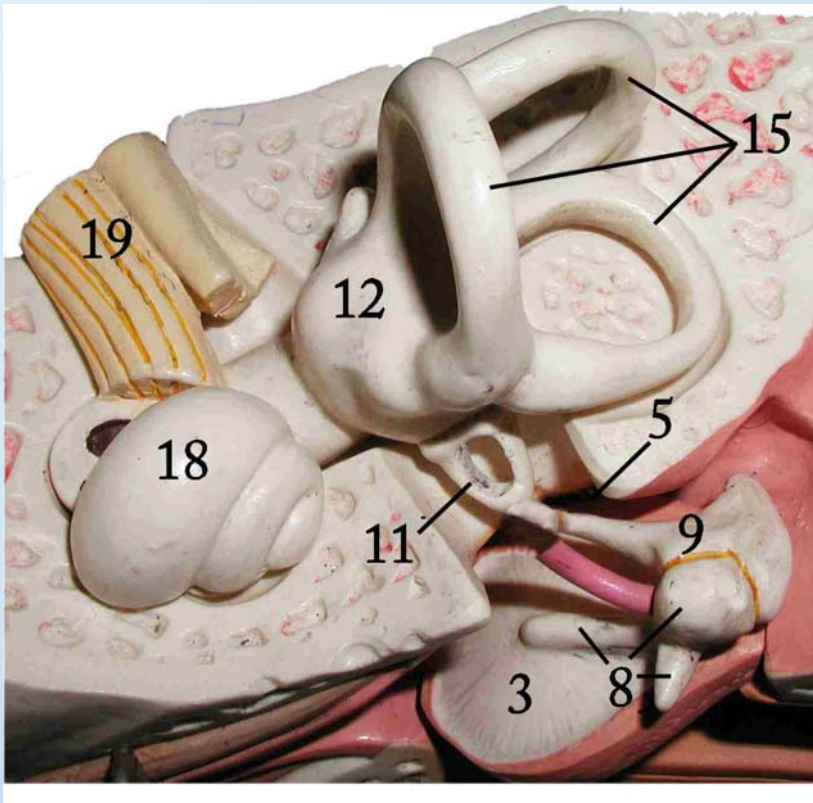
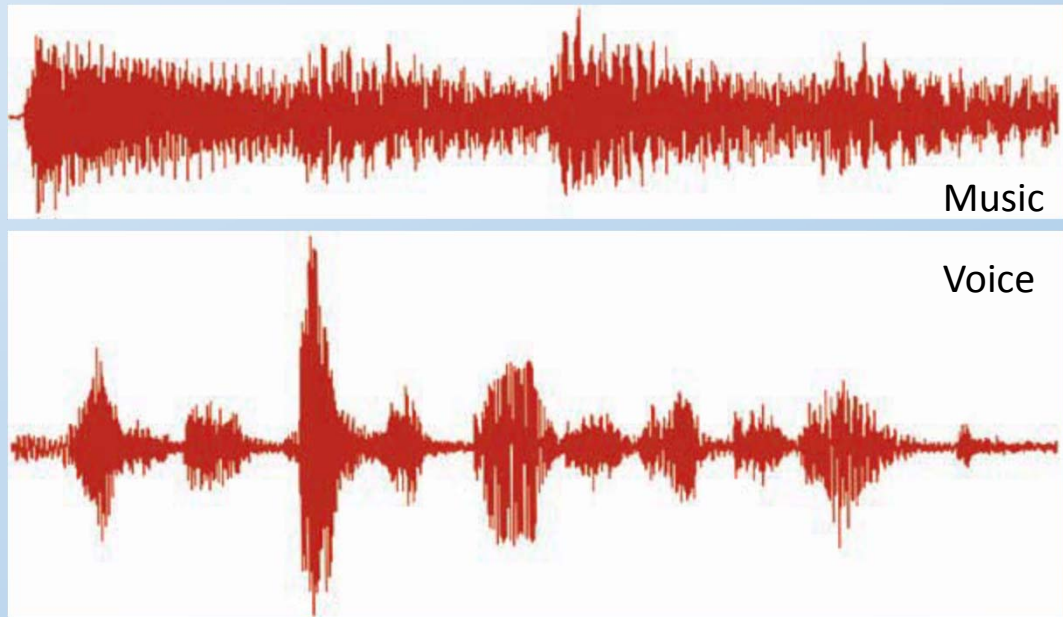
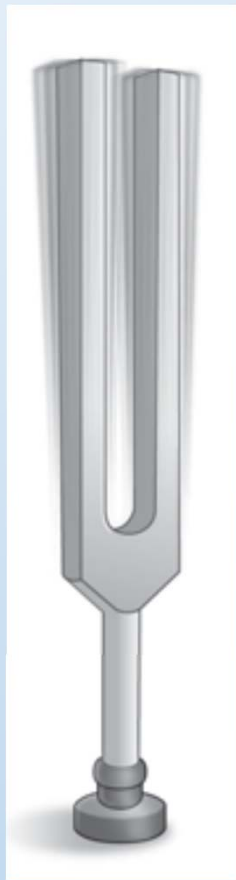


听觉系统

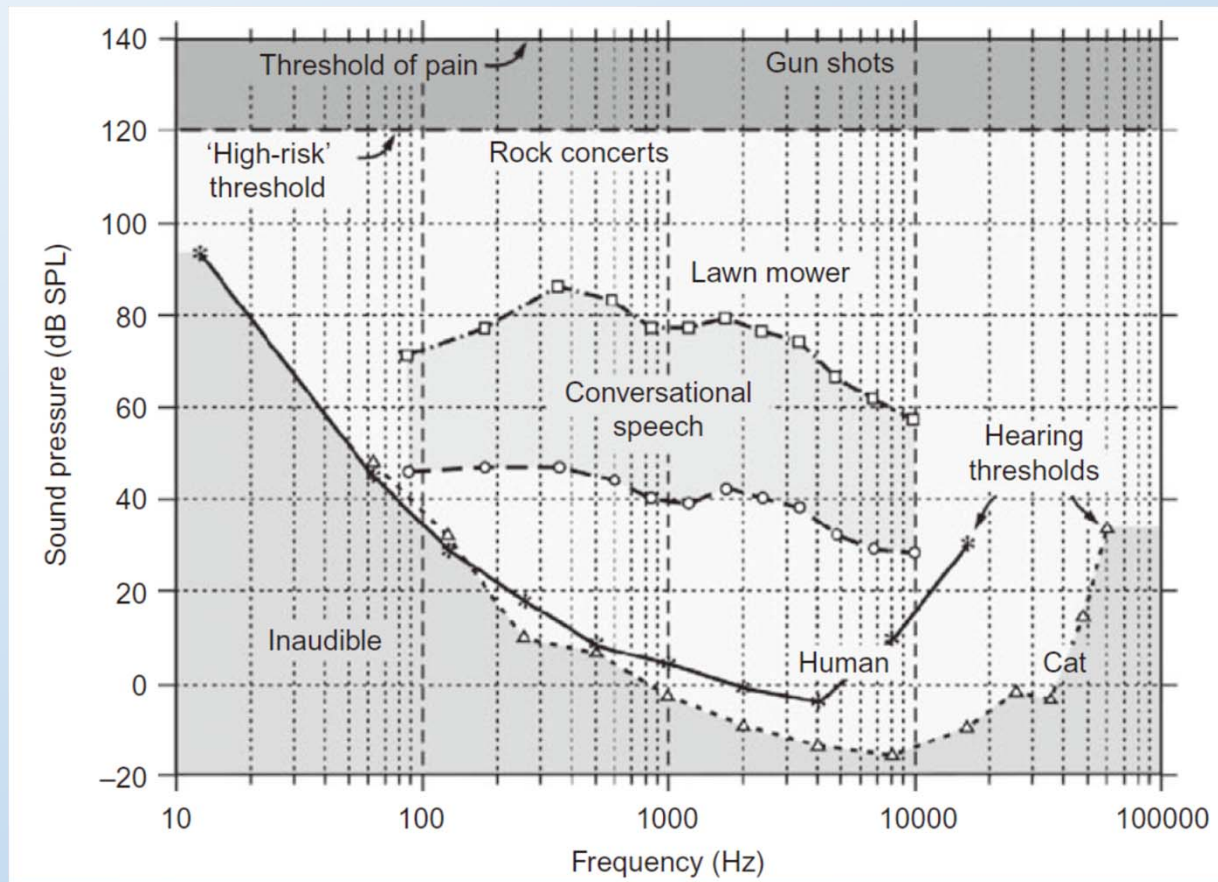


声音 = 一定频率的空气气压变化.

