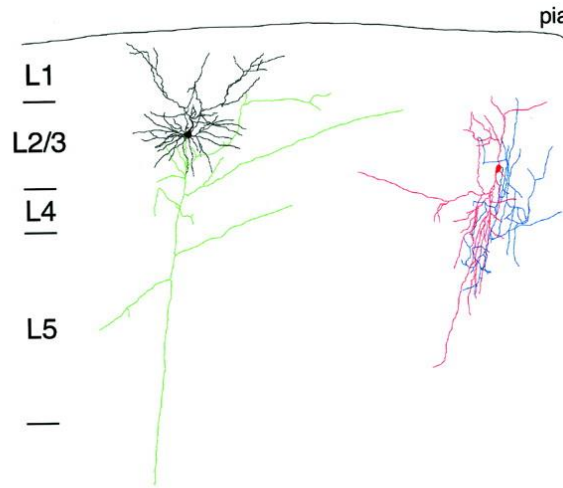


BP->P



50 ms

A



100 μm

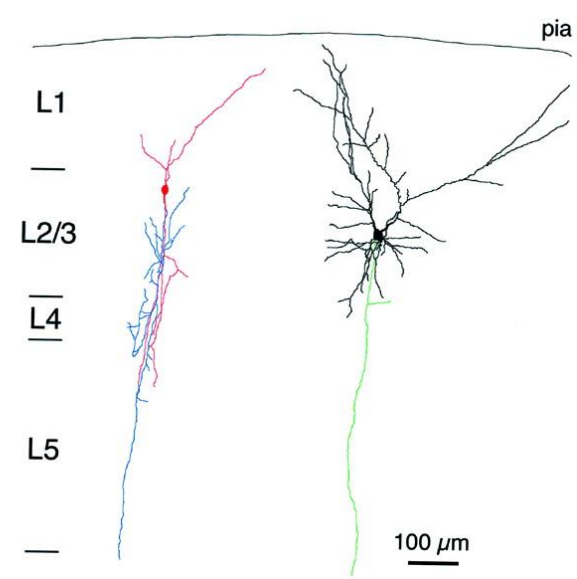
B

P->BP



20 μm

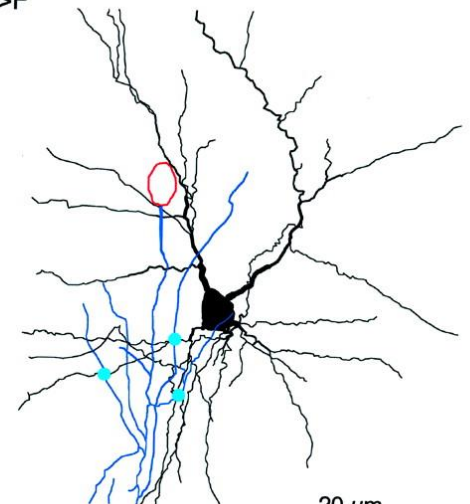
C



100 μm

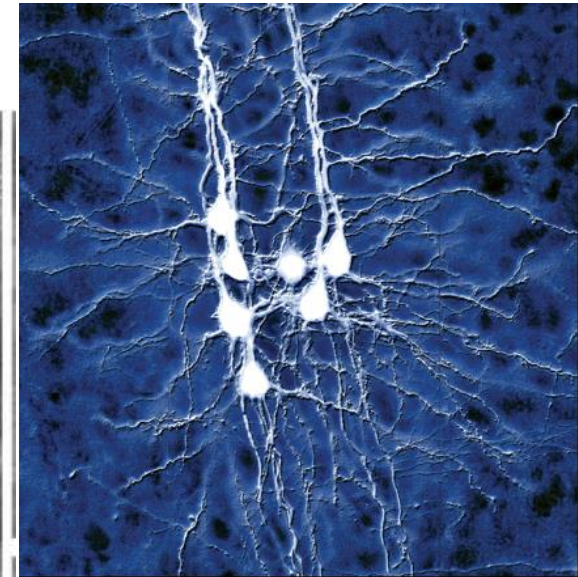
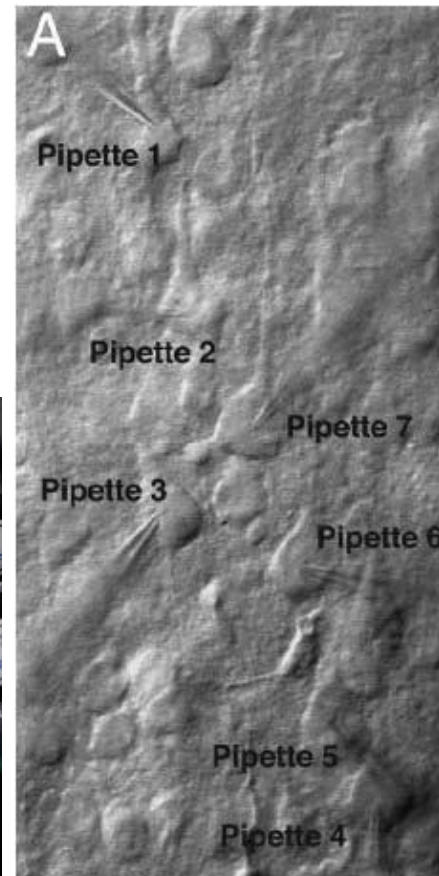
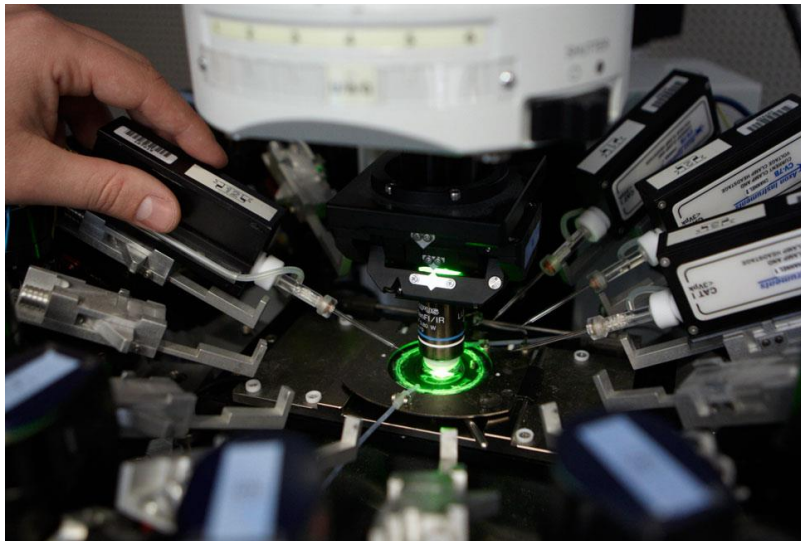
D

