

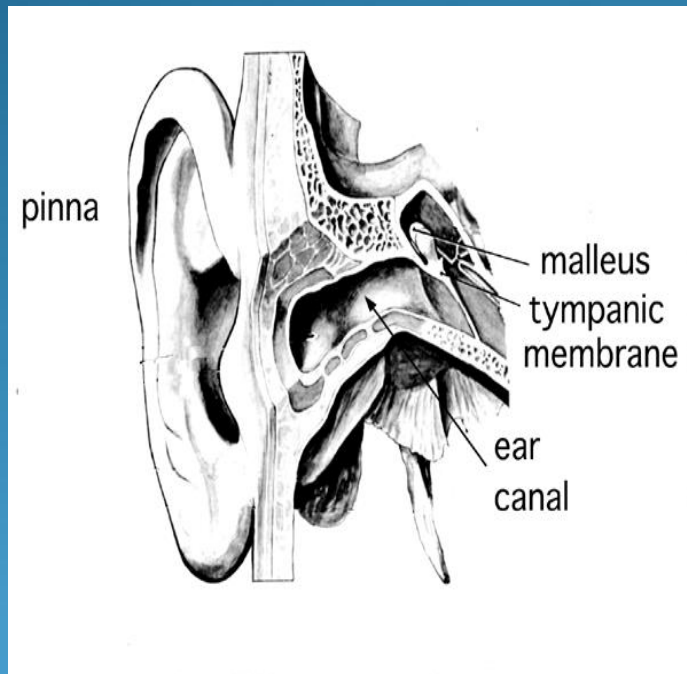
# Lezioni di Audiologia & Foniatria

Prof.ssa Claudia Aimoni

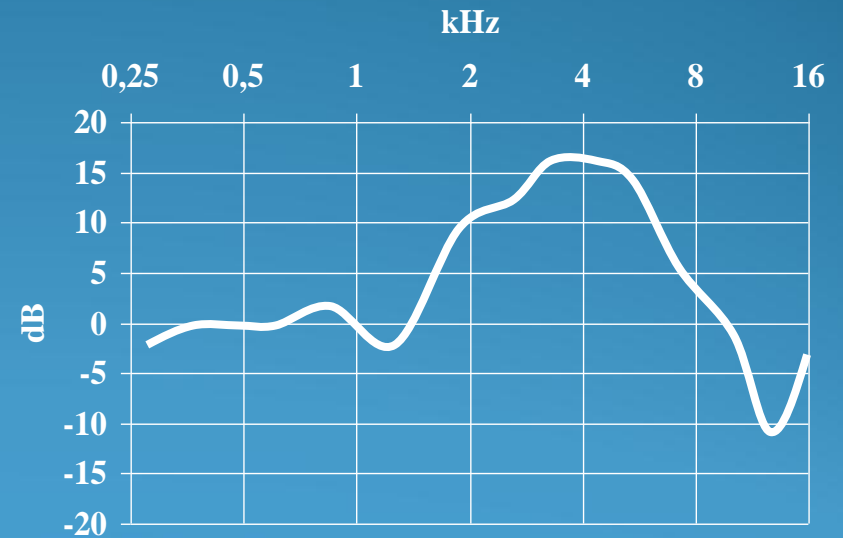
CLINICA ORL – AUDIOLOGIA  
UNIVERSITA' degli STUDI di FERRARA

- L'orecchio esterno è composto dal padiglione auricolare o pinna, e dal condotto uditivo esterno.
- La struttura cartilaginea della pinna con il suo complesso di rilievi e solchi è in relazione a funzioni di localizzazione delle sorgenti sonore sul piano frontale-verticale.

# ORECCHIO ESTERNO PROPRIETA' ACUSTICHE

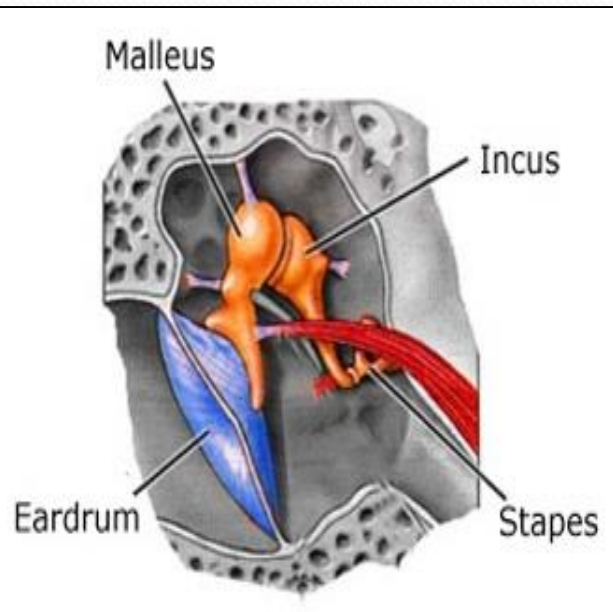


RISPOSTA IN FREQUENZA DEL C.U.E.

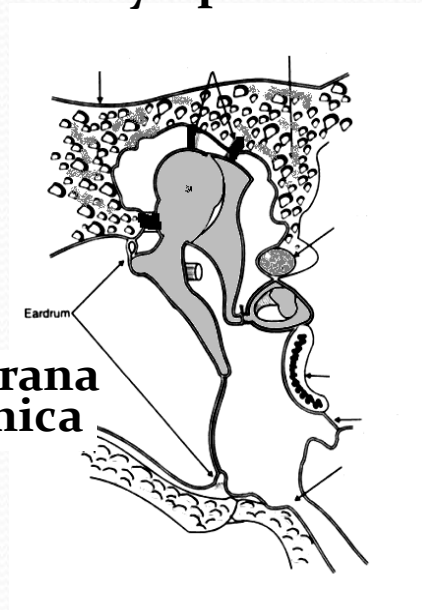


# ORECCHIO MEDIO

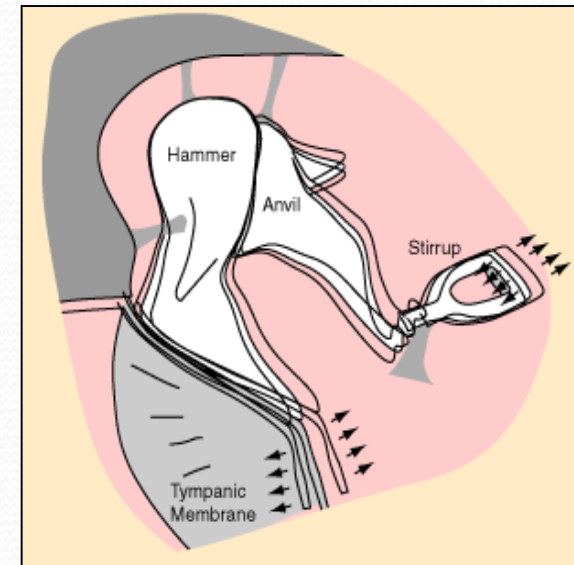
## STRUTTURE ANATOMICHE



tegmen  
tympani



membrana  
timpanica



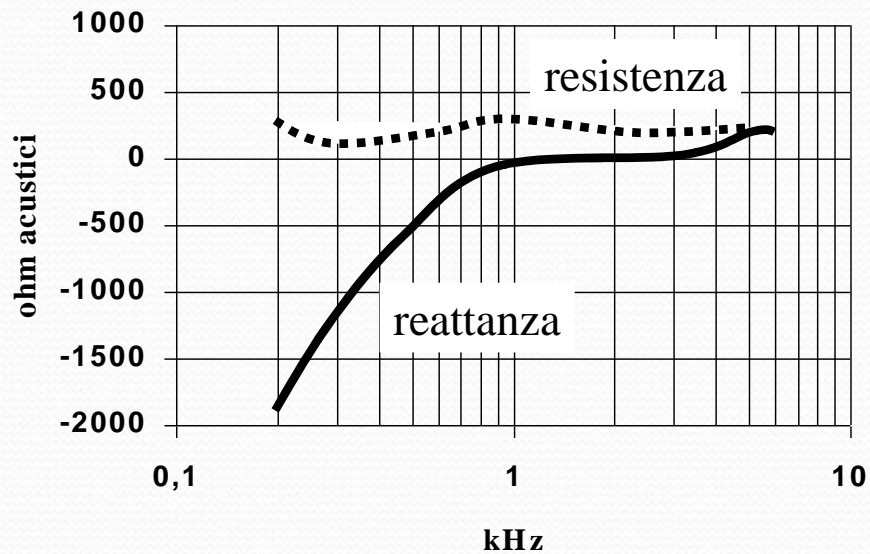
tuba  
uditiva



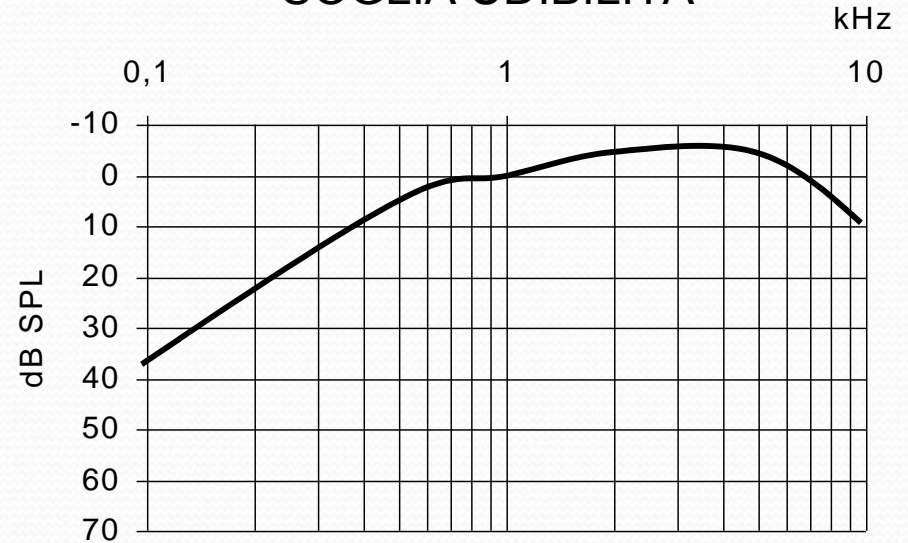
# ORECCHIO MEDIO

## PROPRIETA' FISICHE E SENSIBILITA' UDITIVA

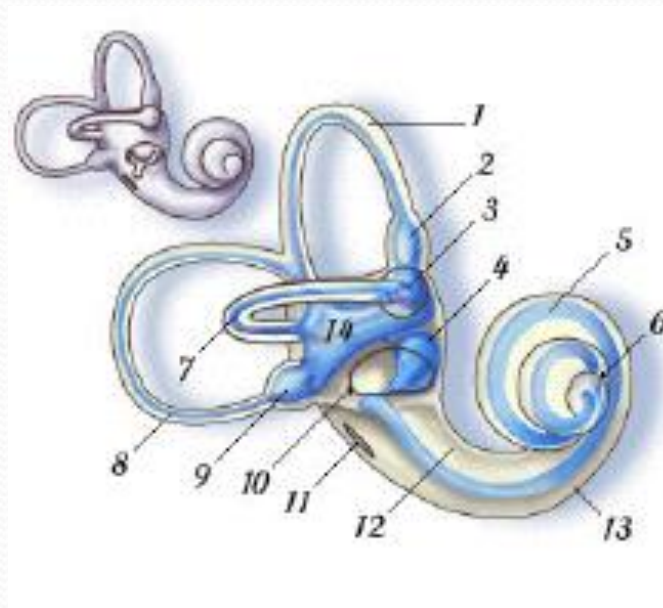
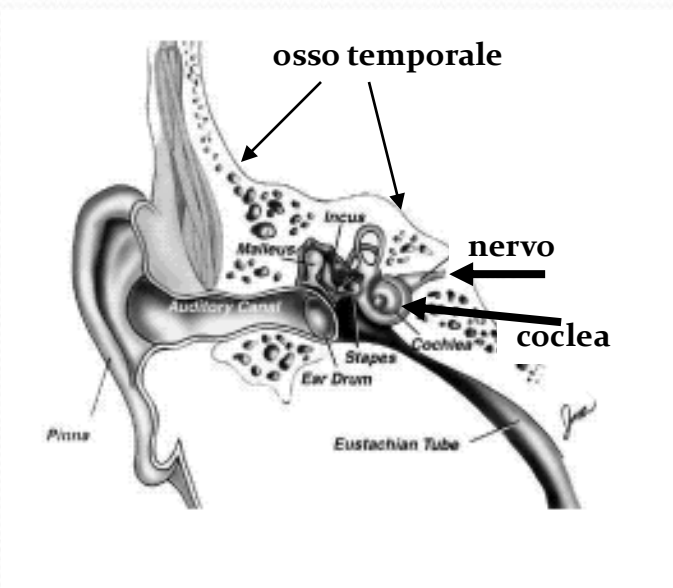
### IMPEDENZA ORECCHIO MEDIO



### SOGLIA UDIBILITA'



# ORECCHIO INTERNO LABIRINTO MEMBRANOSO

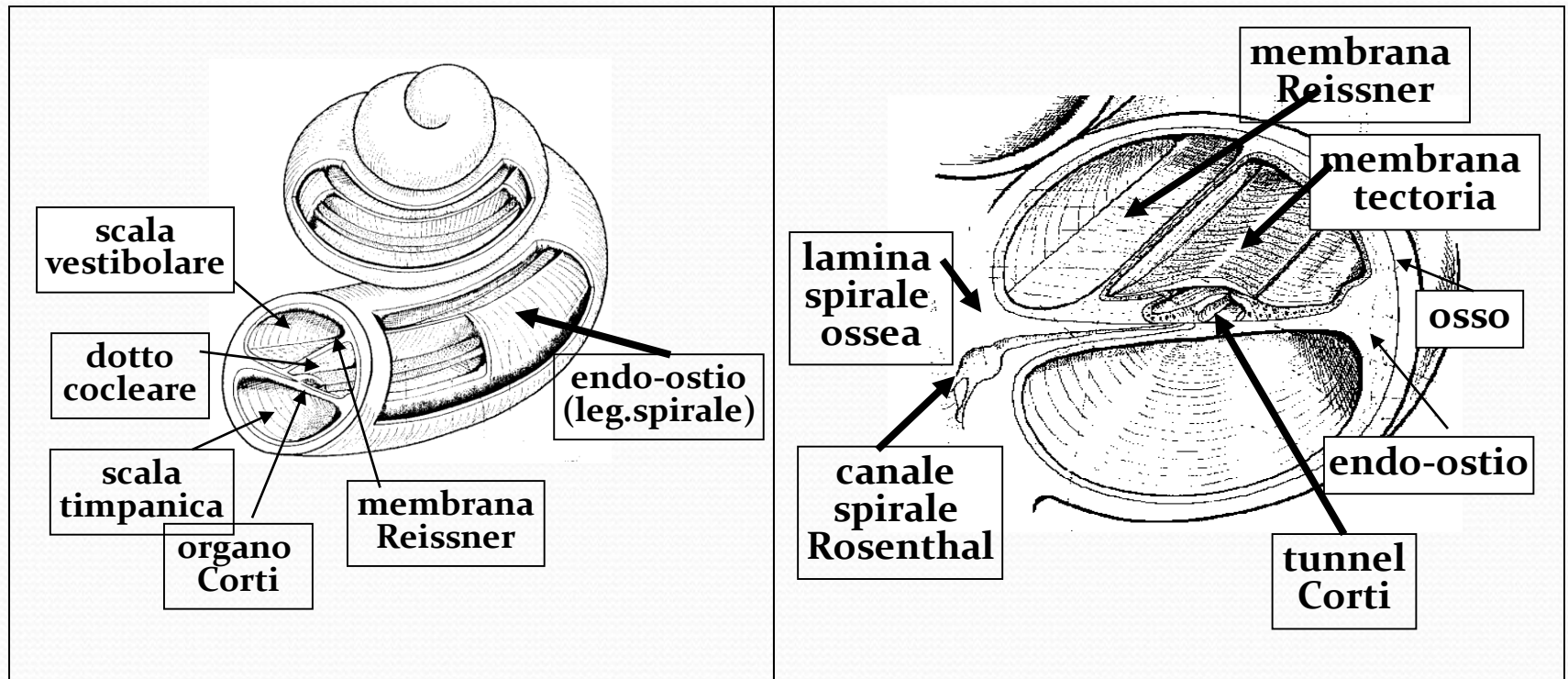


- 10. finestra ovale
- 11. finestra rotonda
- 12. scala vestibolare
- 13. scala timpanica
- 5. coclea membranosa
- 4. sacculo
- 14. utricolo

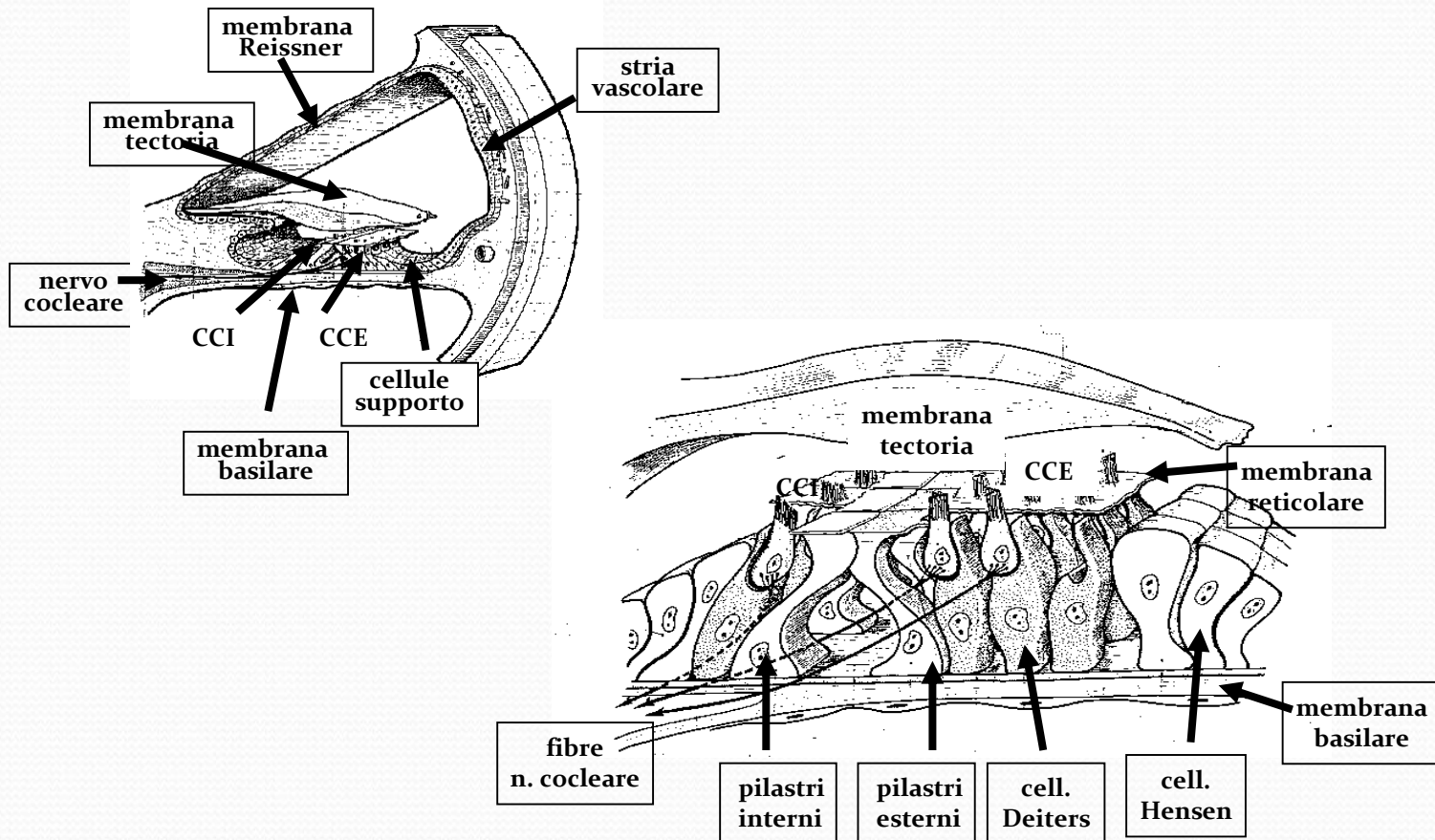


# COCLEA

## STRUTTURE ANATOMICHE

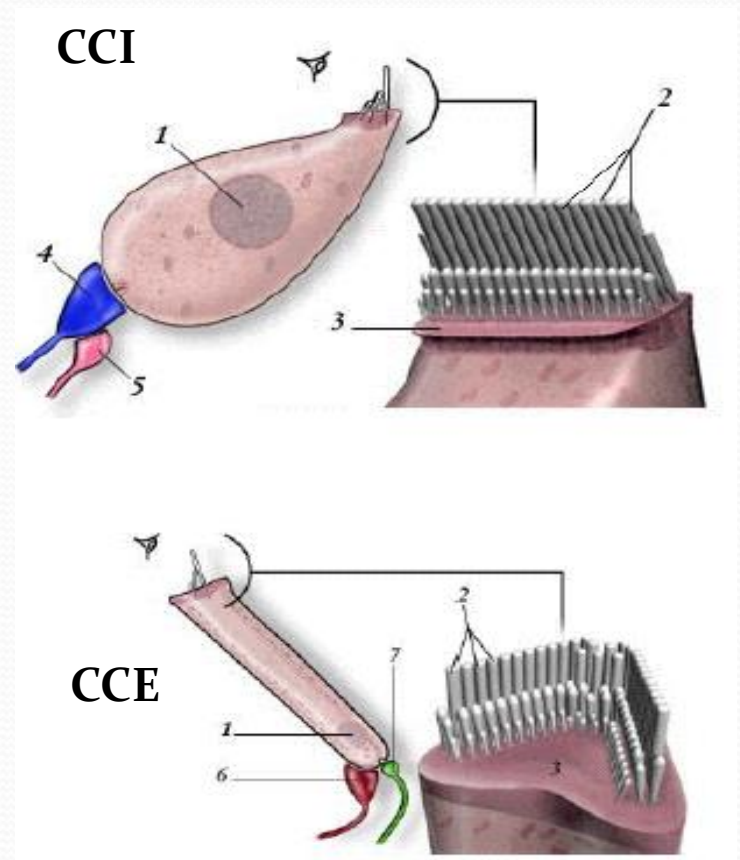
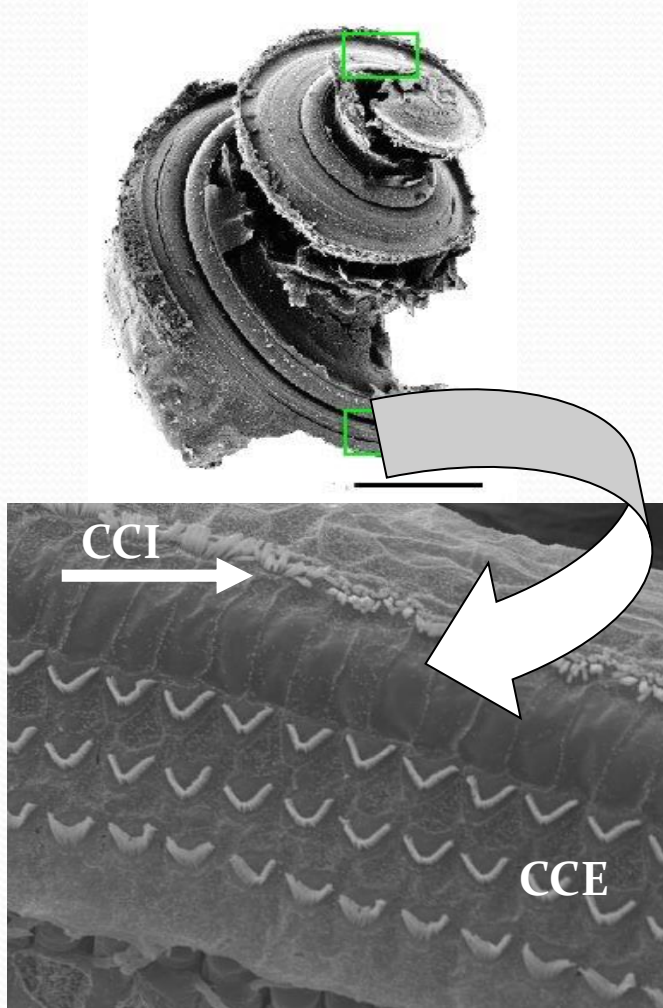