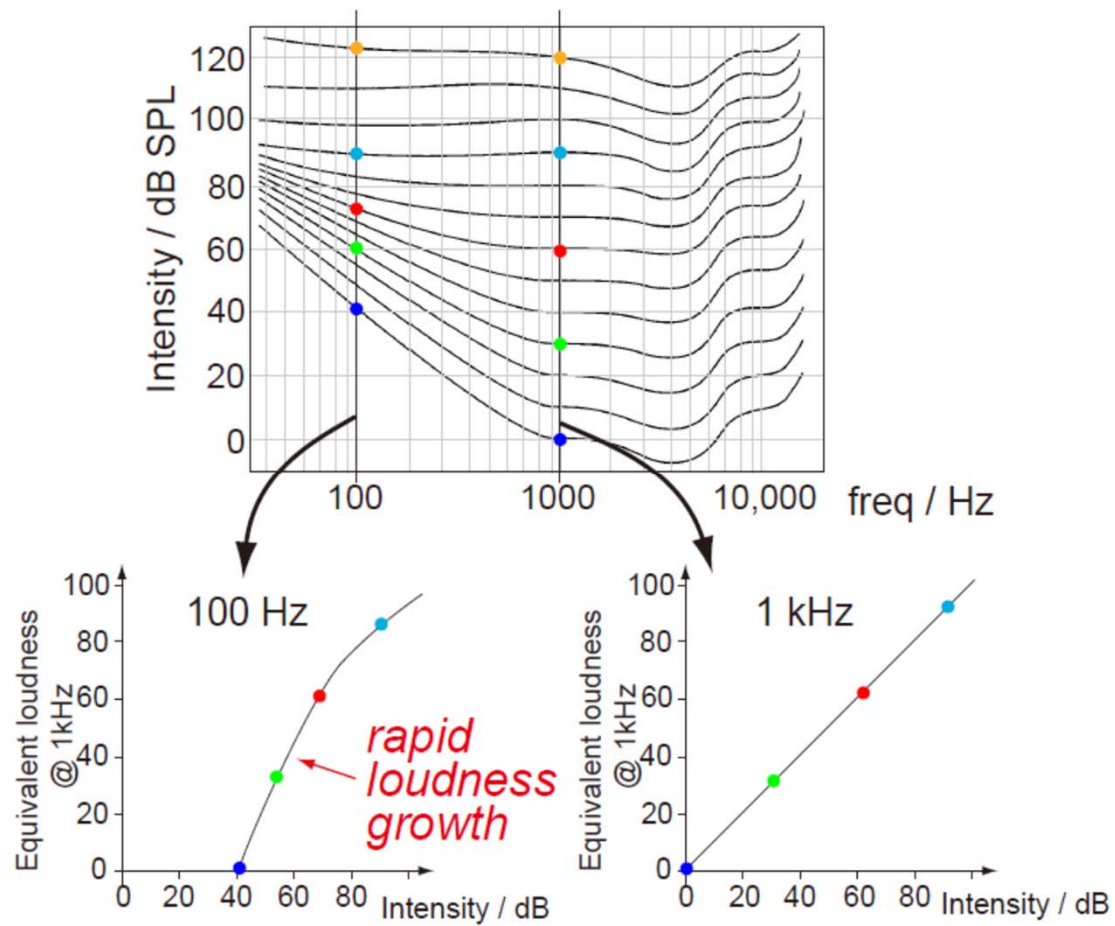
- 频率
- 强度
- 音品
- 20-20000 Hz



听觉范围

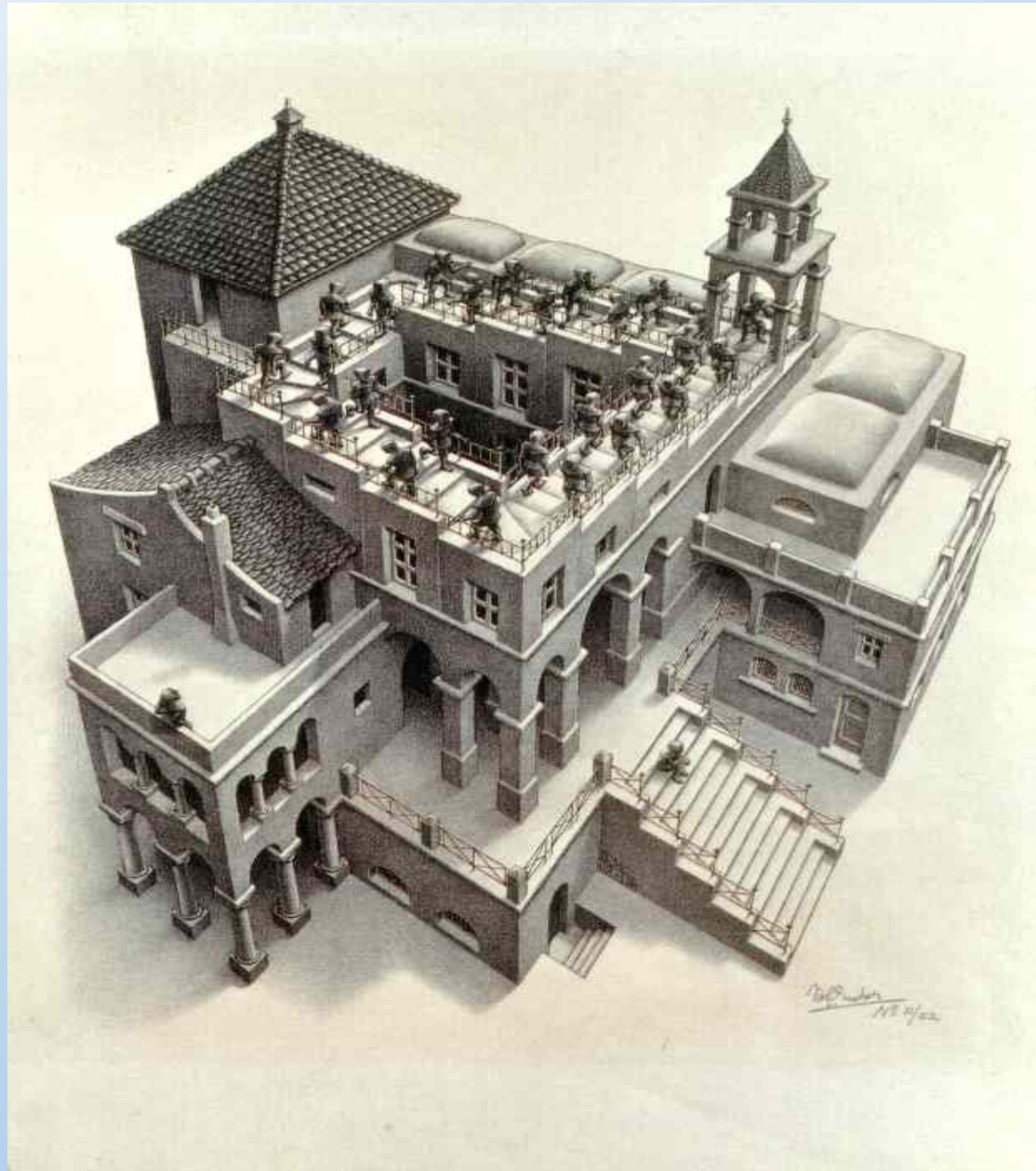


强度与音感的关系

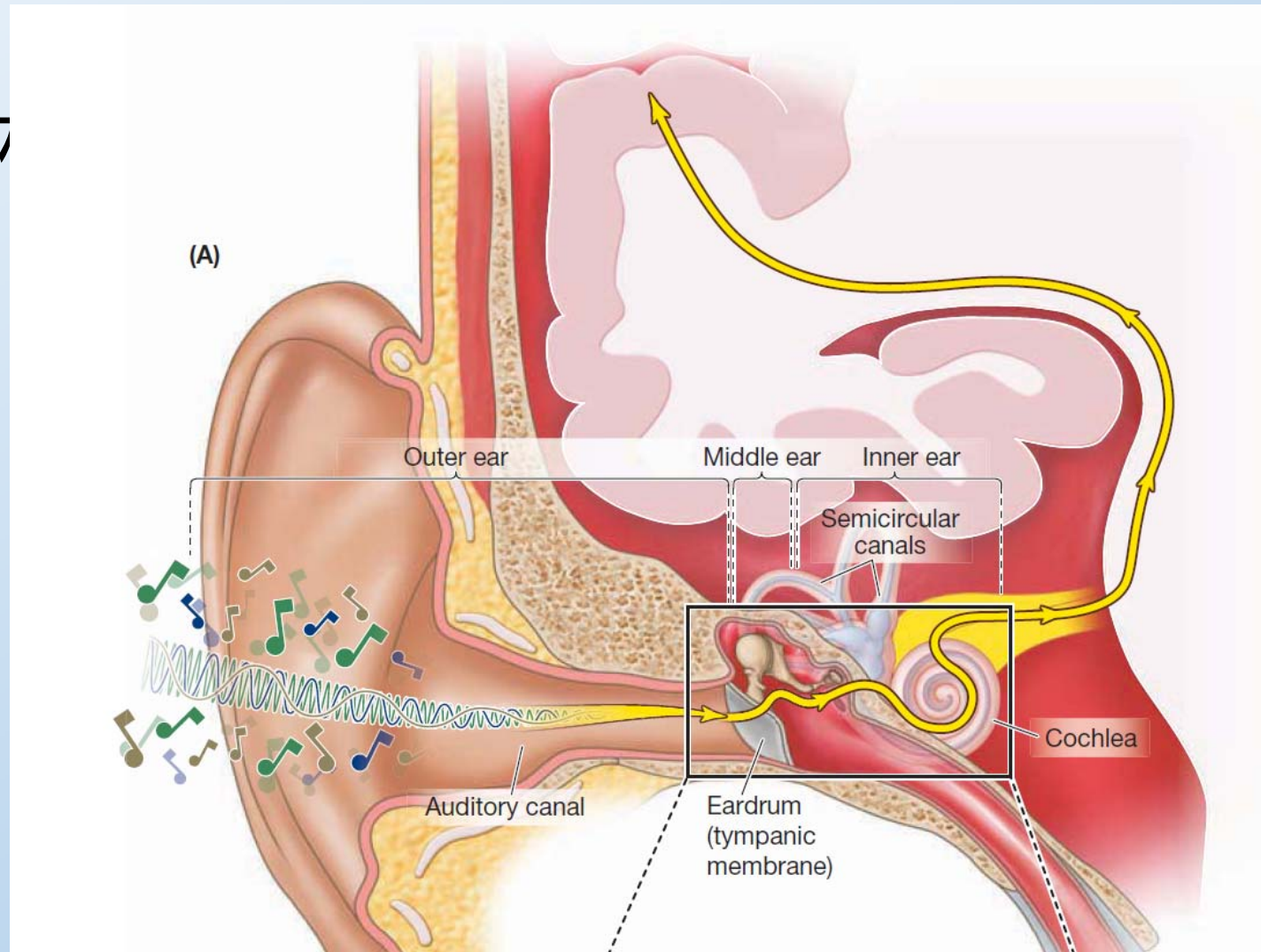


视觉与听觉的相似性(?)