BP->P



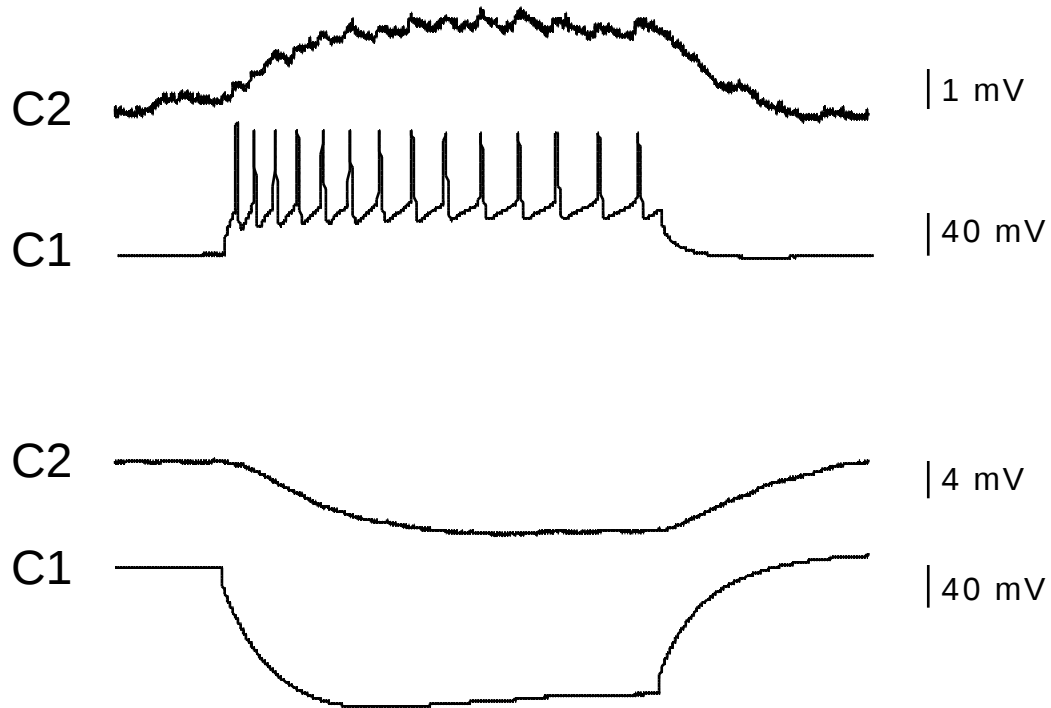
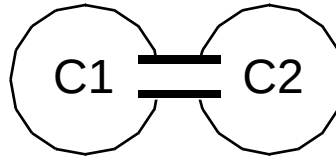
20 μm

Whole cell регистрация одновременно от многих синаптически связанных нейронов

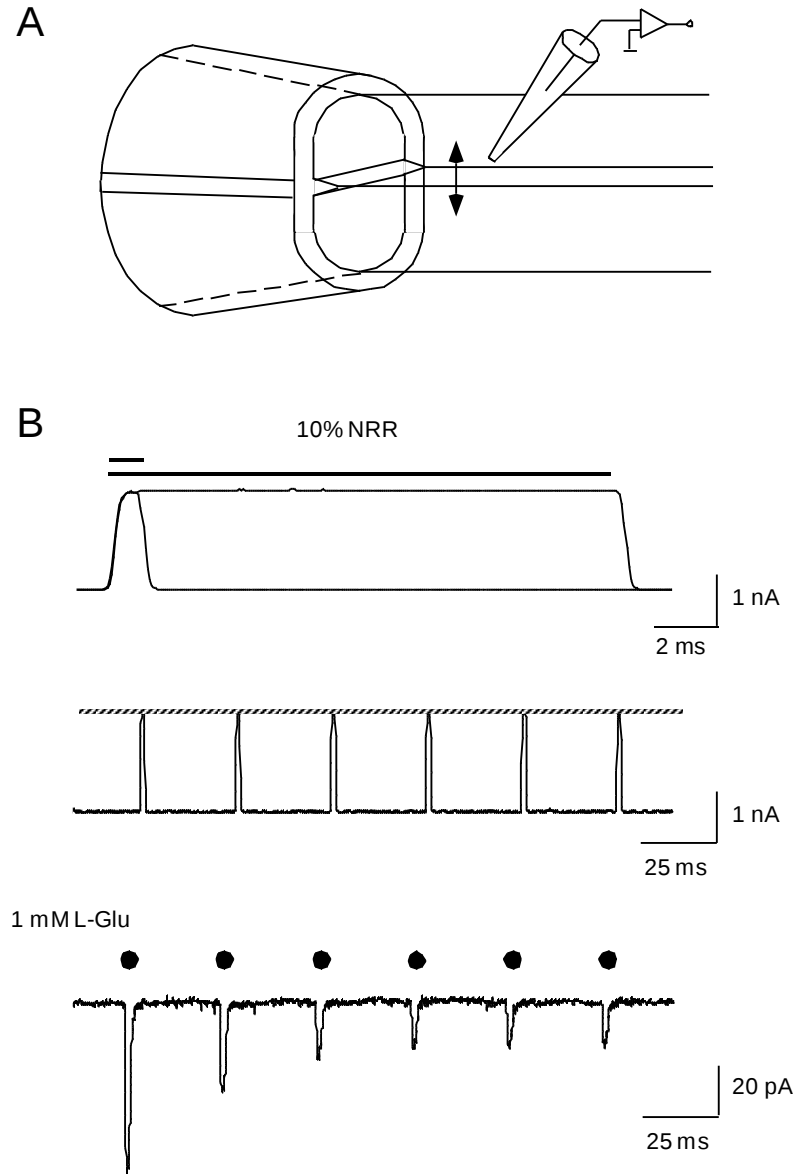


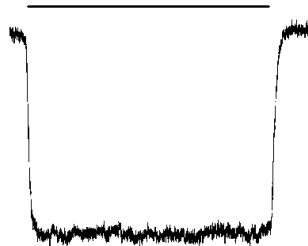
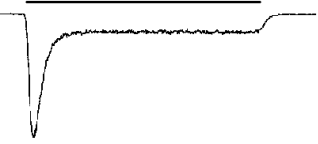
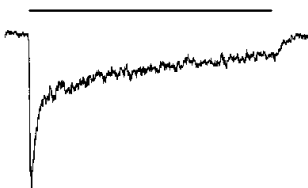
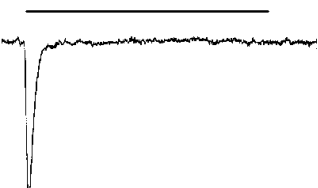
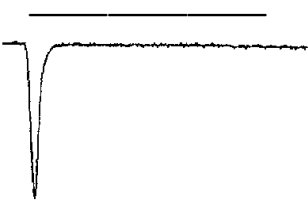
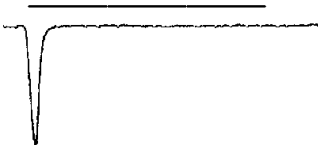
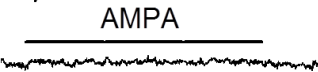
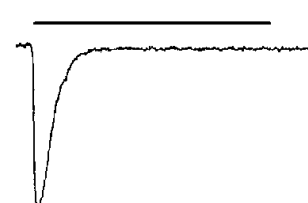
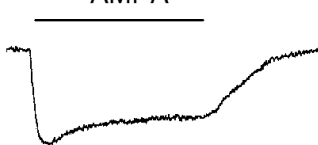
Функционирование электрических синапсов

