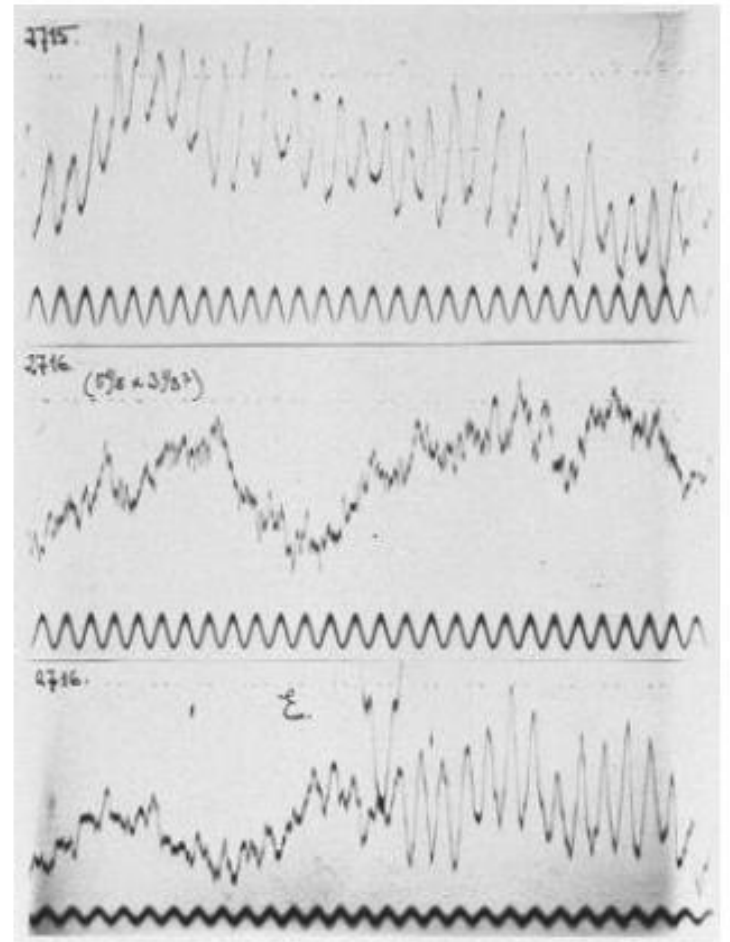
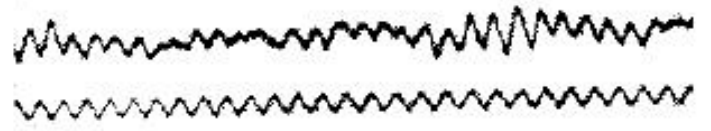


# Seizure Mechanism and Treatment

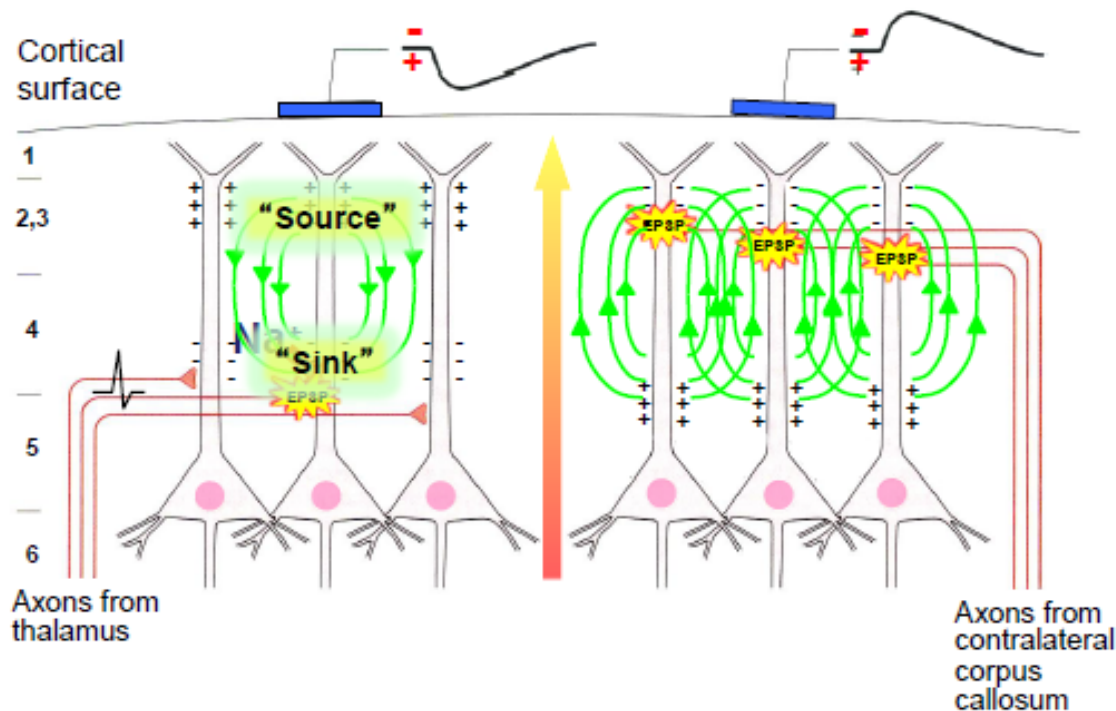
David Lardizabal, M.D.  
Staff Faculty  
Cleveland Clinic Abu Dhabi