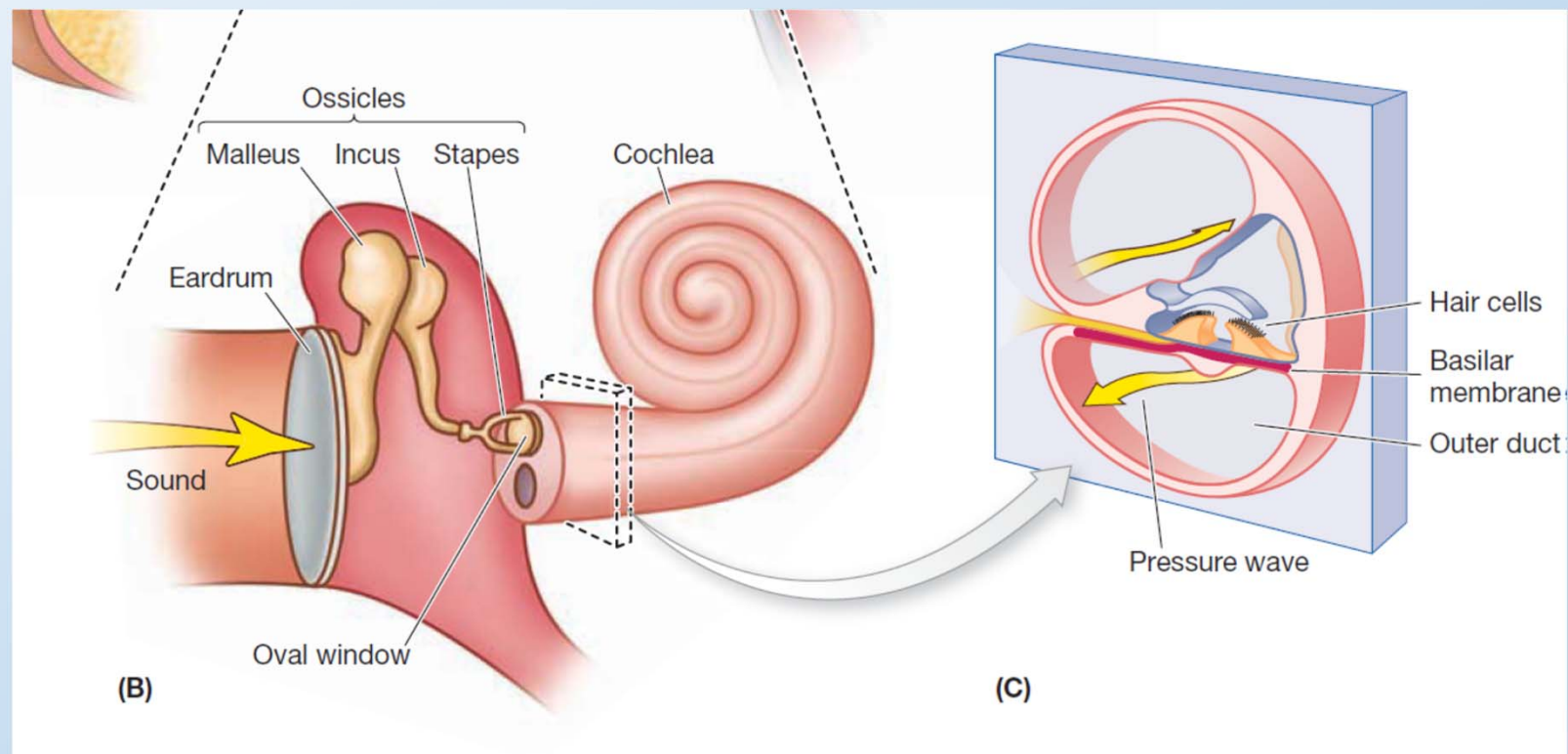
Escher's staircase and Shepard's tones



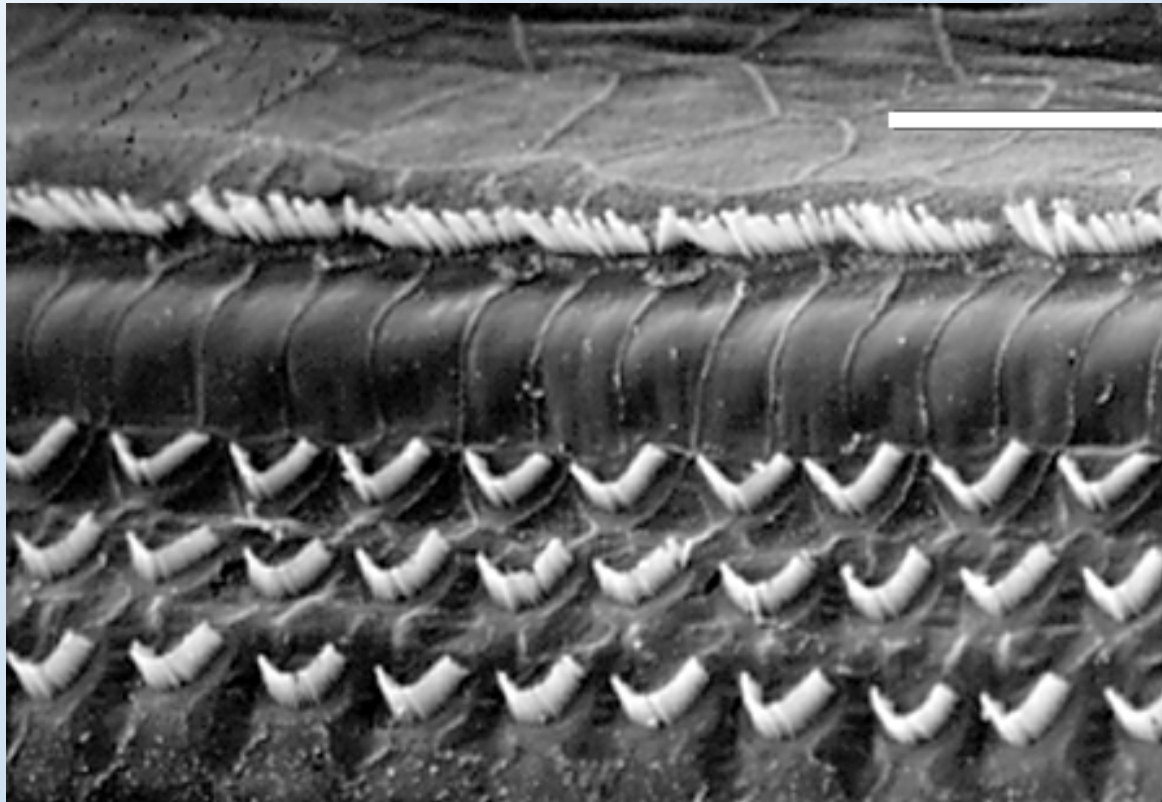
听觉系统的结



耳蜗



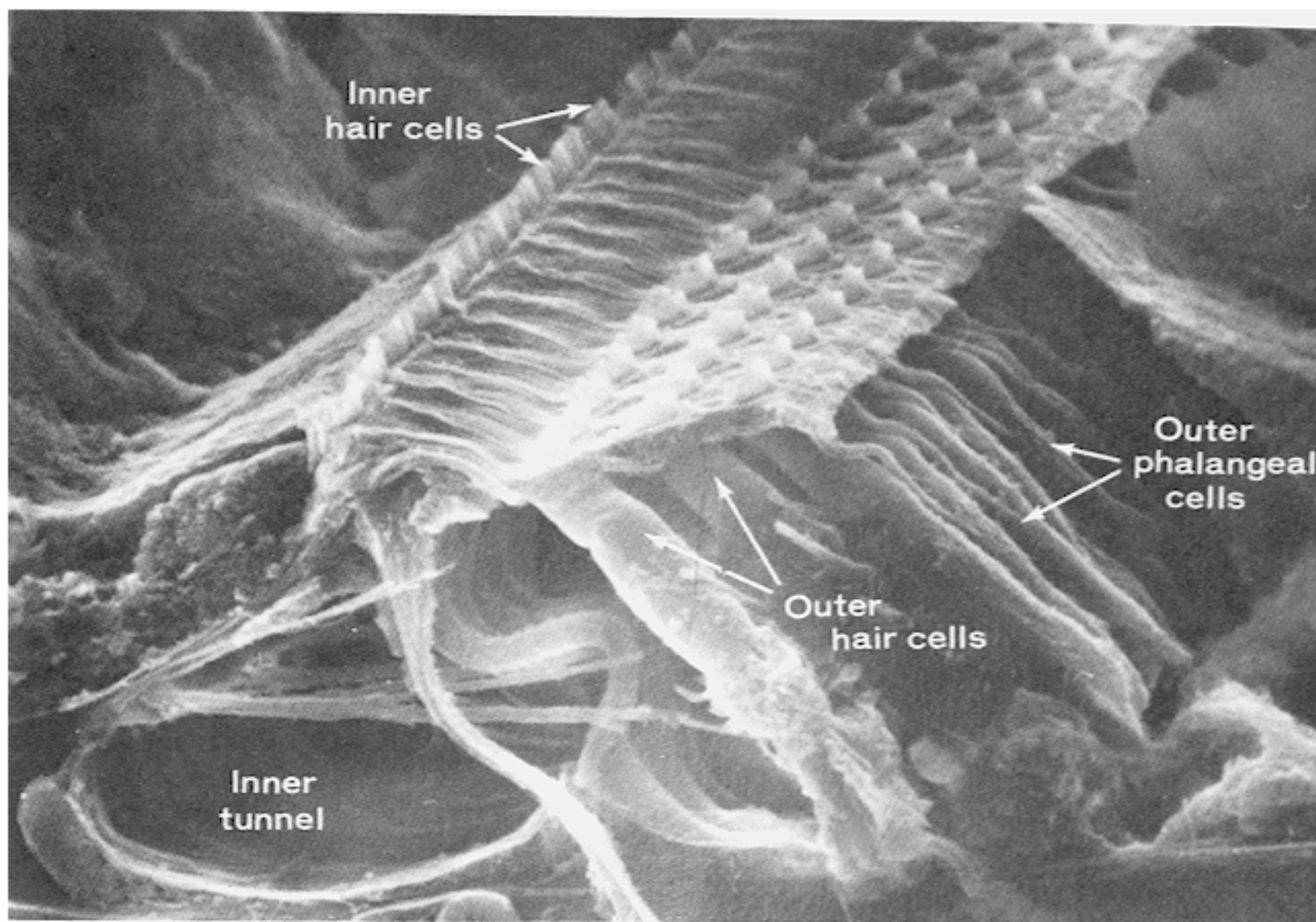
精细结构



Human ear has
~ 3500 IHCs

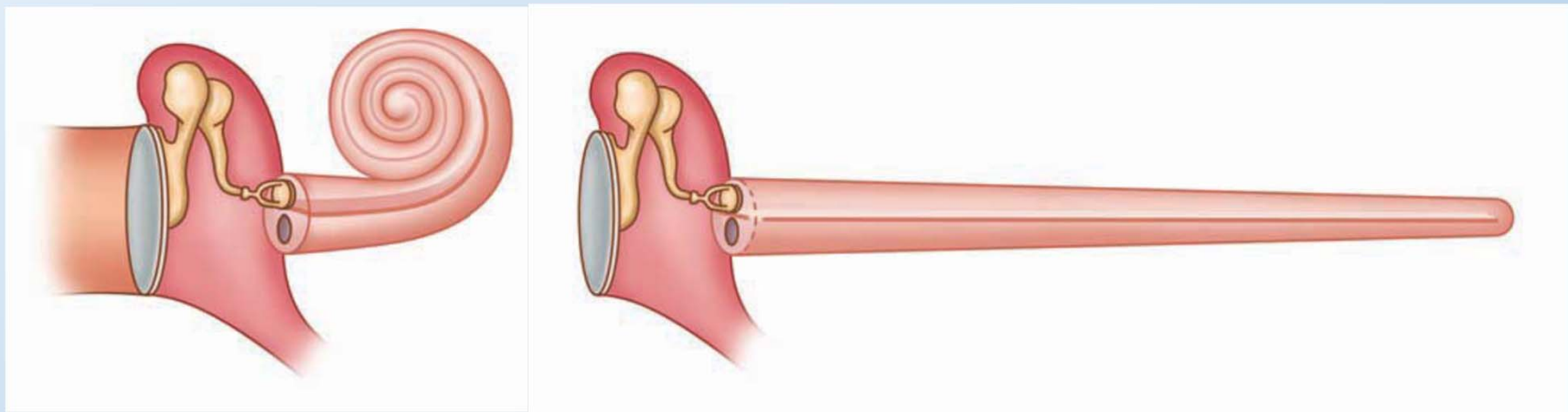
Each has ~7 connection to
auditory nerve

