



Nuova Fiera di Roma  
28, 29 e 30 novembre 2018



# Nuovi Approcci Terapeutici per Migliorare i Deficit Cognitivi nella Sindrome di Down

Laura Cancedda, PhD

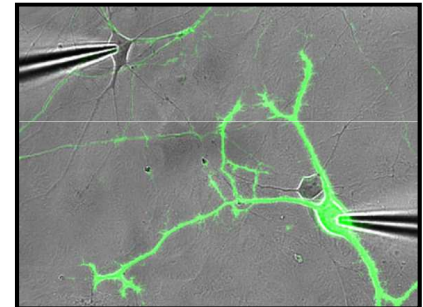


# Cosa Posso Fare per Voi?

**Le basi del funzionamento del cervello**



**Panoramica sulle tecniche sperimentali in neuroscienza**



**Risultati sperimentali su modelli animali di sindrome di Down**



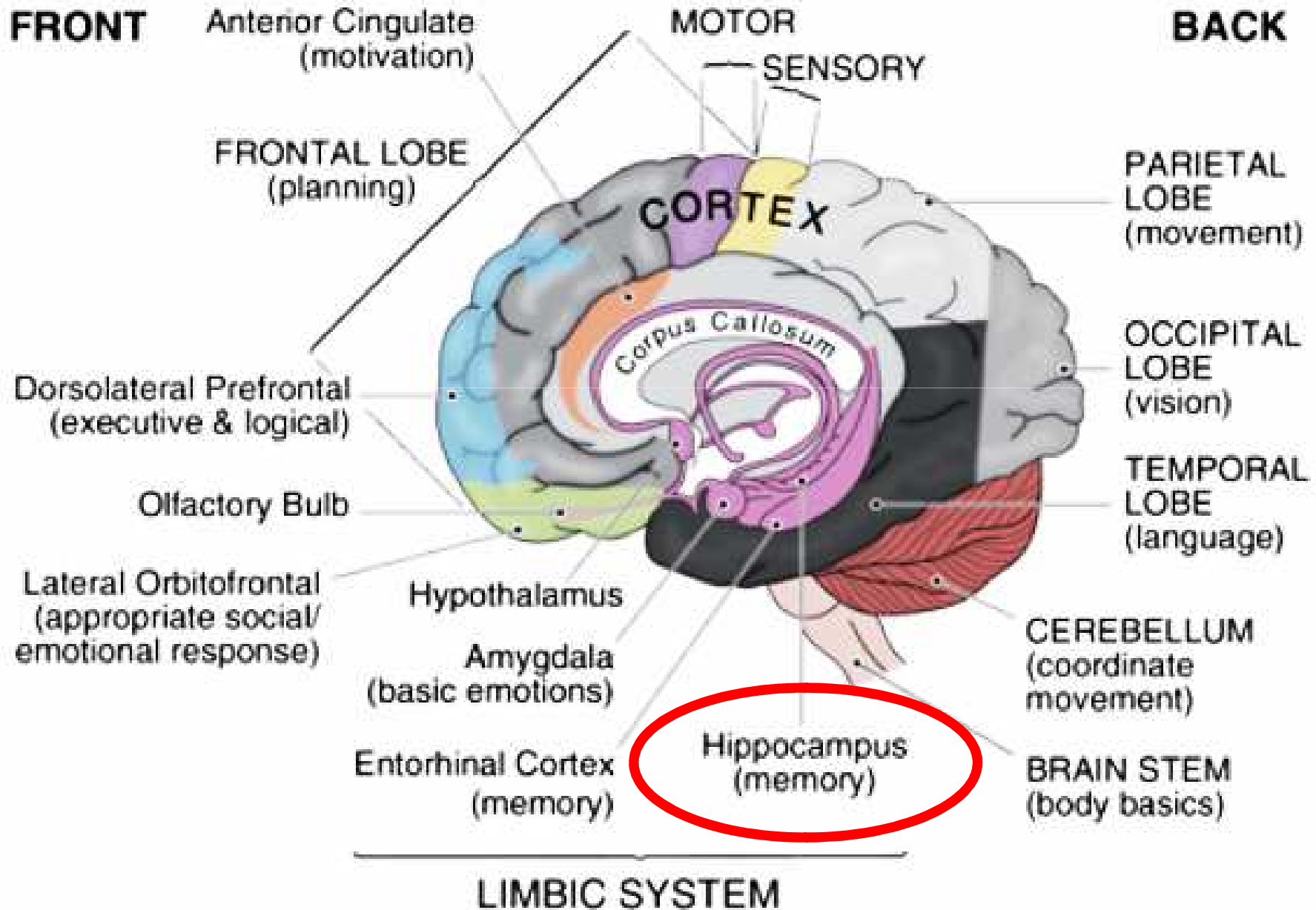
# **Il cervello Umano Genera Comportamenti che Promuovono il Benessere dell'Animale**