Gap junctions

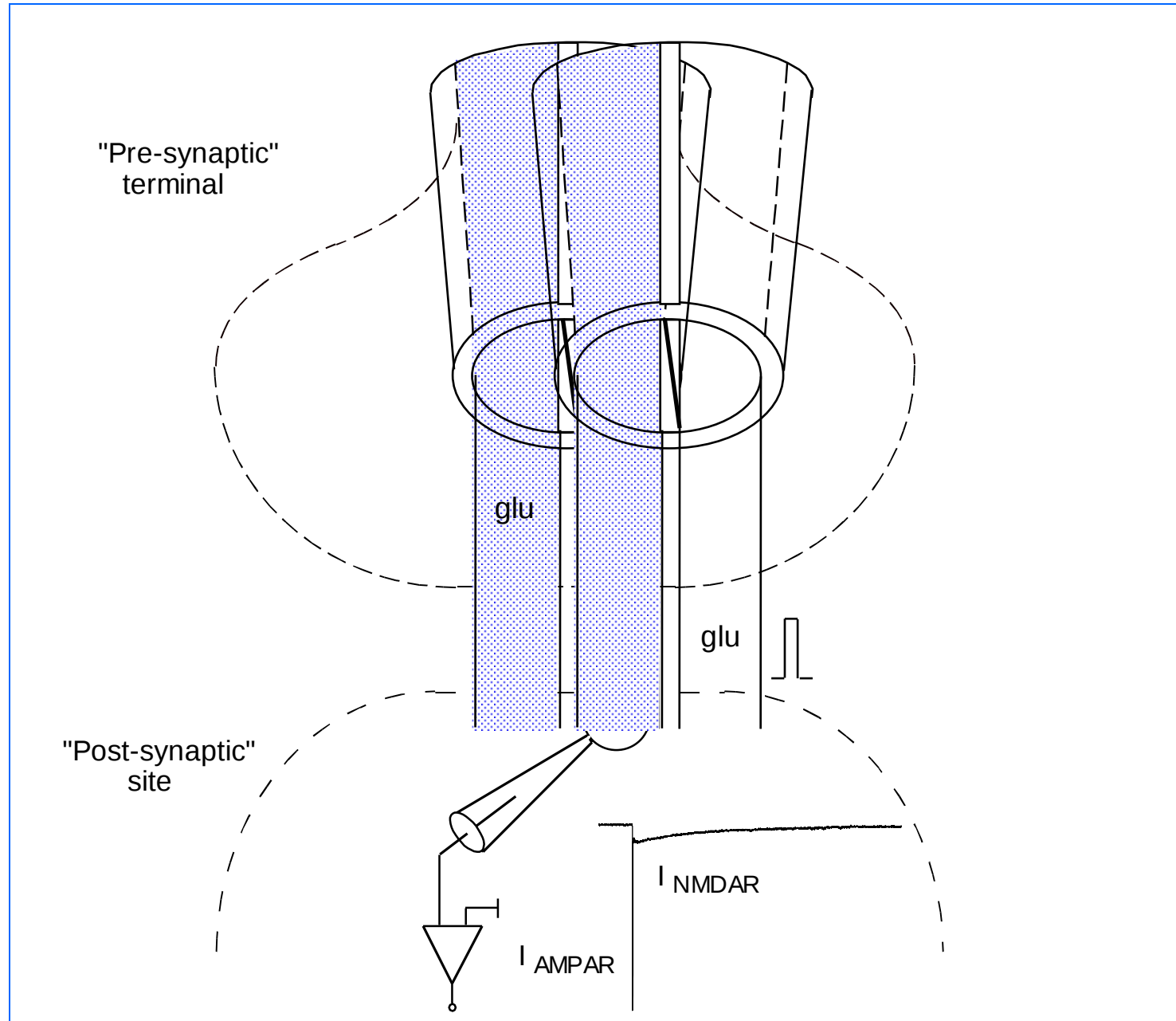


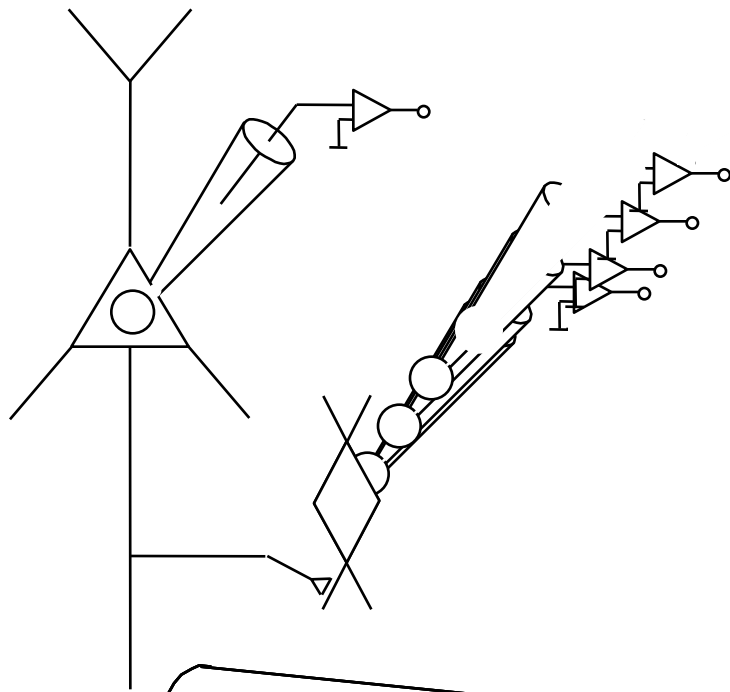
Быстрая подача агонистов на изолированную мембрану



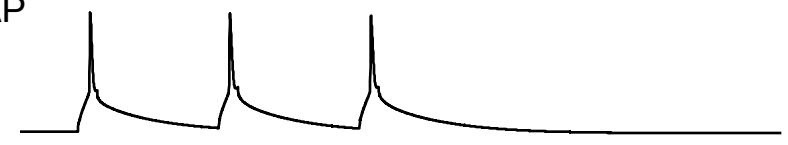
AMPA, KA receptors	Kainate	L-glutamate or AMPA
GluR-A,-B,-C,-D		flip  flop 
GluR5		
GluR6		L-glutamate  AMPA 
GluR6/KA-2		AMPA 