# Objectives

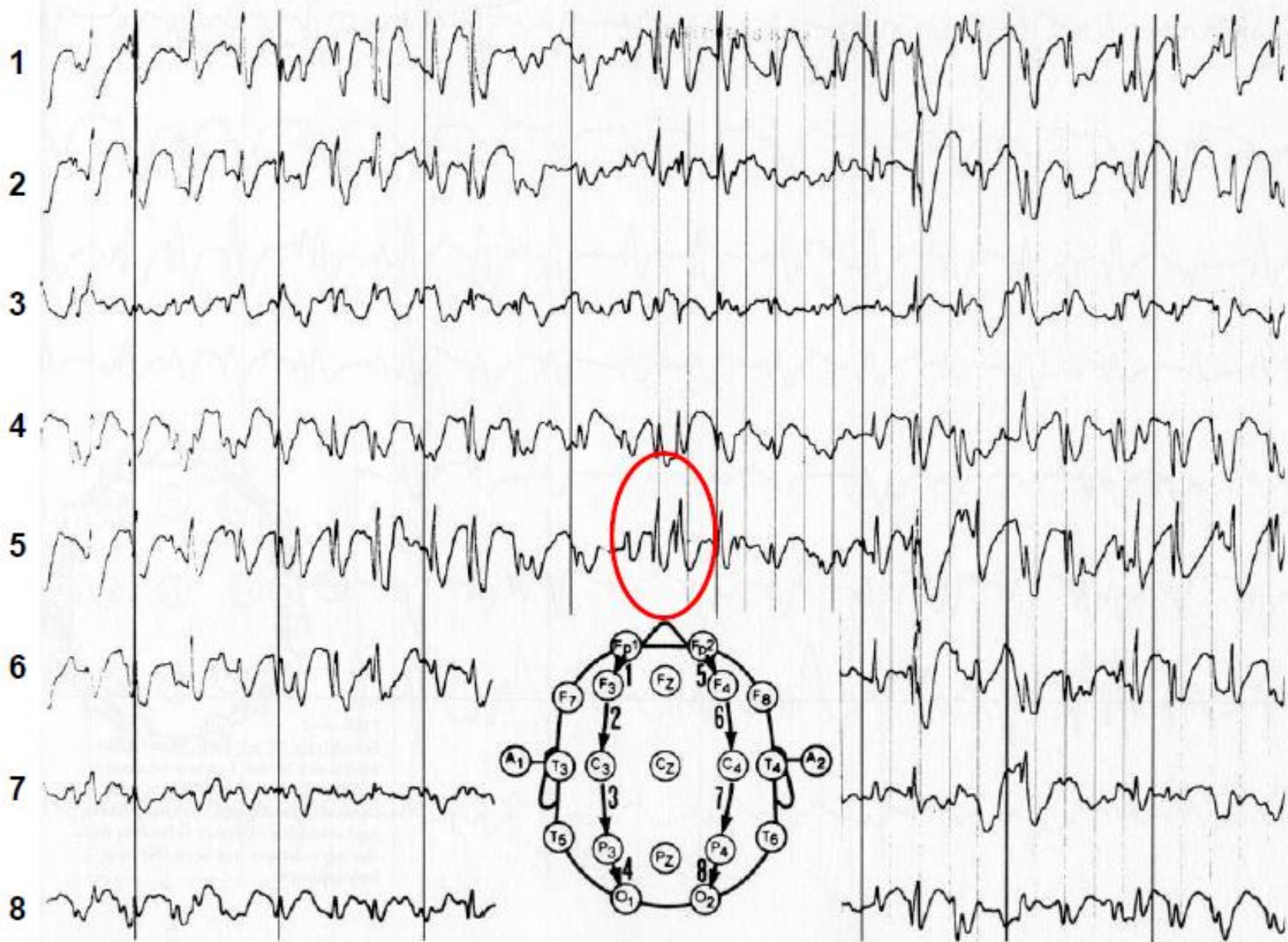
- Basic Epileptic Seizure Generation
- Seizure Treatment- Present, Future