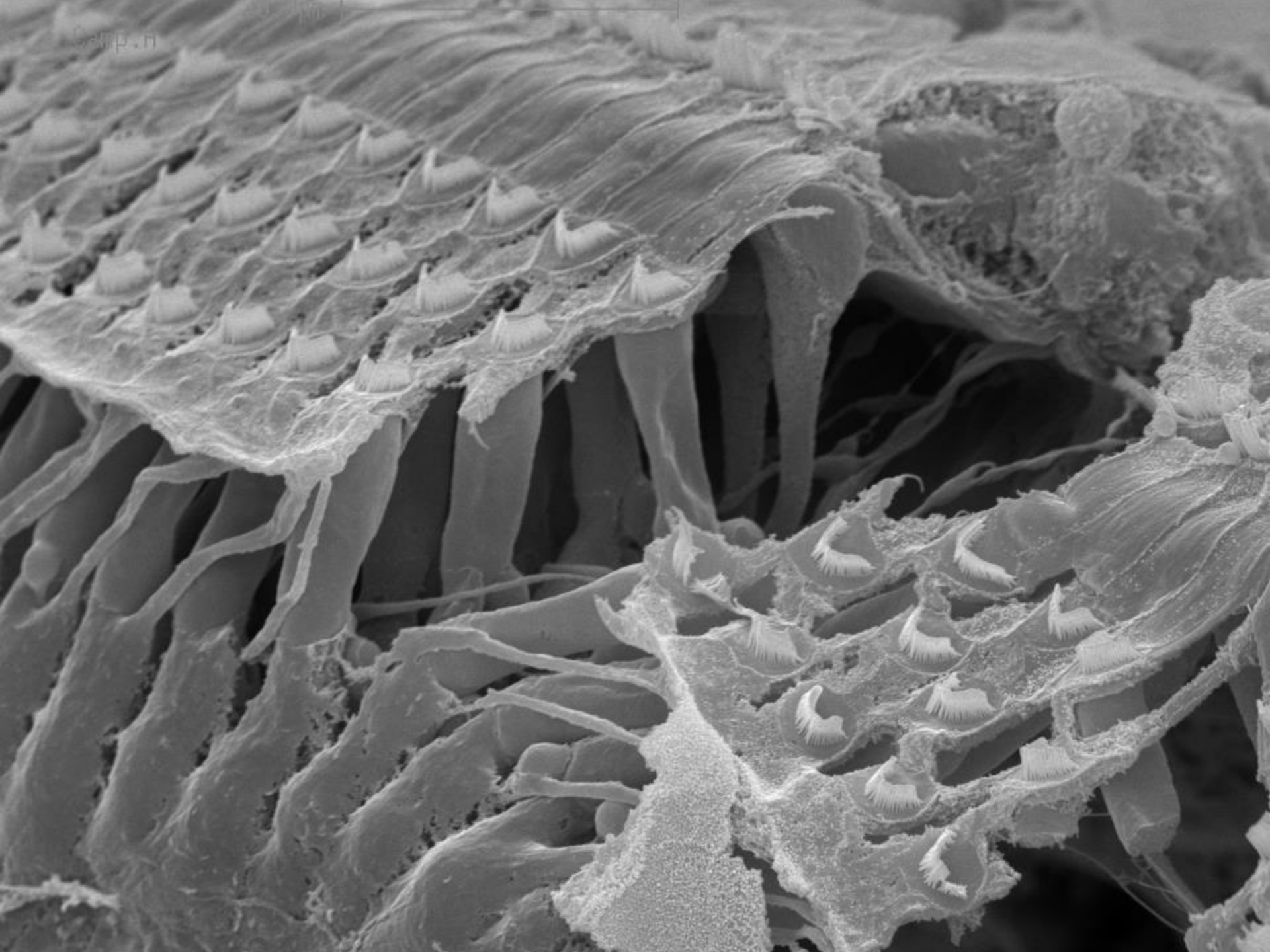
# COCLEA MICROSTRUTTURA



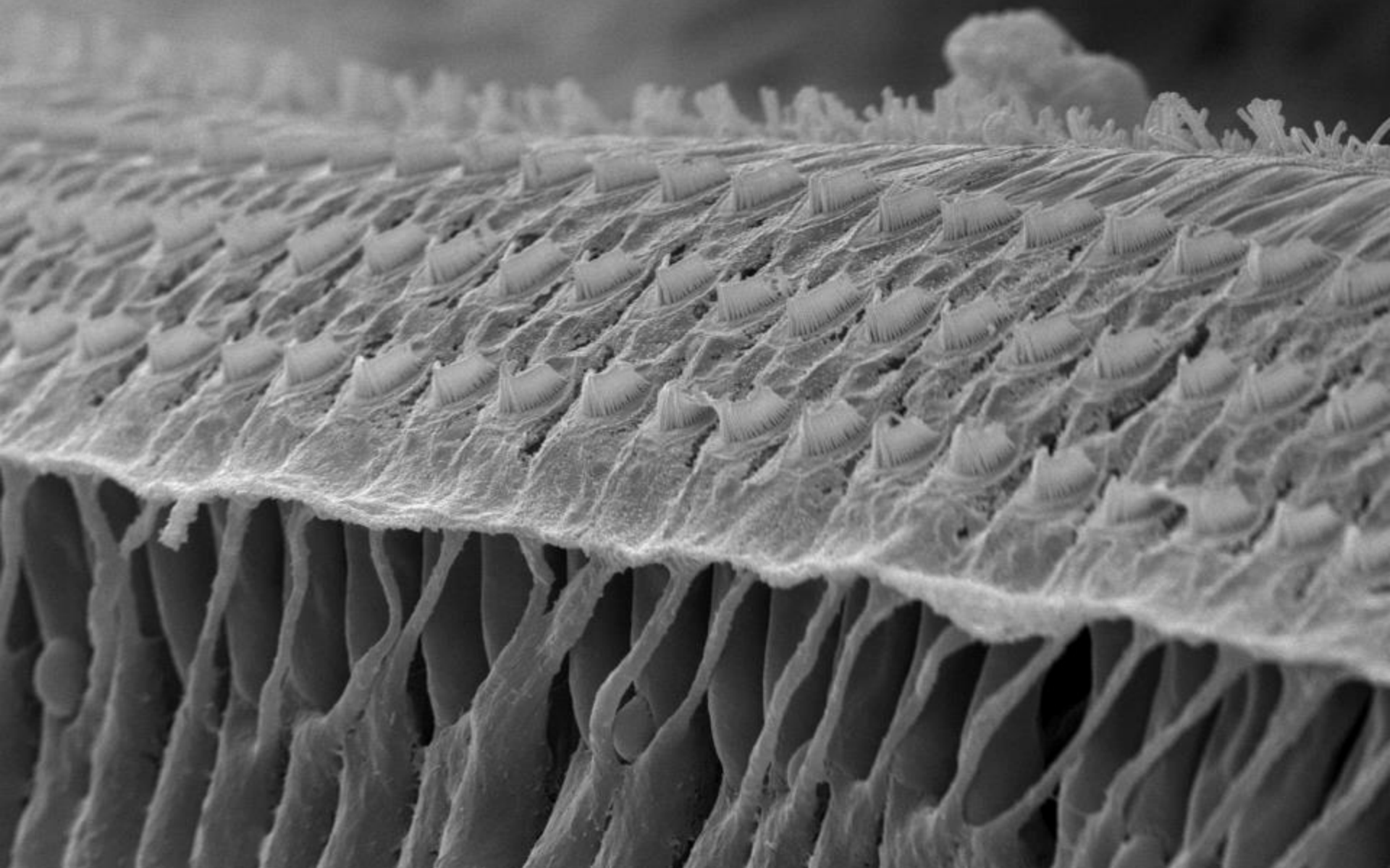


# CELLULE CIGLIATE ESTERNE-INTERNE MICROSTRUTTURA

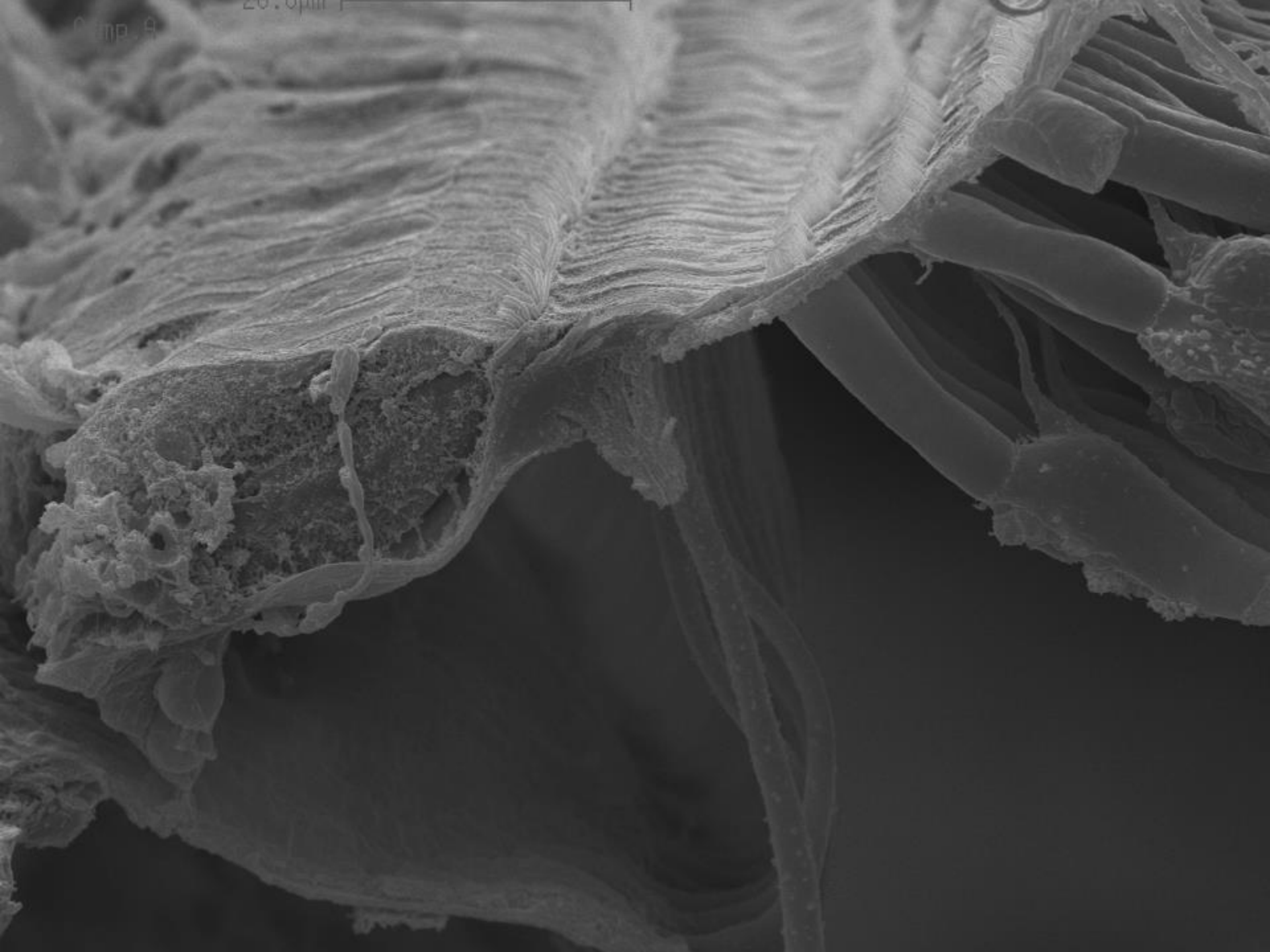




Camp. A

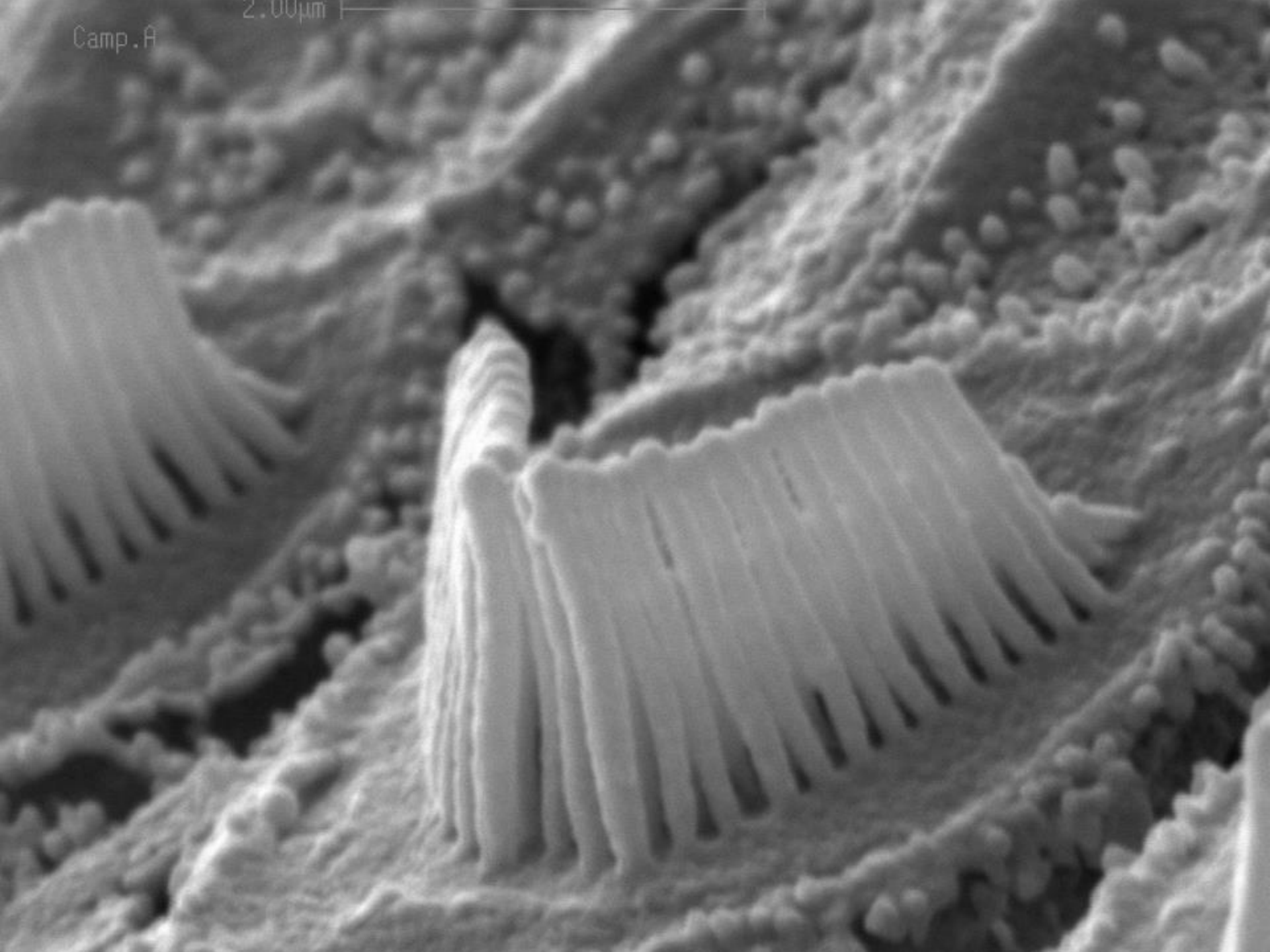






Camp. A

2.00µm



# CELLULE CIGLIATE INNERVAZIONE

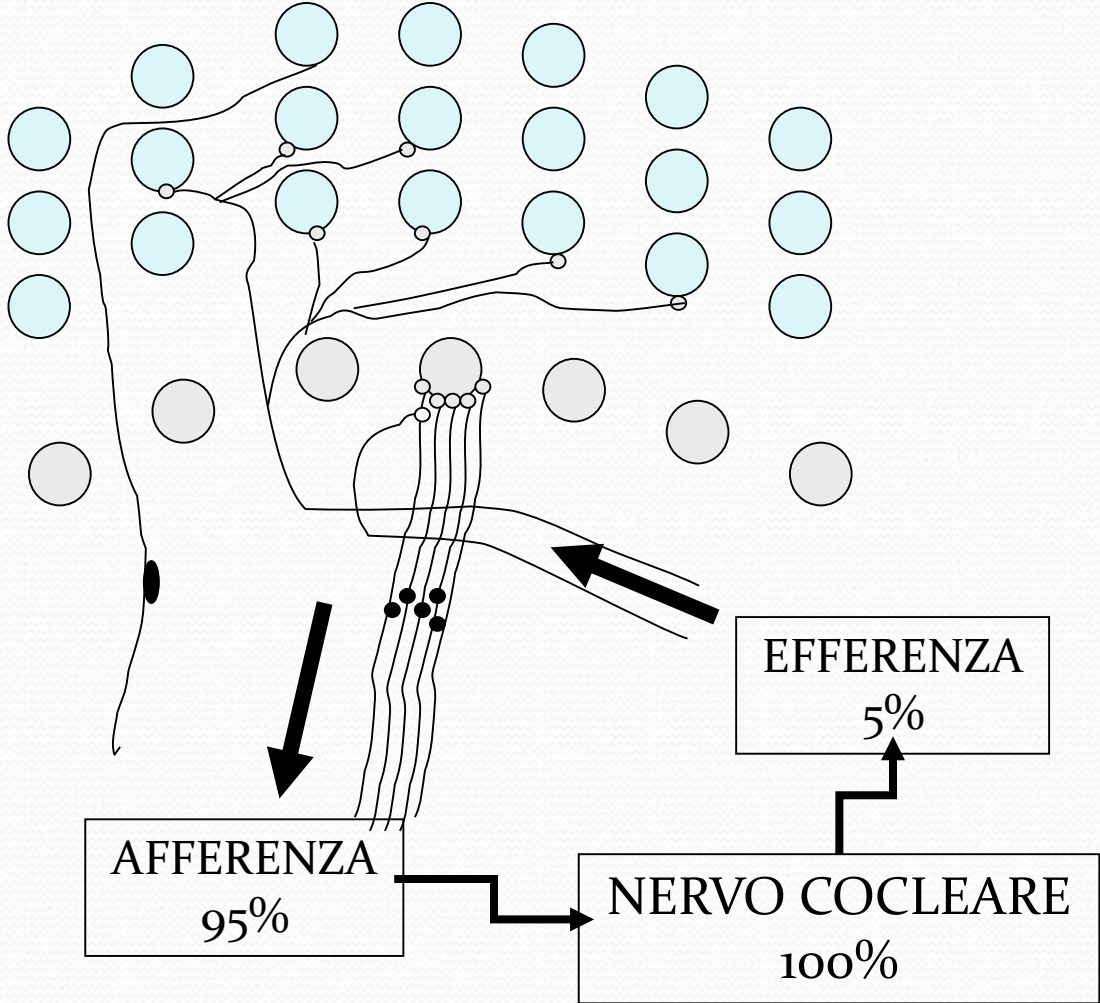
CCE=12500

CCI=3500

AFFERENZA  
95%

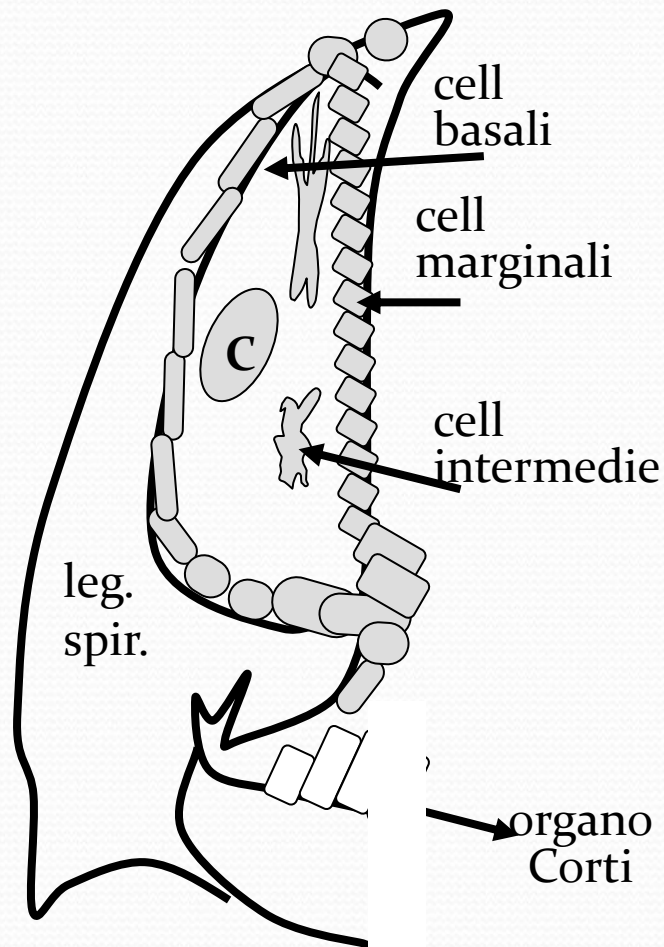
NERVO COCLEARE  
100%

EFFERENZA  
5%





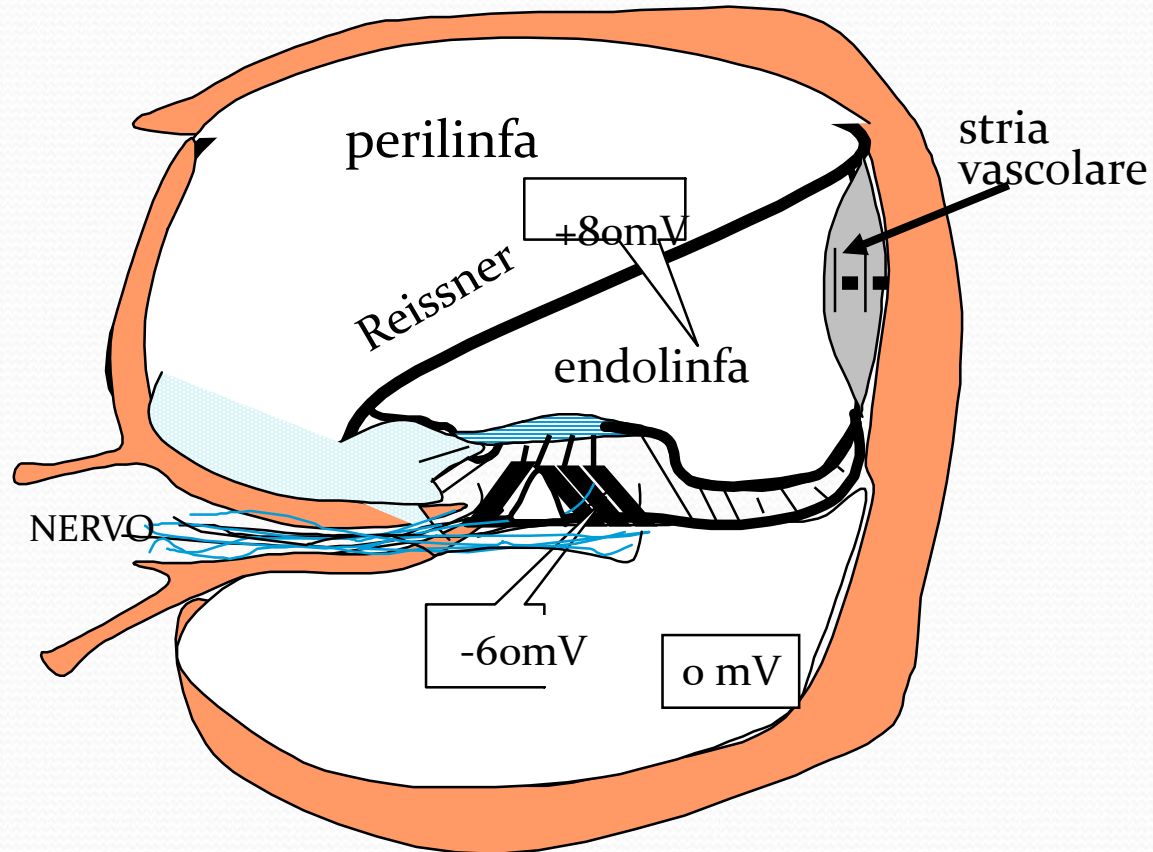
# STRIA VASCOLARE MICROSTRUTTURA



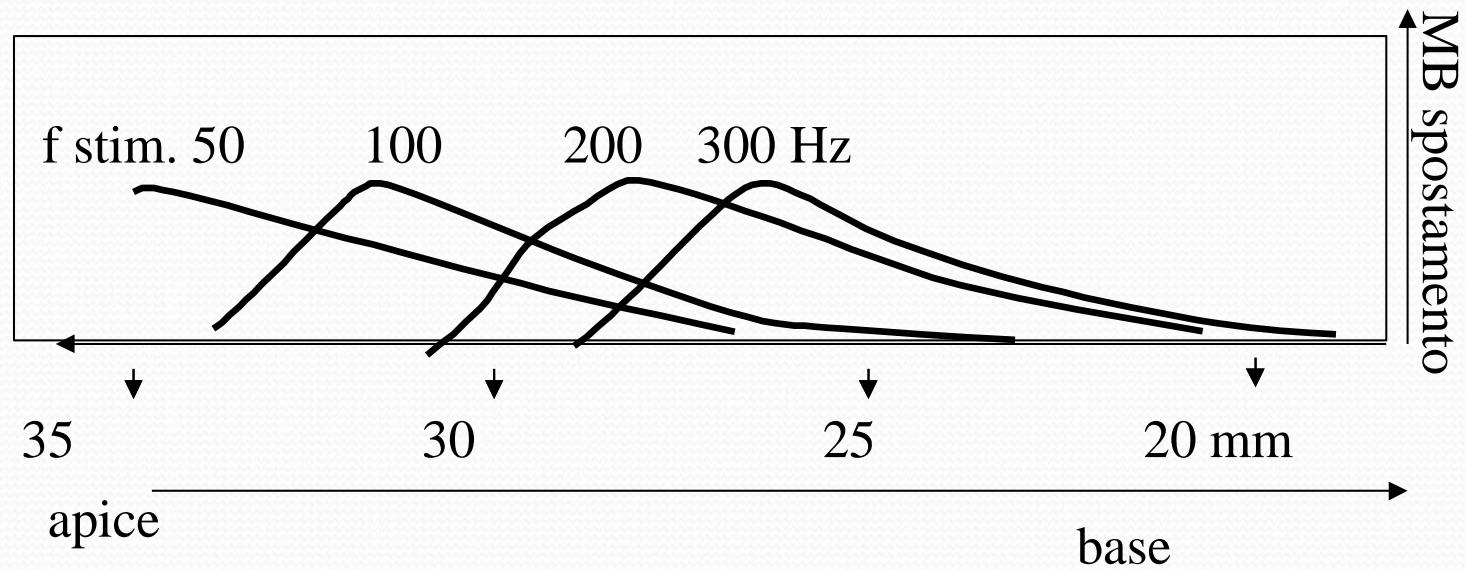
# COCLEA

## COMPARTIMENTAZIONE ELETTROCHIMICA

perilinfia =  $K^+$  4 meq/l,  $Na^+$  139 meq/l  
endolinfia =  $K^+$  144 meq/l,  $Na^+$  1.3 meq/l



# ONDA VIAGGIANTE, (von Bekesy )





# ONDE VIAGGIANTI SMORZAMENTO

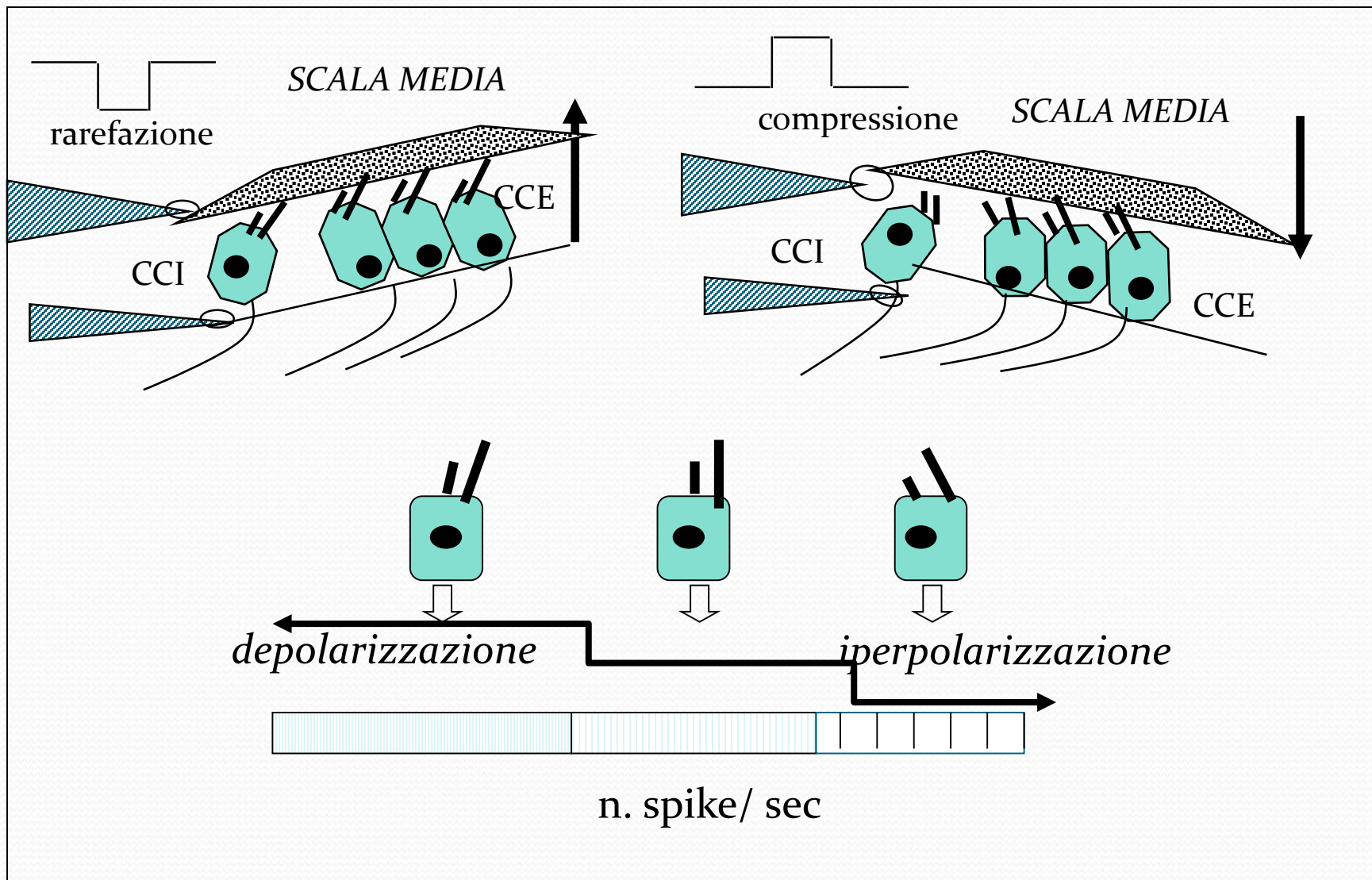


(a)



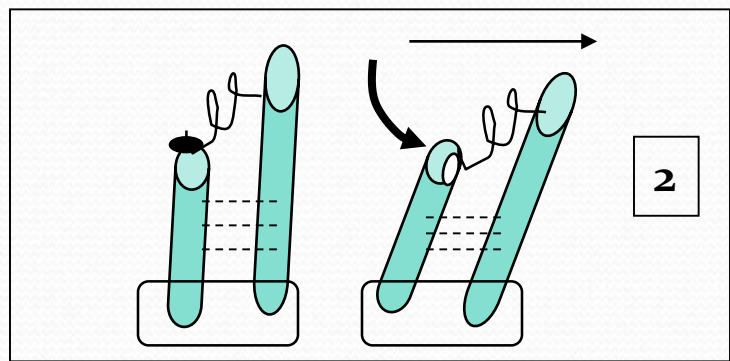
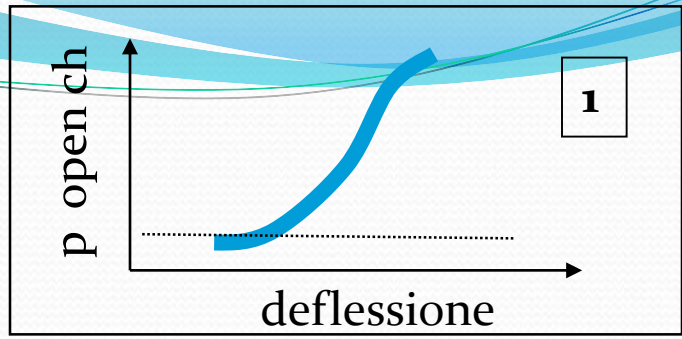
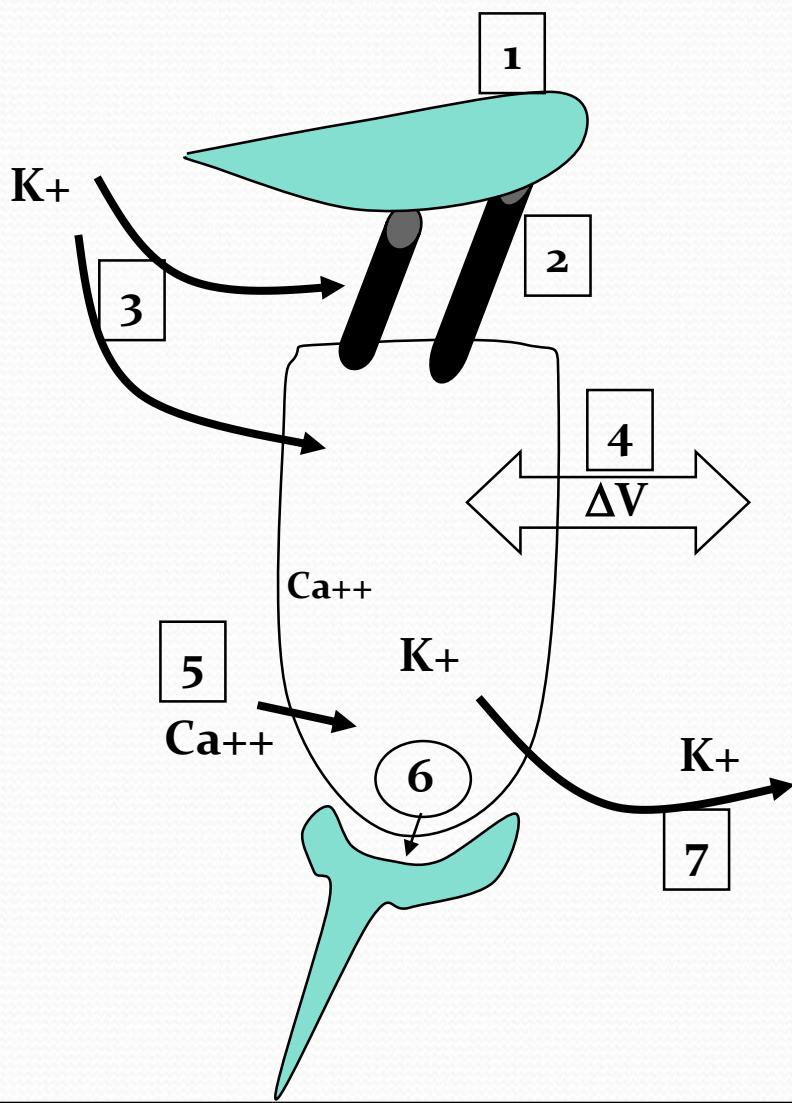
(b)