Искусственный синапс





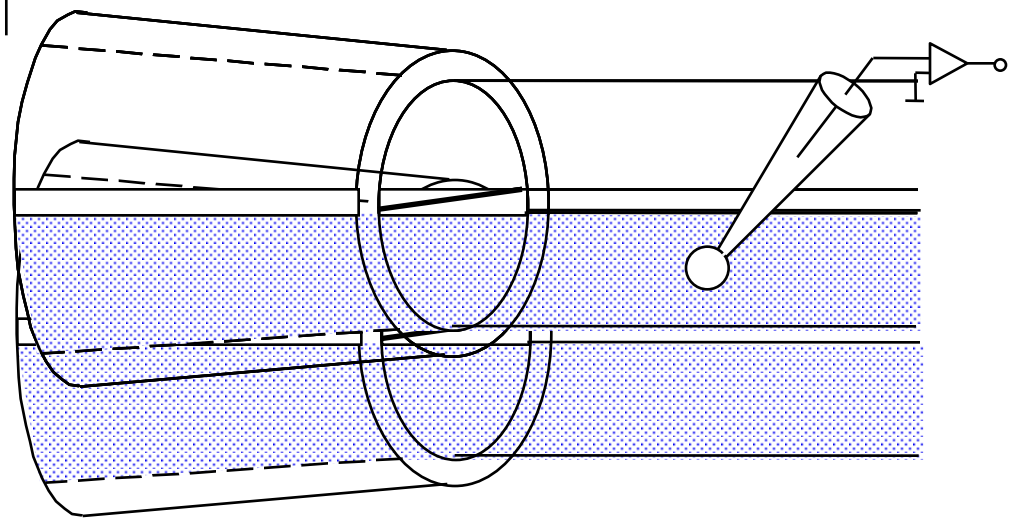
AP



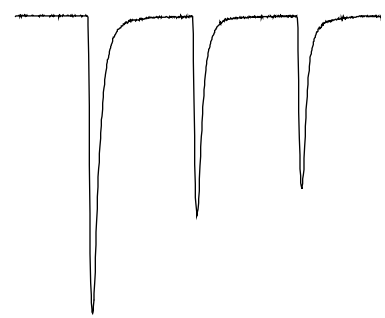
EPSP



Glu

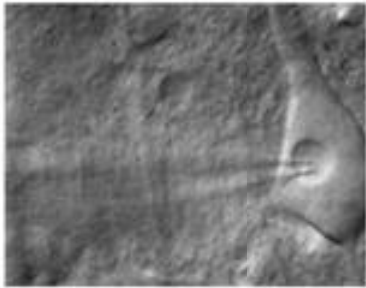


I_{Glu}

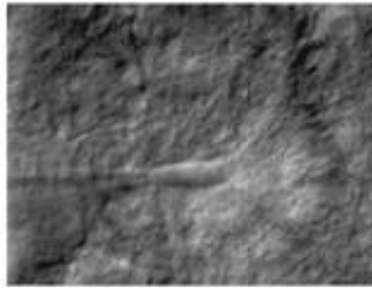


Formation of a nucleated patch

A



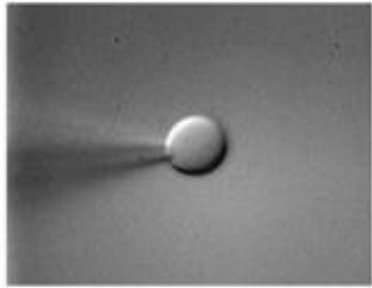
B



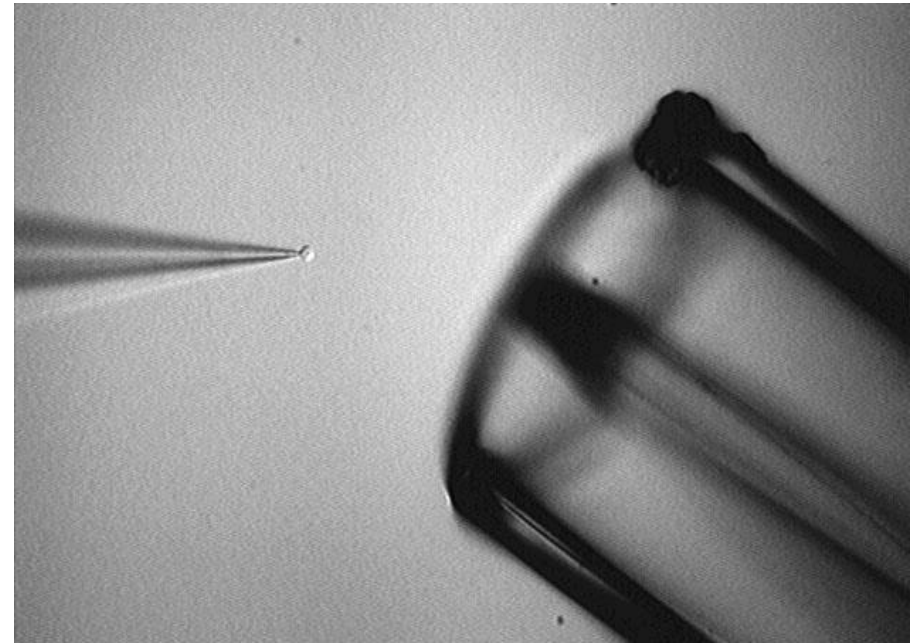
C



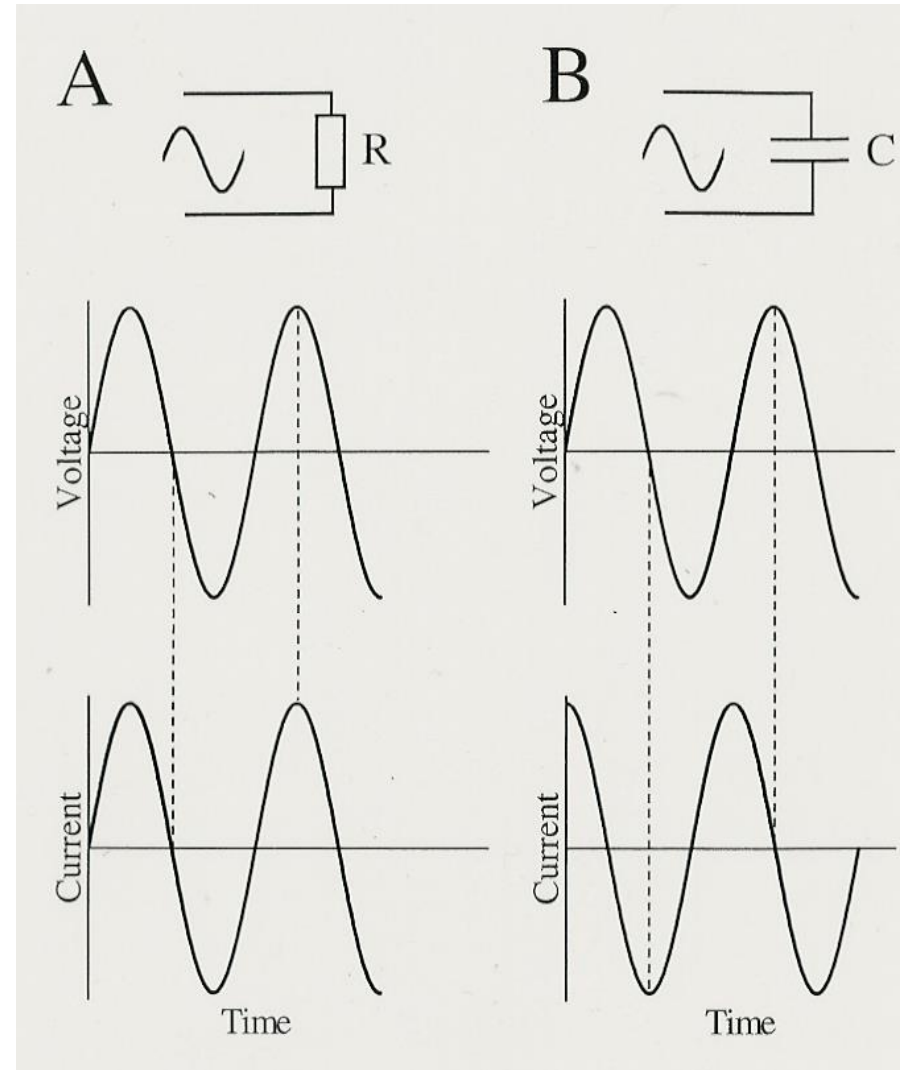
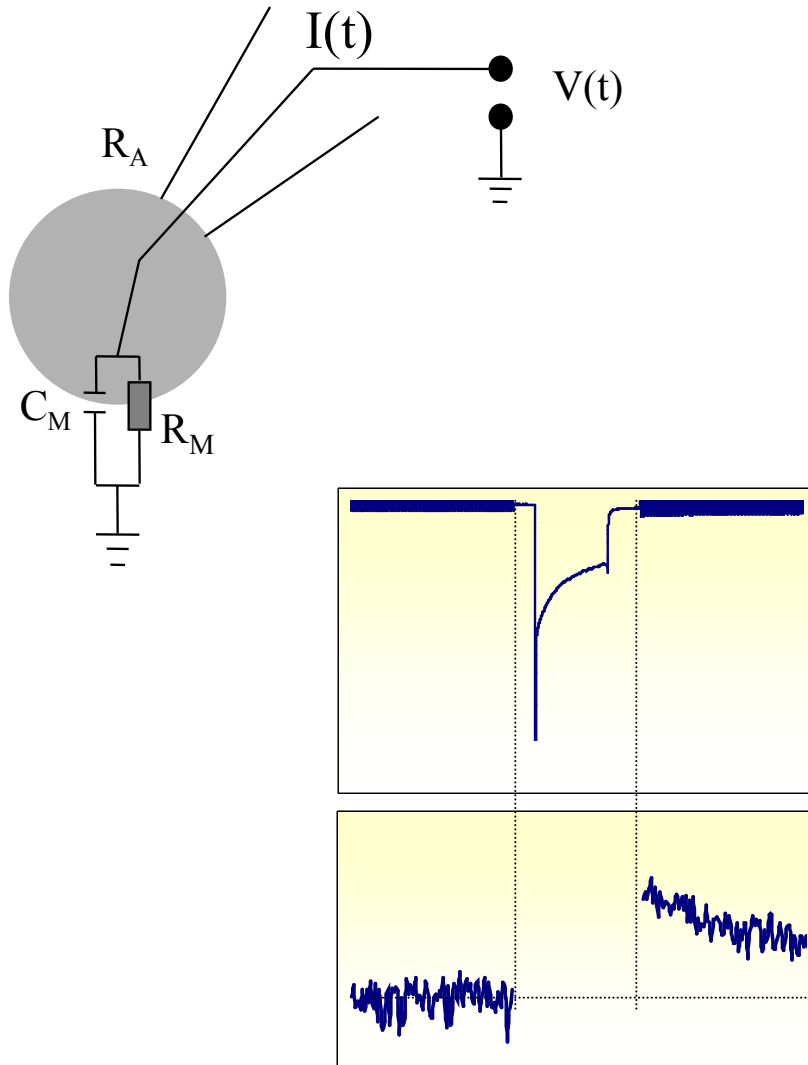
D