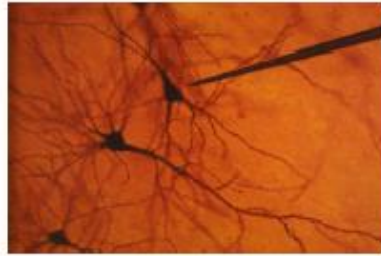
# The cellular basis of the EEG



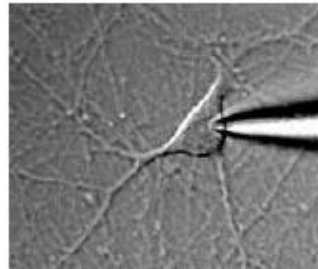
1. Large projection neurons in cortex have similar orientation
2. Inputs (e.g. EPSPs) cause flow of ions and produce a current sink and a current source
3. Summation of electrical activity in groups of neurons is detected by the scalp electrode



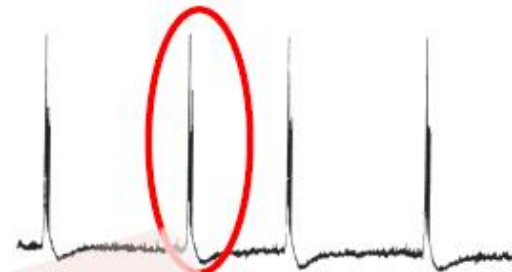
# Neuronal Excitability



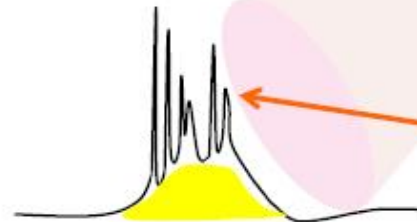
Extracellular recording



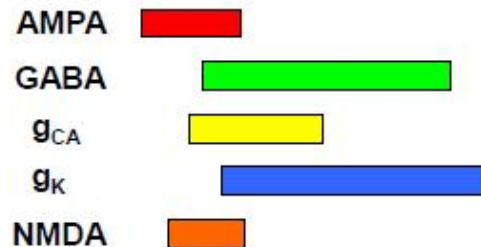
Intracellular recording



**Paroxysmal  
Depolarization  
Shift (PDS)**



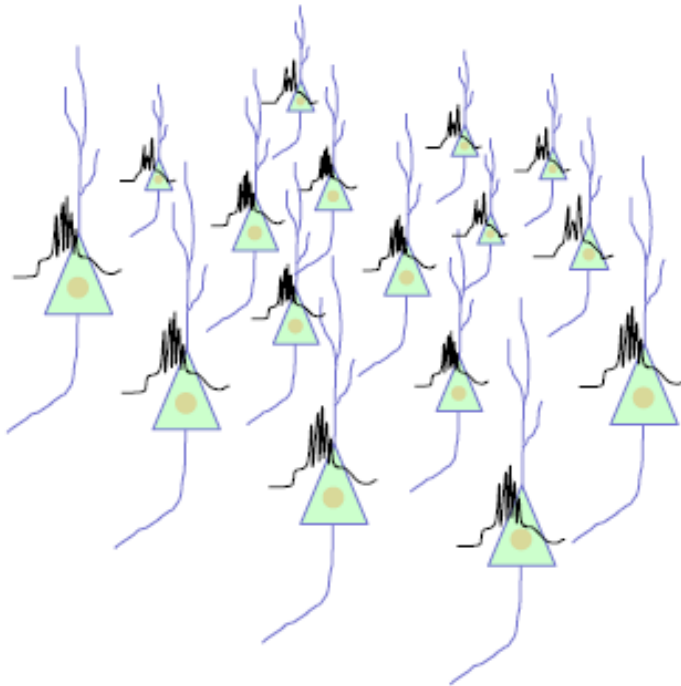
a "train" of  
action potentials





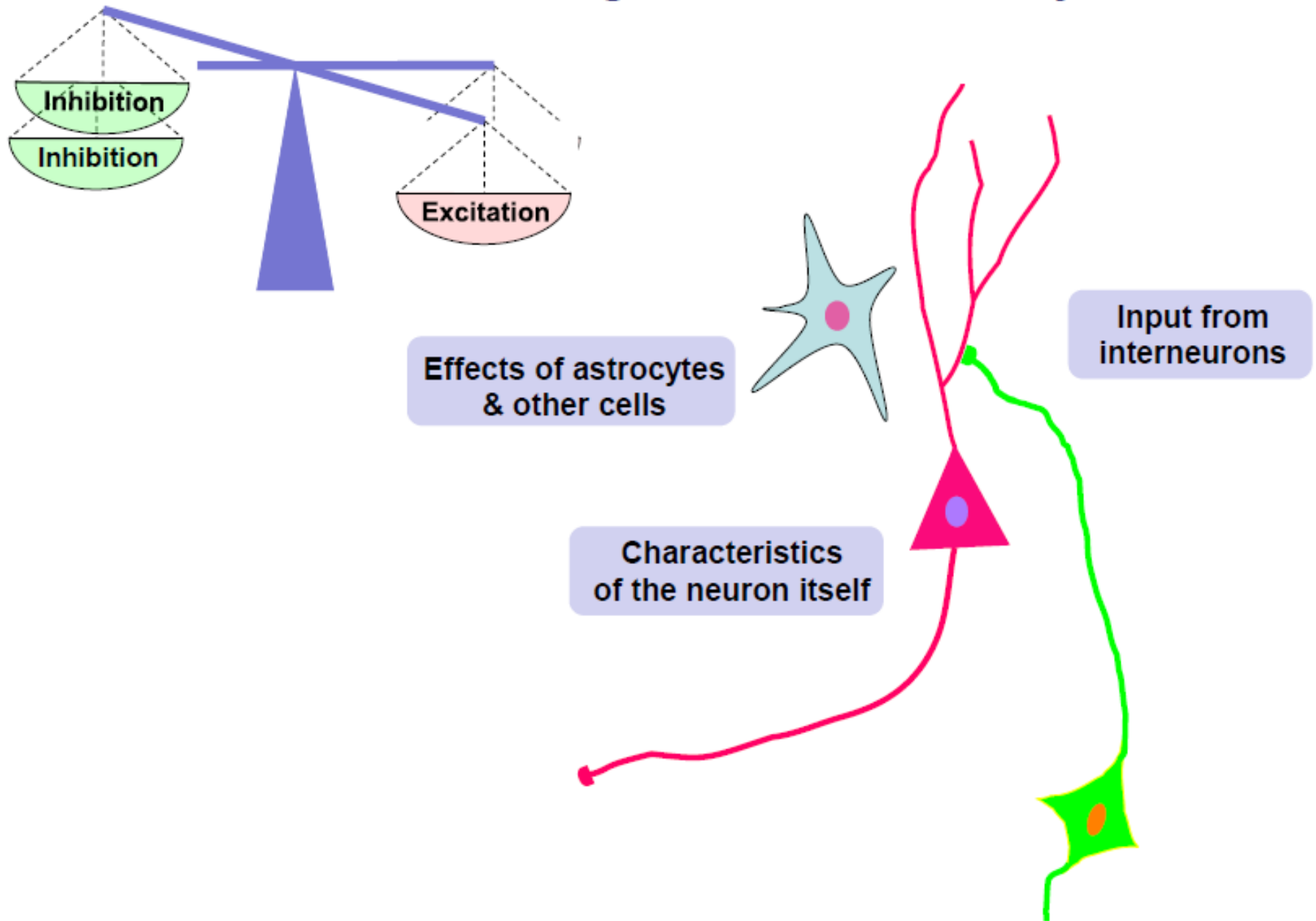
# Seizure

A paroxysmal derangement of cerebral function due to uncontrolled, excessive discharges from an aggregate of neurons