Auditory nerve: about
30,000 fibers in
humans

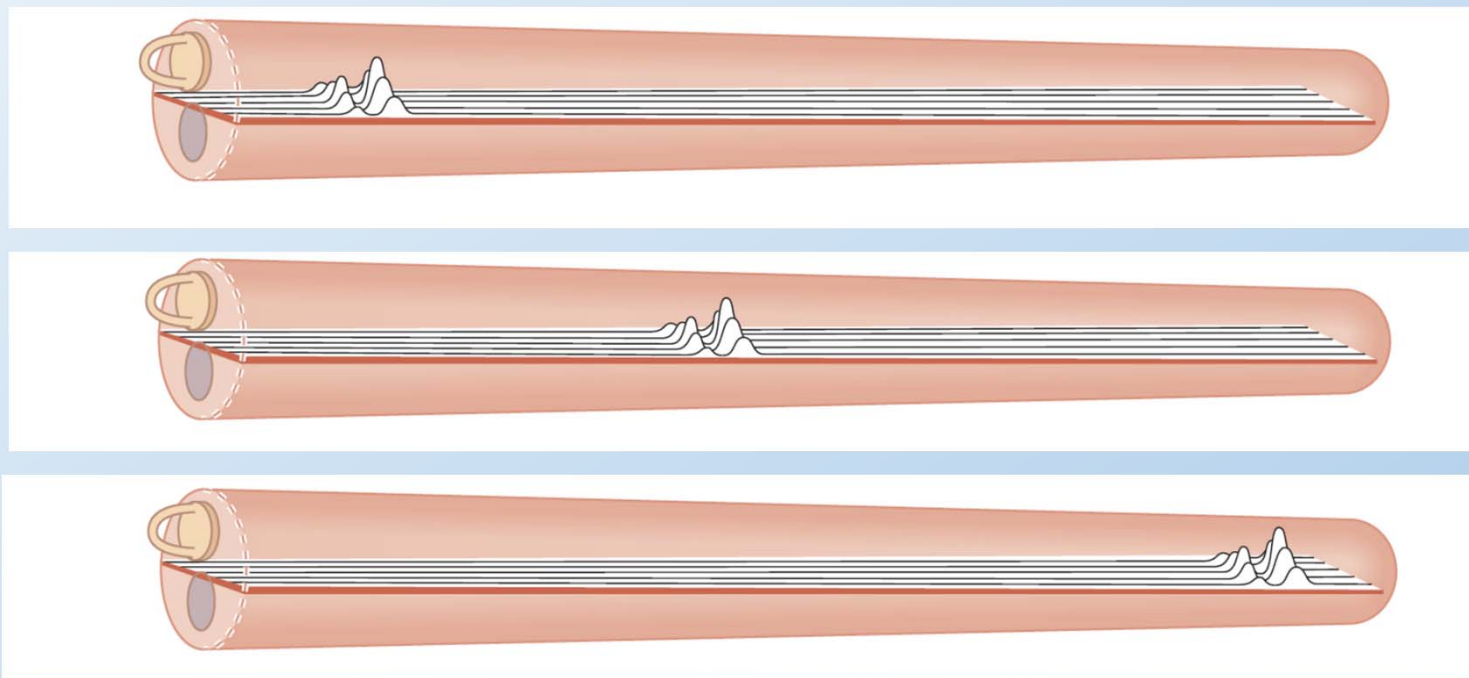




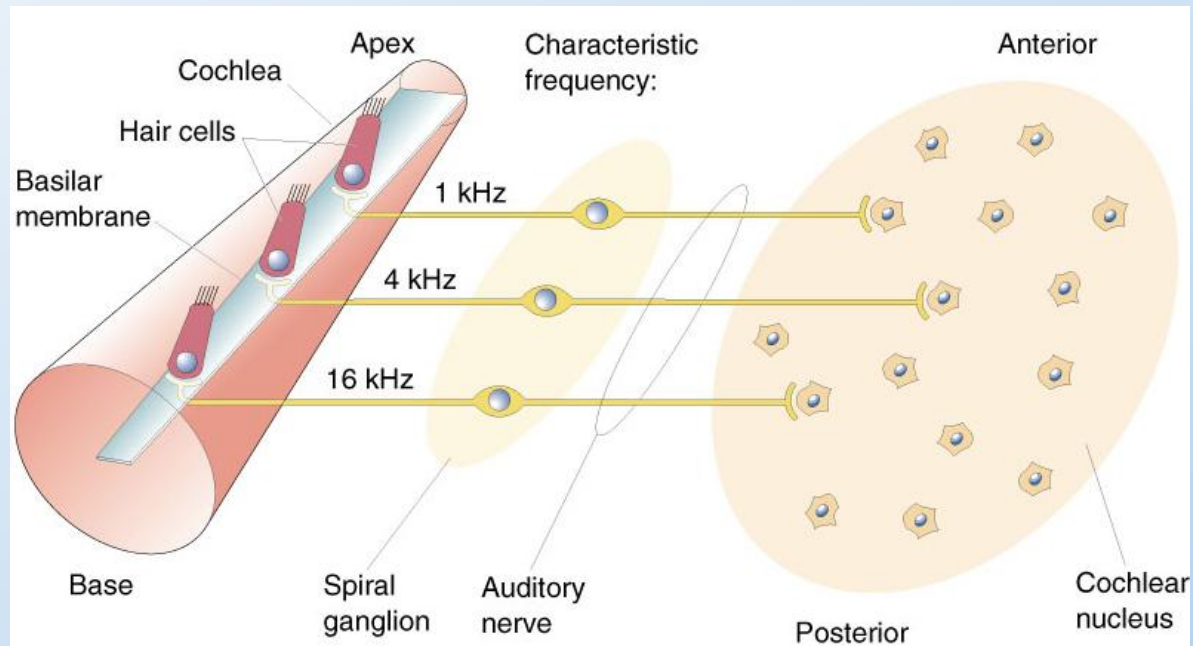
耳蜗



听觉感受方式:



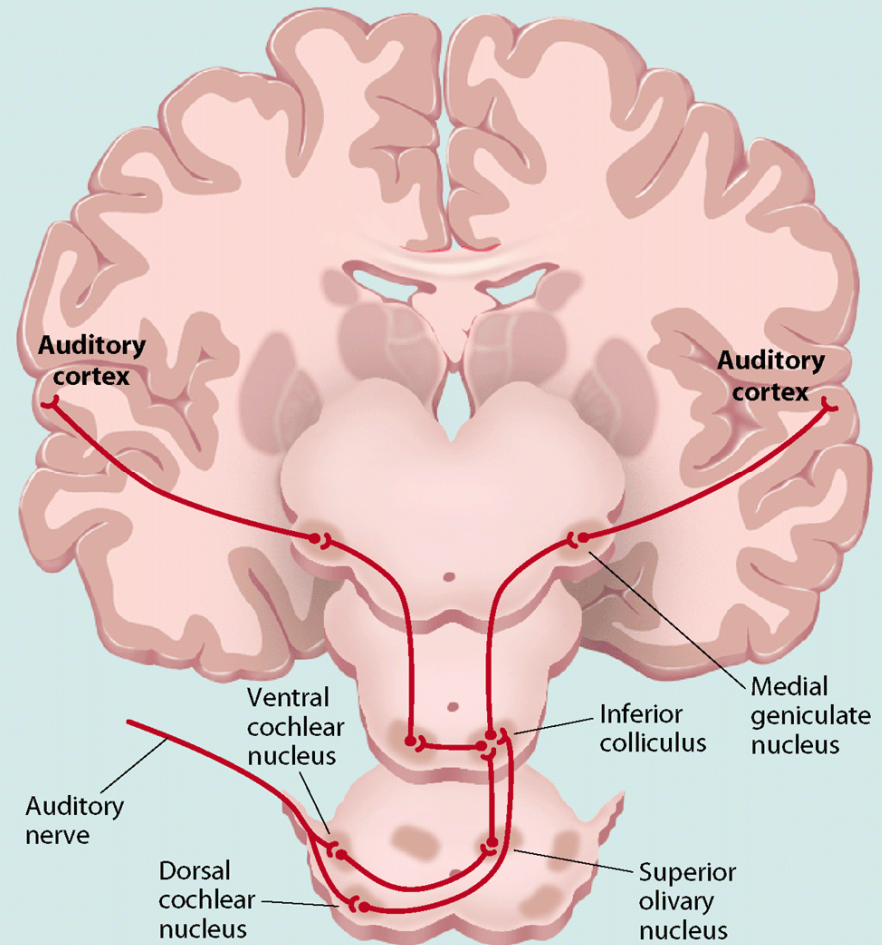
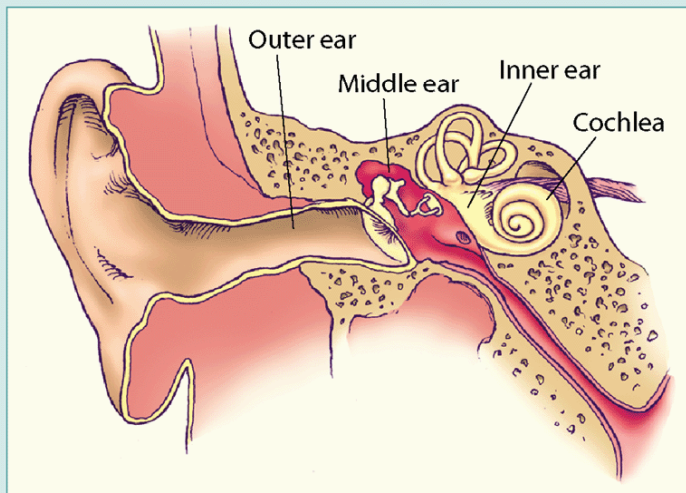
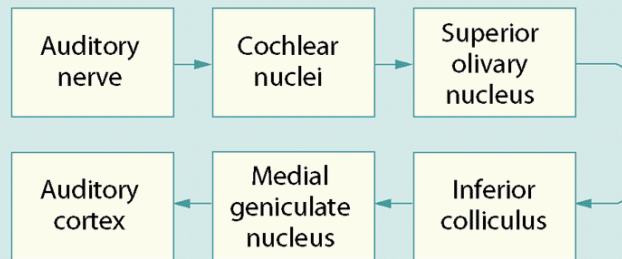
听觉系统的基础结构