Fast agonist application

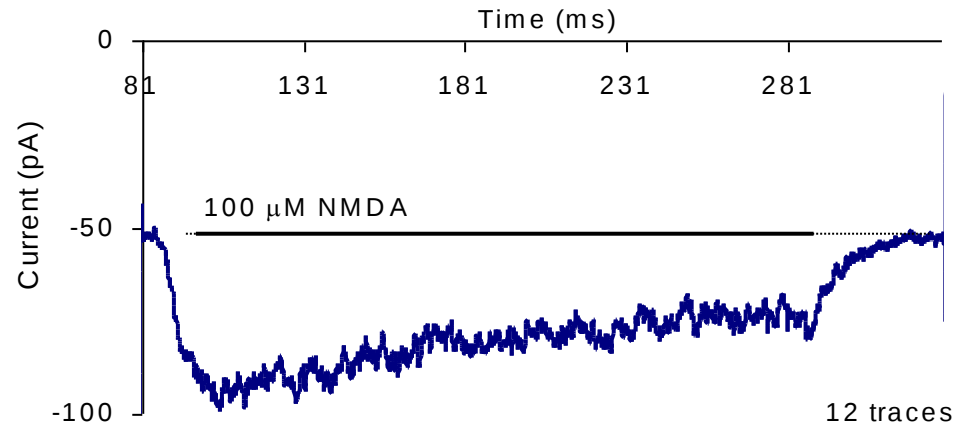
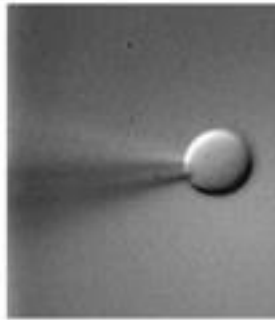


Измерение электрической емкости мембраны

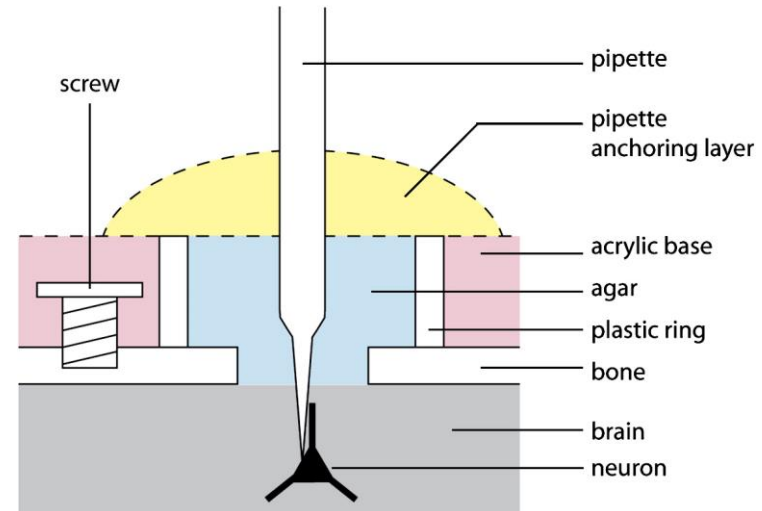
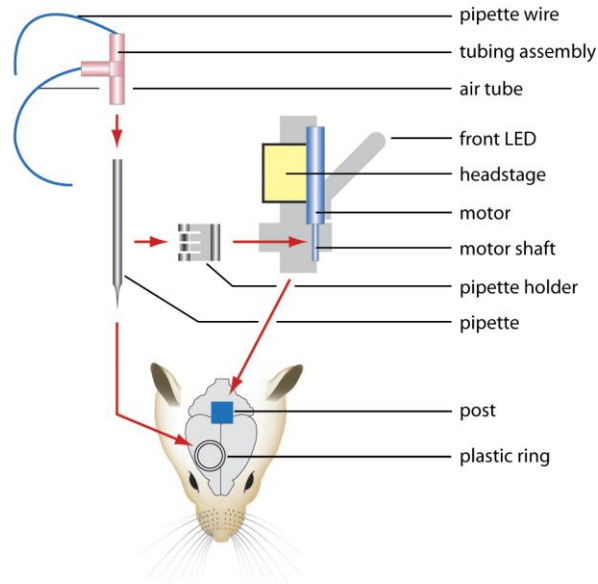
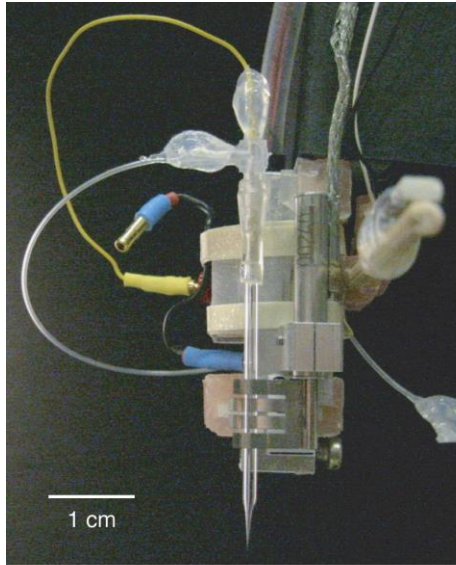