**Hyperexcitability**  
+  
**Hypersynchronization**

# Factors Affecting Network Excitability





# Epilepsy

A tendency toward recurrent seizures

## Epileptogenesis

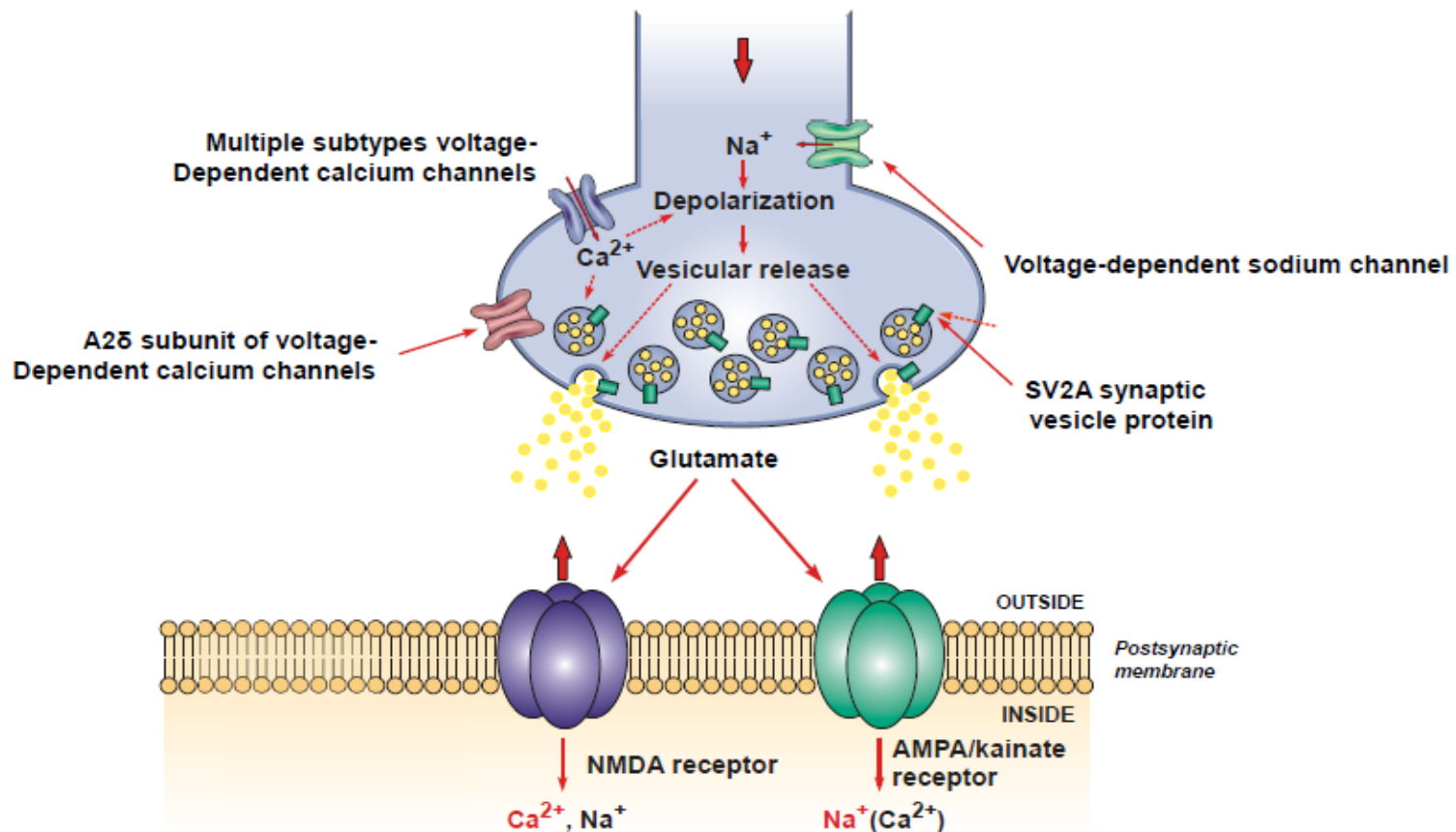
The sequence of events that turns a normal neuronal network into a hyperexcitable network