听觉以频率解码

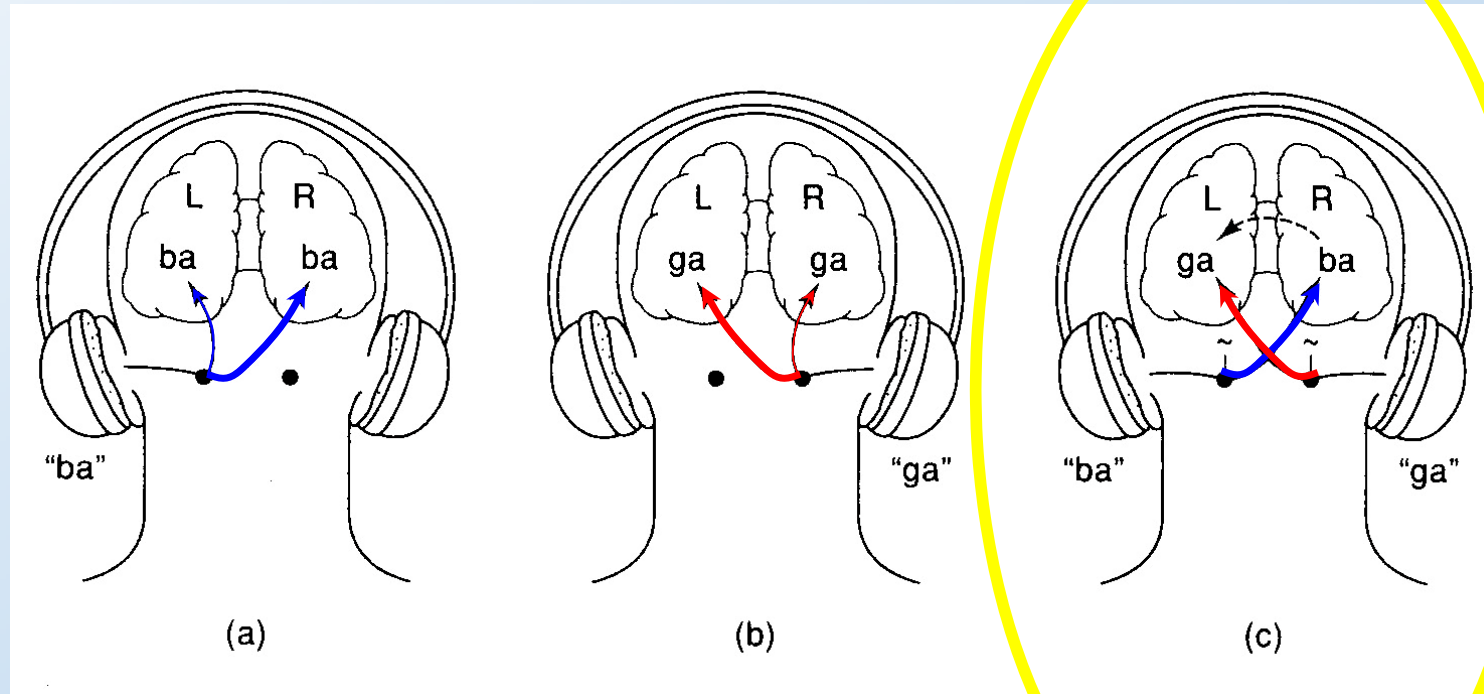
听觉脑机制

听觉通路

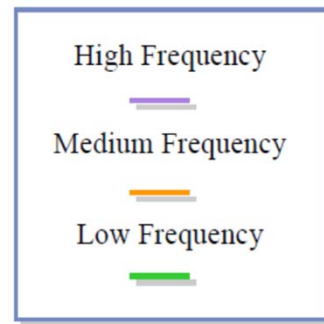


双耳听觉

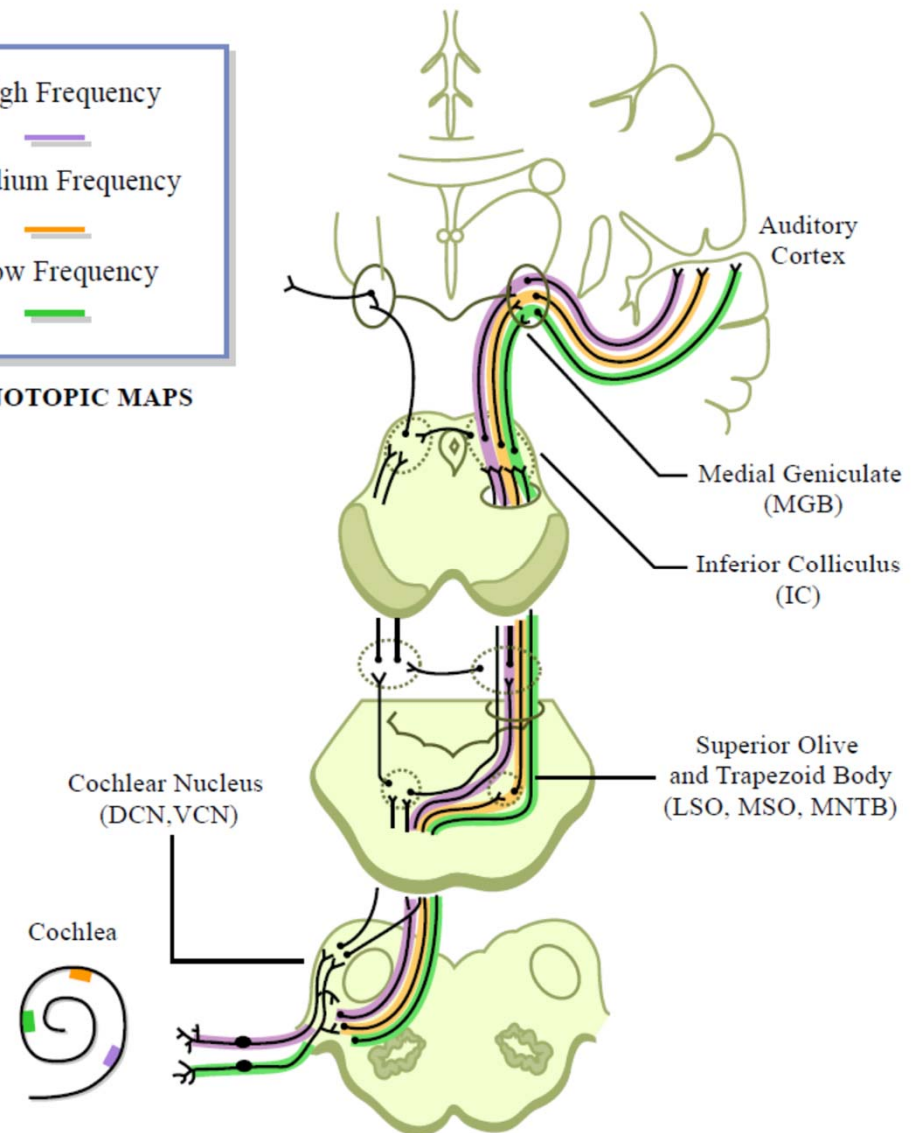
Dichotic Listening



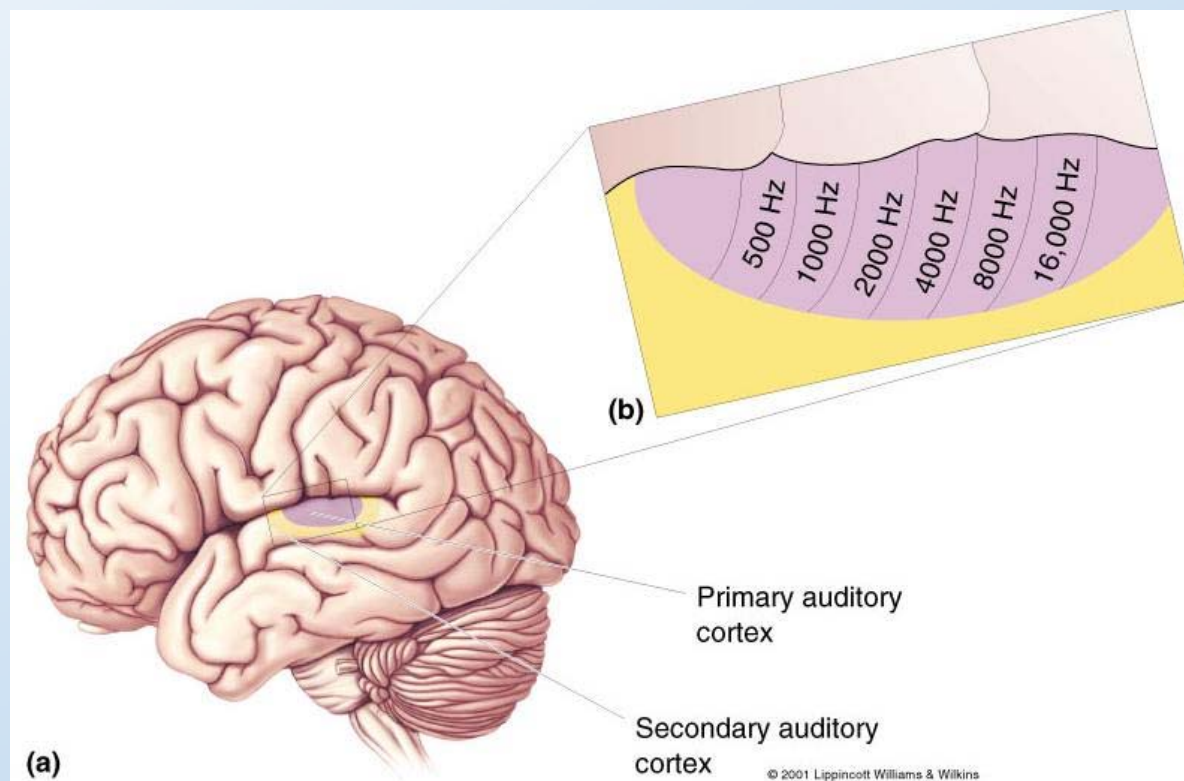
频率分布

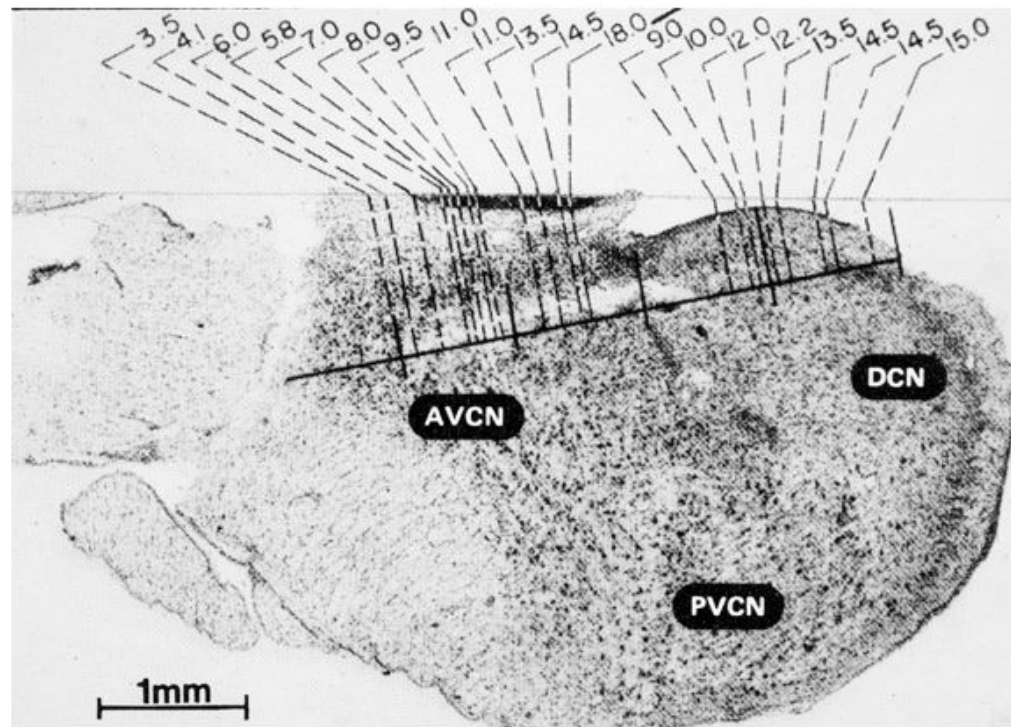


TONOTOPIC MAPS

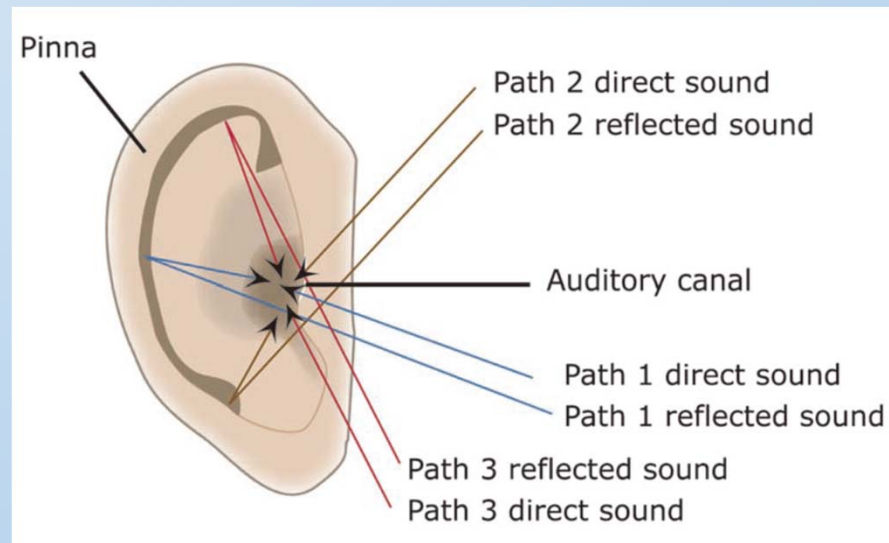
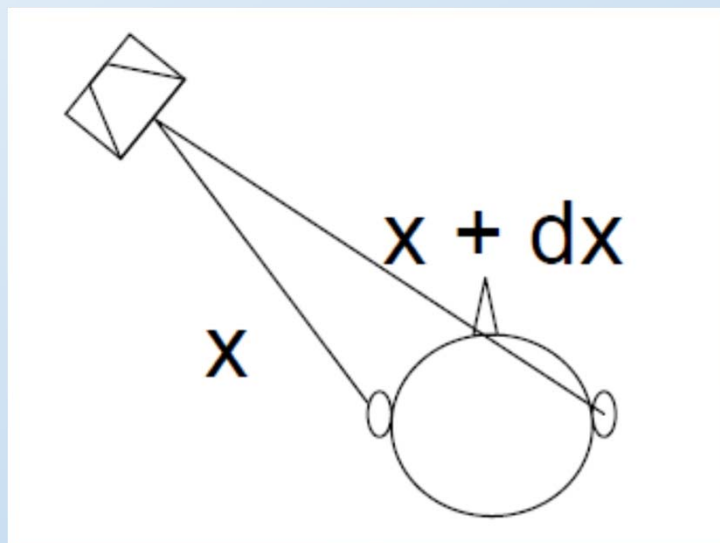