Несинаптический выброс медиатора

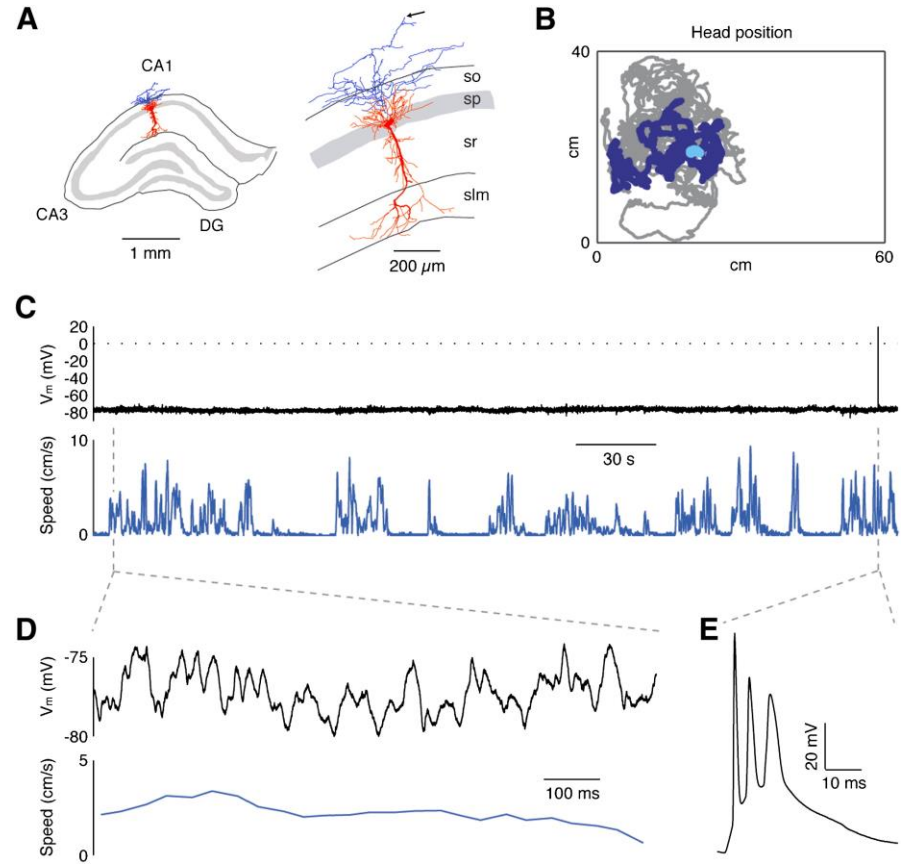
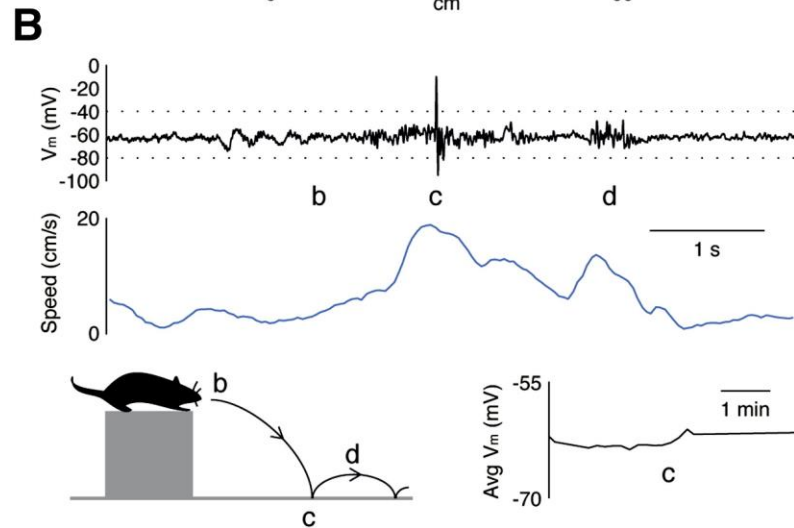
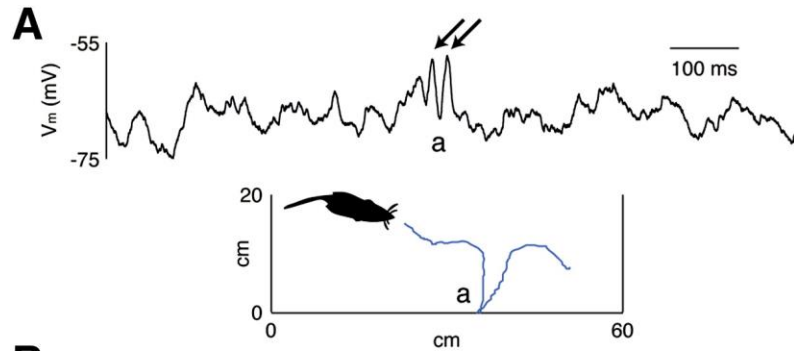
(L7-9, 5 mM Ca^{2+} , 100 μ M NMDA)



Patch clamp регистрация *in vivo*



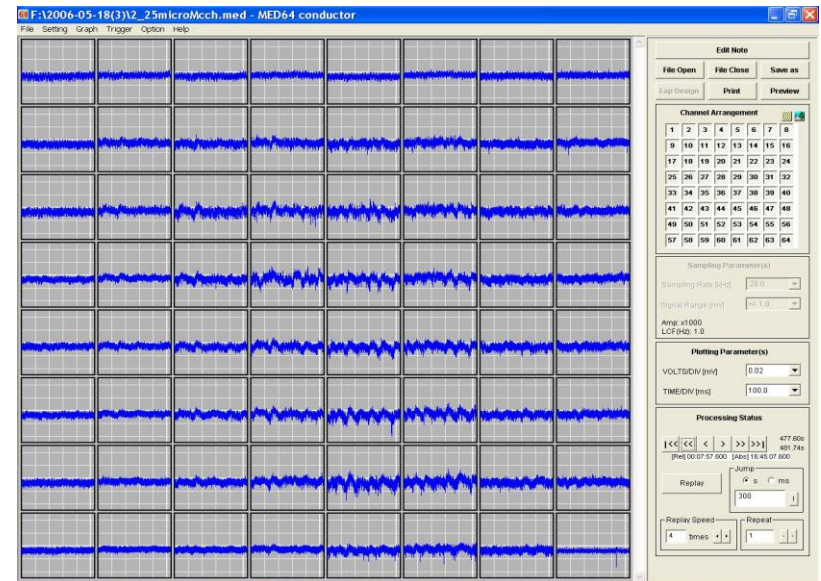
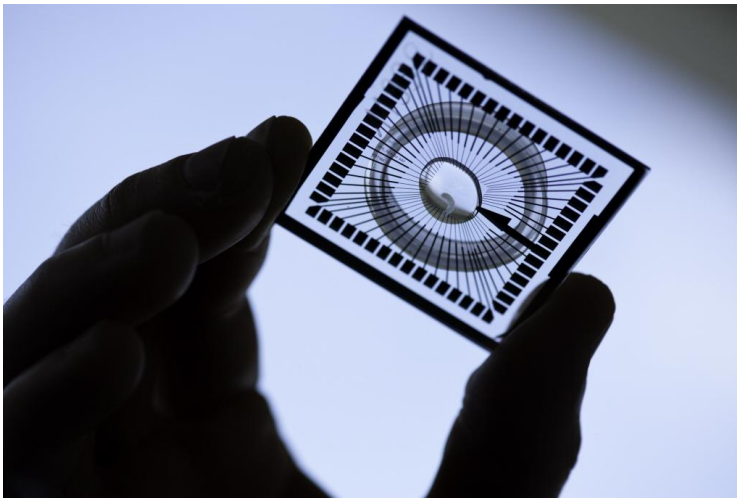
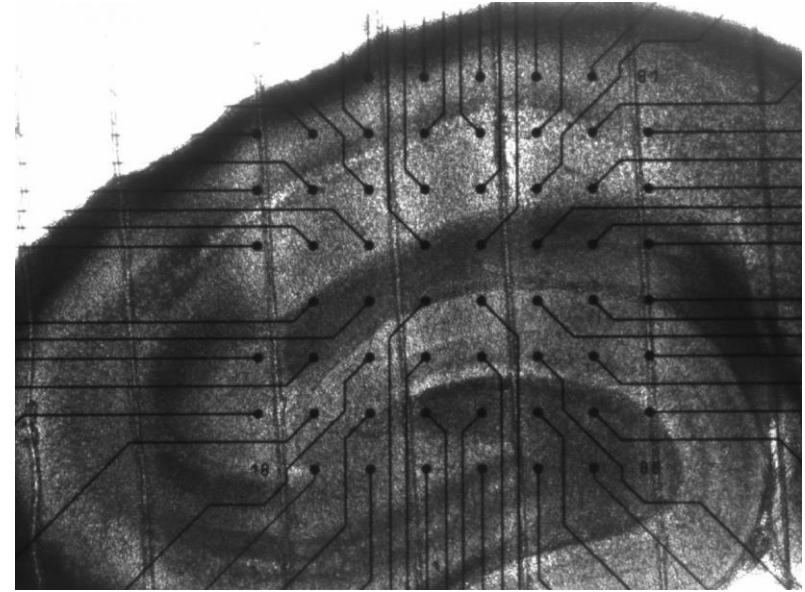
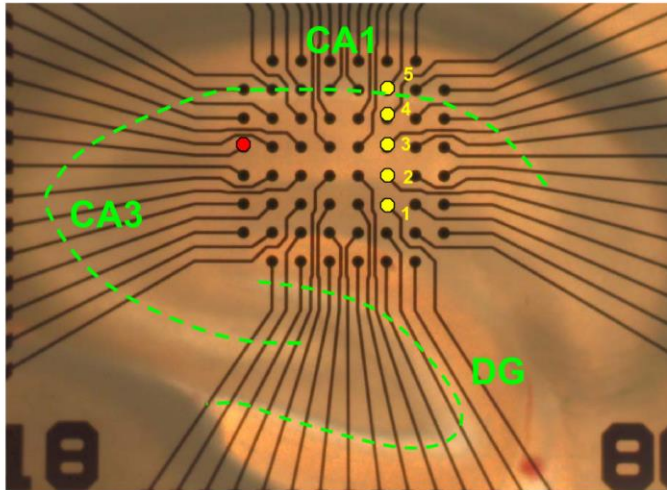
Стабильность patch clamp регистрации *in vivo*