# CELLULE CIGLIATE MOVIMENTI A CESCOIA





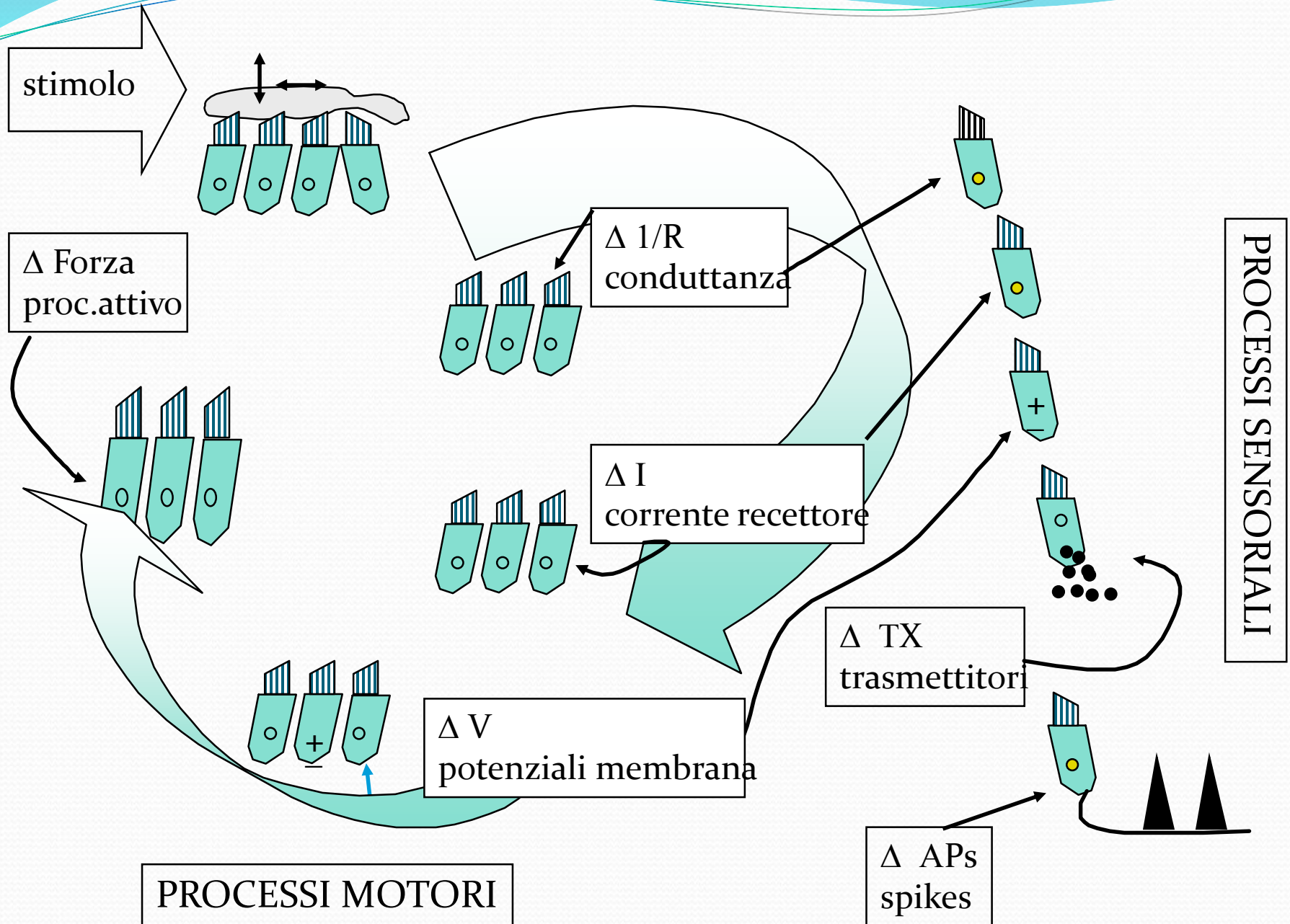
# CELLULE CIGLIATE TRASDUZIONE



1. deflessione cigliare
2. > p di apertura canali
3. entra K<sup>+</sup>
4. cambia il V di membrana
5. entra Ca<sup>++</sup>
6. esce mediatore sinaptico
7. esce K<sup>+</sup>



# CELLULE CIGLIATE TRASDUZIONE (Patuzzi, 1996)



# SINTONIA NEURALE E MECCANICA (Sellick, 1982)

dB spl

100

90

80

70

60

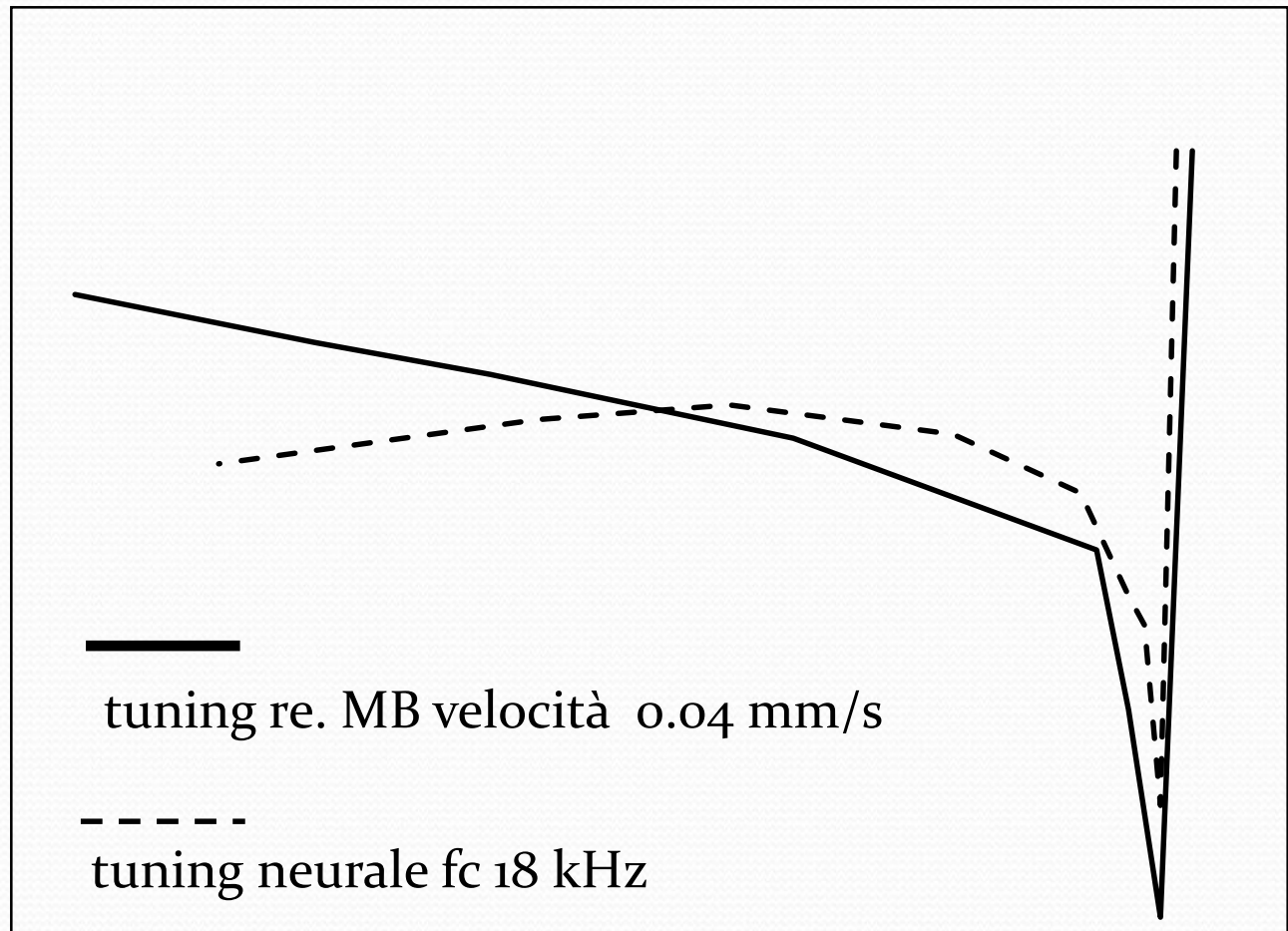
50

40

30

20

10



— tuning re. MB velocità 0.04 mm/s

- - - tuning neurale fc 18 kHz

2

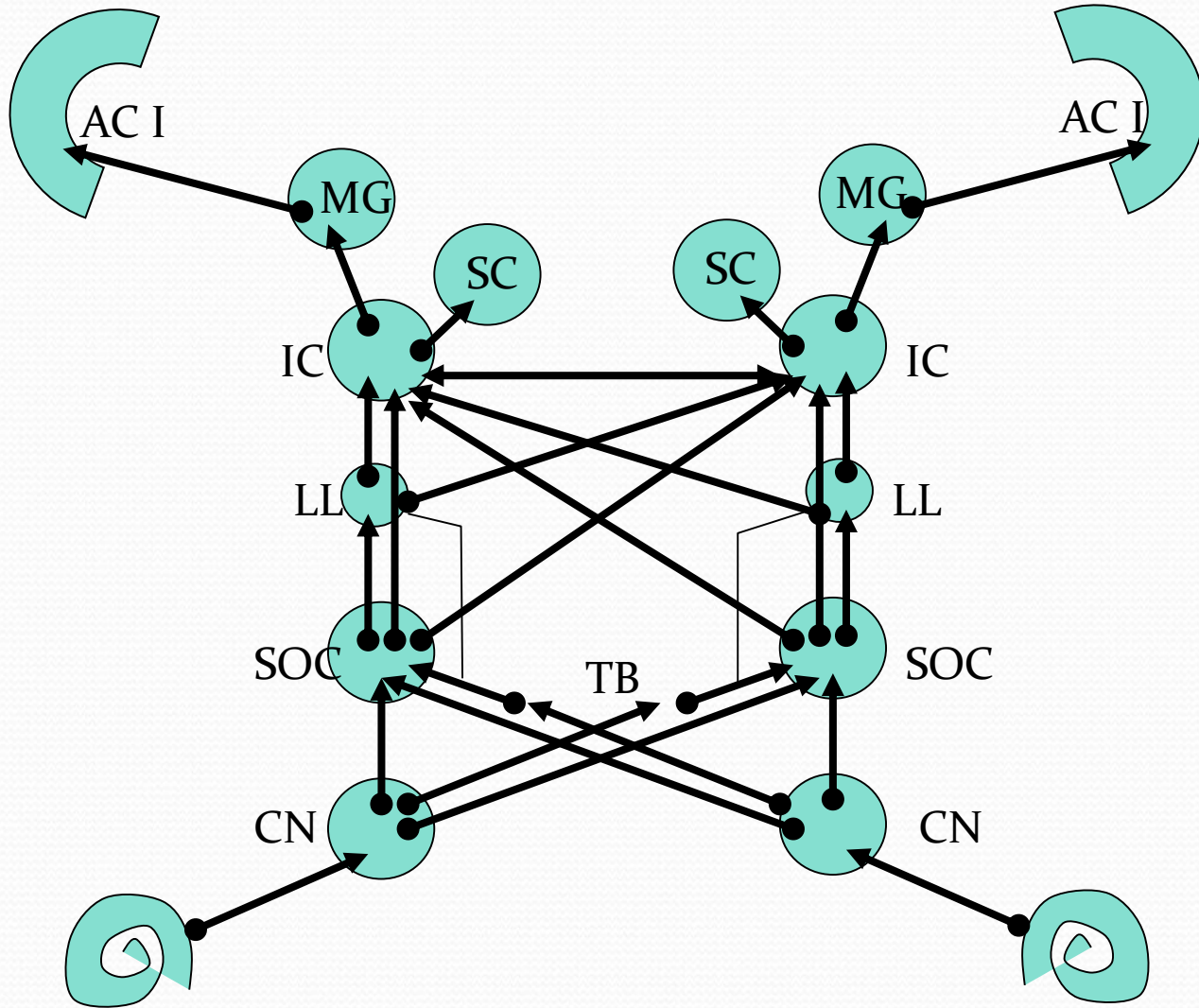
5

10

20 kHz

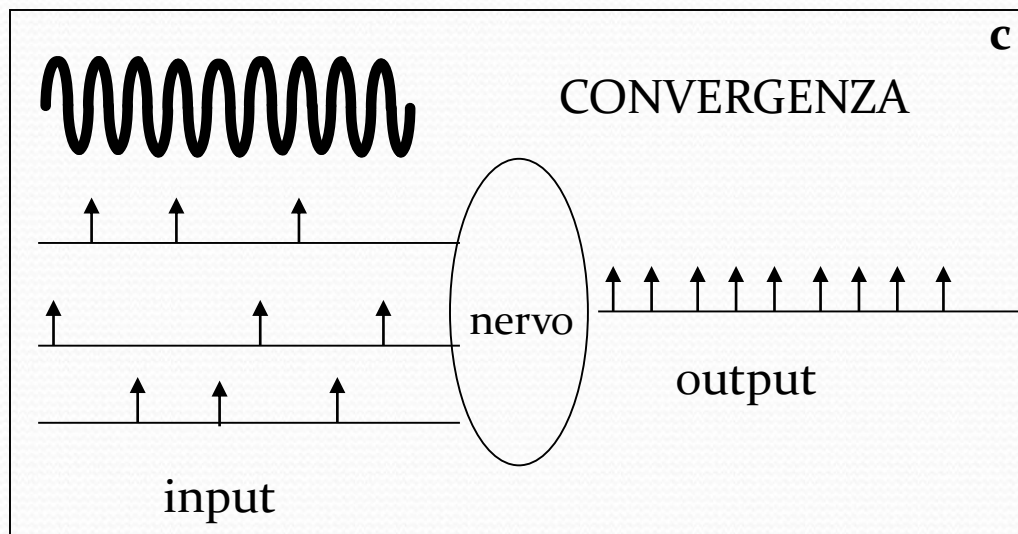
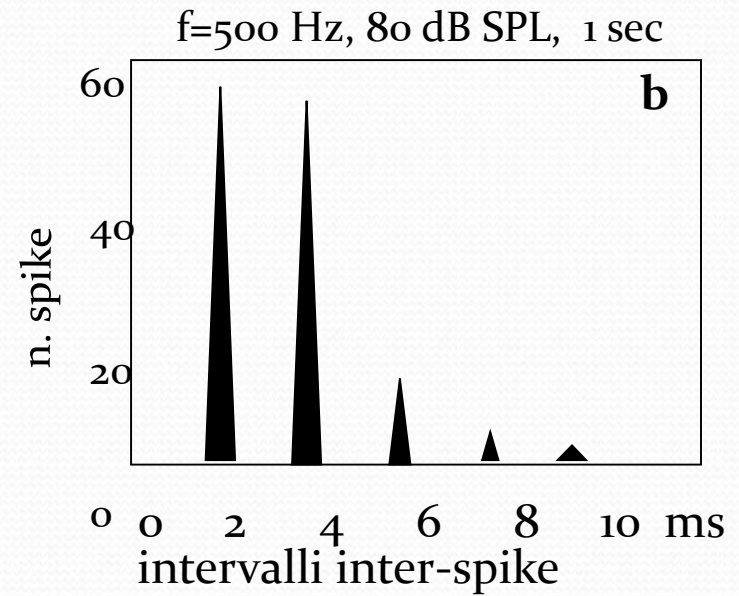
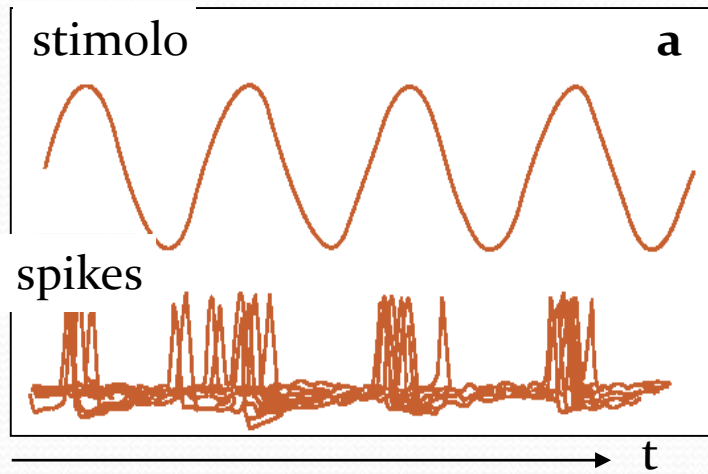


# VIE UDITIVE CENTRALI





# FIBRE NEURALI RISPOSTA PERIODICA



# RISPOSTE DI SINTONIA NEURALE

dB spl

100

90

80

70

60

50

40

30

20

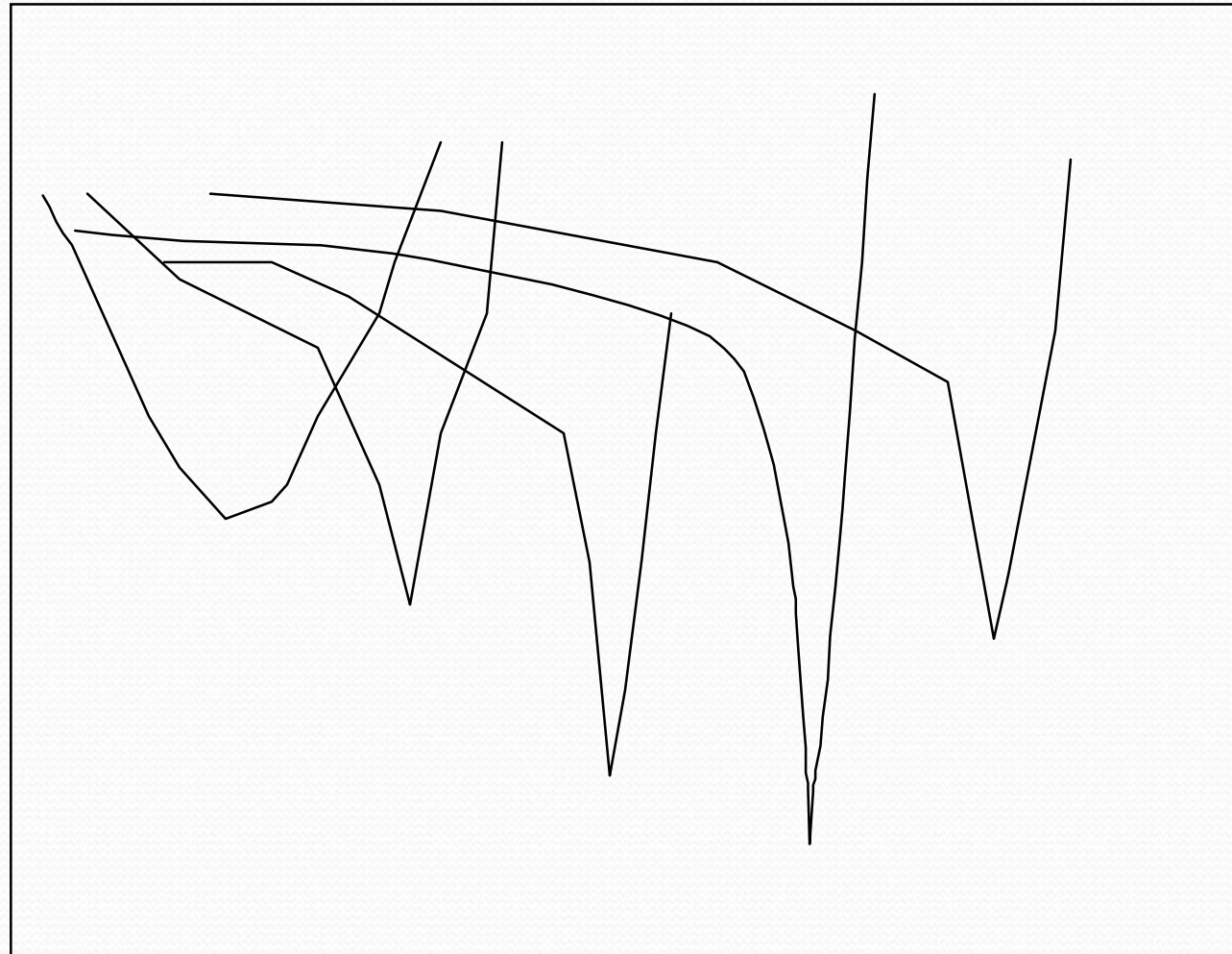
10

0.1

1

10

50 kHz



# INIBIZIONE LATERALE

dB spl

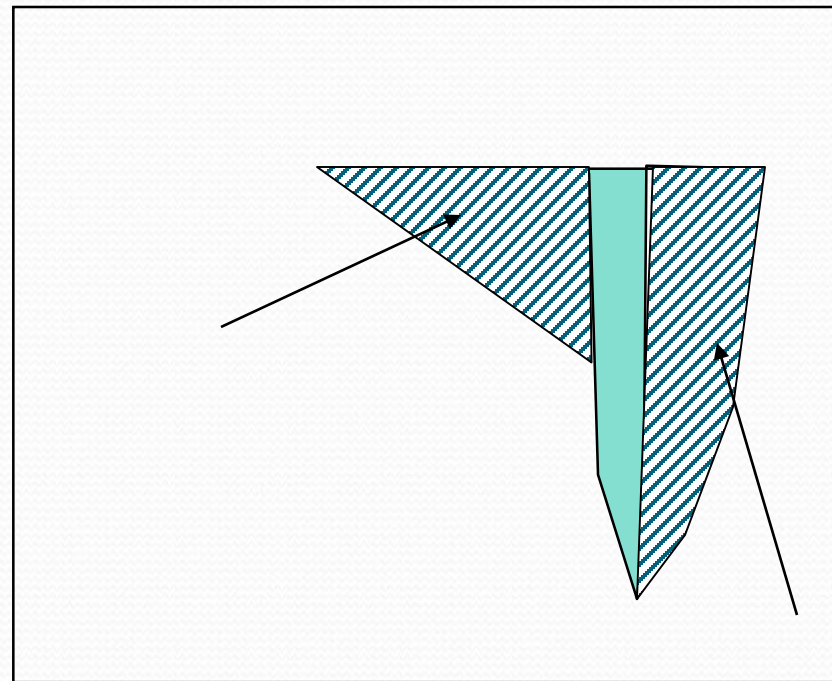
60

50

40

30

20



2

3

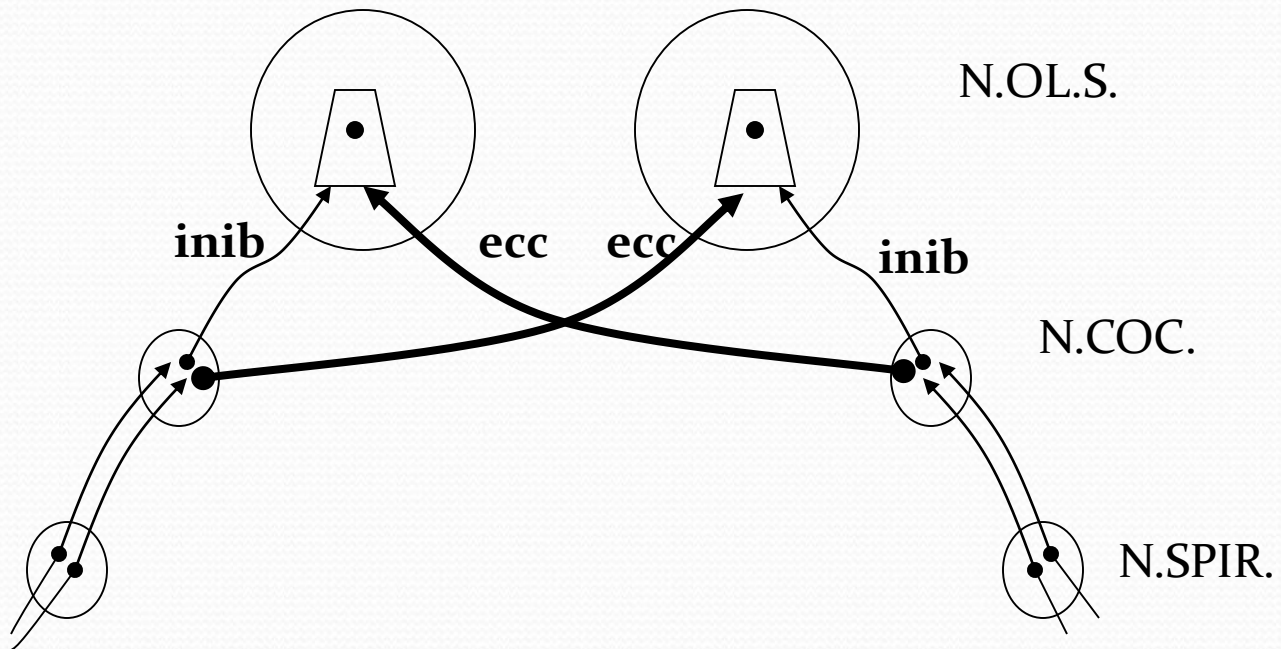
4

5

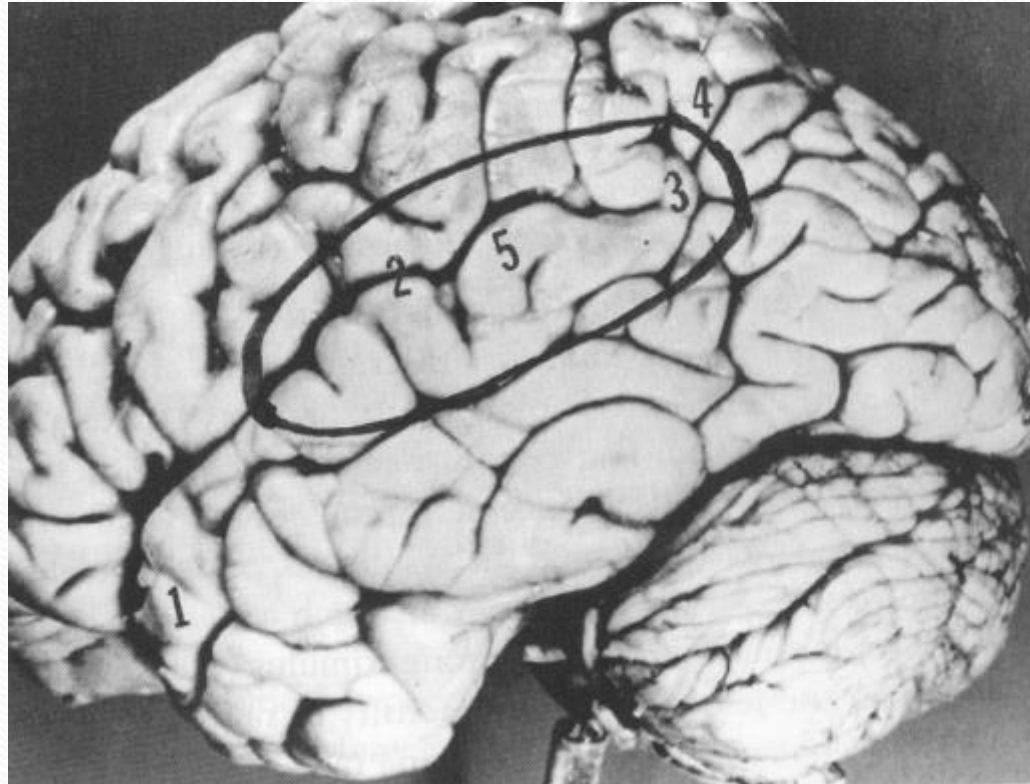
6 7 kHz



# UDITO BINAURALE: AFFERENZE



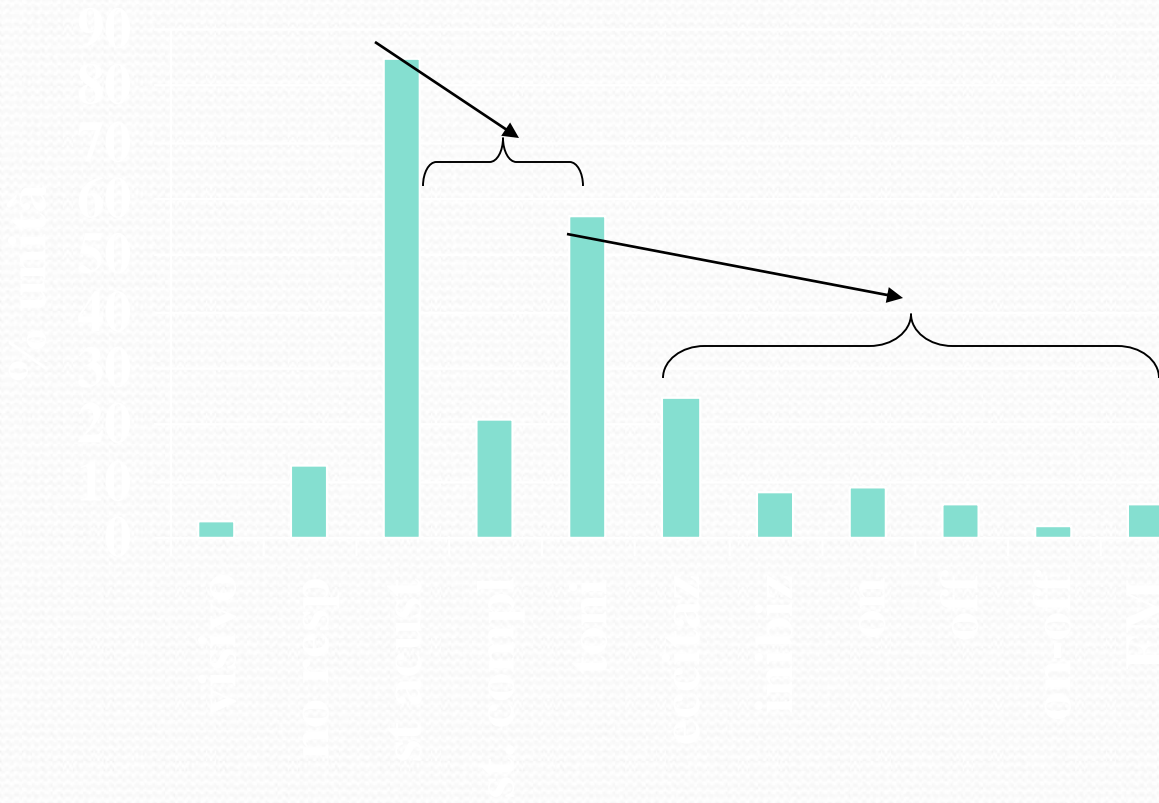
## AREE CORTICALI UDITIVE





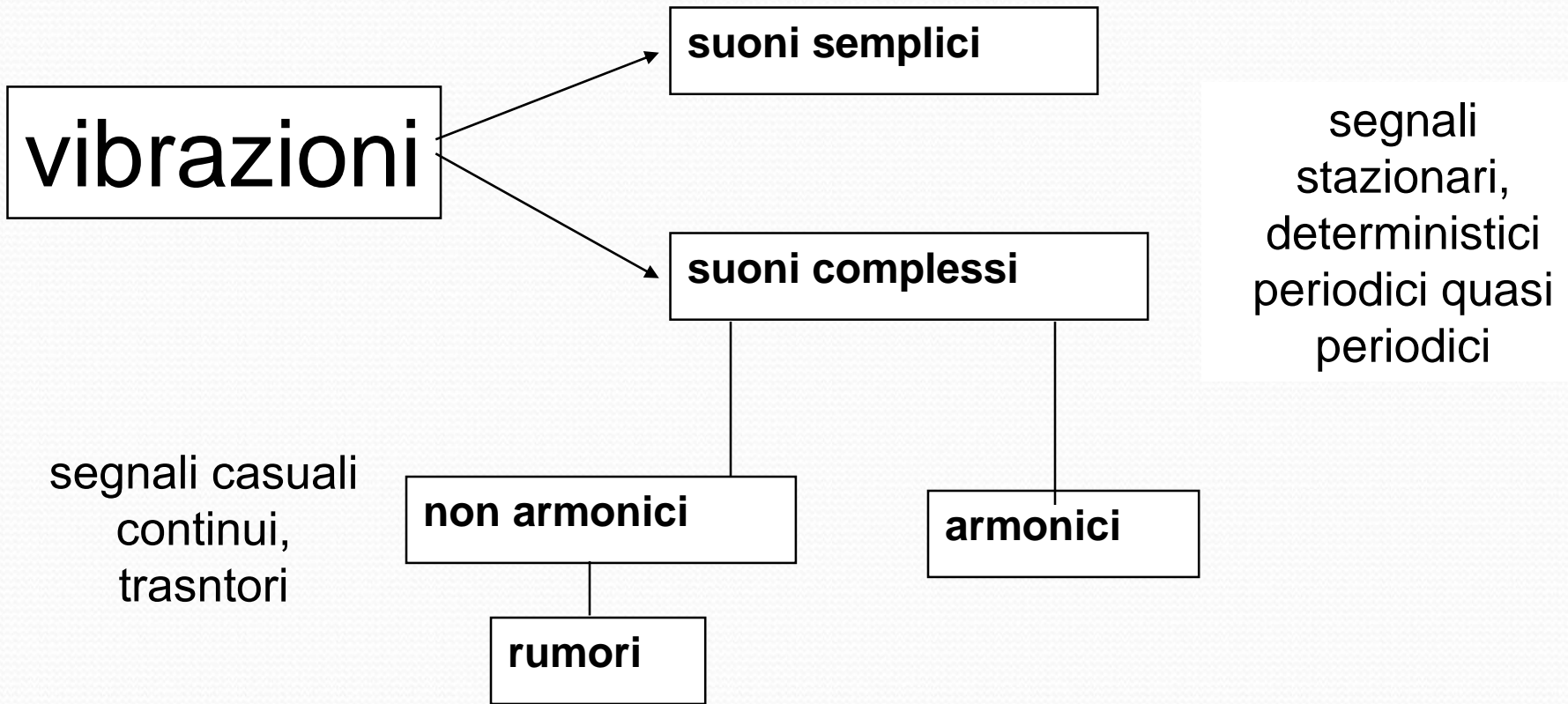
# RISPOSTE DEI NEURONI DELLA CORTECCIA UDITIVA

corteccia ud. gatto (Evans)