听觉皮质





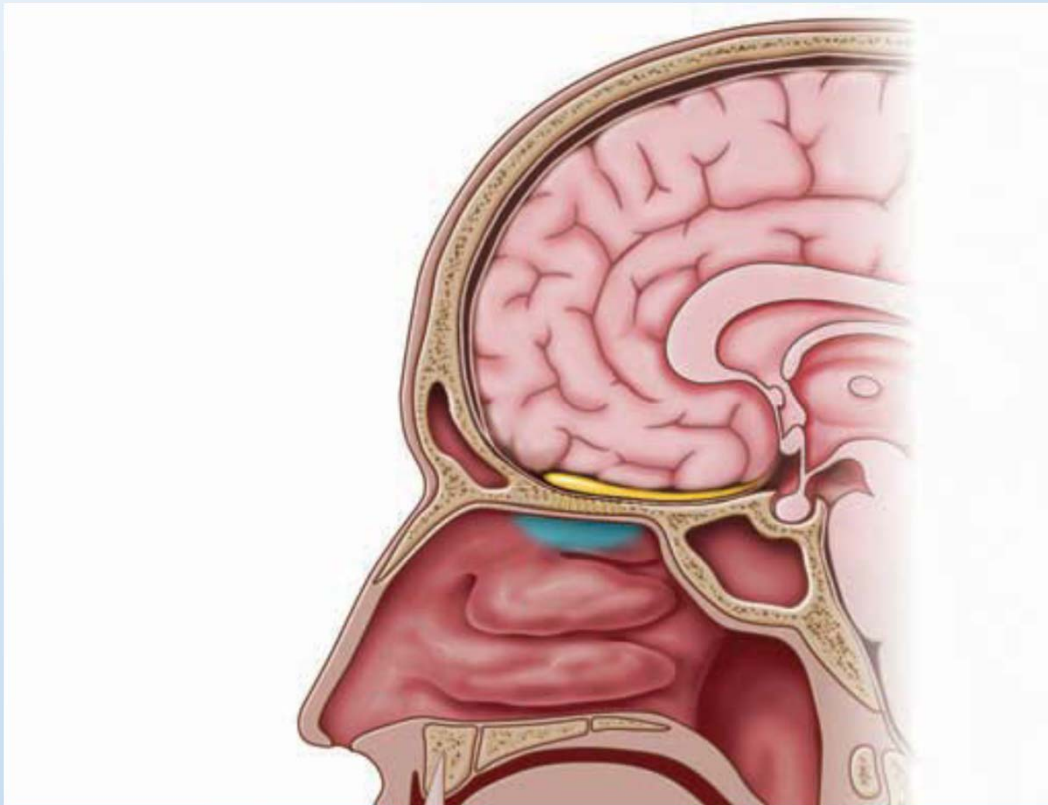
听觉的水平与垂直定位



信息冲突

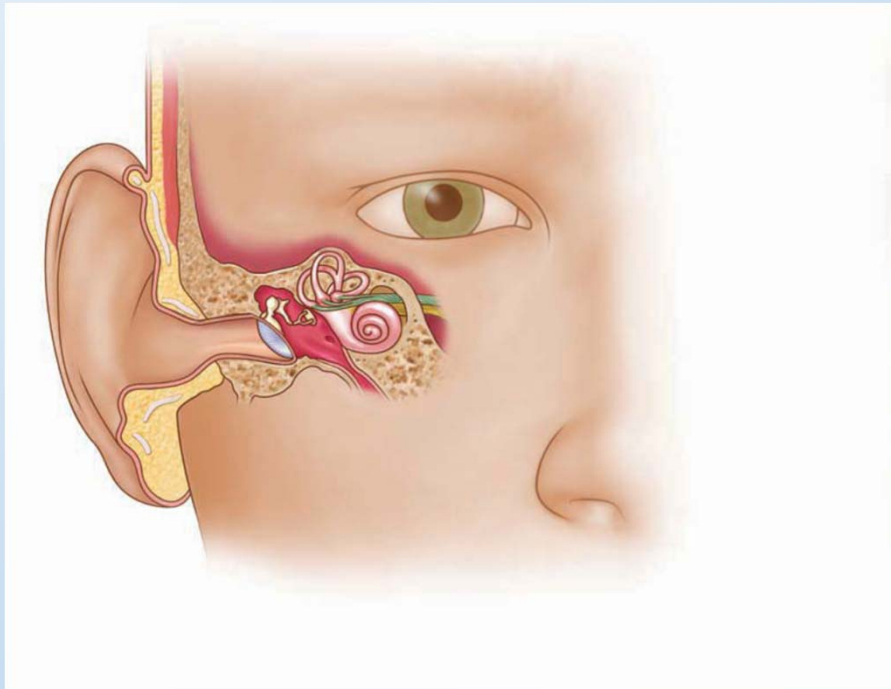
- 双眼
- 双耳
- 不同感觉器官

嗅觉

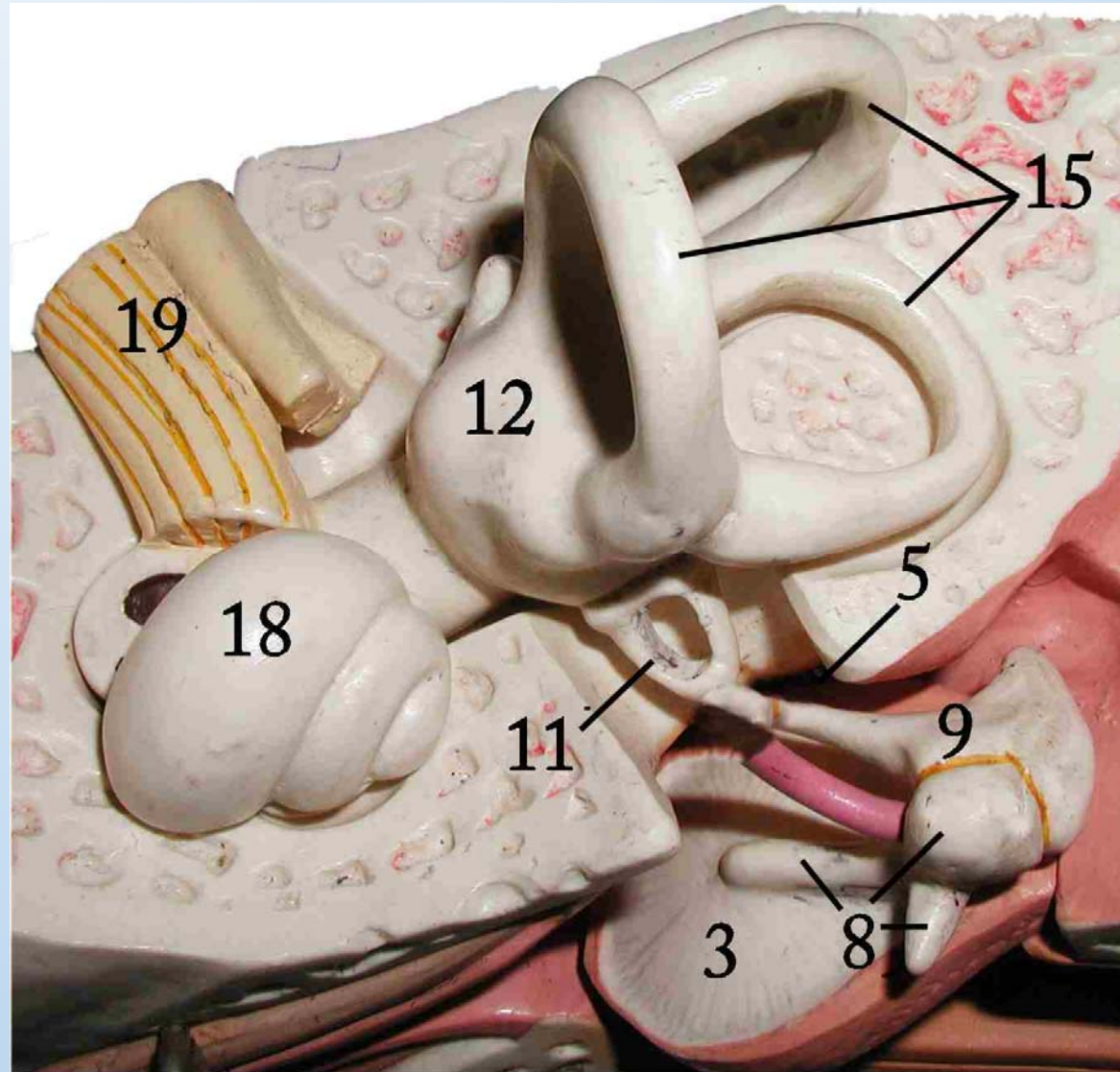


已知人有1000多种嗅觉受体，

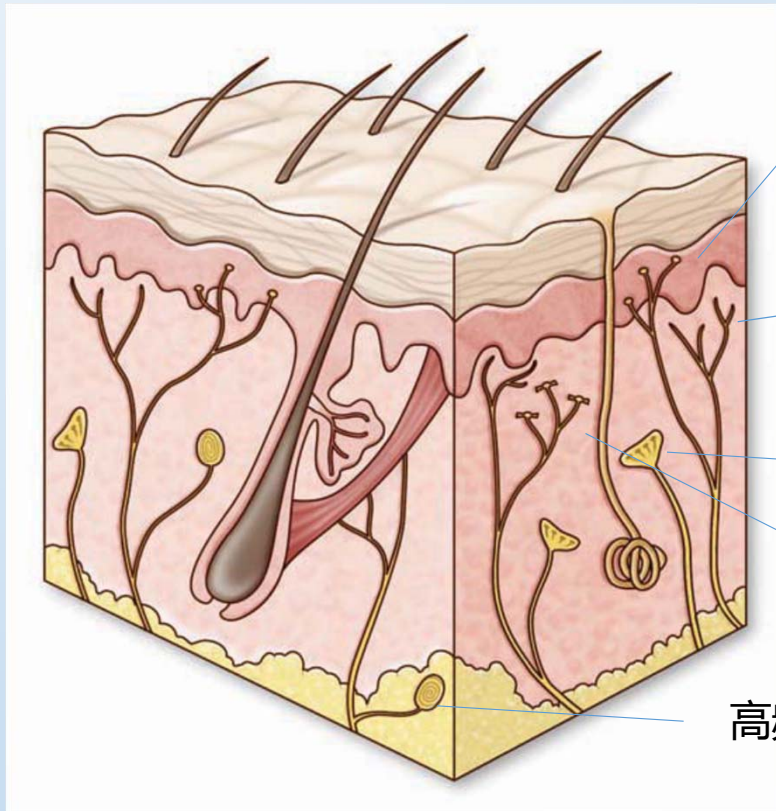
平衡觉 Vestibular sense 动觉 Kinesthesia



平衡觉



皮肤感觉



纹理与结构 (texture & Pattern)