Внеклеточное отведение

Многоканальное внеклеточное отведение на срезах

A

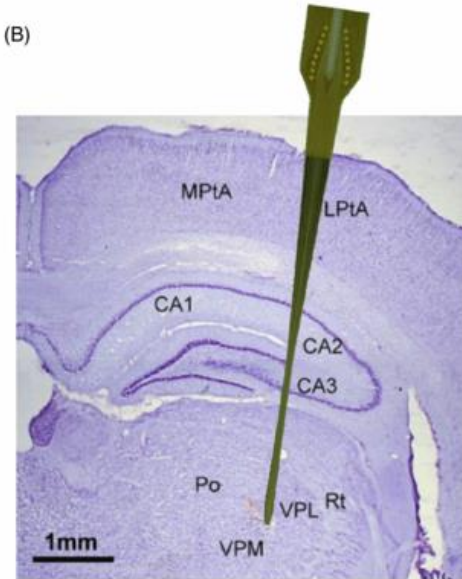


Многоканальное внеклеточное отведение *in vivo*

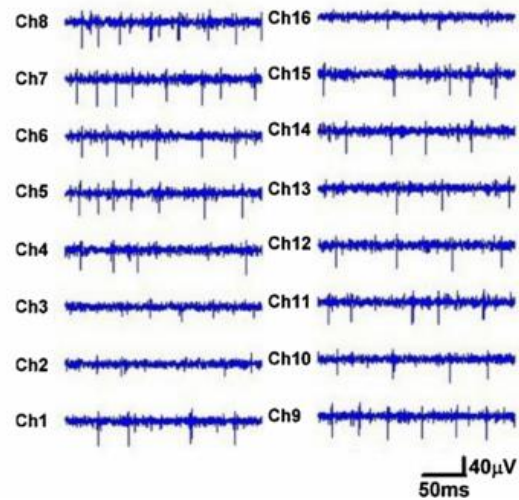
(A)



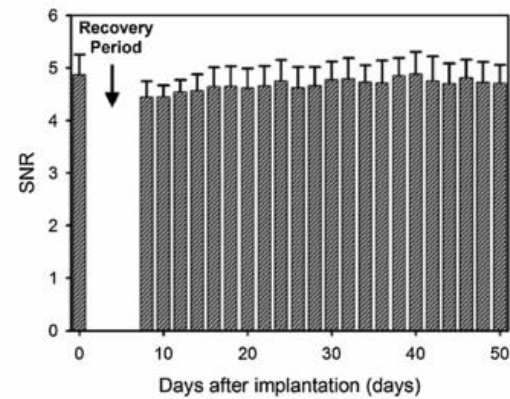
(B)



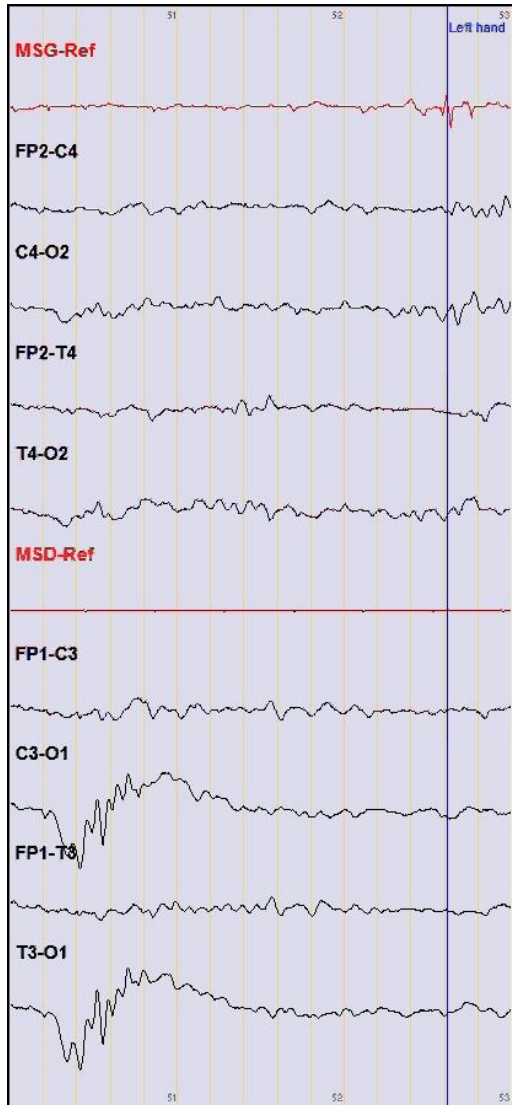
(C)



(D)