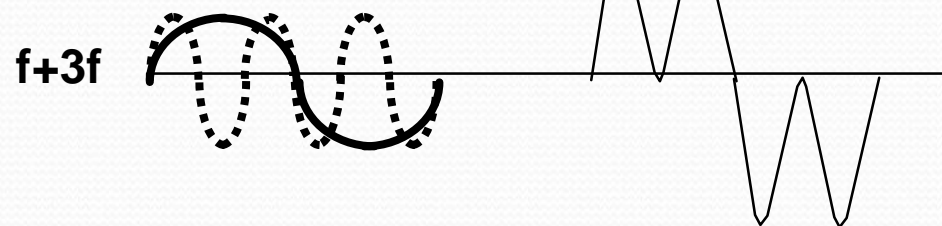
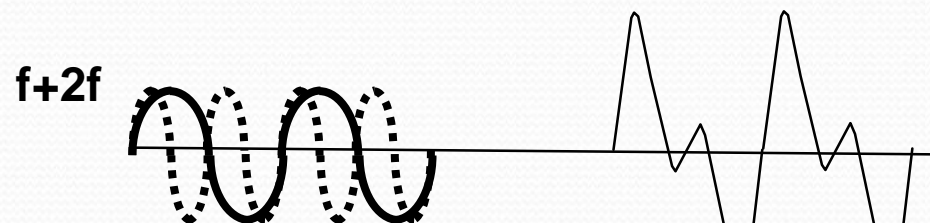
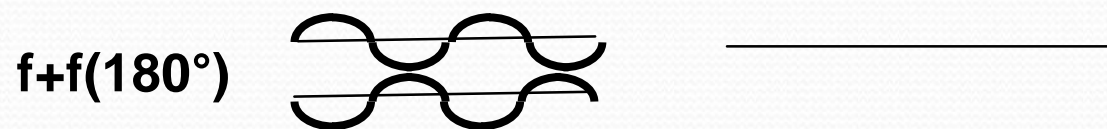




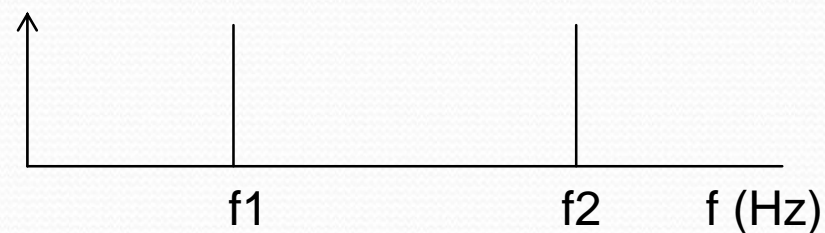
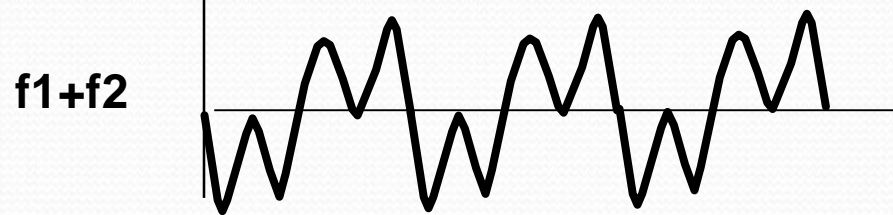
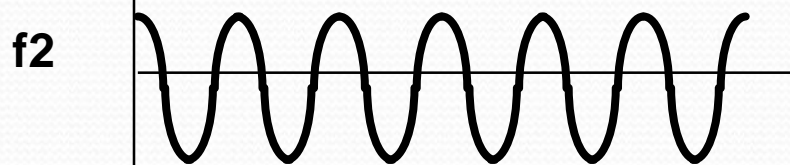
# CLASSIFICAZIONE DEI SUONI



# COMBINAZIONI TONI PURI

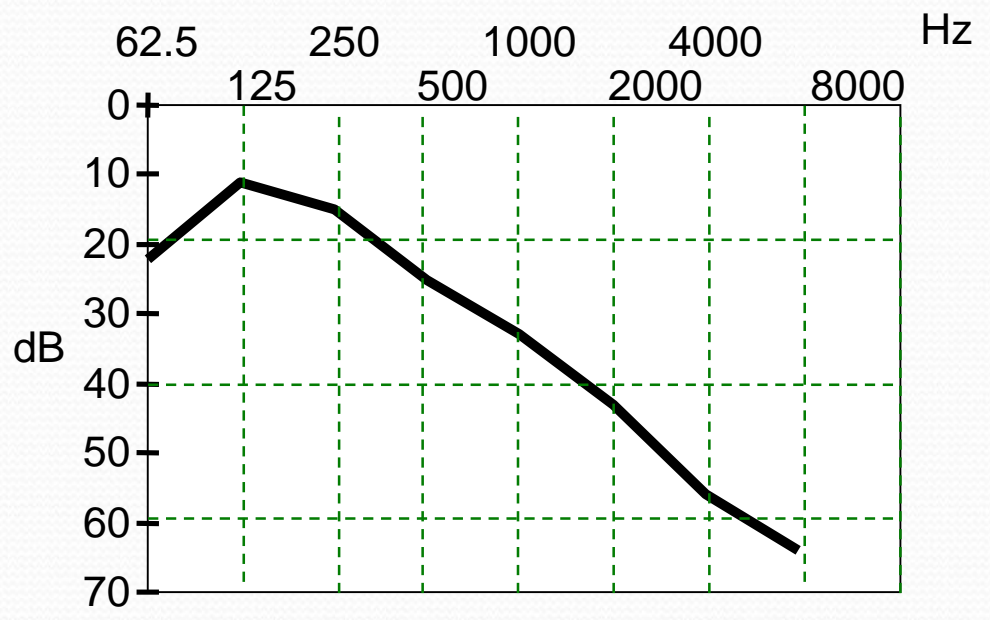
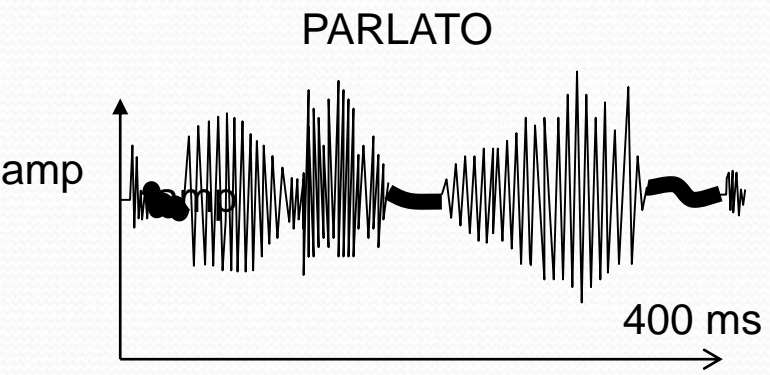
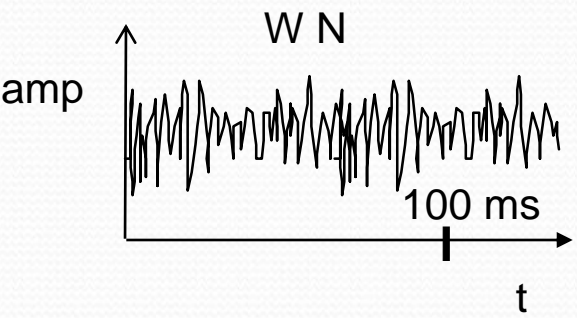


# TONI PURI E SPETTRI

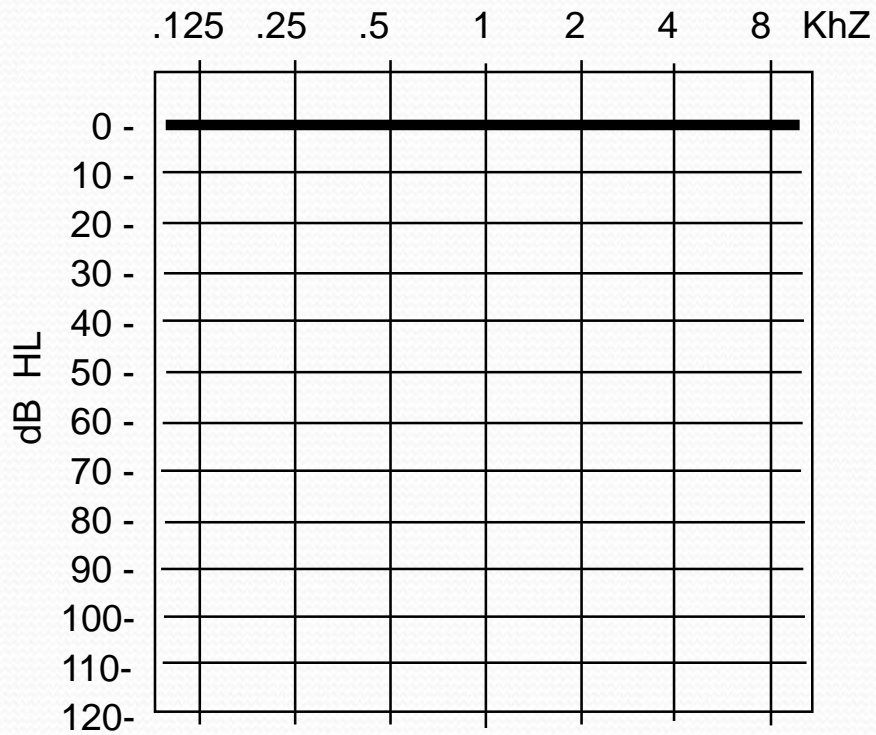




# SUONI COMPLESSI E SPETTRI

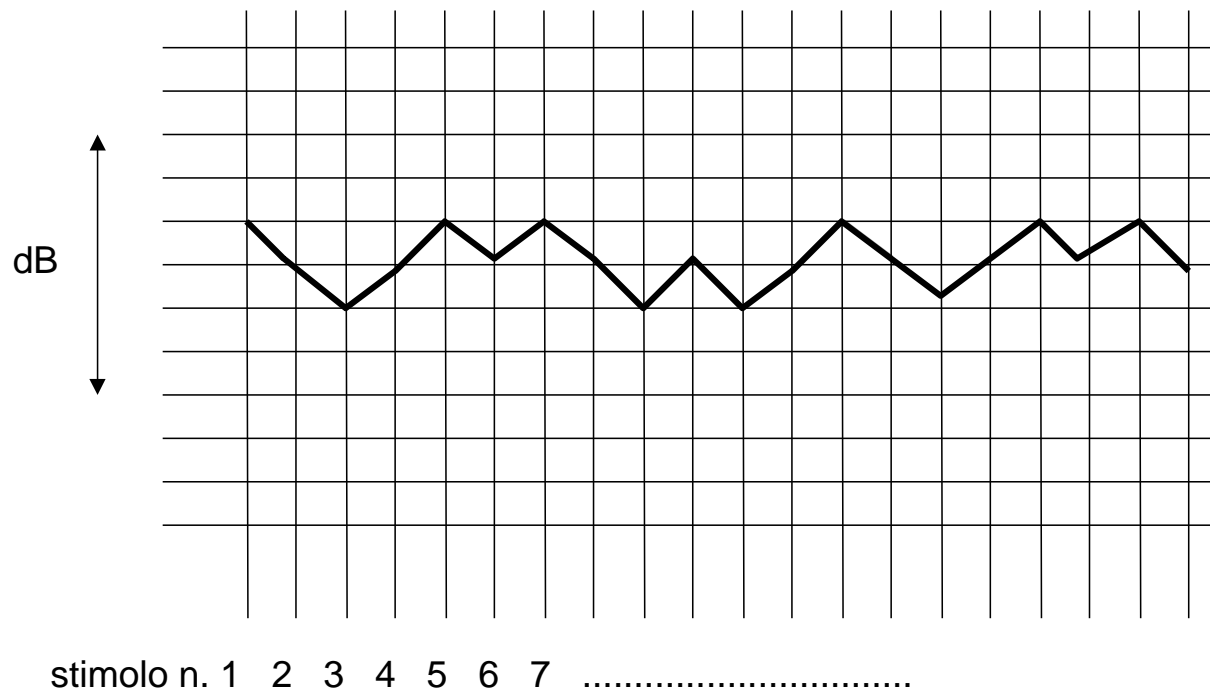


# AUDIOGRAMMA



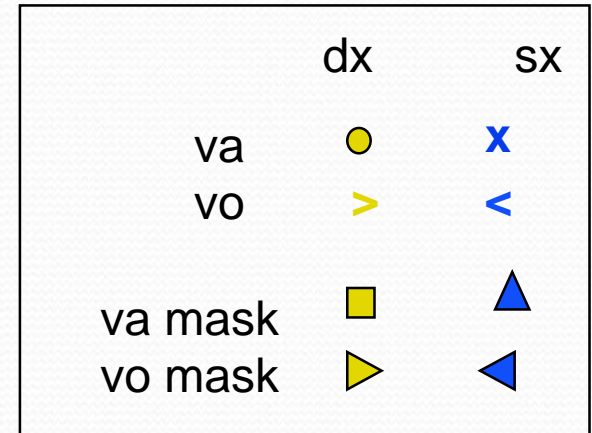
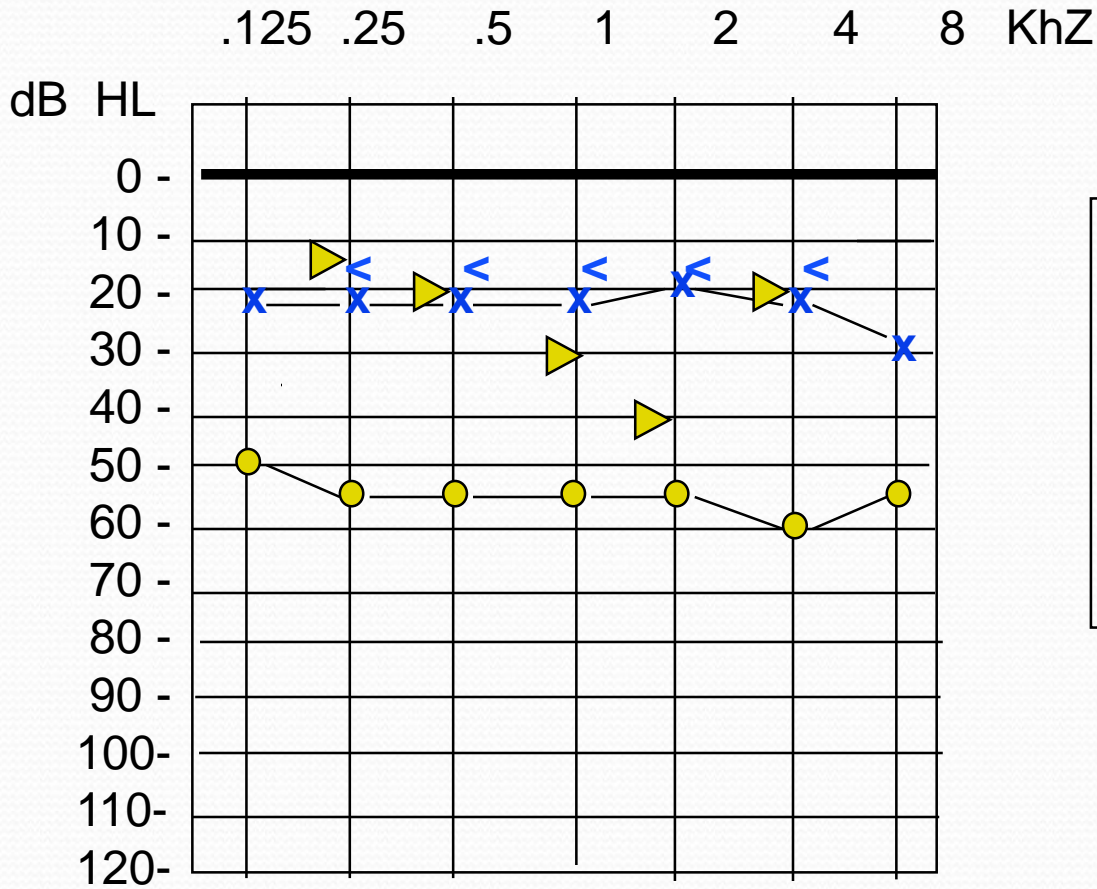
	dx	sx
v.a.	O	X
v.o.	>	<
v.a. mask.	□	△
v.o. mask	▶	◀

# METODO ADATTIVO

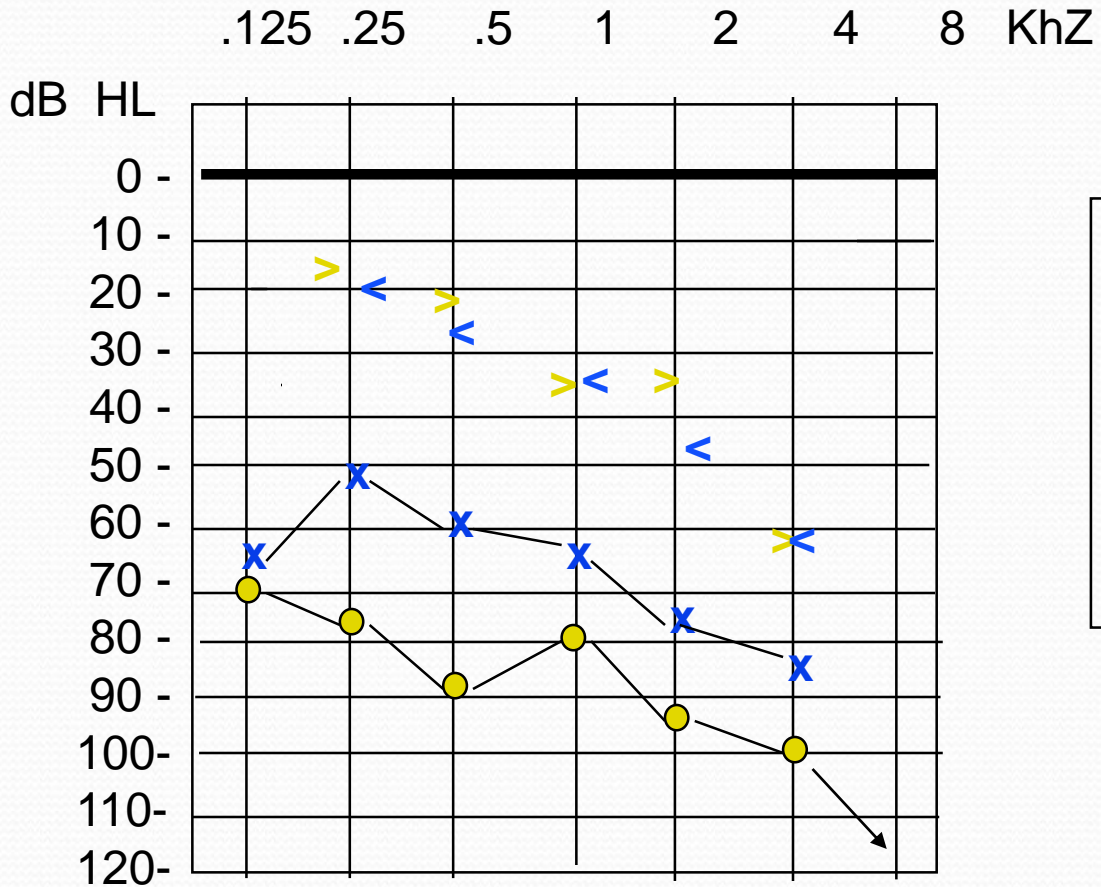




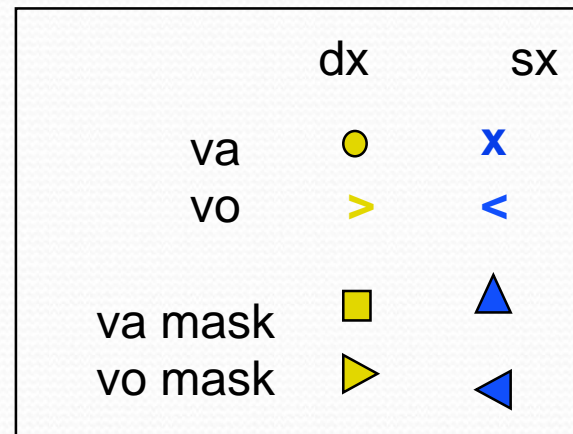
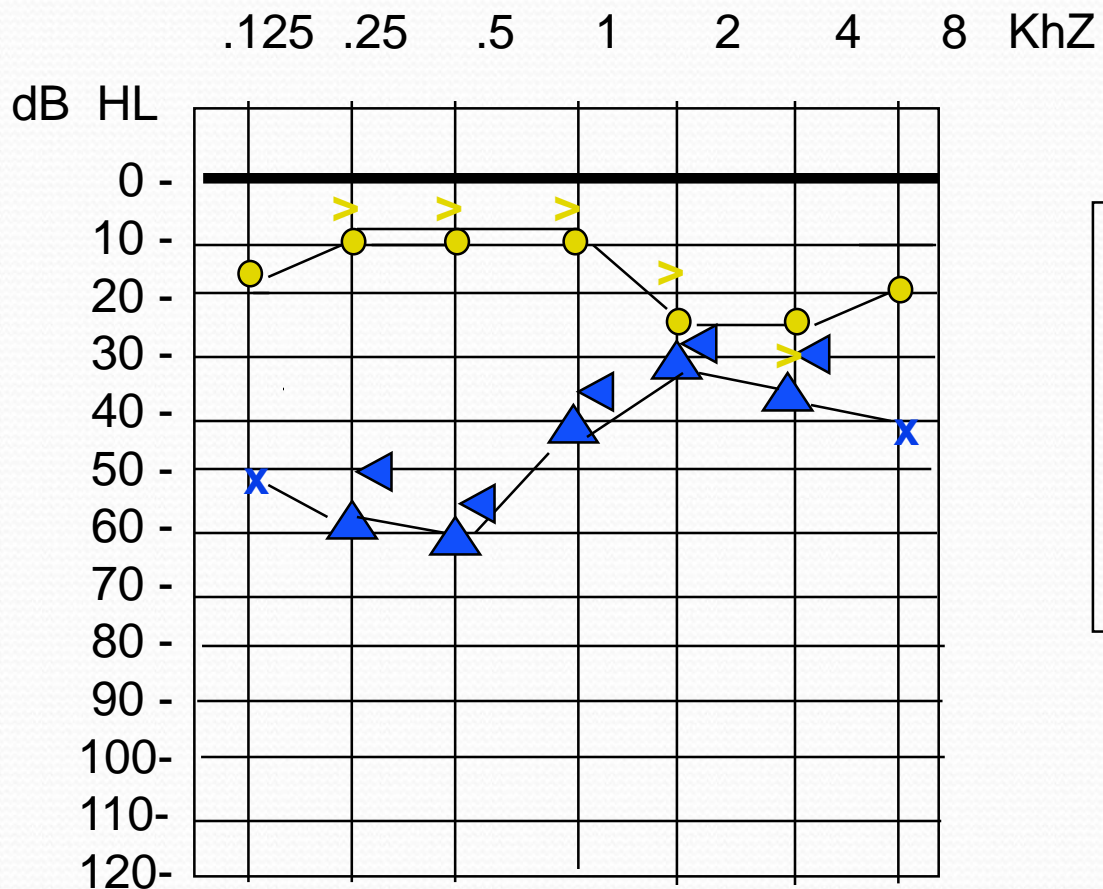
# otosclerosi



# otosclerosi

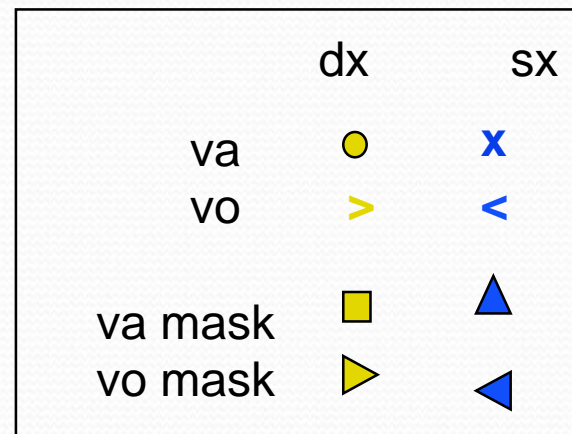
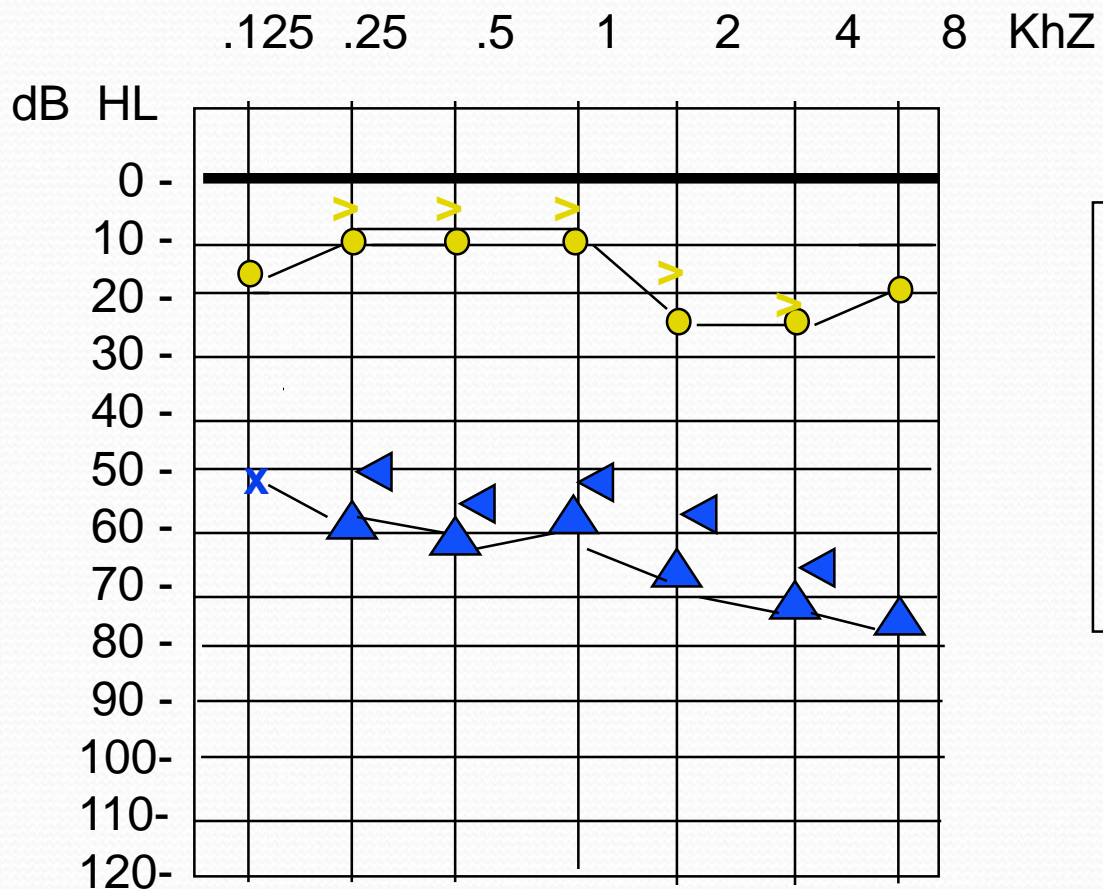