### *Causes of epilepsy:*

- Brain injury (trauma, stroke)
- Tumor
- Genetic
- Developmental (acquired and genetic)
- Infection
- Metabolic (endogenous and exogenous)

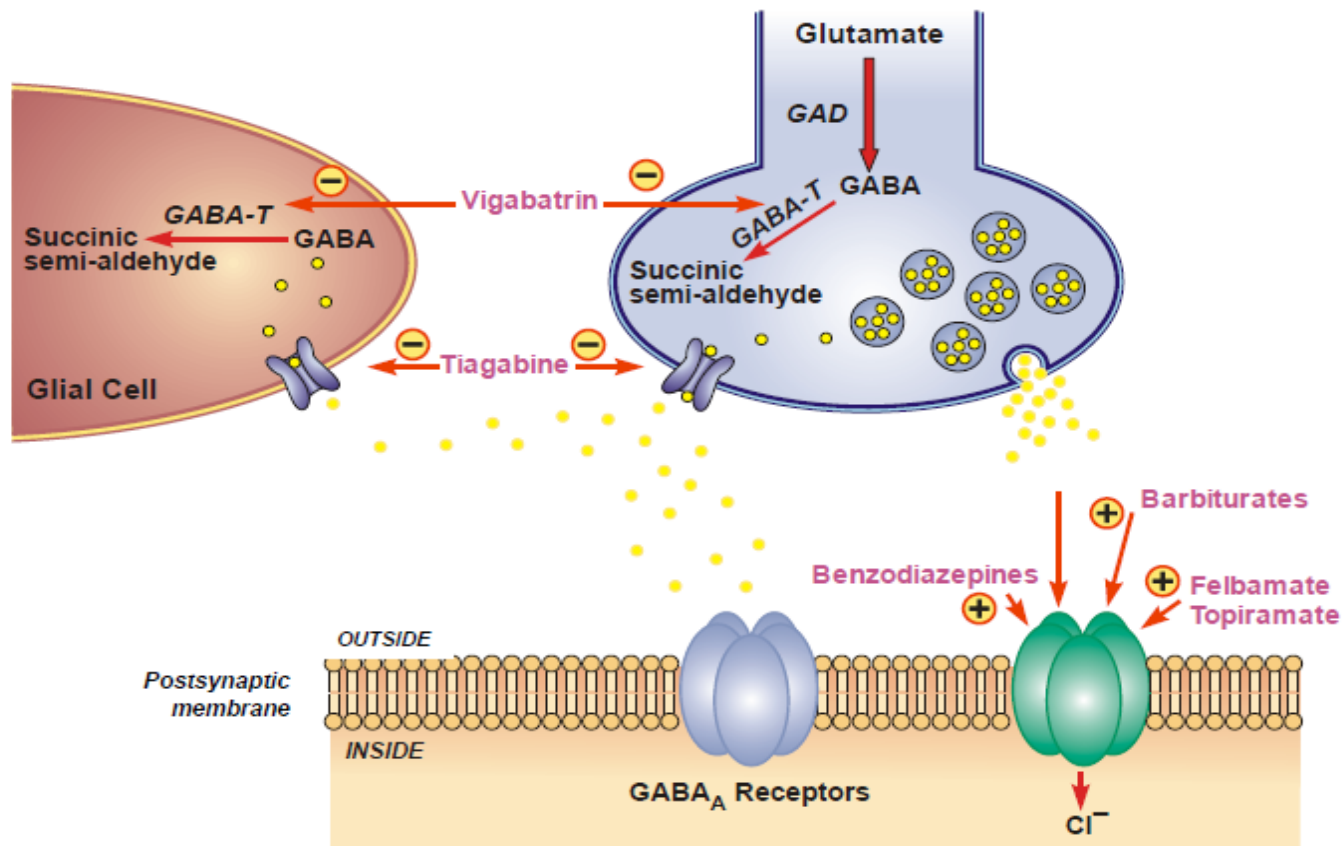
# Mechanism of Current Anti-Epileptic Drugs