ЭЭГ у пациентов

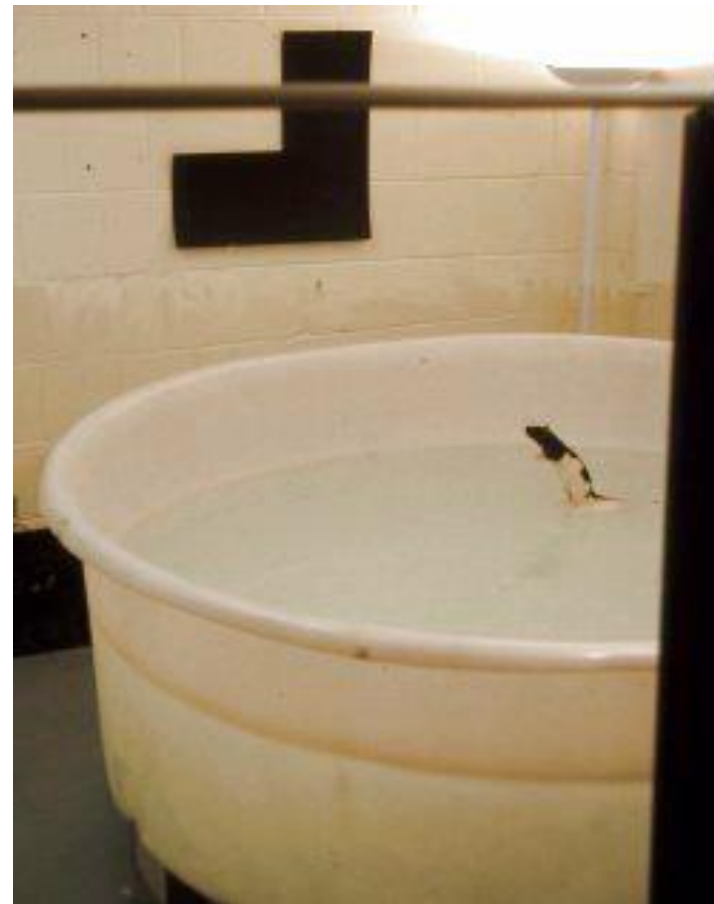


Поведенческие тесты

Тестирование обучения

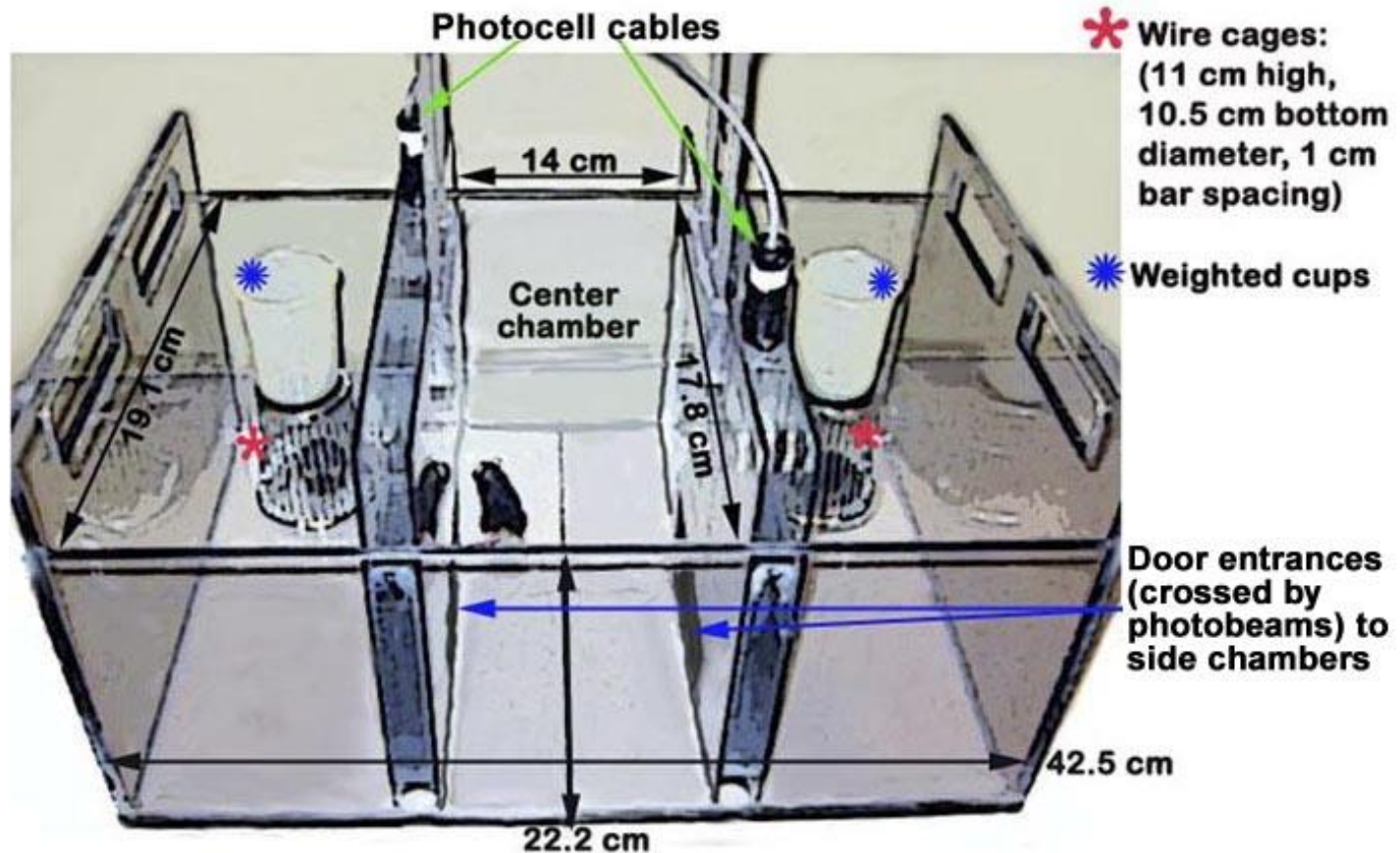


Радиальный лабиринт



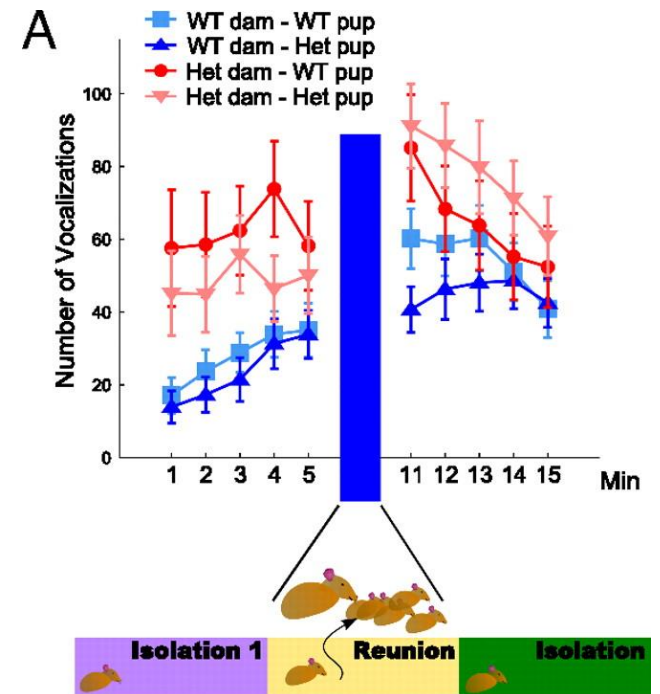
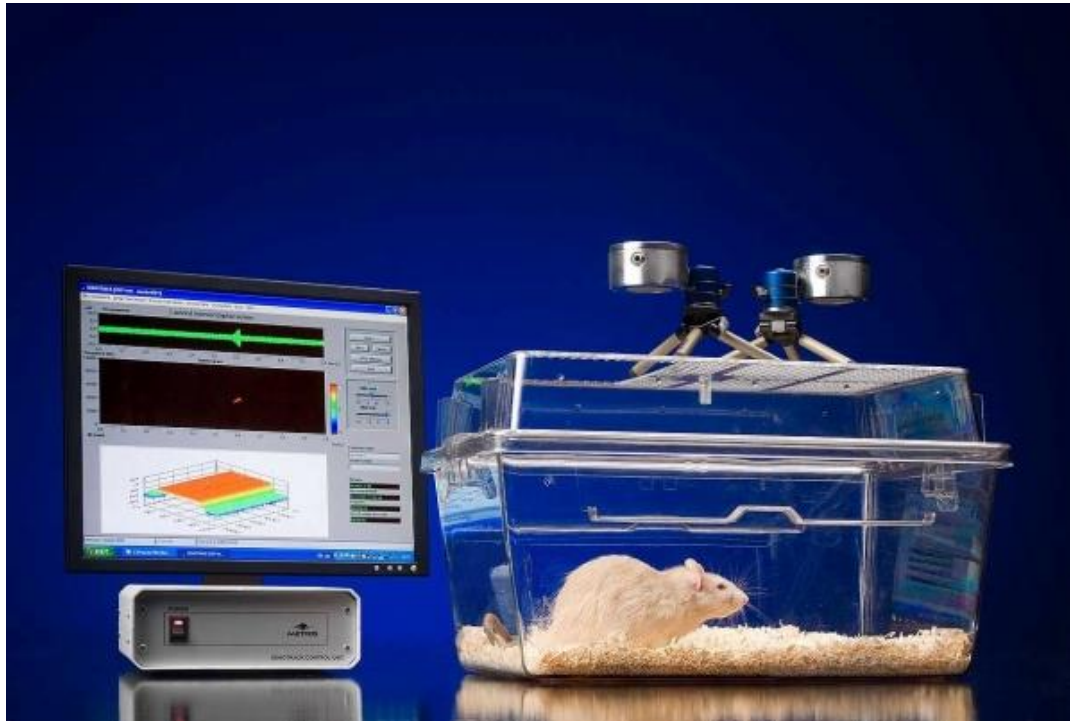
Водный лабиринт

Тестирование социального поведения



Adapted from Moy et. al., 2007. *Behavioral Brain Research* 176(1):4-20.

Вокализация



Тестирование внимания и когнитивных функций