# Malattia di Menière sinistra

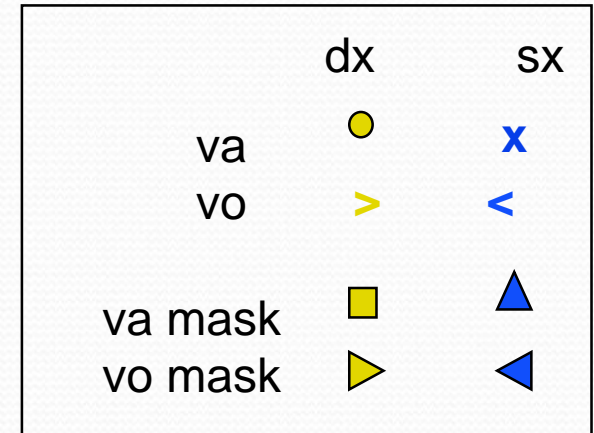
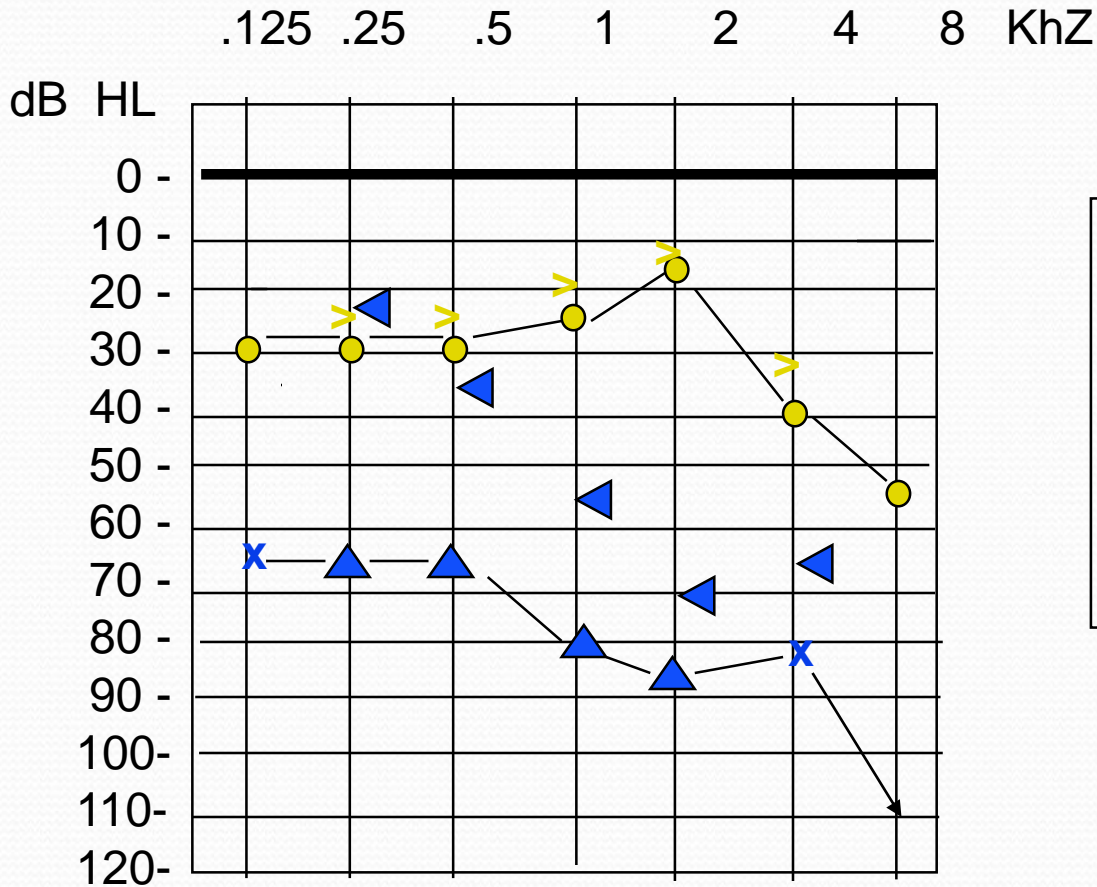




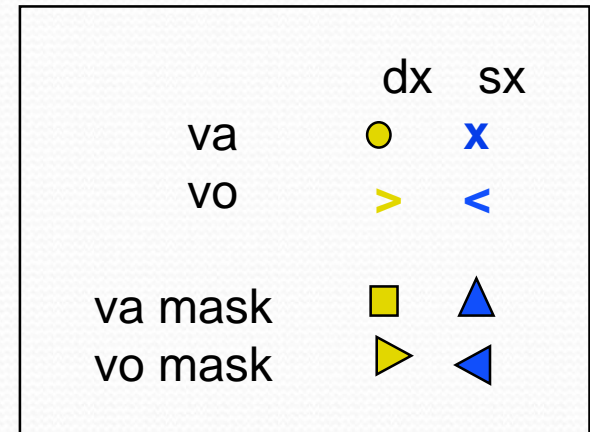
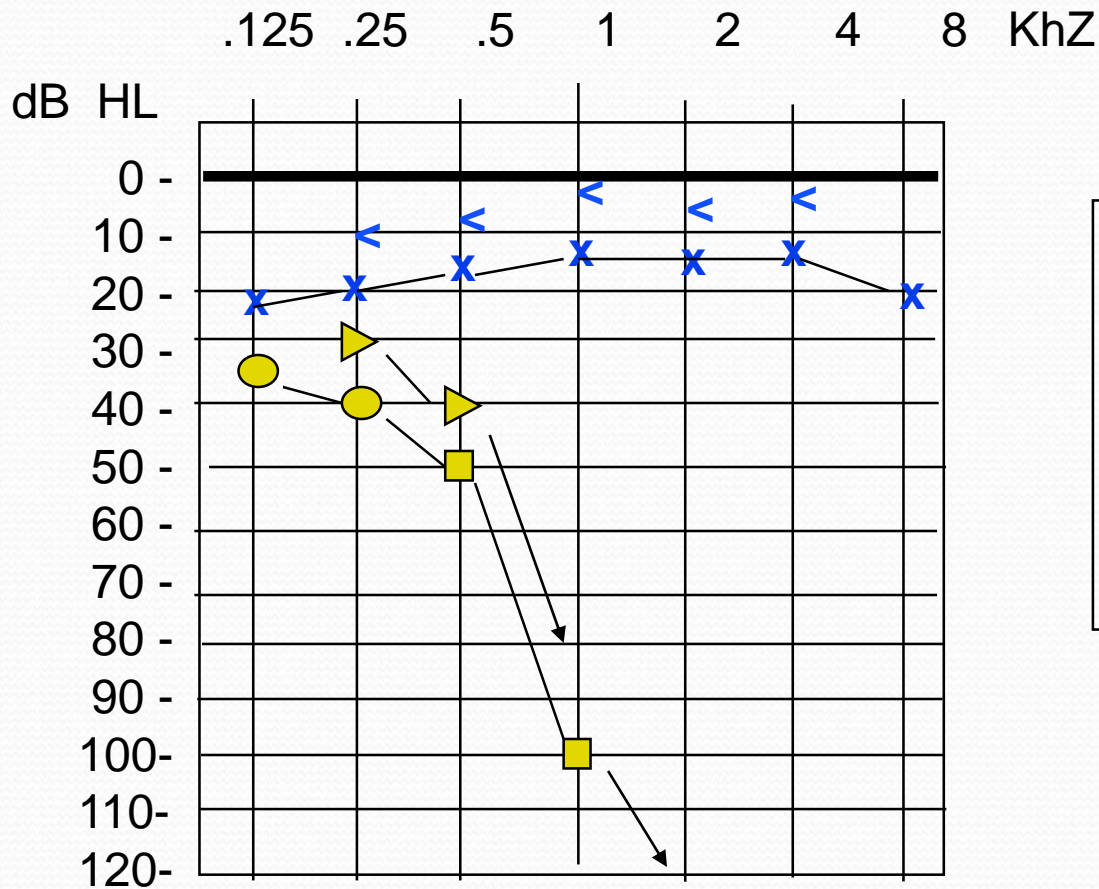
# Malattia di Menière sinistra



# Otite acuta emorragica

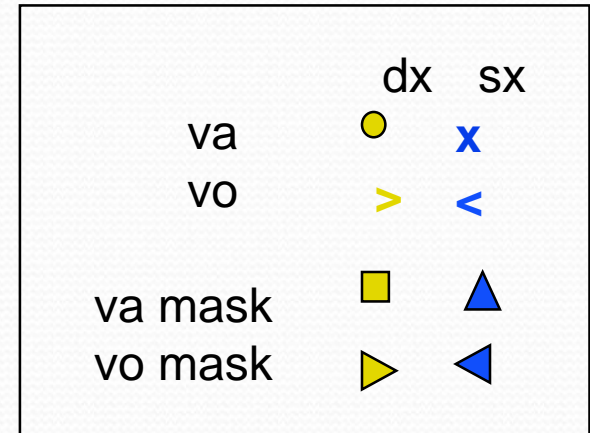
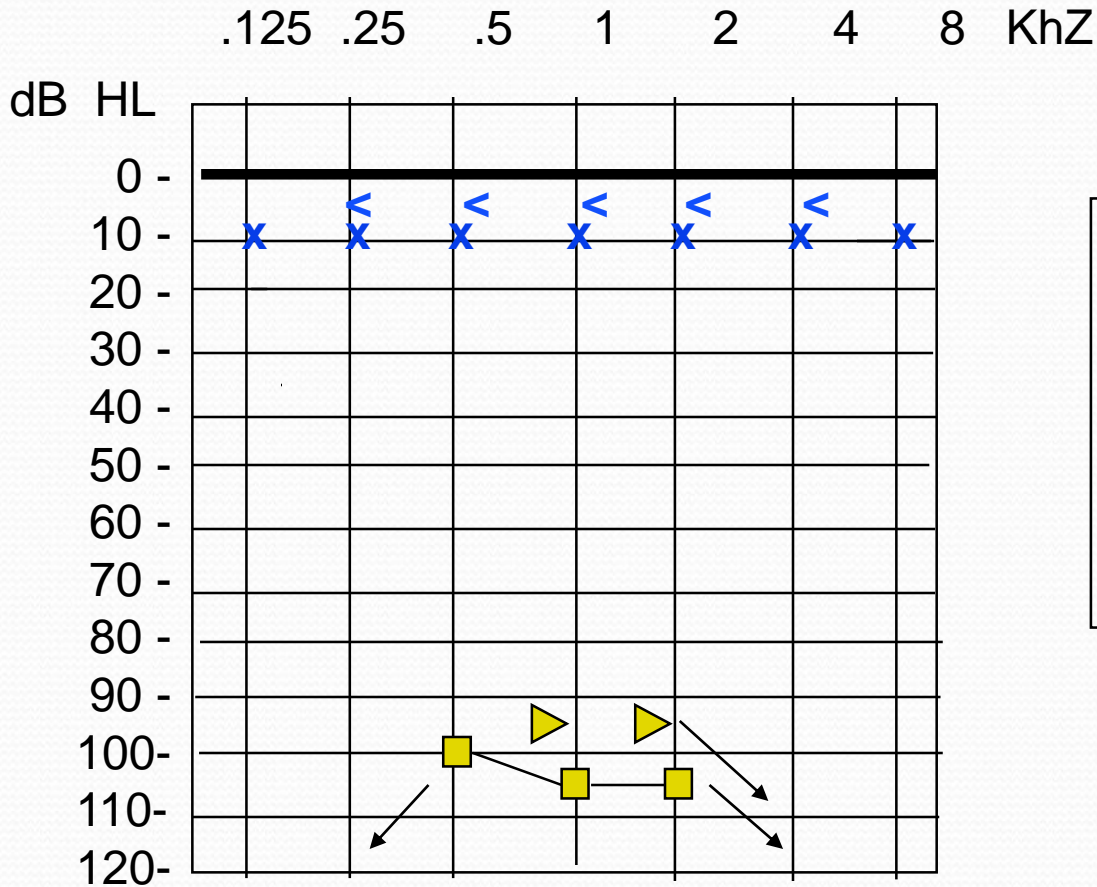


# Barotrauma (da immersione)



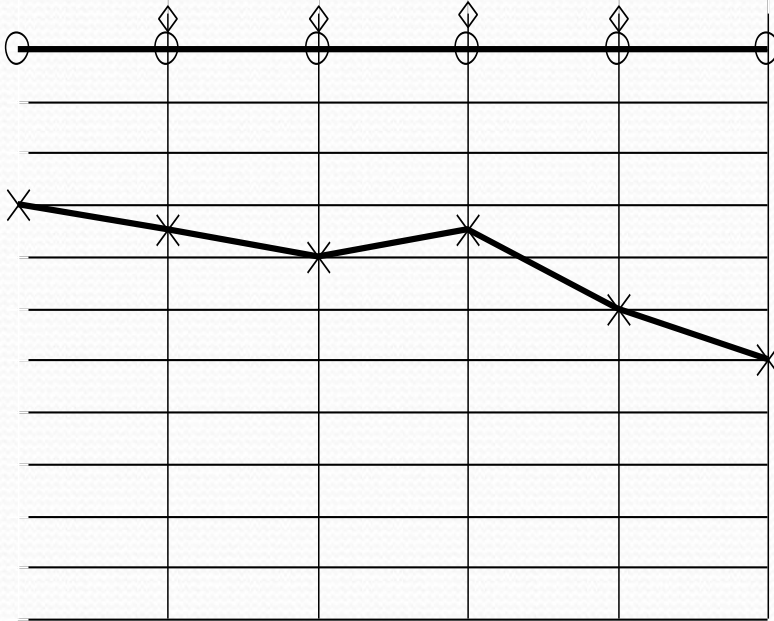
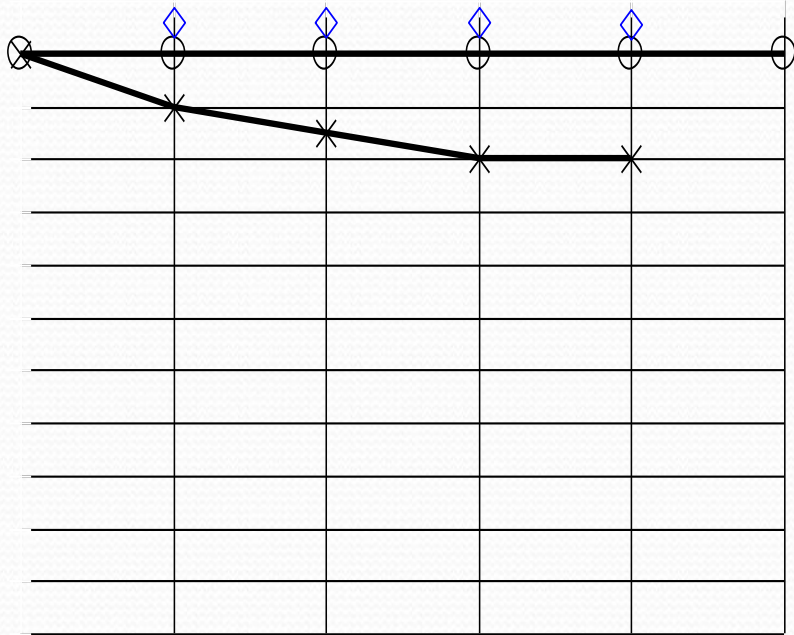


# Barotrauma (da immersione)



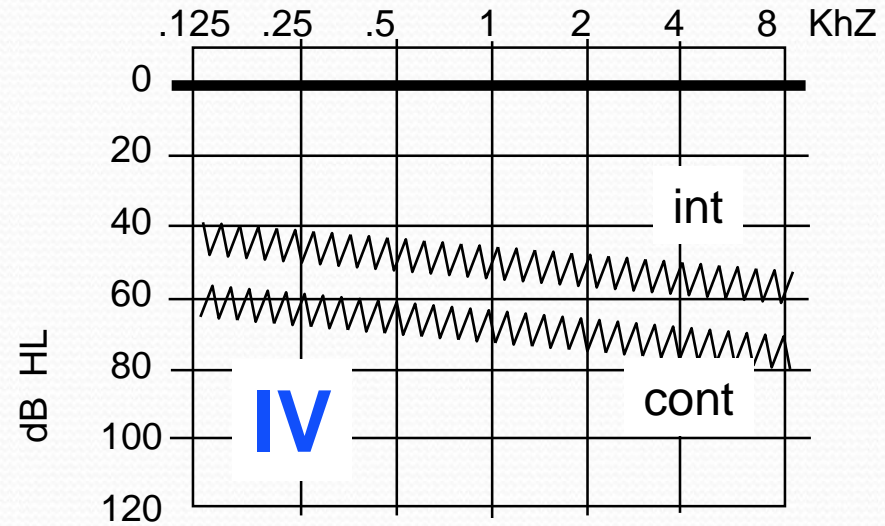
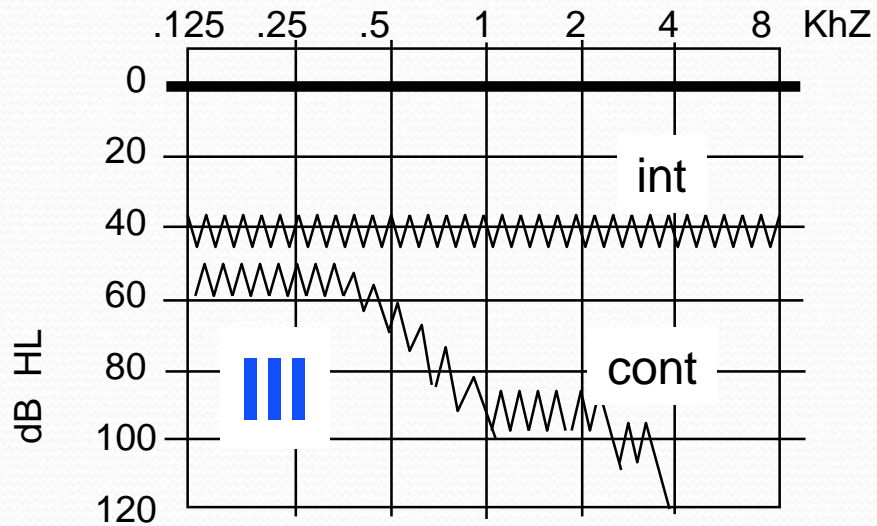
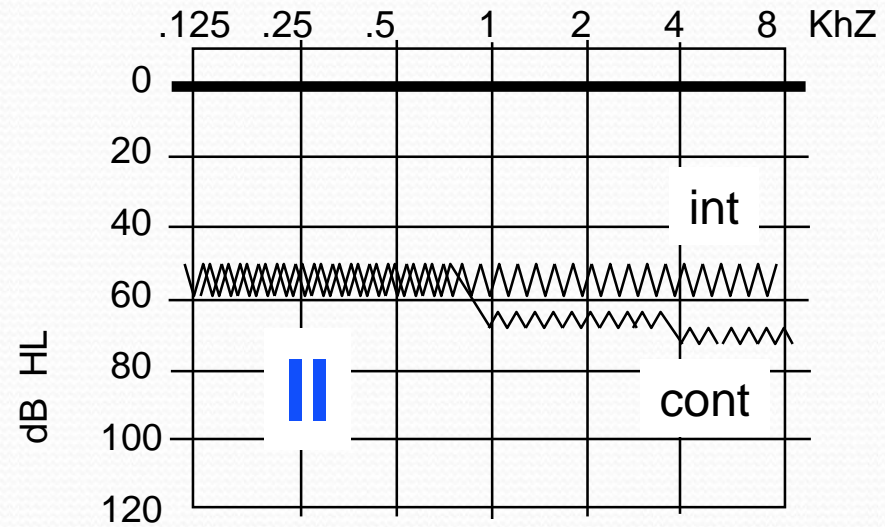
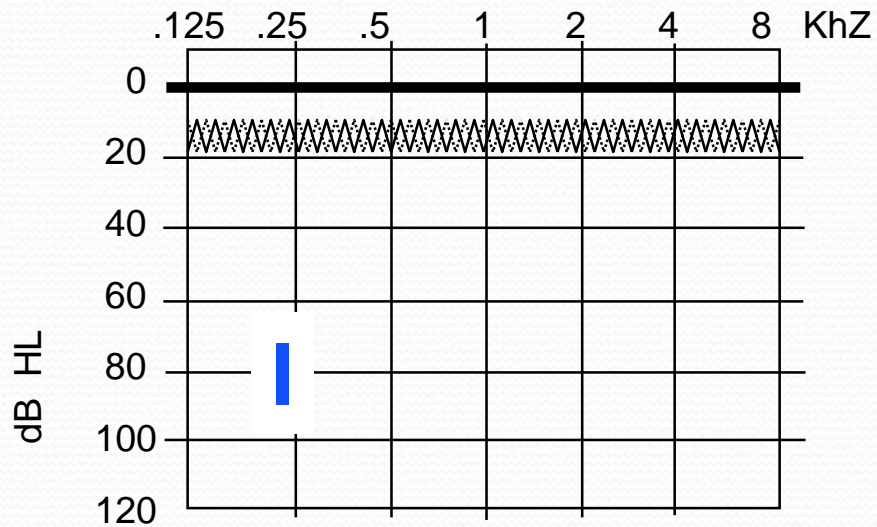
# MASCHERARE LA VIA OSSEA

# MASCHERARE LA VIA AEREA



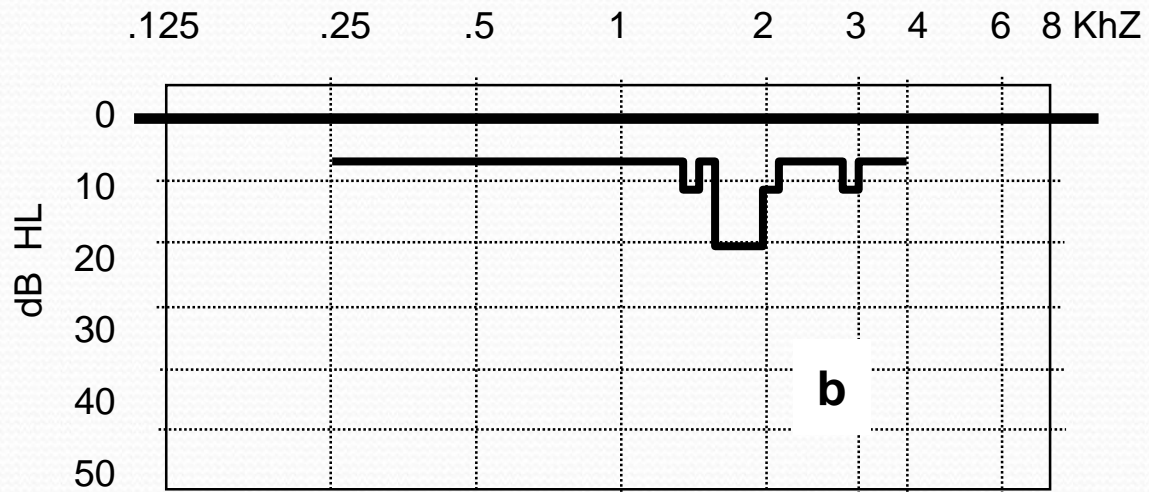
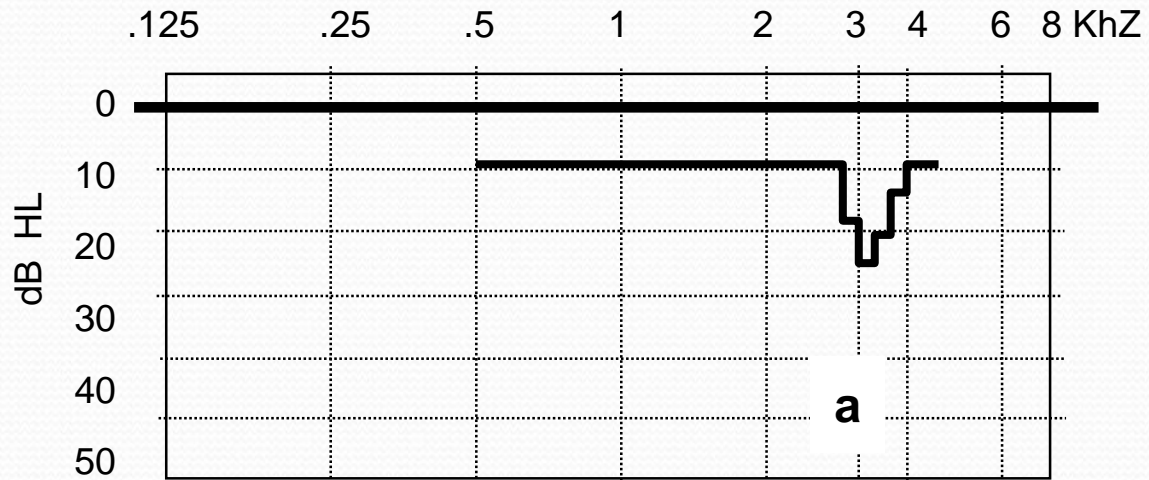


# AUDIOMETRIA AUTOMATICA

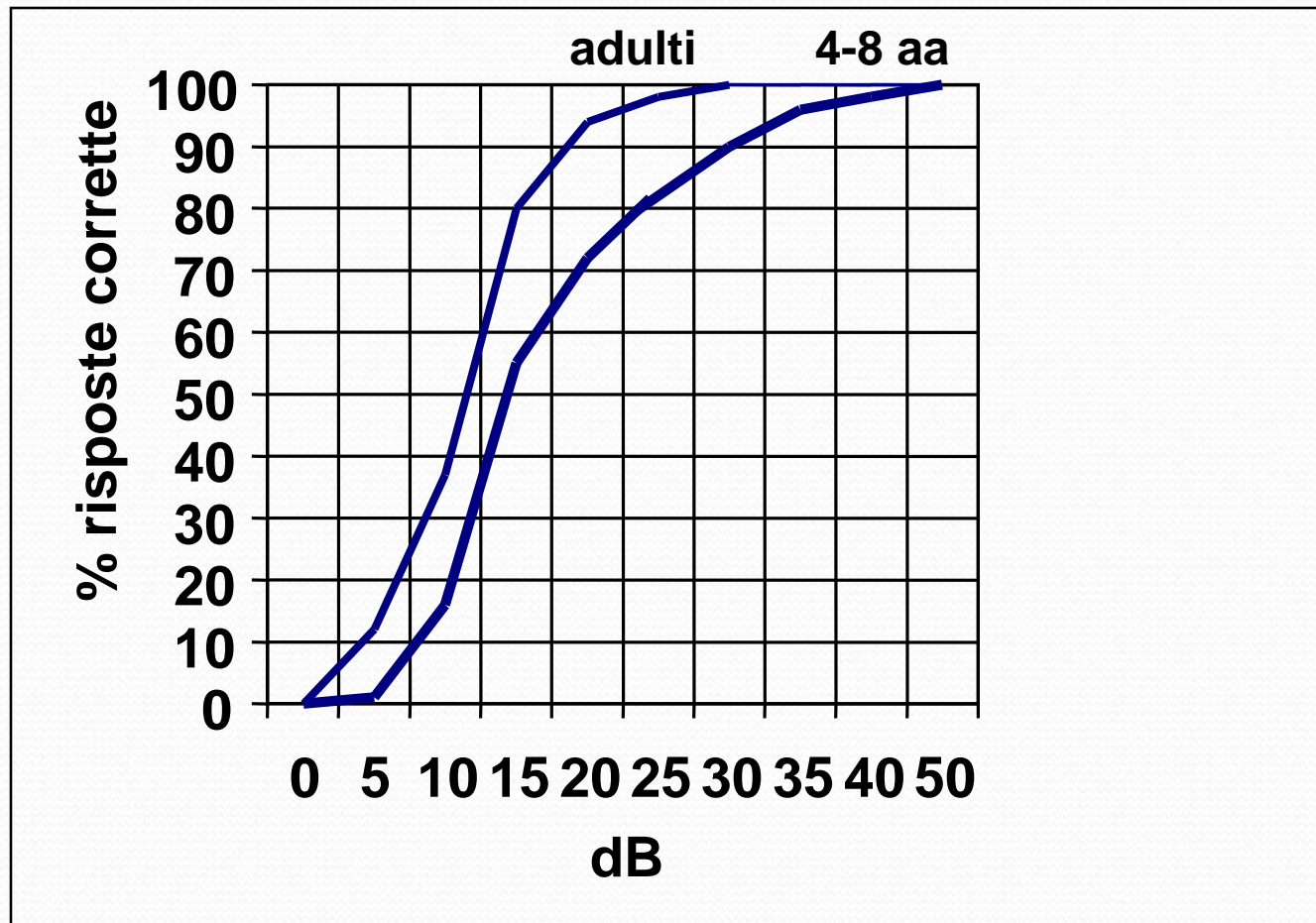




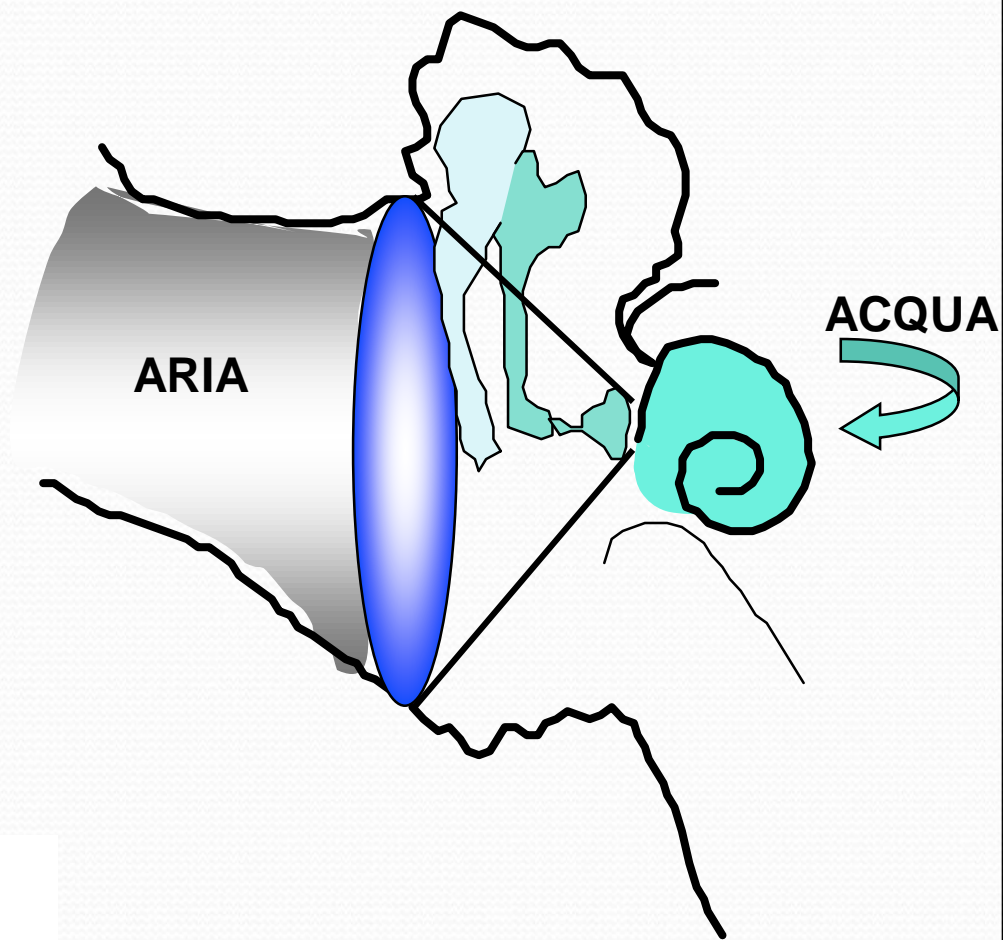
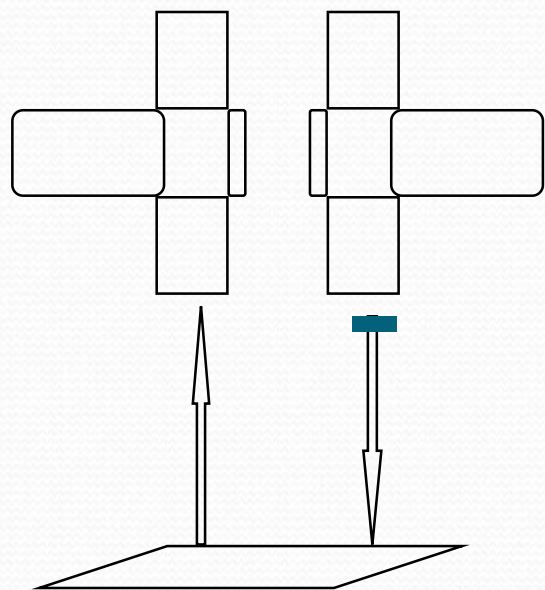
# AUDIOSCAN