## Excitatory Synapse in the CNS and Putative Major Sites of Action of AEDs



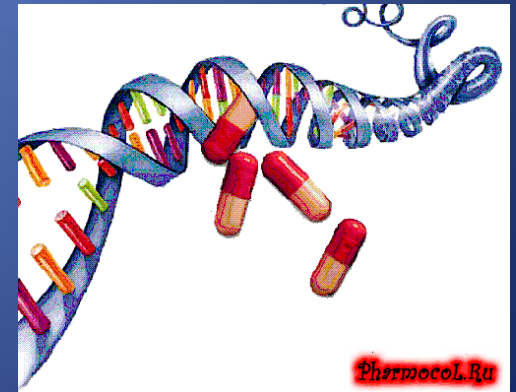
# Mechanism of Current Anti-Epileptic Drugs

## *Inhibitory Synapse in the CNS and the Putative Major Sites of Action of Various AEDs*



# Personalized Medicine

- Also known as Precision Medicine
- Inherited genetic variation to drugs
  - Pharmacogenetics
- Genomic responses to drugs
  - Pharmacogenomics



# Main Goals of Precision Medicine

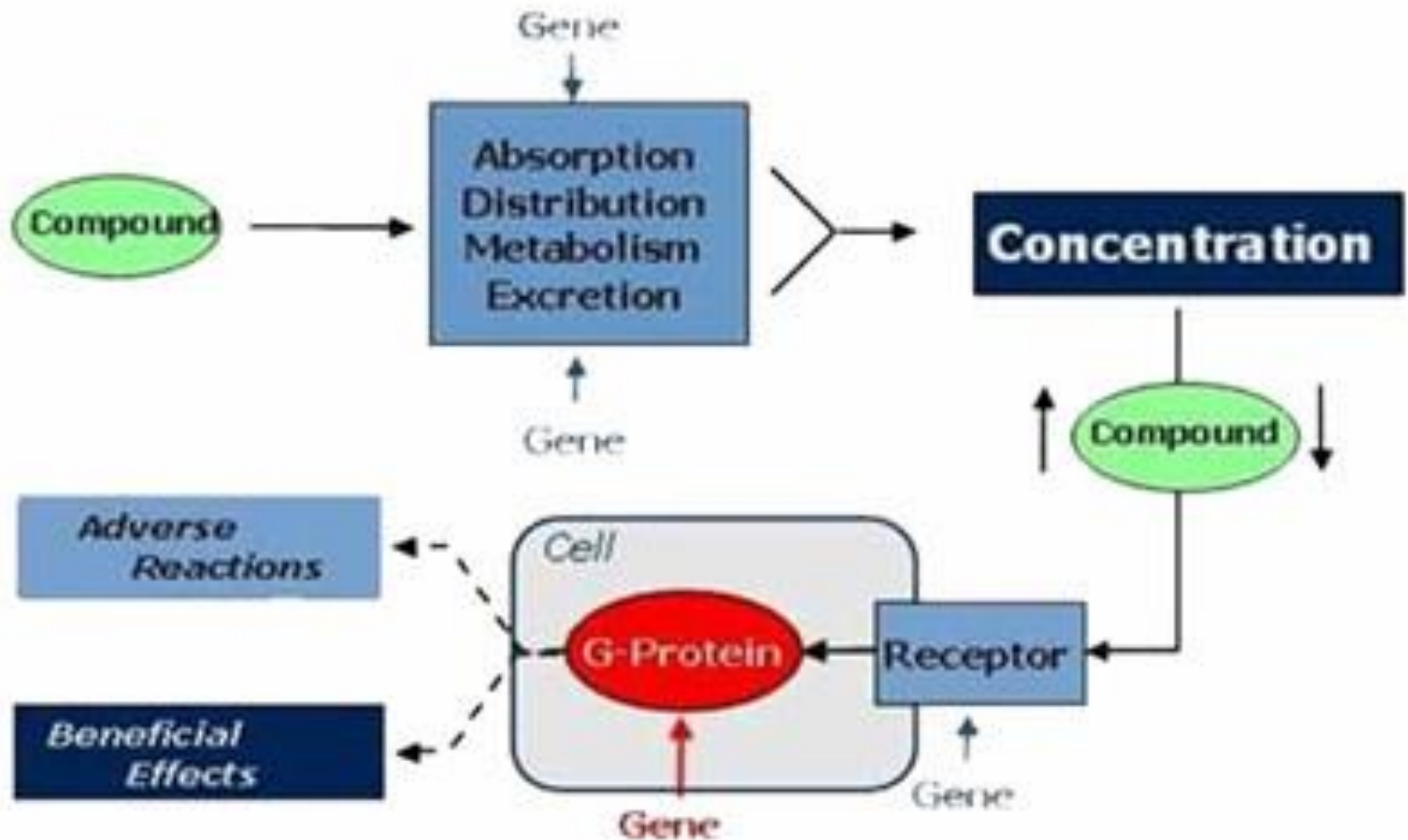
- To determine which medication will respond or not respond to a specific patient.
- To determine which medication will cause an adverse event to a specific patient.
- To determine which medication will modify the course of the disease.