疼痛

低频震动

Ruffini endings, 多功能：
温度，皮肤撕扯，压力

高频震动

意识

知觉、意识与思维

perception, conscious, thinking

- 知觉与意识
- 思维

知觉和意识

- 认识外界是一个非常难的任务
- 为此我们维持着一个内在的对世界的判断，简化这个过程
- 意识是一个过程

为什么认知外部世界如此之难

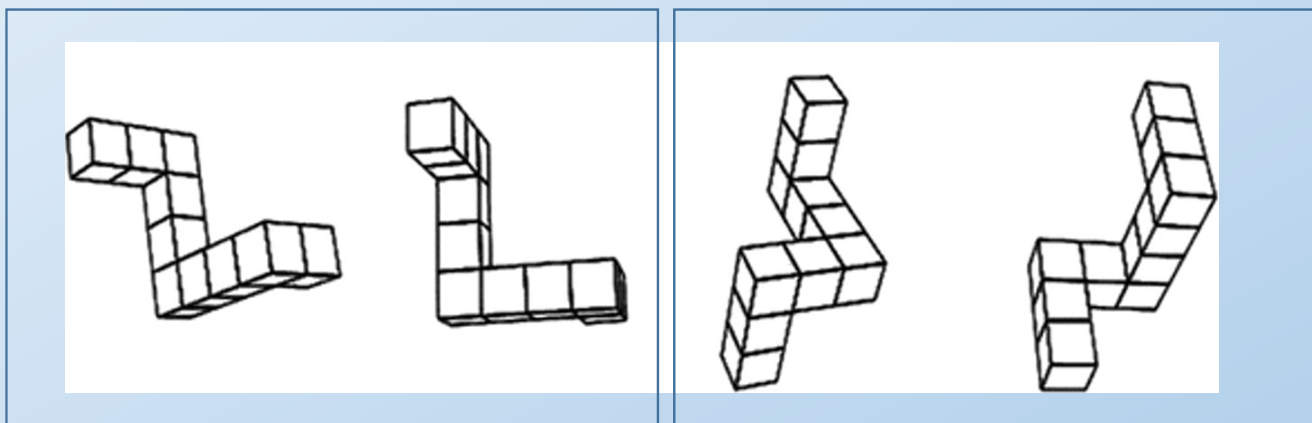
- 我们需要从 2 D 的感觉信息，重建 3 D 的世界
- 理论上是不可能的

我们的解决方法是：借助于参照

什么定义了意识

- 图灵测试
- 镜子测试

思维是一个有结构的过程



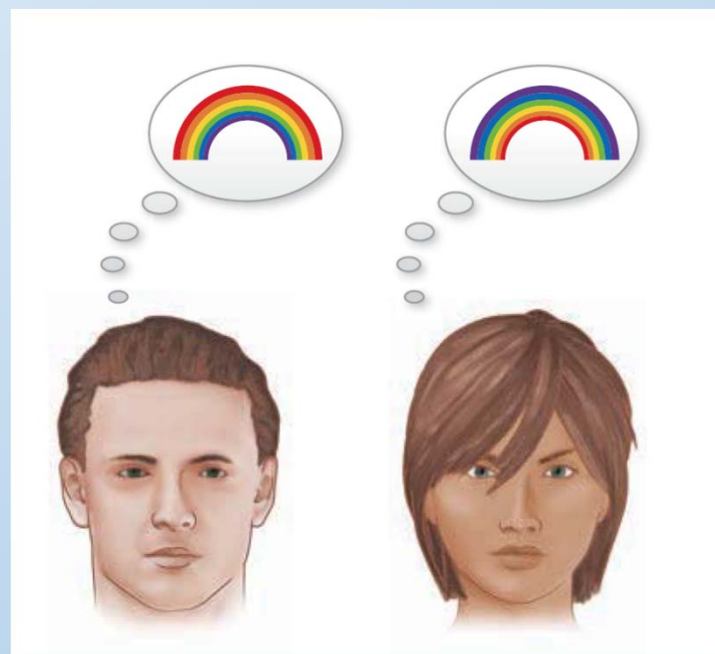
意识

- 意识与语言
- 心理概念与物理属性