## INTELLIGIBILITA' ADULTI E BAMBINI

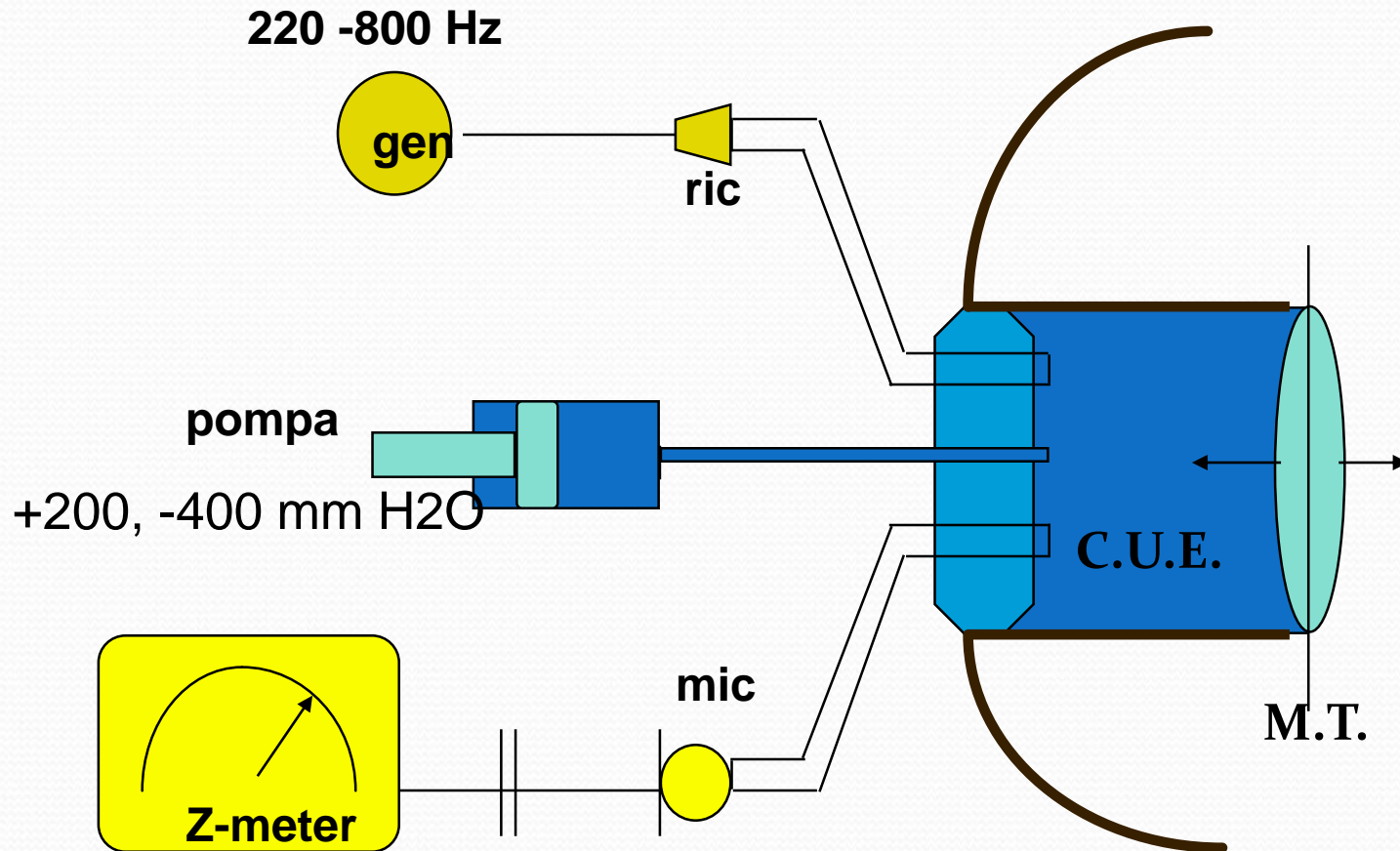


# ORECCHIO MEDIO TRASFORMATORE DI IMPEDENZA

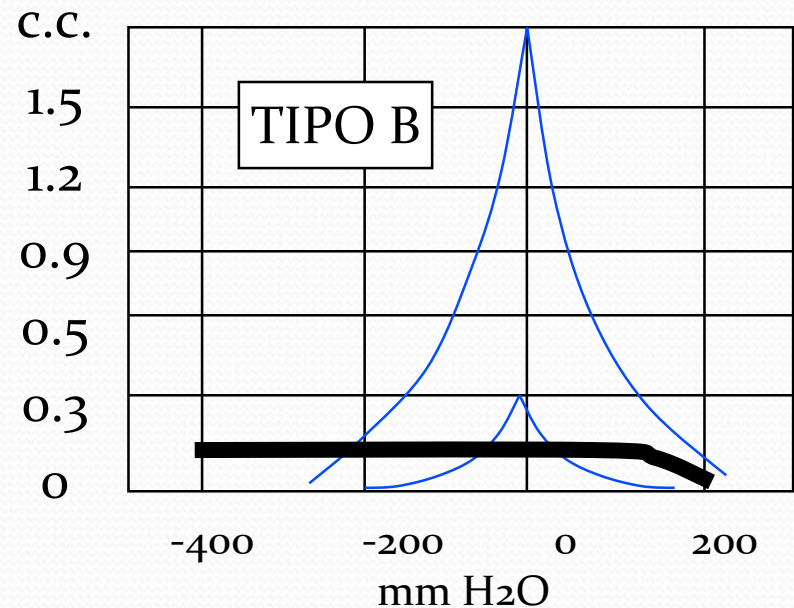
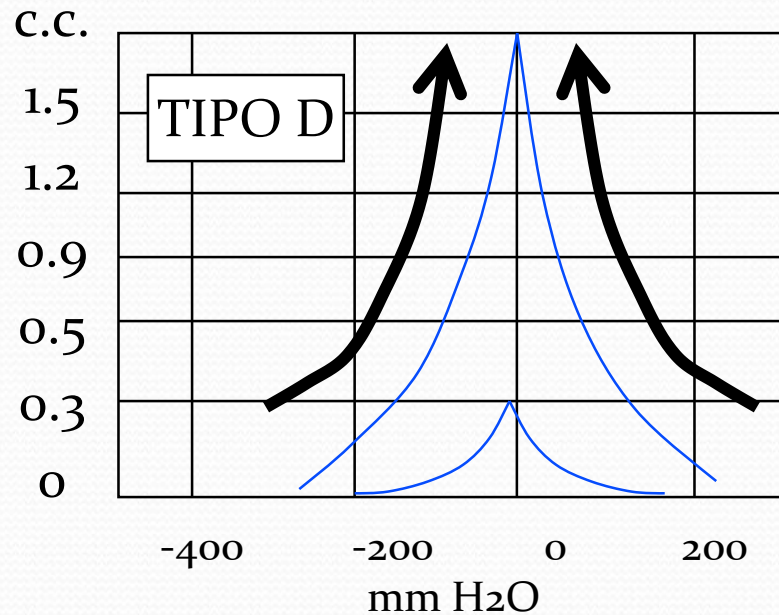
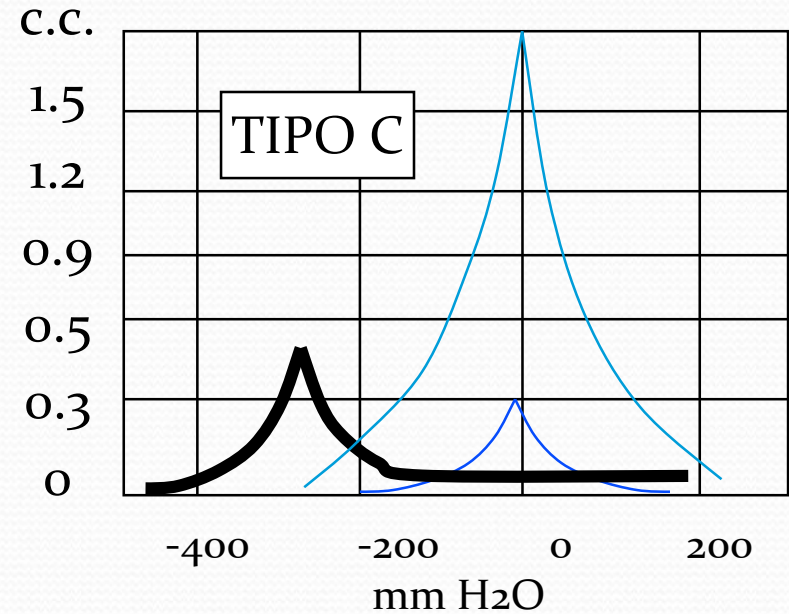
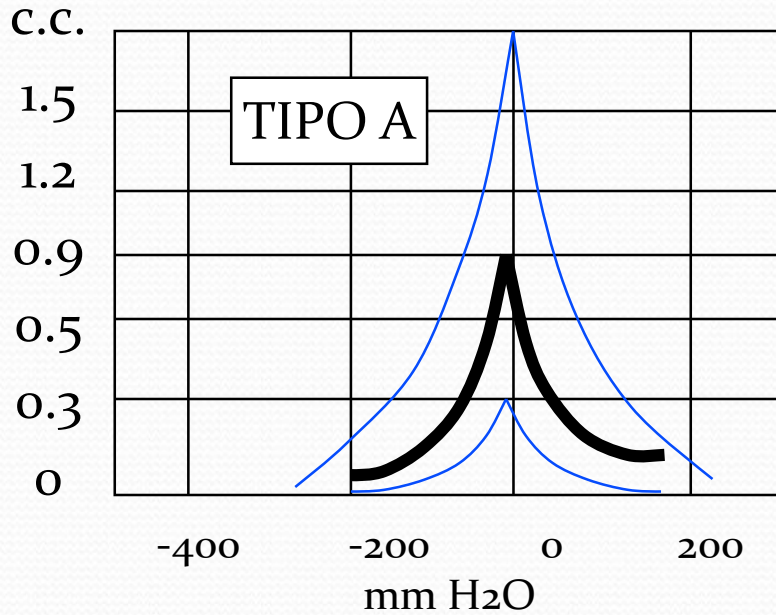




# IMPEDENZOMETRO-schema



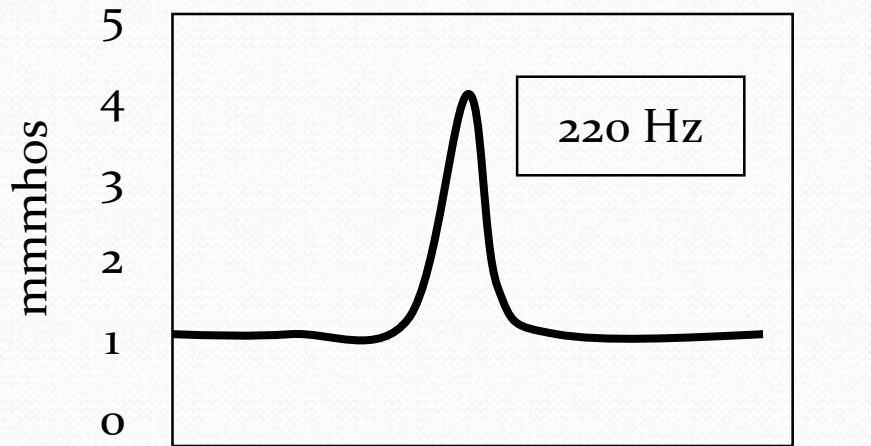
# CLASSIFICAZIONE TIMPANOGRAMMI



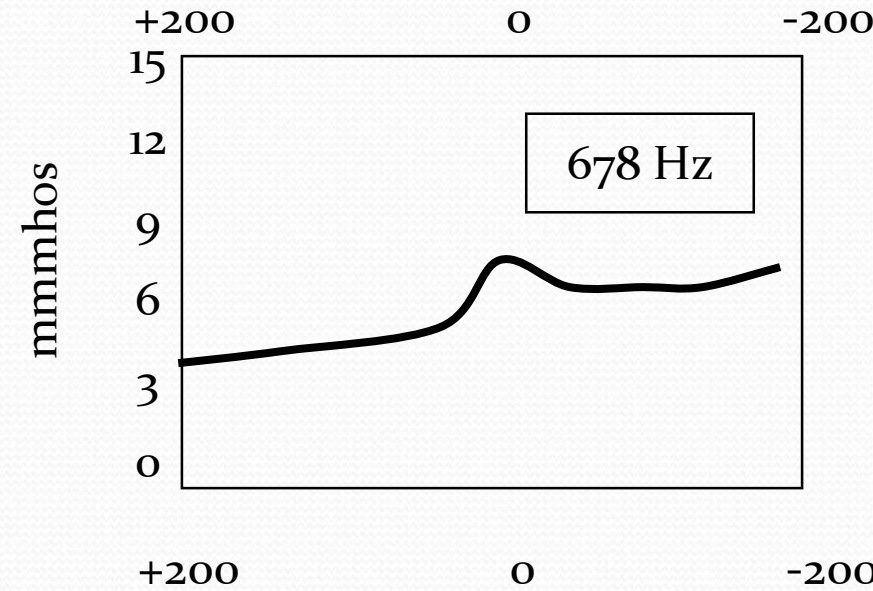
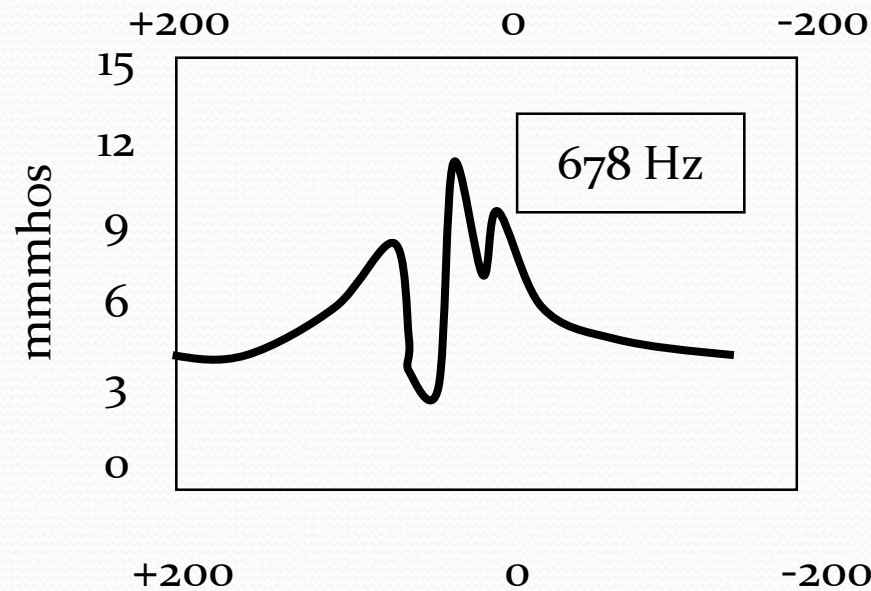
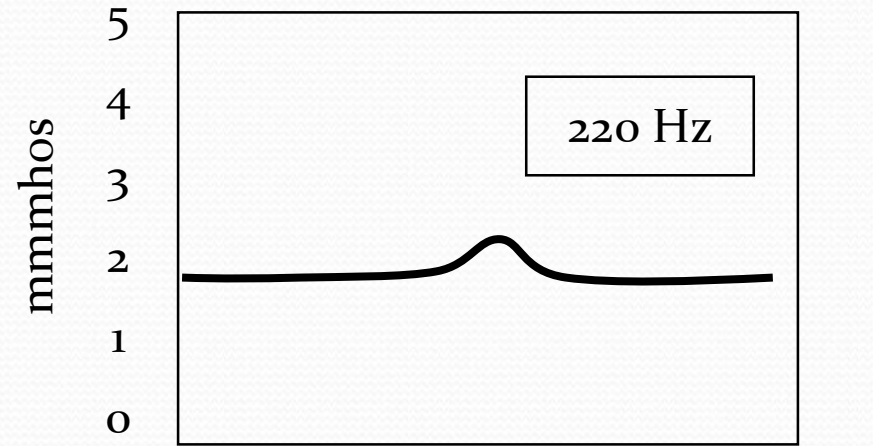


# VARIARE IL TONO SONDA

“mass controlled”

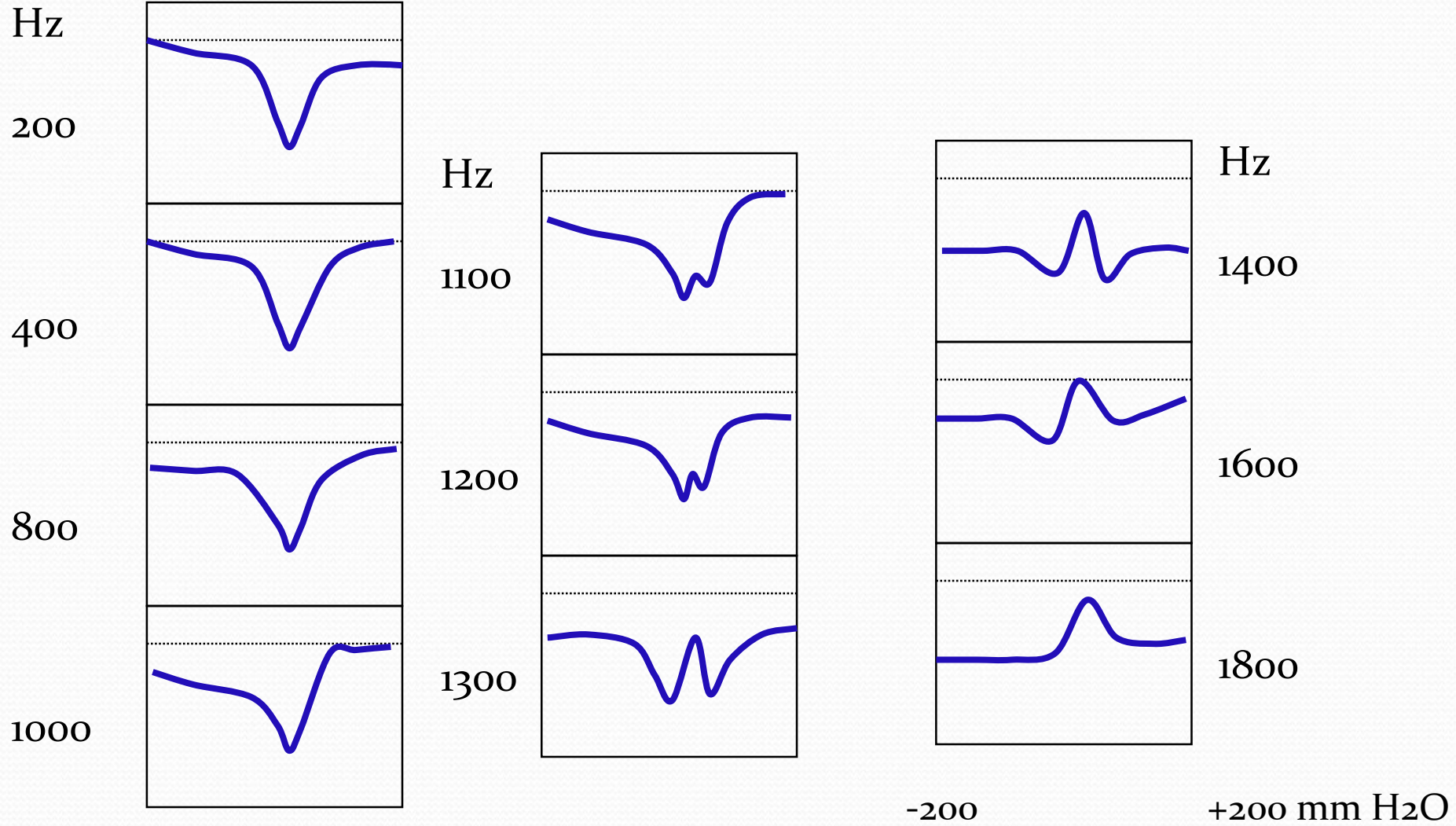


“stiffness controlled”