# The Future: Pharmacogenetics and “Personalized” Medicine

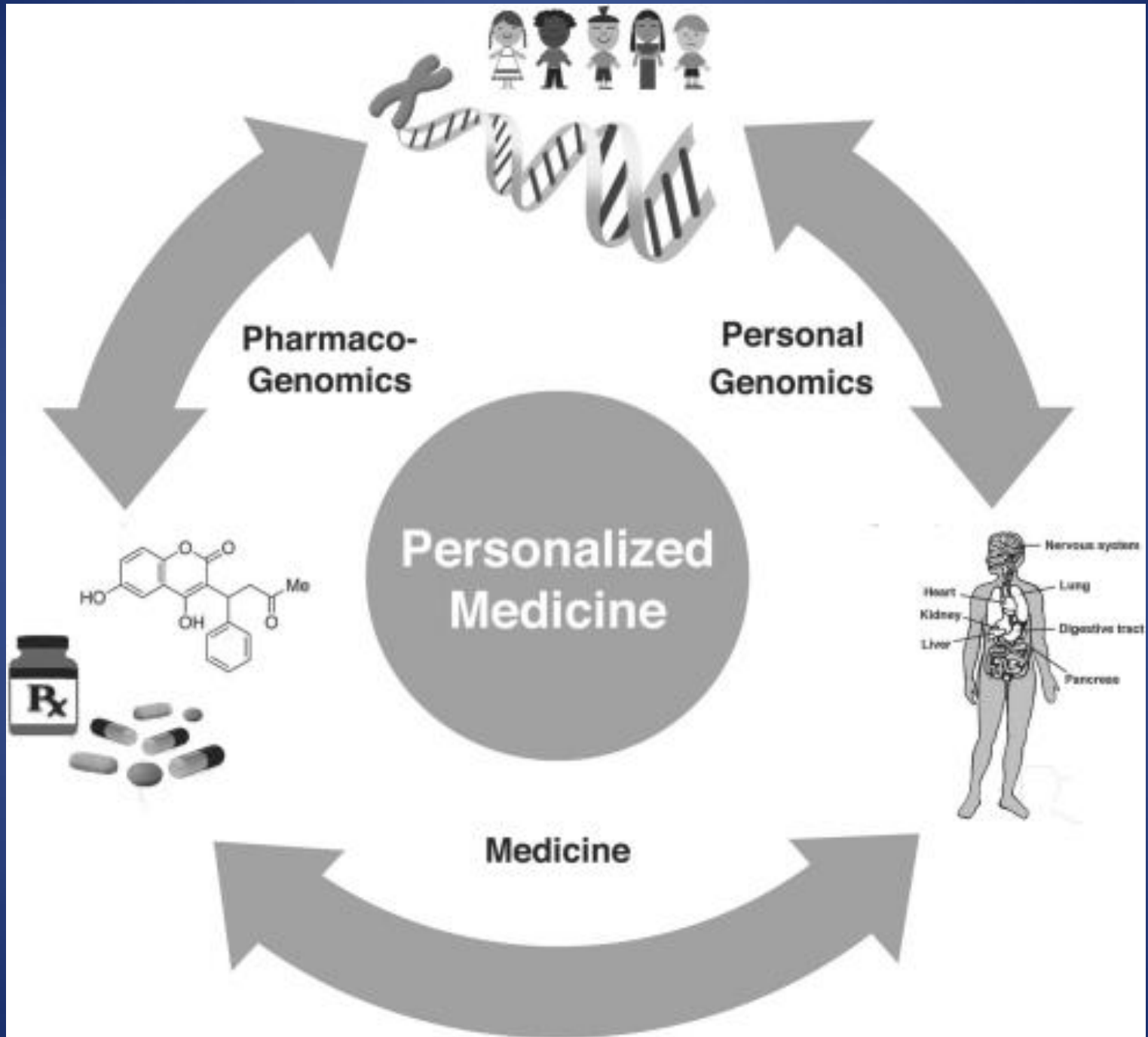