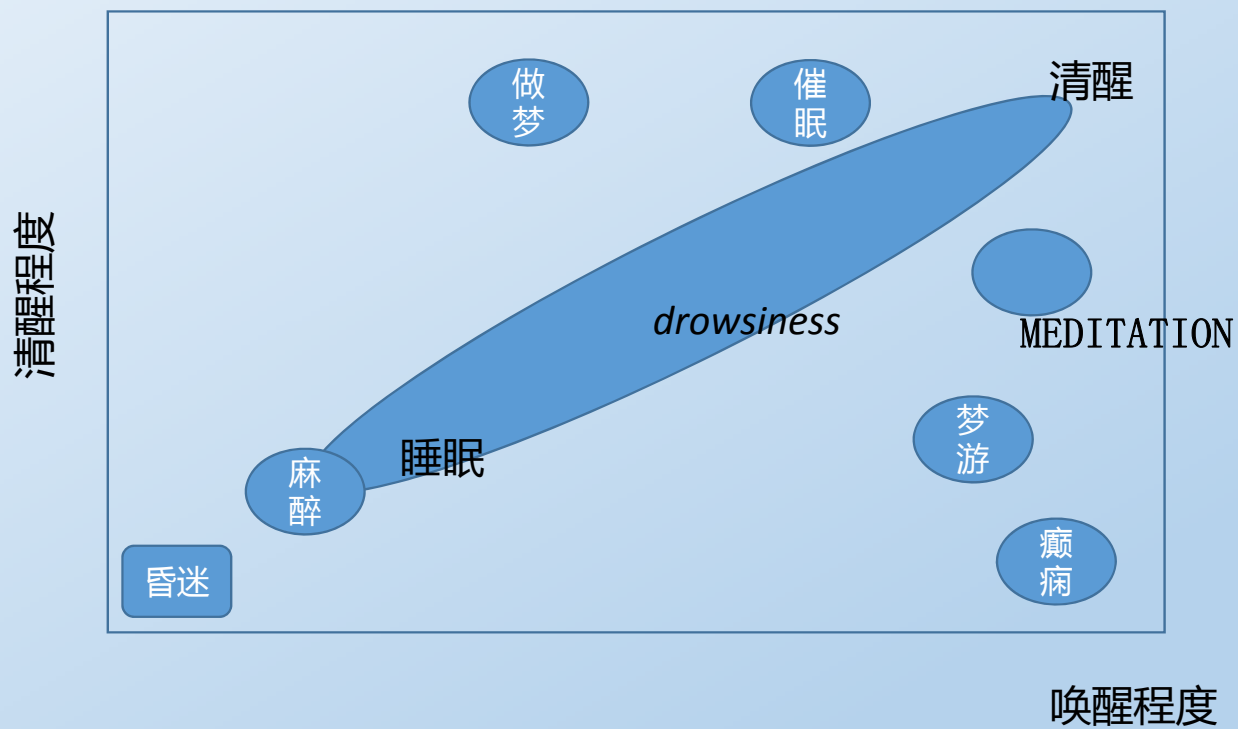


意识

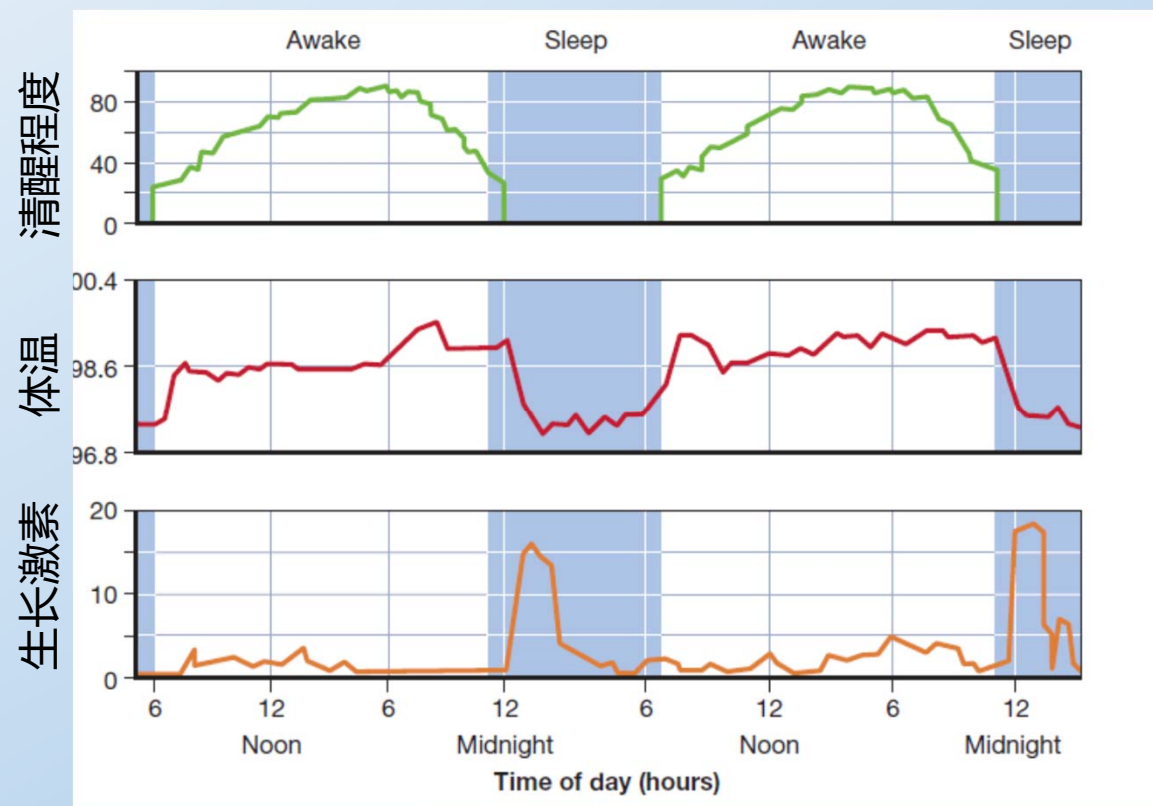
- 意识与语言
- 心理概念与物理属性



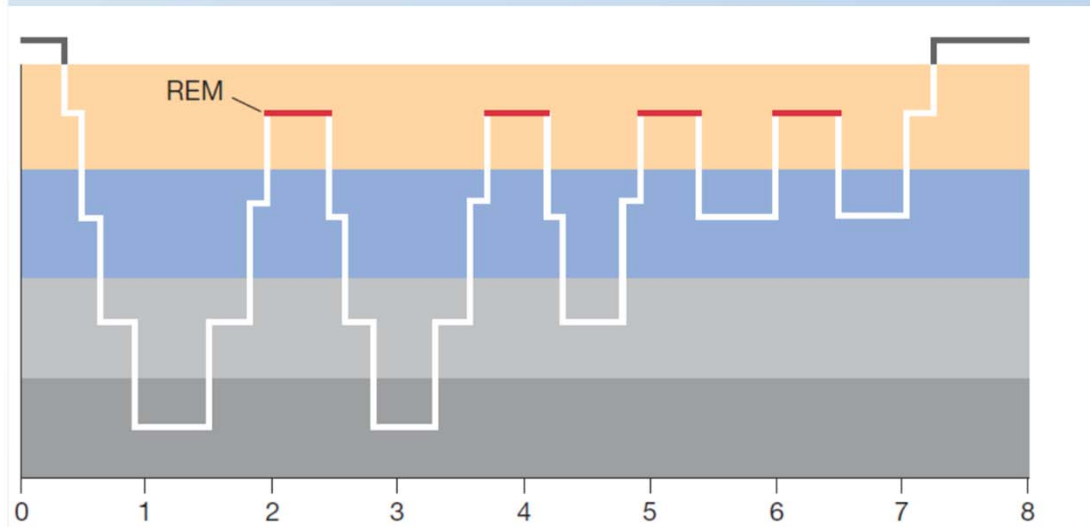
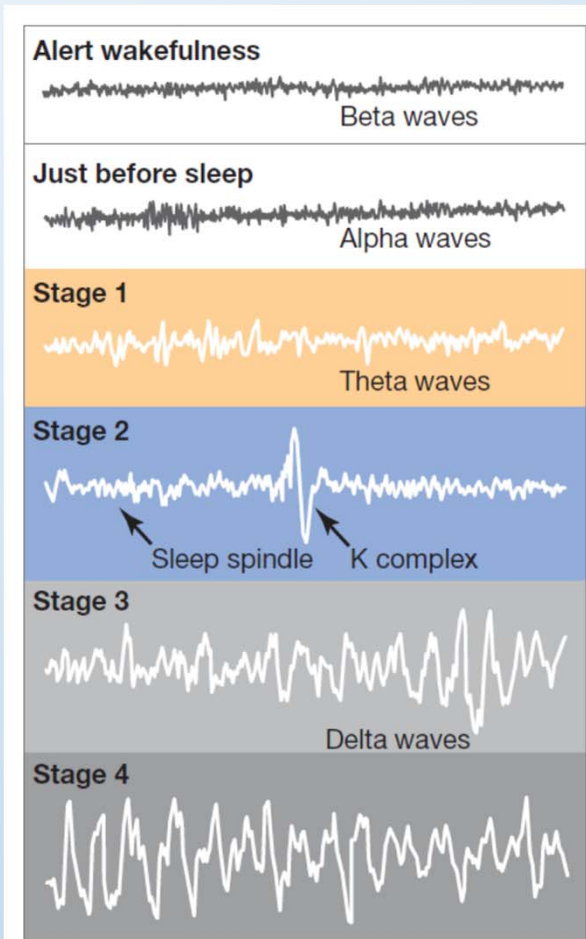
意识的种类



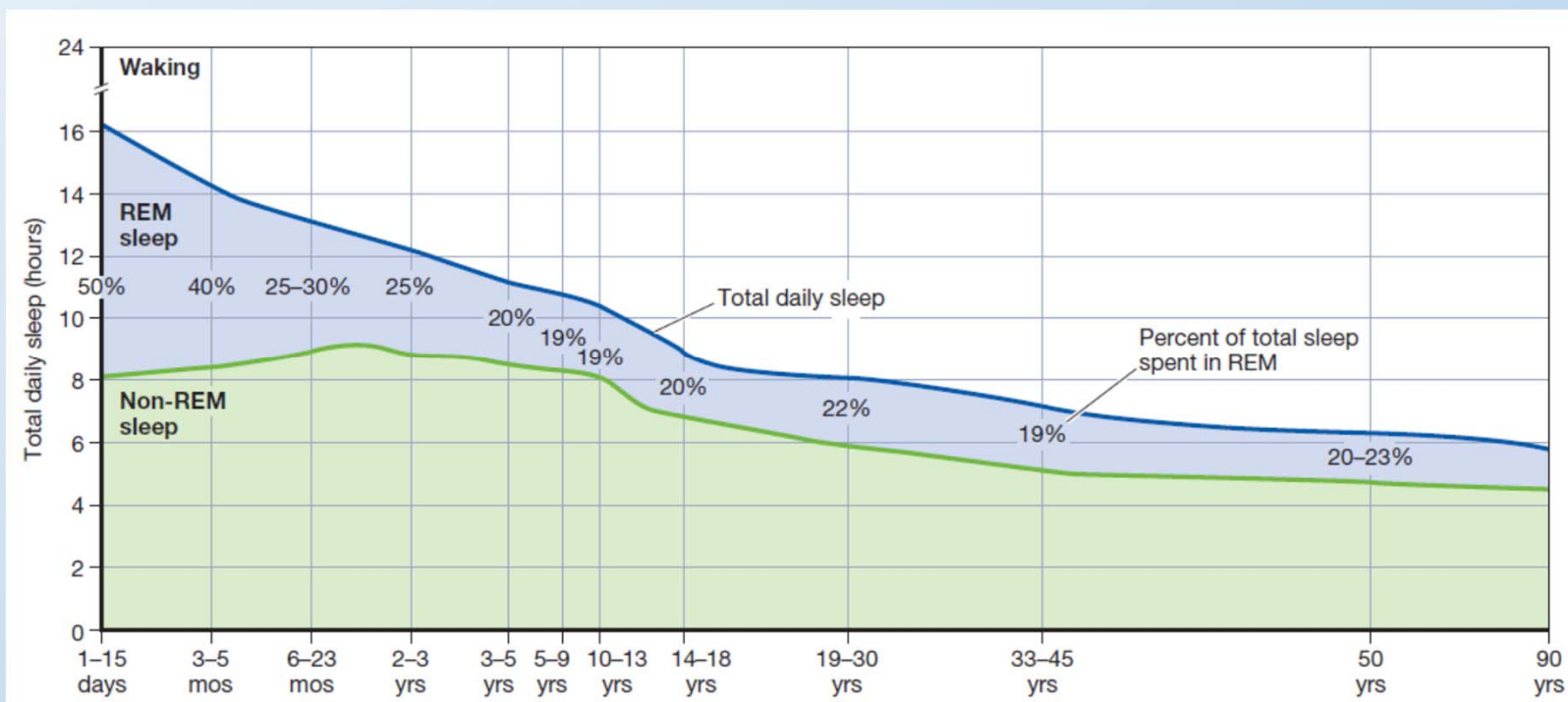
睡眠



睡眠



睡眠



睡眠

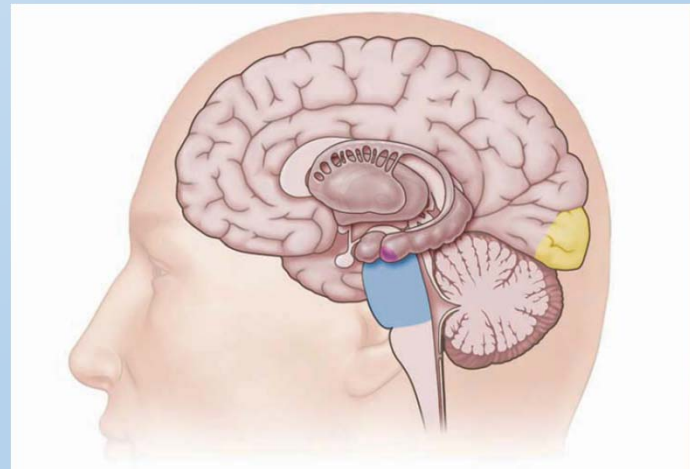


催眠



睡眠 - 梦

- 梦 - 发生在任何阶段
- 梦的内容
 - <http://dreambank.net/>
- 梦的原因



药物 - 对意识状态的改变



药物 - 对意识状态的改变