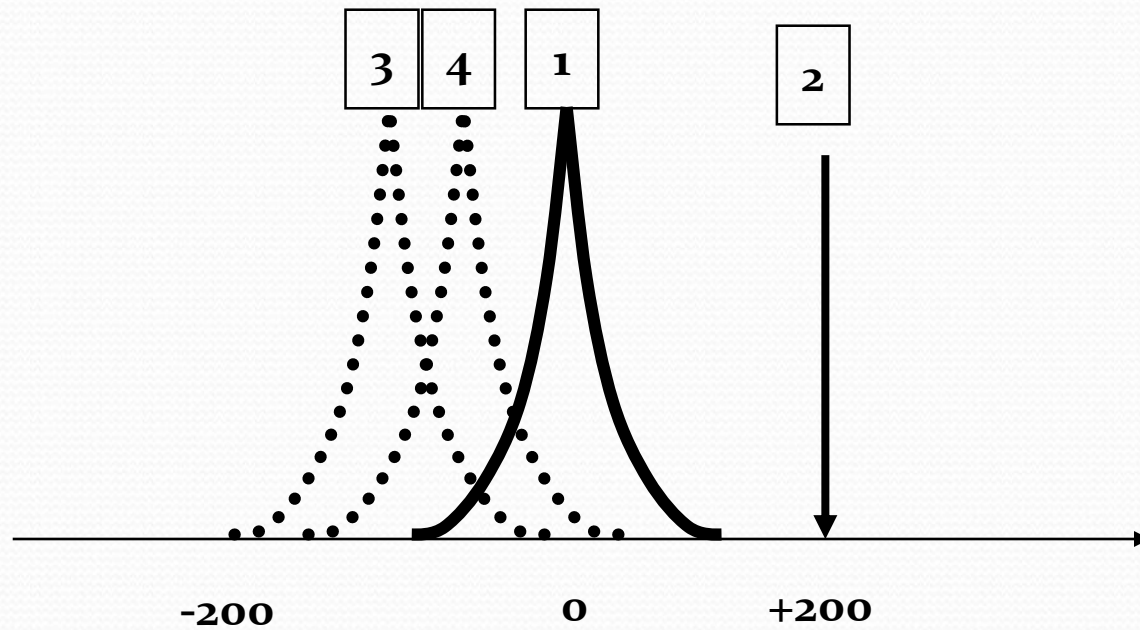




# IMPEDENZOMETRIA MULTIFREQUENZIALE

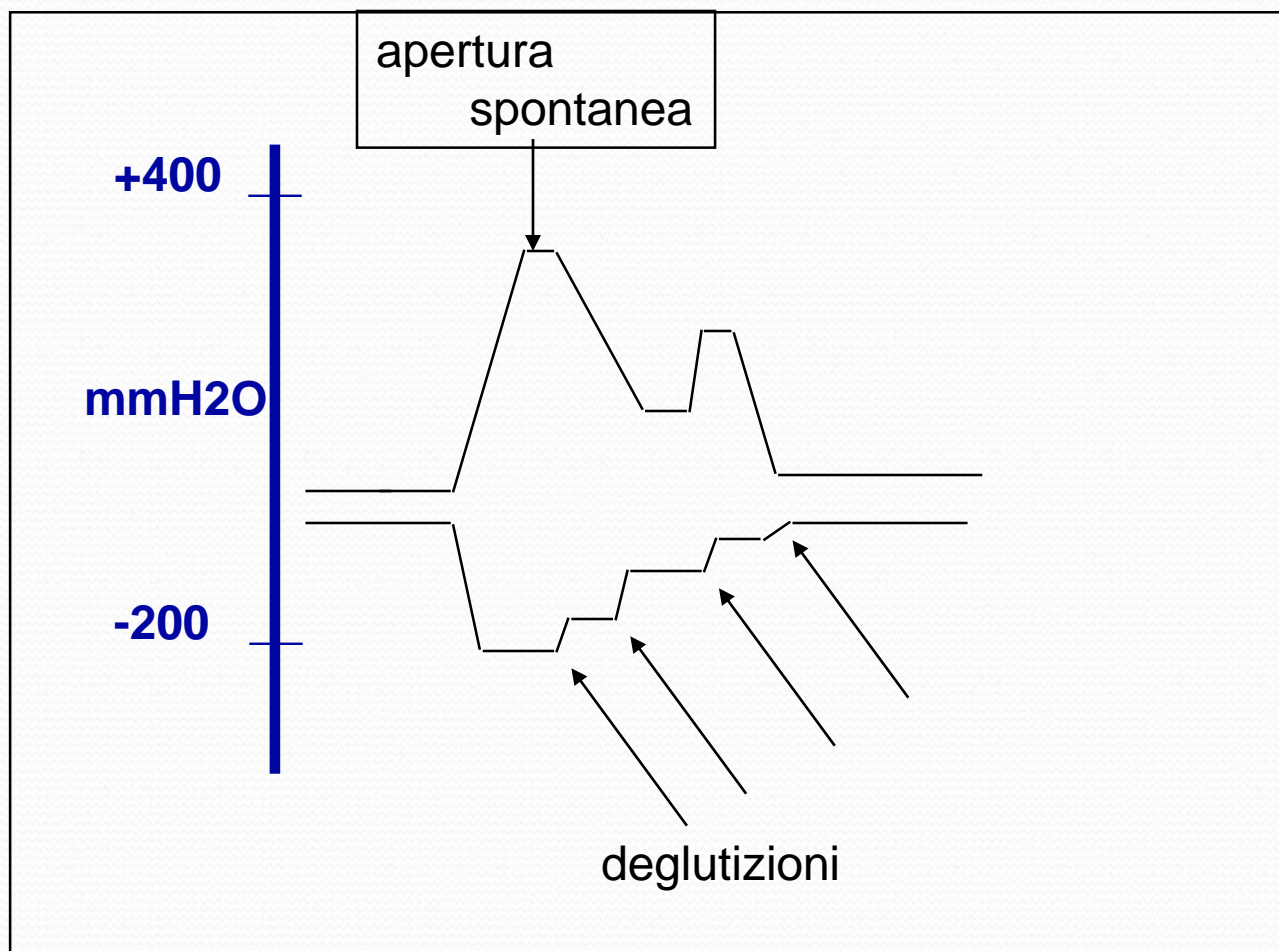


# TIMPANOMETRIA: FUNZIONALITÀ TUBARICA



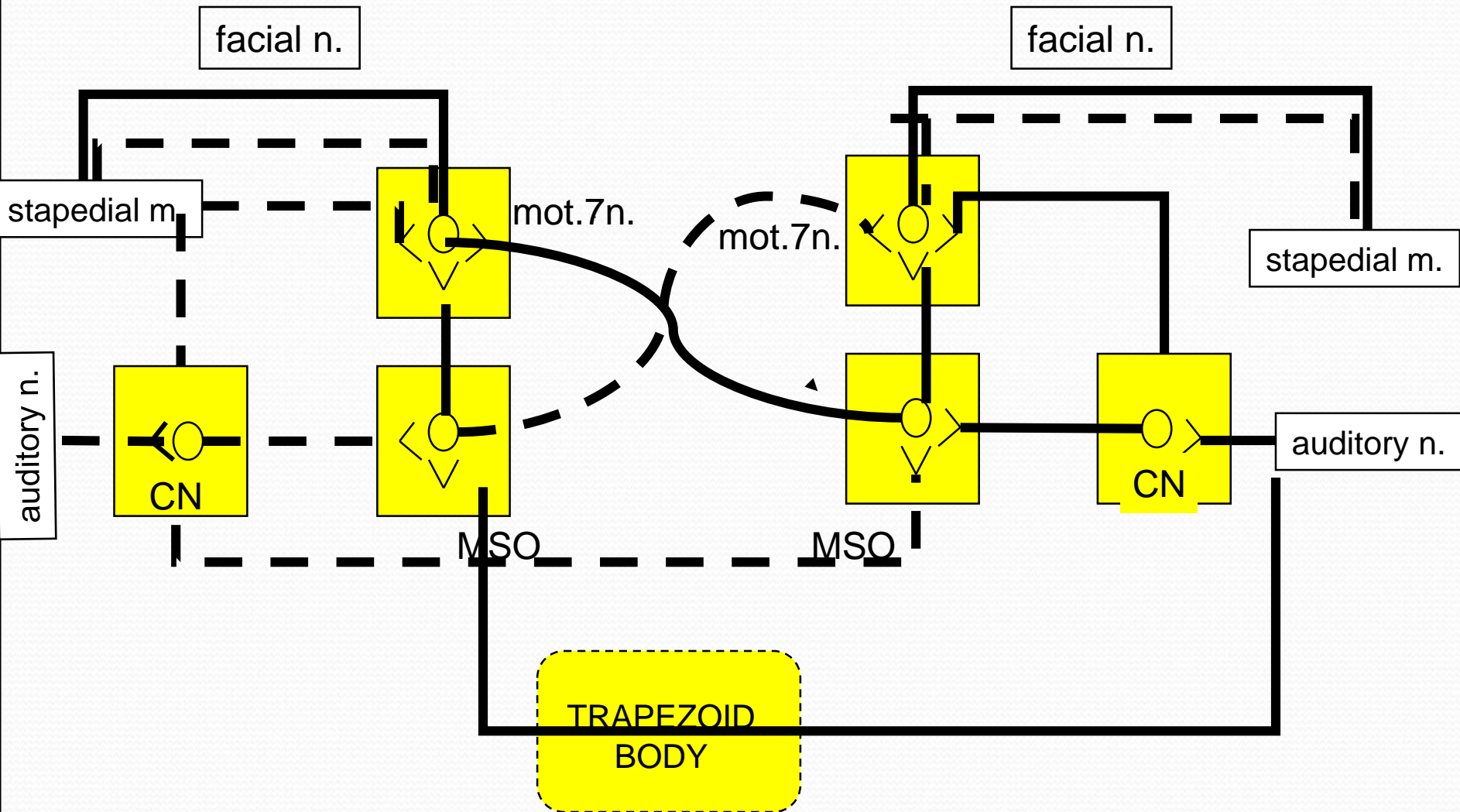


# TIMPANOMETRIA-FUNZIONALITÀ TUBARICA



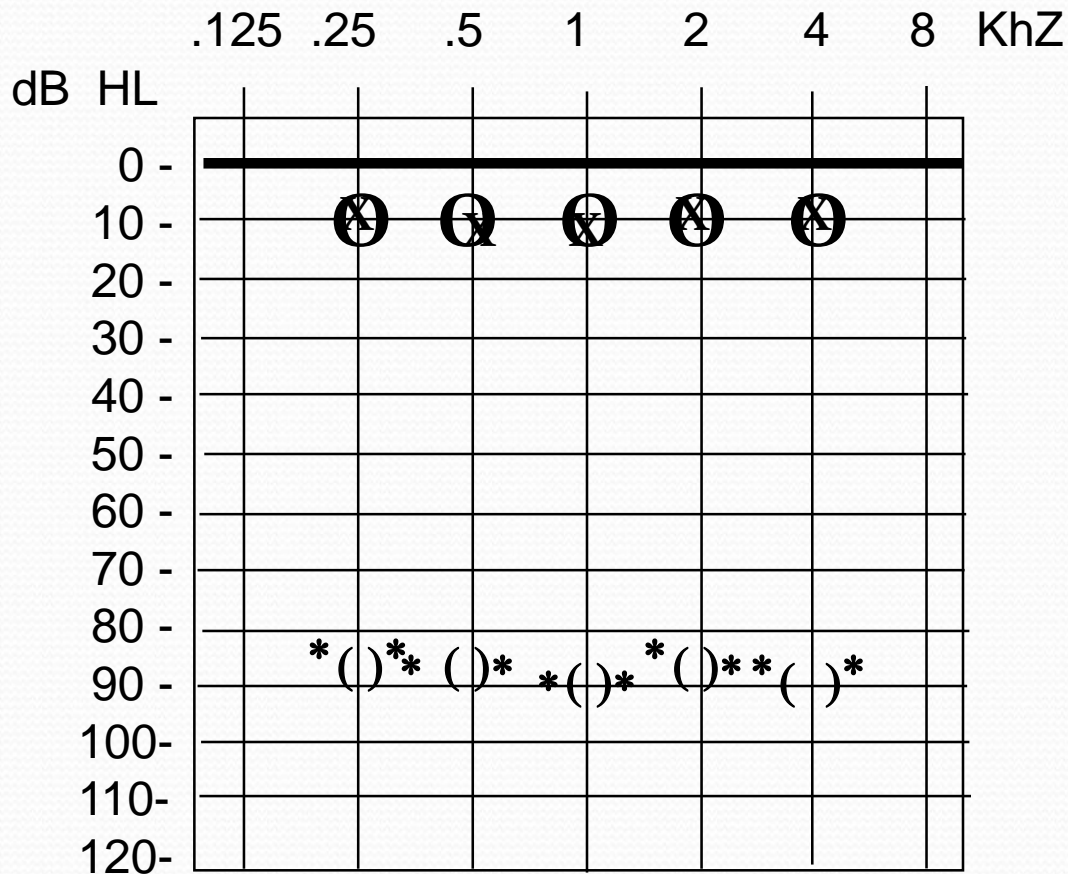


# ARCO RIFLESSO STAPEDIALE - schematico



MSO: media superior olivary complex. CN: cochlear nucleus

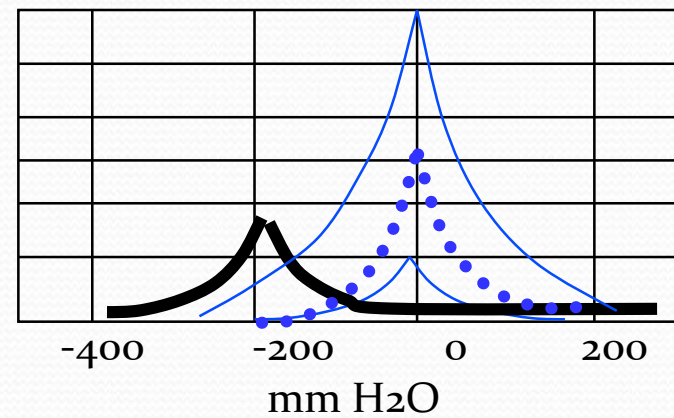
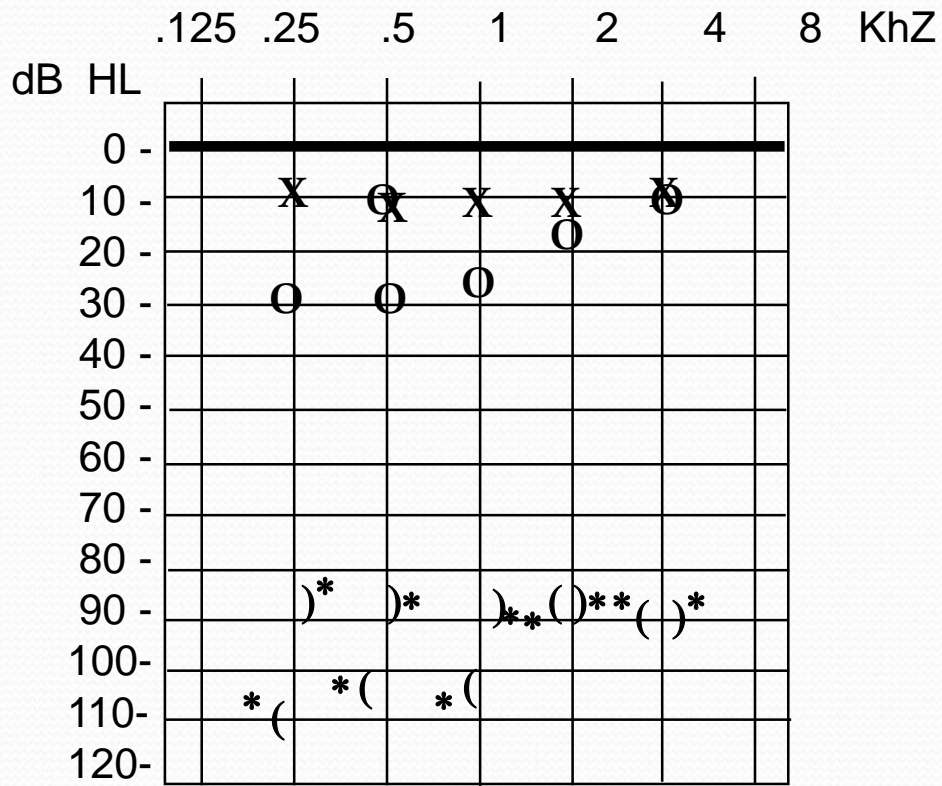
# RIFLESSI STAPEDIALI - rappresentazione



Au stimolato  
 rosso destro, blu sinistro

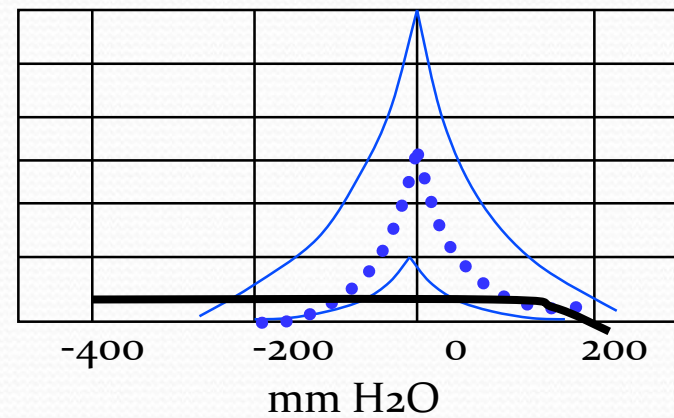
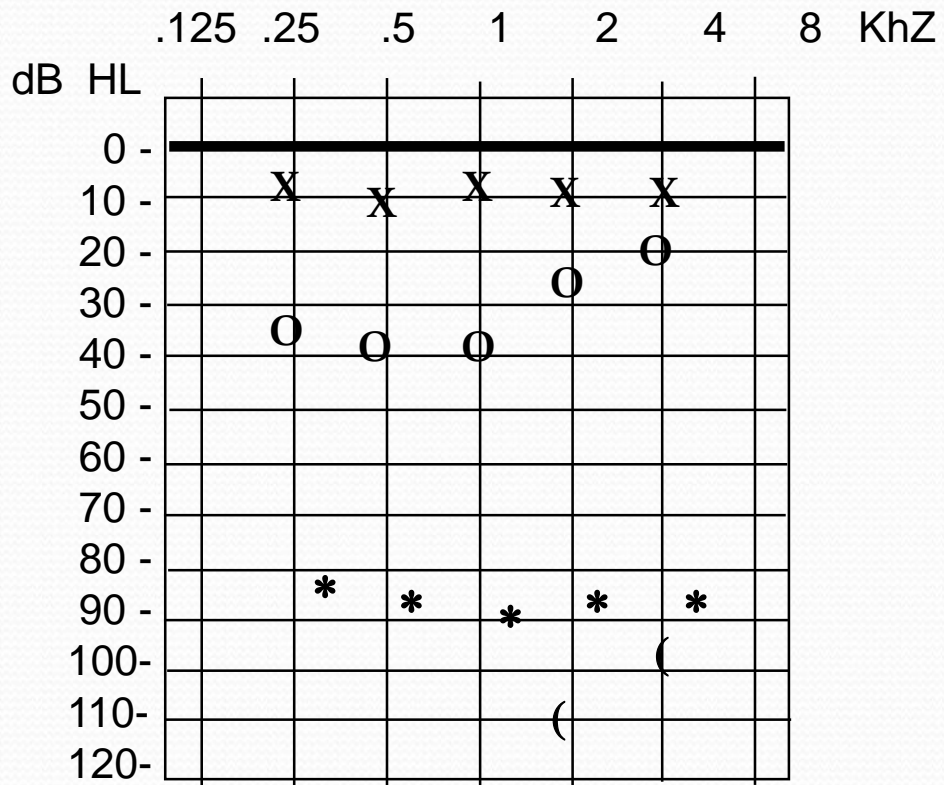
( riflesso controlaterale  
 \* riflesso ipsilaterale

# DEPRESSIONE AEREA ENDOTIMPANICA A DESTRA

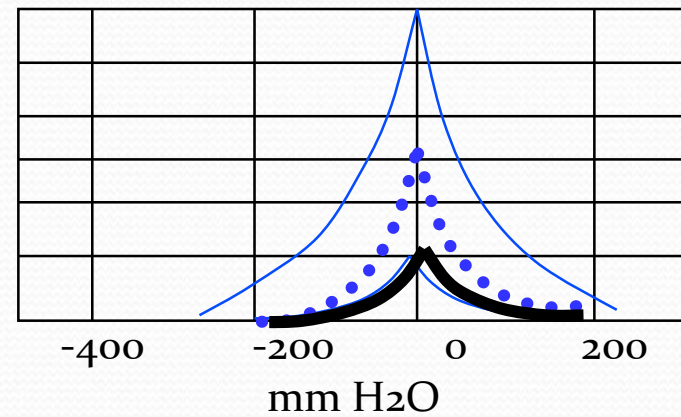
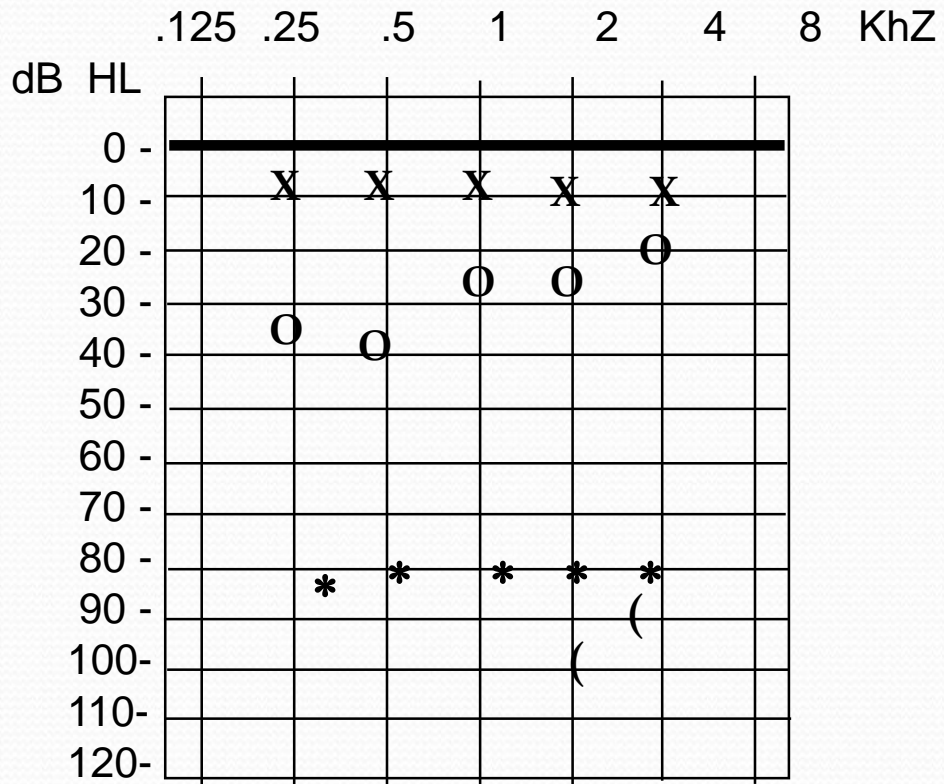




# VERSAMENTO ENDOTIMPANICO A DESTRA

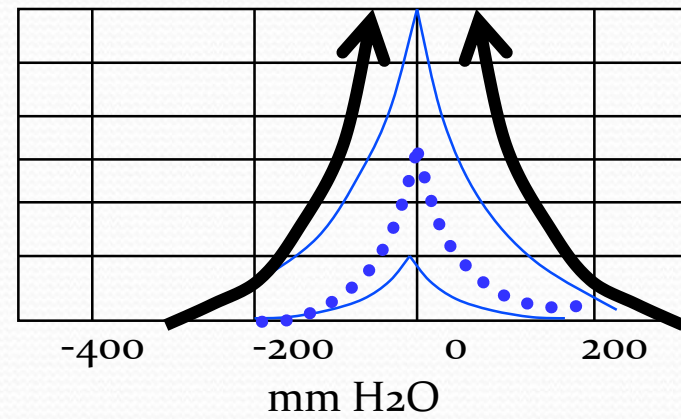
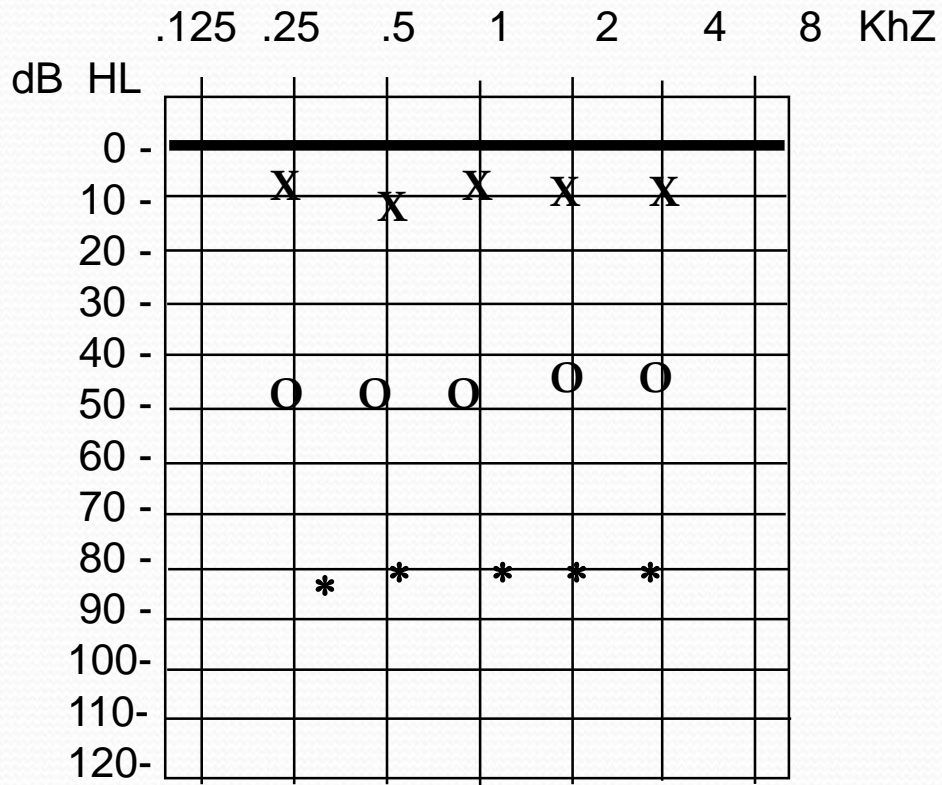


# FISSITA' OSSICULARE A DESTRA (otosclerosi)



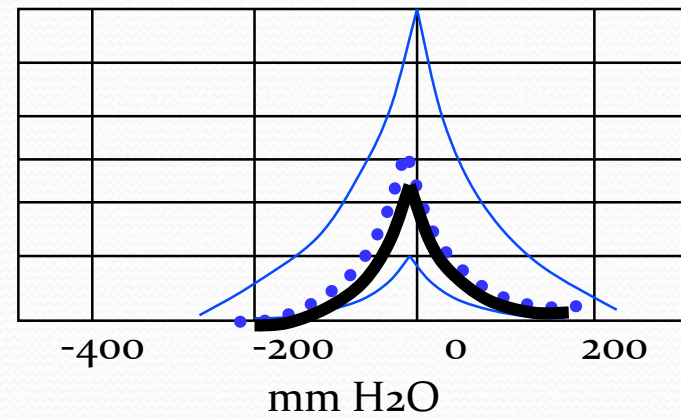
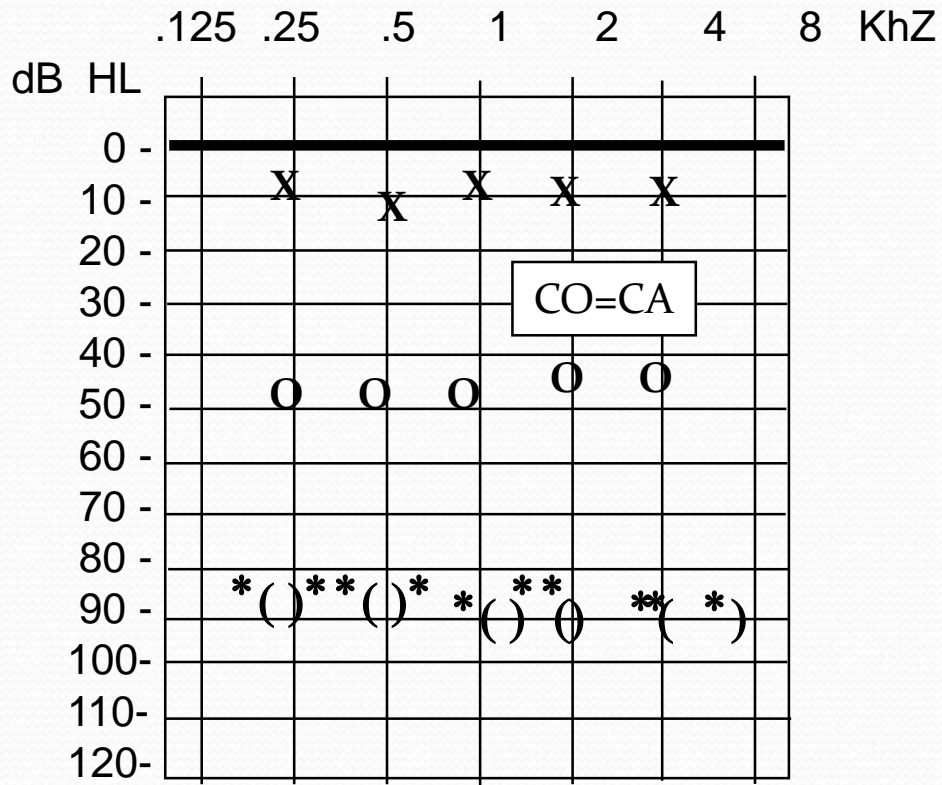


# INTERRUZIONE CATENA OSSICULARE A DESTRA

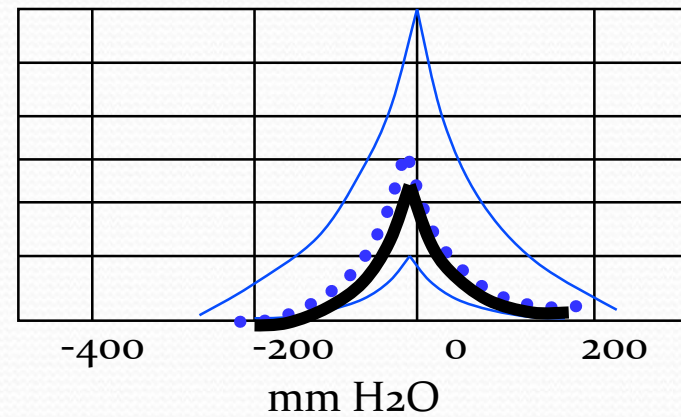
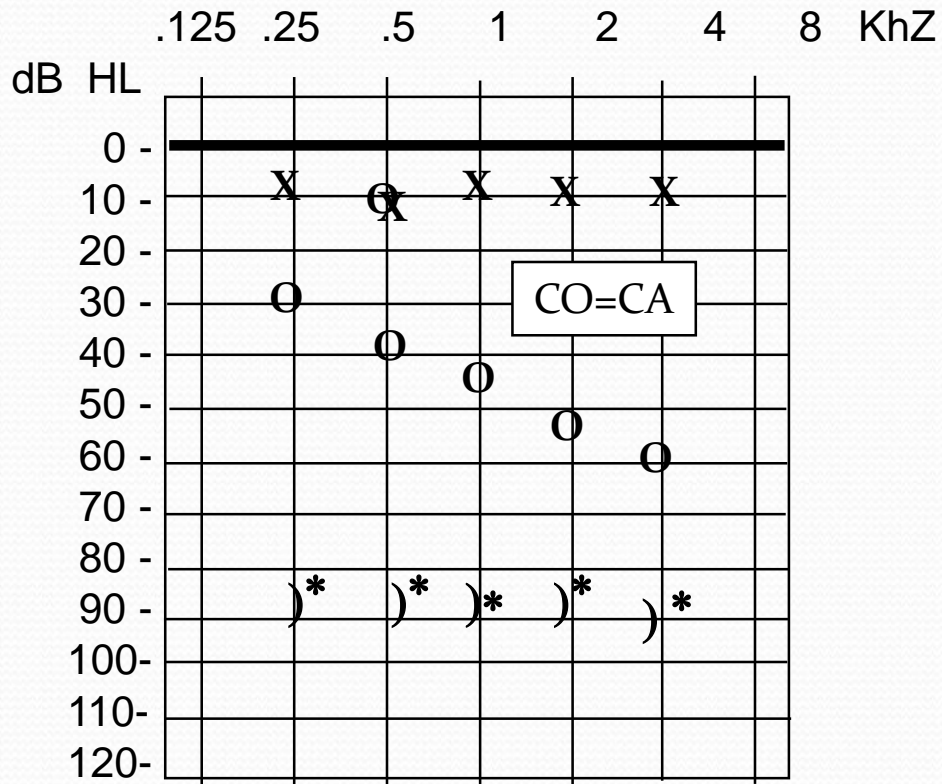




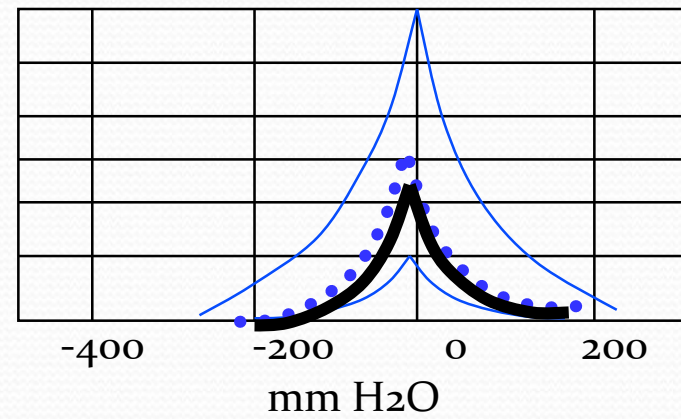
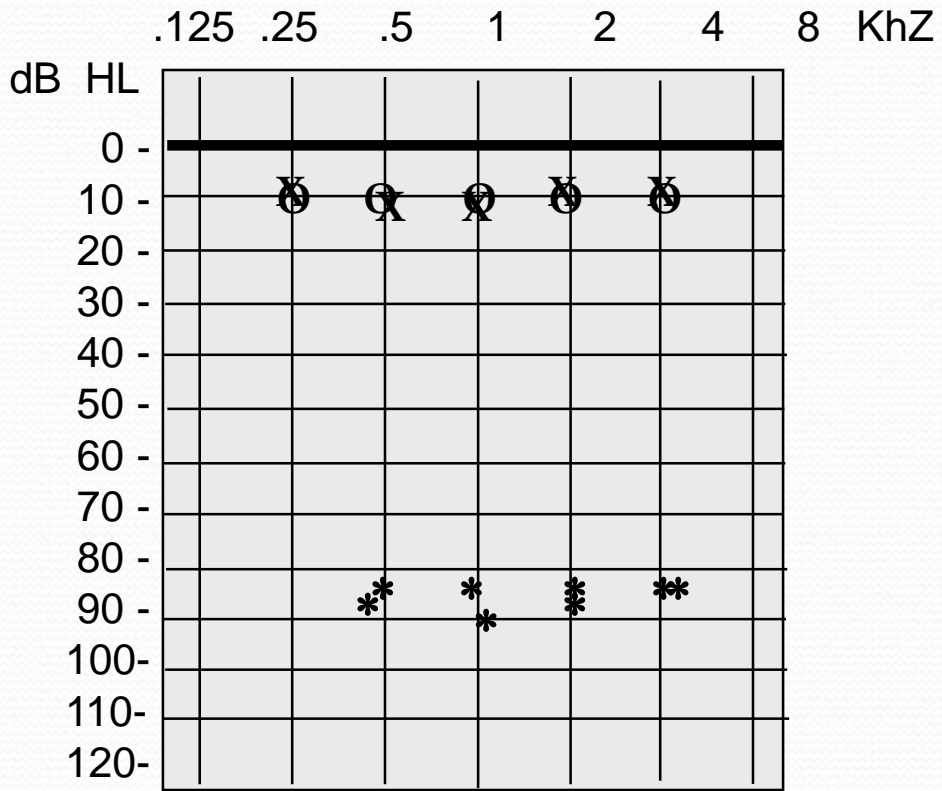
# COCLEOPATIA A DESTRA ("Metz" positivo)



# LESIONE RETROCOCLEARE A DESTRA

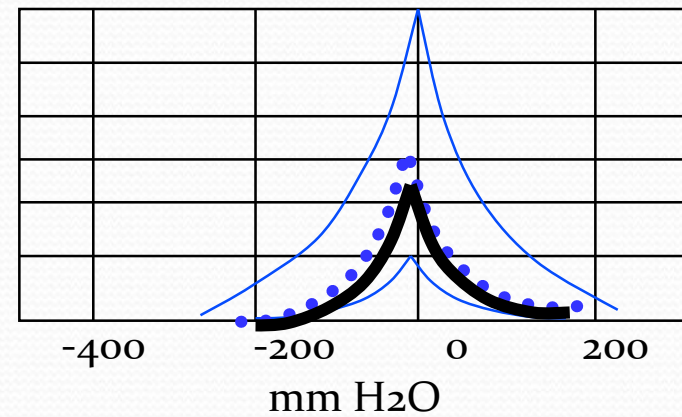
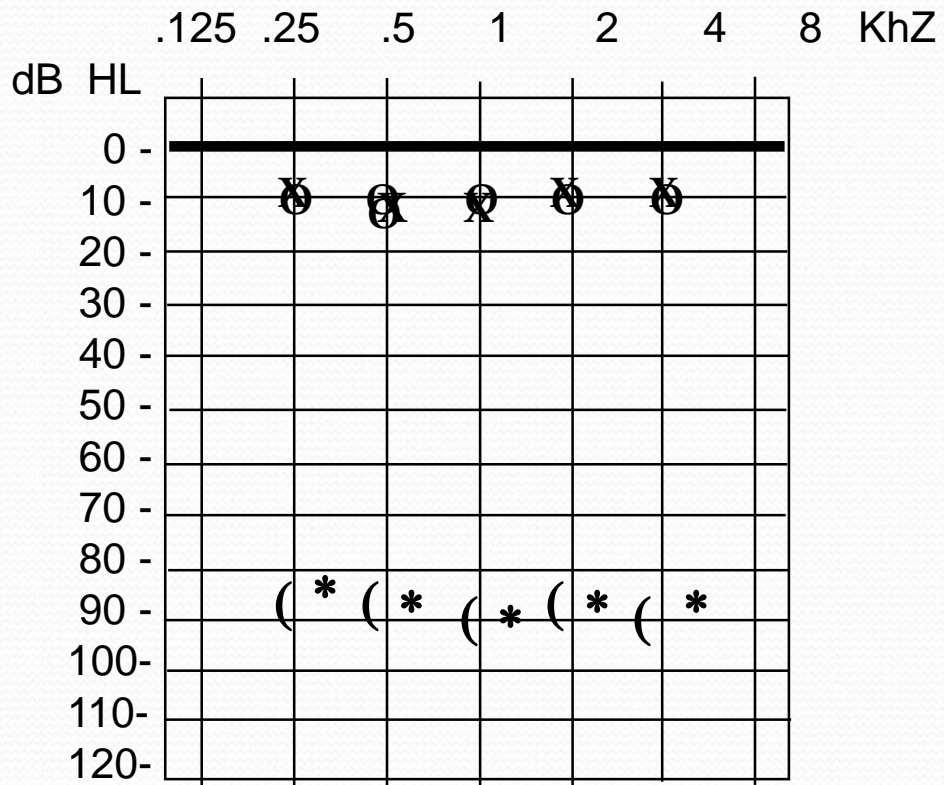