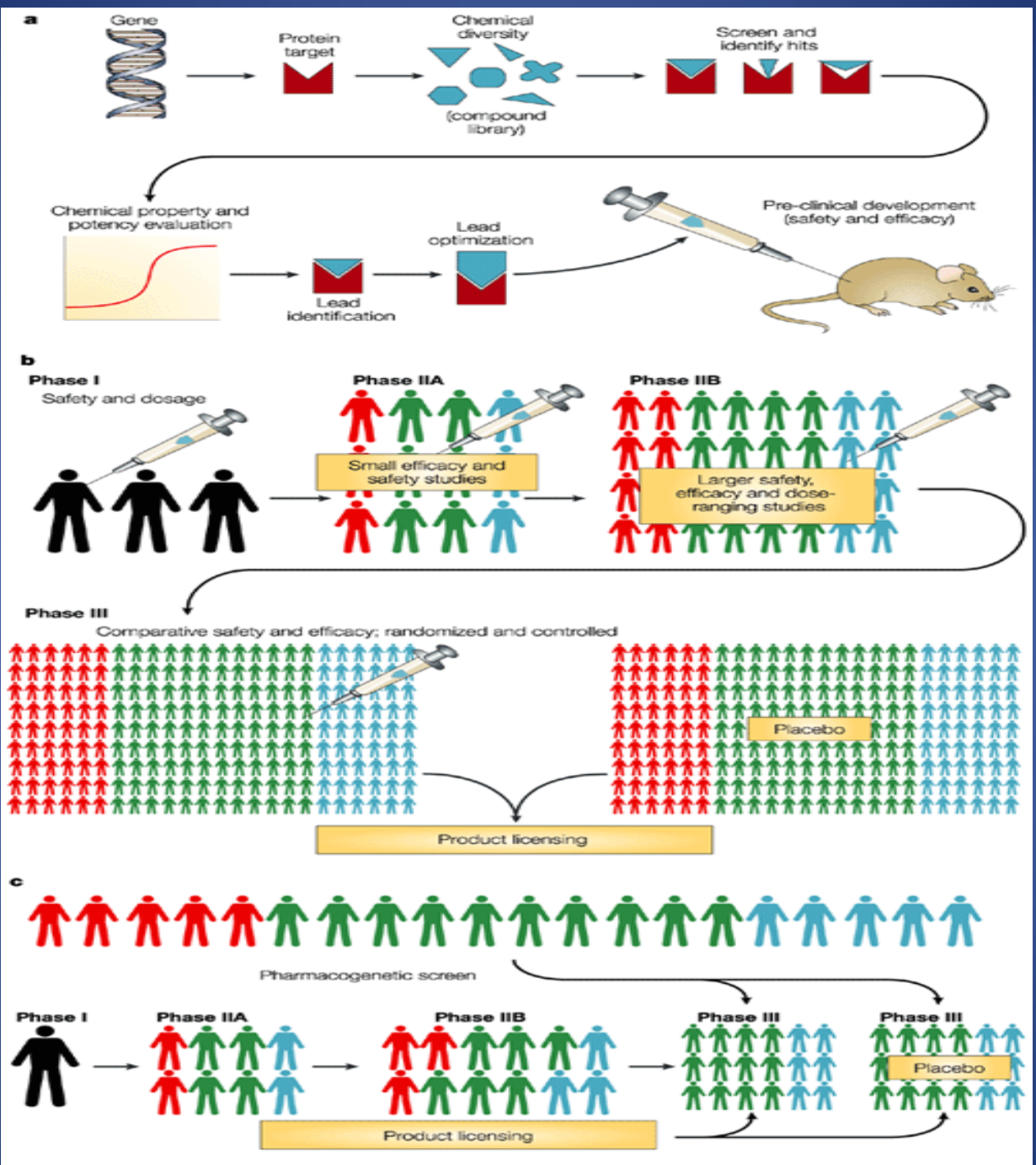


# Genes Determine Drug Effects



# Examples of Pharmacogenetics





Thank You