# LESIONE TRONCOENCEFALICA

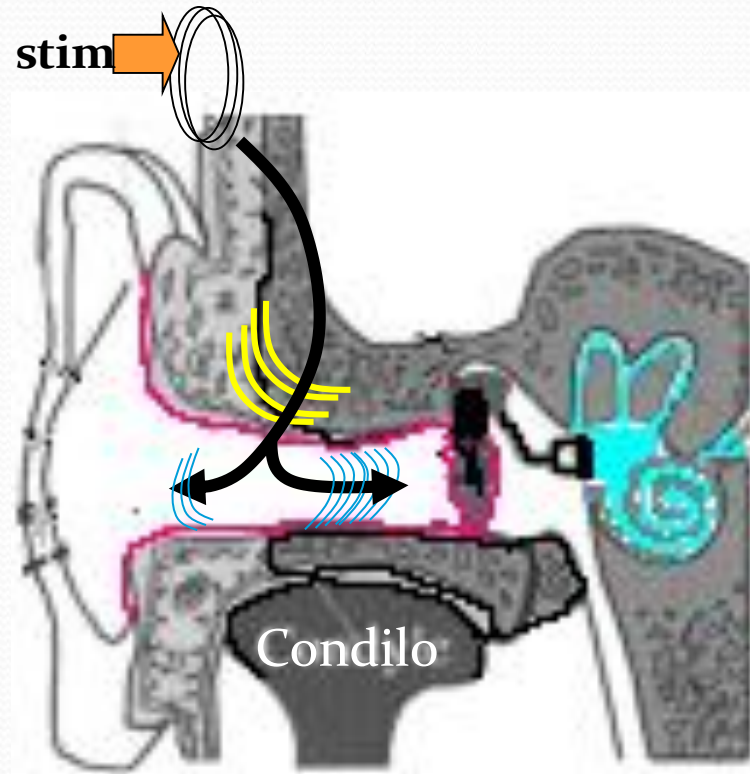




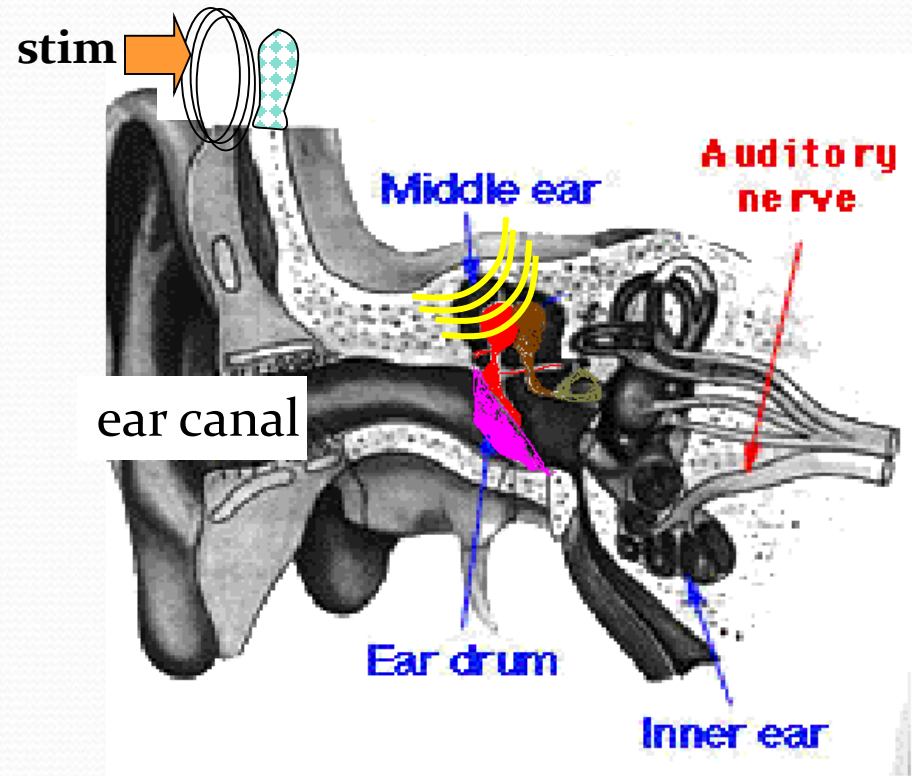
# PARALISI NERVO FACCIALE A DESTRA



# CONDOTTO UDITIVO ESTERNO: RADIAZIONE

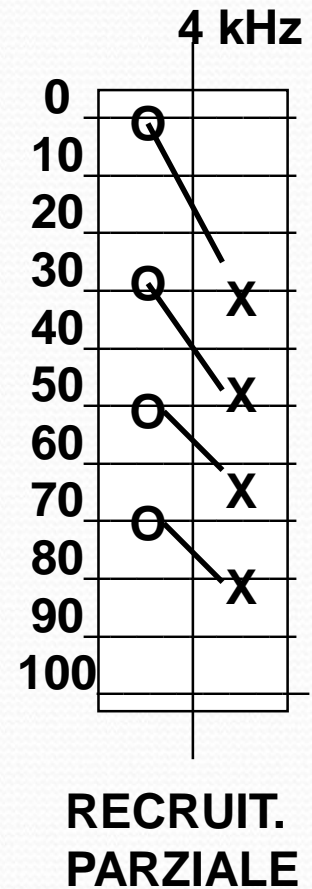
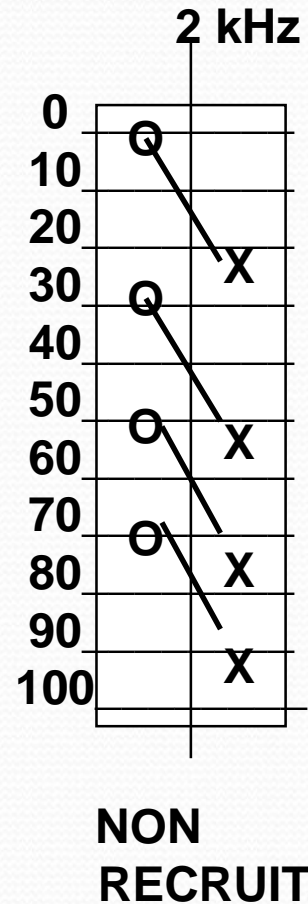
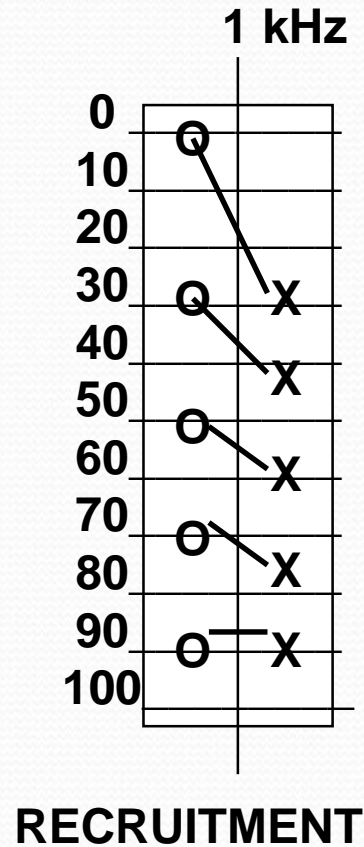
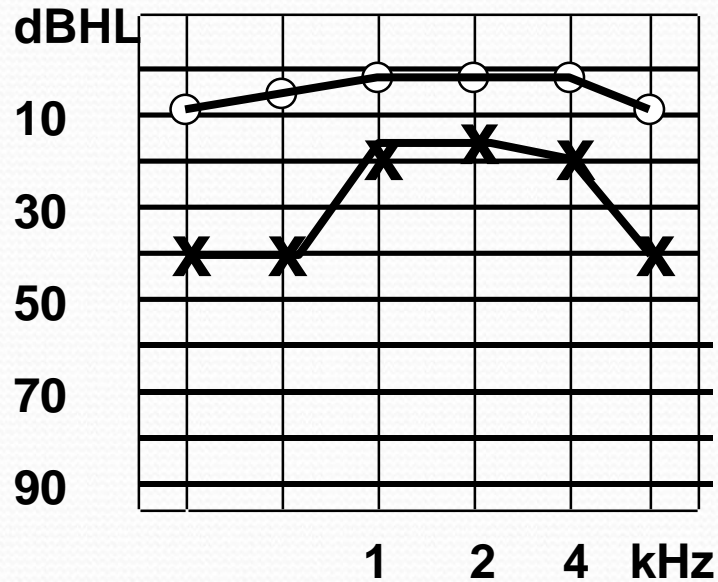


# ORECCHIO MEDIO: INERZIA



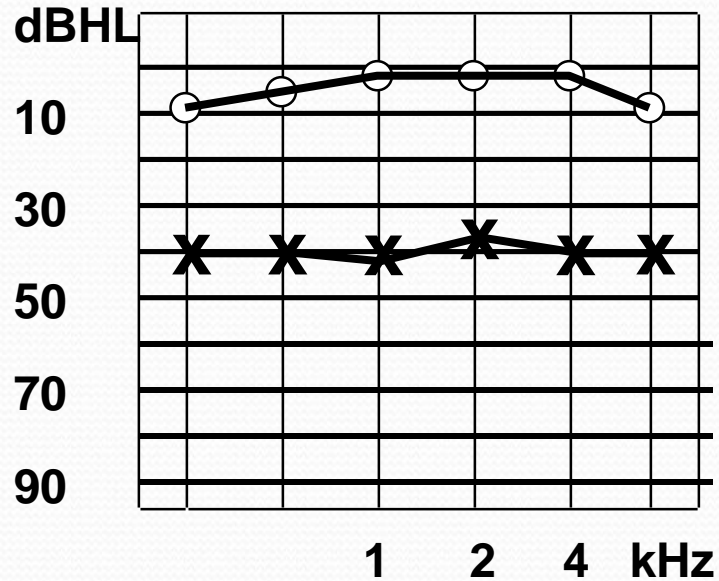


# ALTERNATE BINAURAL LOUDNESS BALANCE (ABLB)

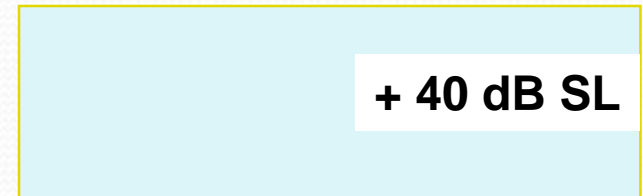




# TEST DI LUESCHER



*STAZIONARIO*



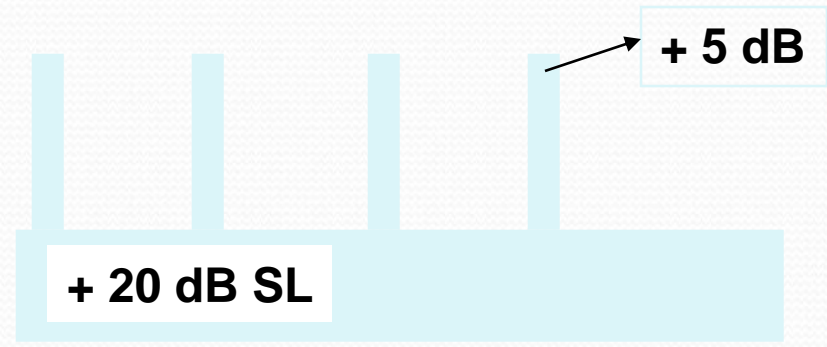
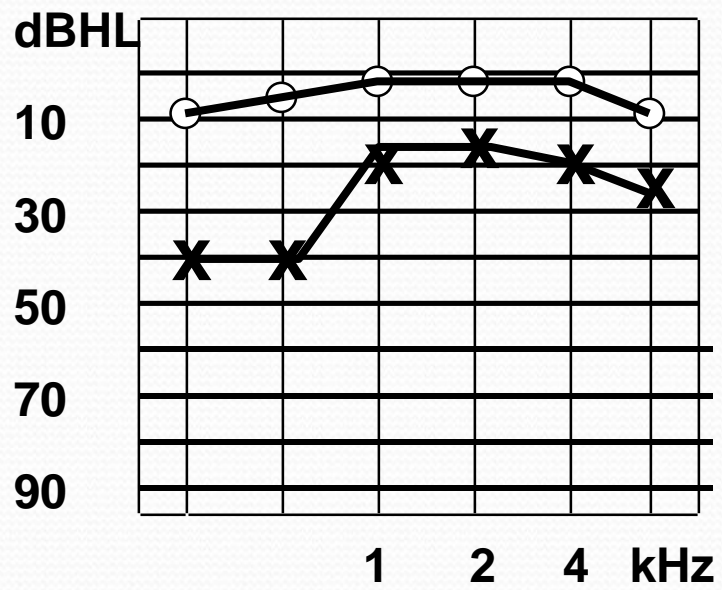
*MODULATO*



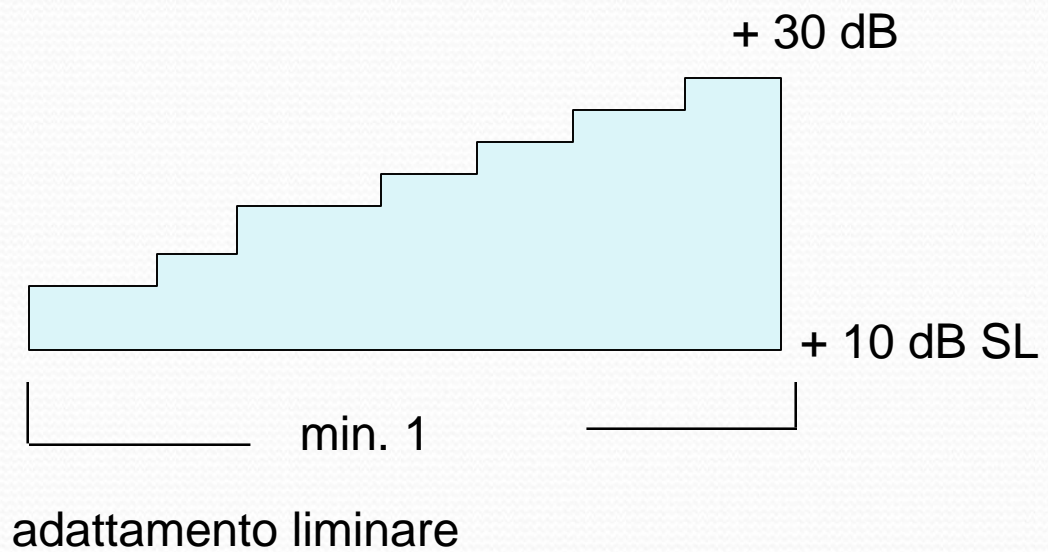
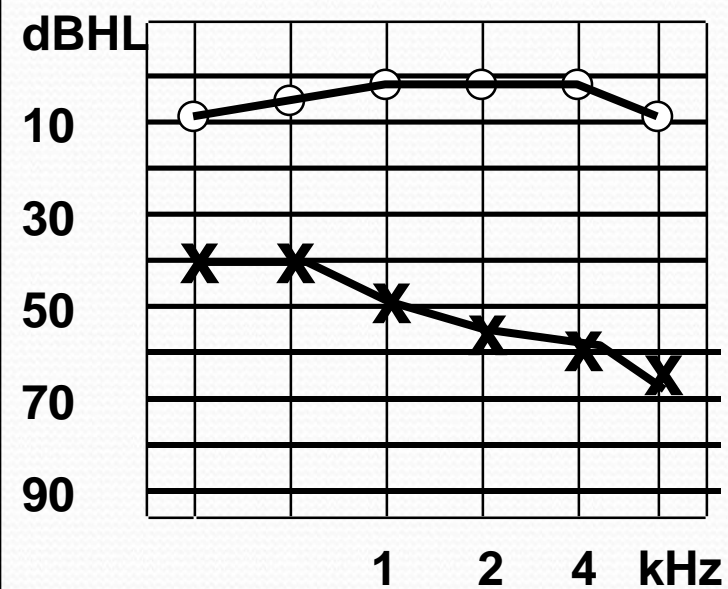
*MODULATO*



# SHORT INCREMENT SENSITIVITY INDEX (S.I.S.I.)

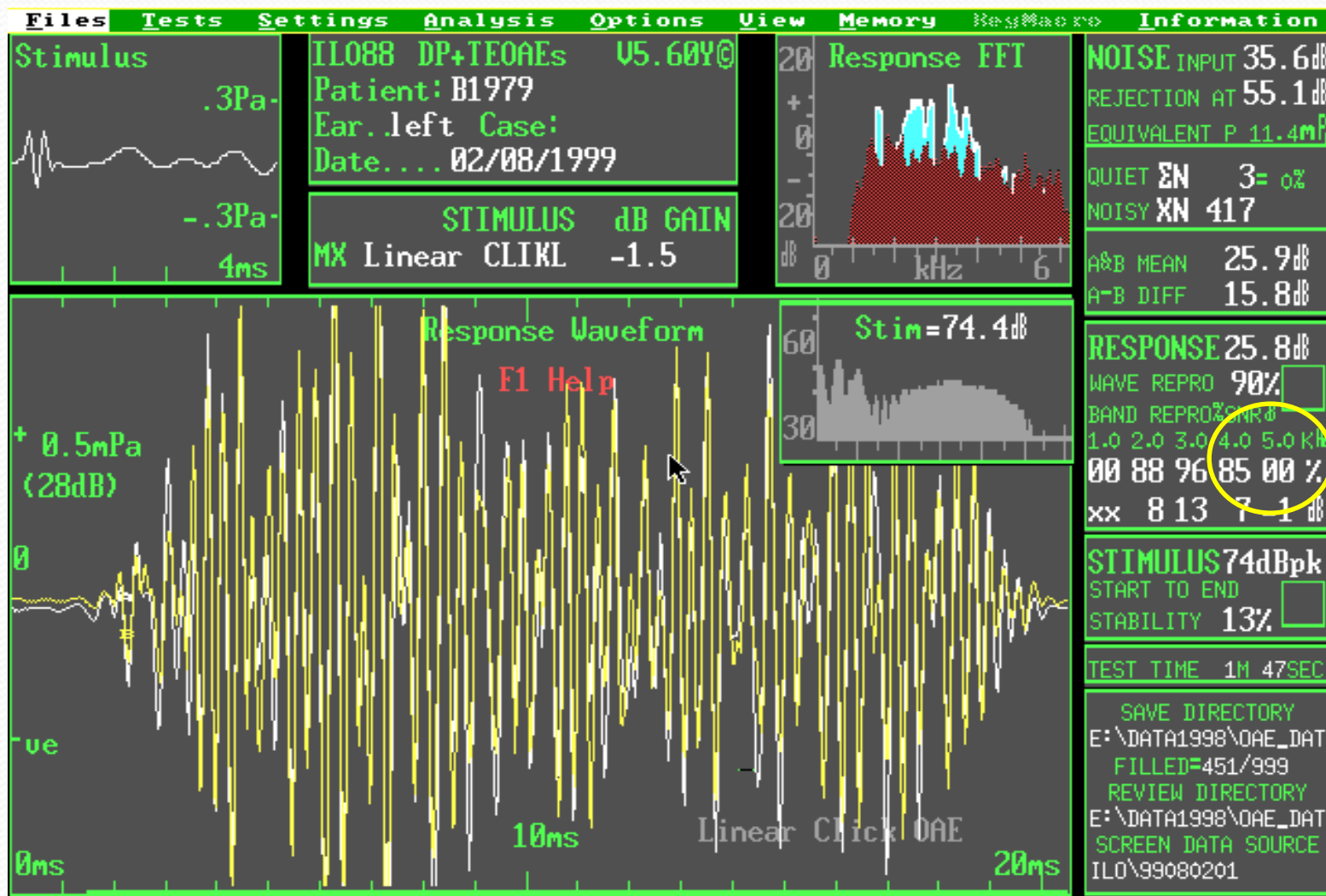


# TEST DI ROSENBERG





# TEOAEs



Stimolo



Risposta TEOAE



# DPOAEs

F1=1233Hz  
F2=1501Hz  
F2/F1=1.22

F1=73.3dBspl  
F2=64.4dBspl

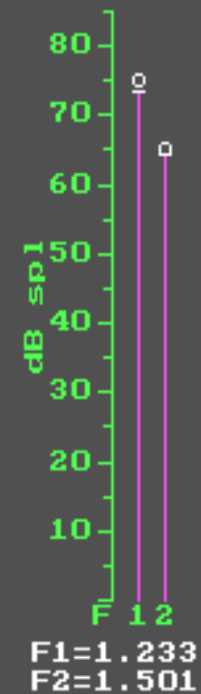
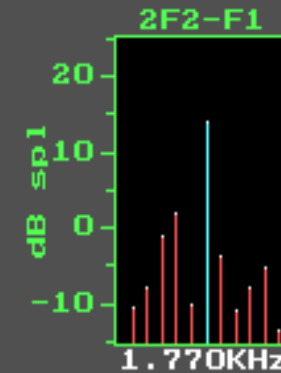
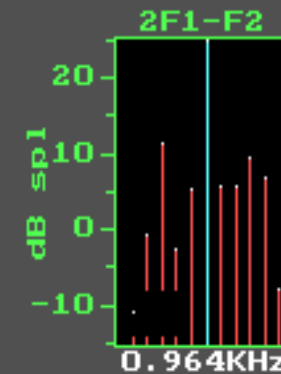
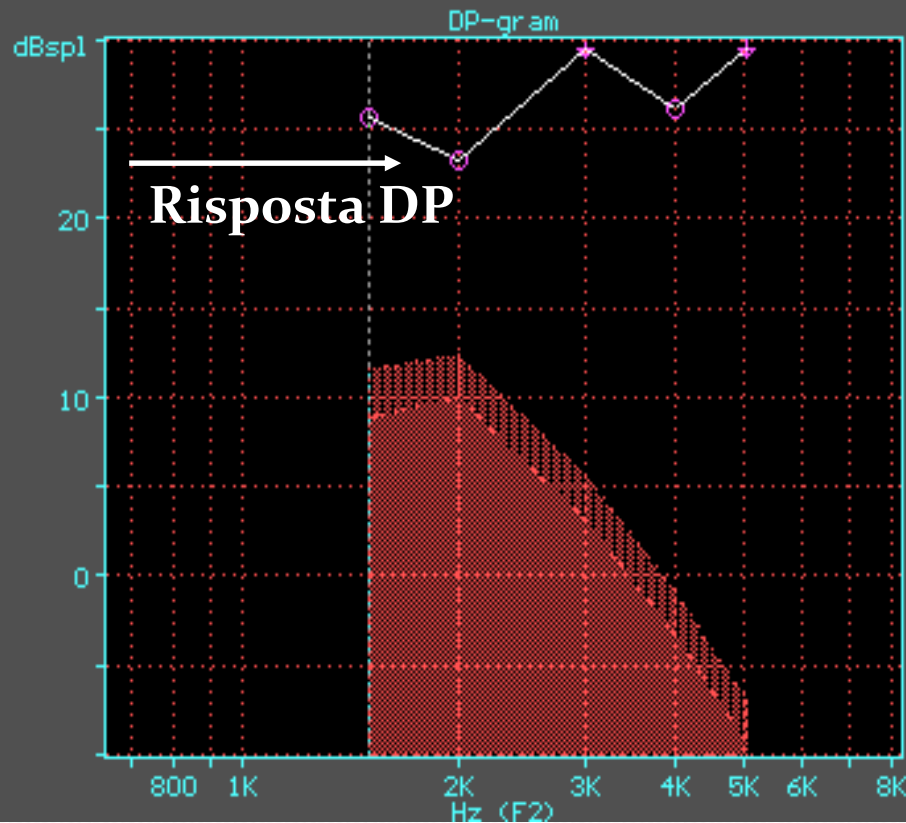
2F1-F2= 25.6dBspl  
2F2-F1= 14.2dBspl  
Sum No.=27/48

S/N=16.8dB(86%), =14.0dB(97%)

S/N=15.8dB(86%), =13.0dB(97%)

Test time=26s DP phase( $\phi$ )= 72.9°

Recalled -> 1322R004.DPG



# Tipi di OAE

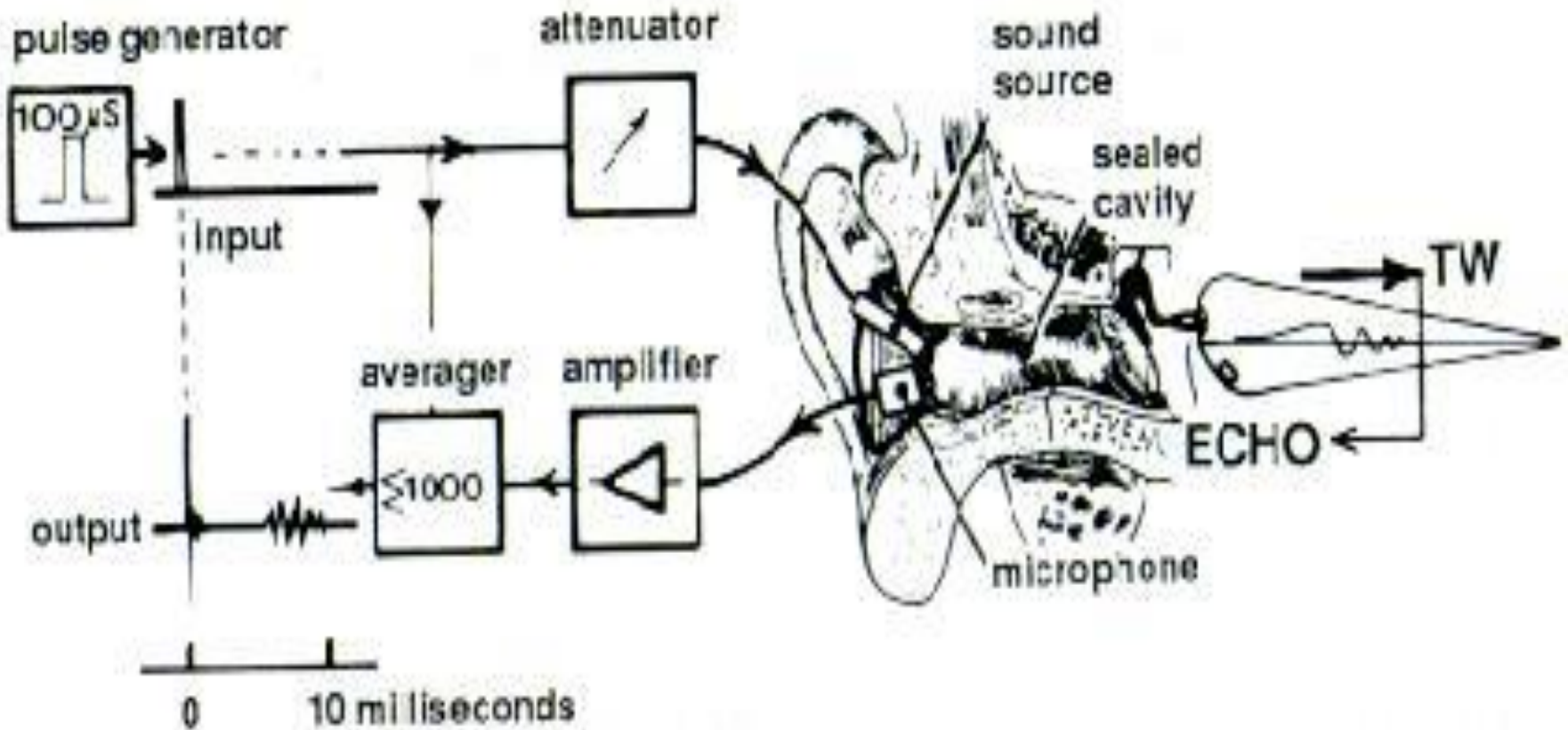
🌸 ***Transienti*** (TEOAE): si stimola la coclea con un segnale transitorio (click).

🌸 ***Prodotti di Distorsione*** (DPOAE): si stimola la coclea con due toni puri di frequenza differente

🌸 ***Spontanee*** (SOAEs) recorded at the absence of any stimulus.

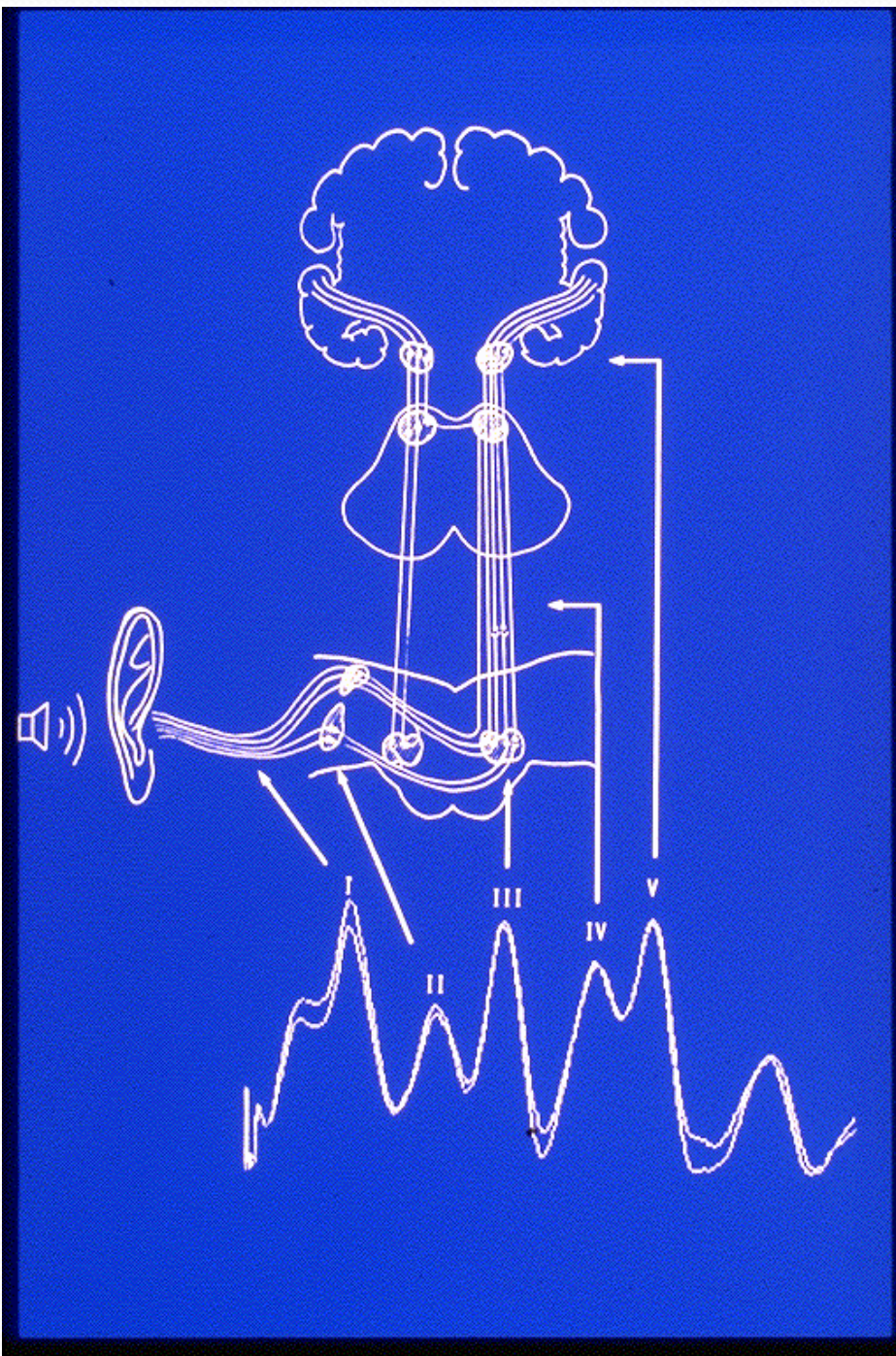


## TEOAE acquisition\*



\* patent of David Kemp







# ABR - GENERAZIONE