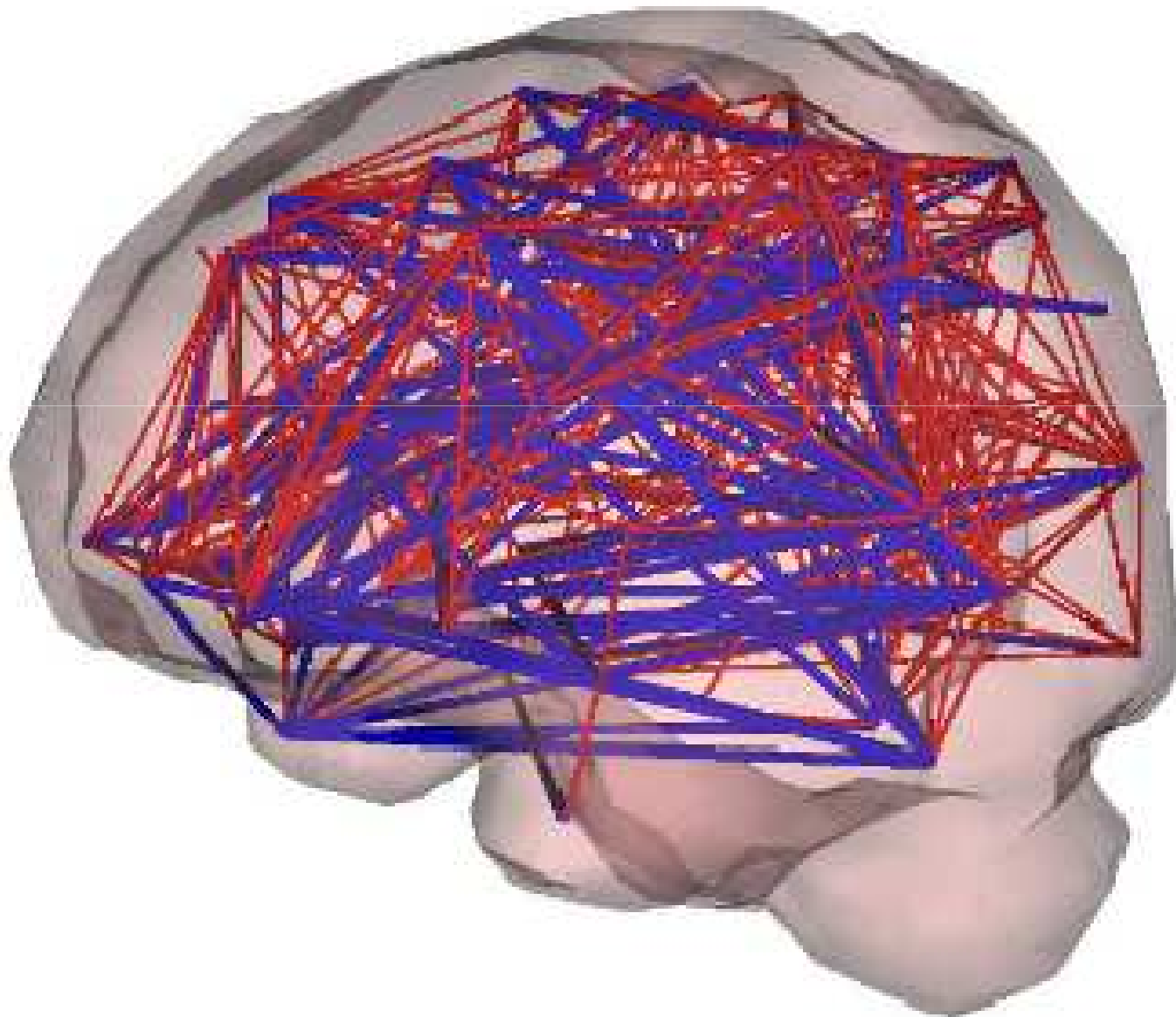
**Cervello adulto: 1,300 - 1,400 g**

**All'incirca 100 miliardi di neuroni  
connessi da 10.000 connessioni l'uno**

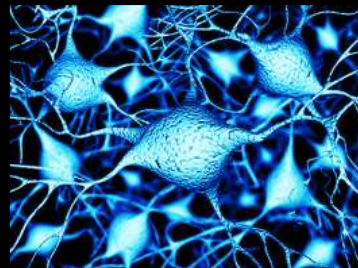
# Il Cervello è Organizzato in Diverse Aree Funzionali



# **Le Diverse Aree del Cervello sono Connesse tra di Loro**



**Come si genera questa  
complessità?**



# NEUROSVILUPPO

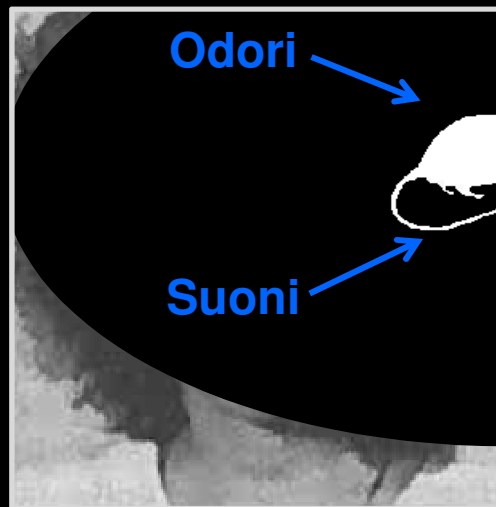
↑  
Genetica

↑  
Esperienze sensoriali

Neonato



Berardi, Pizzorusso 2007



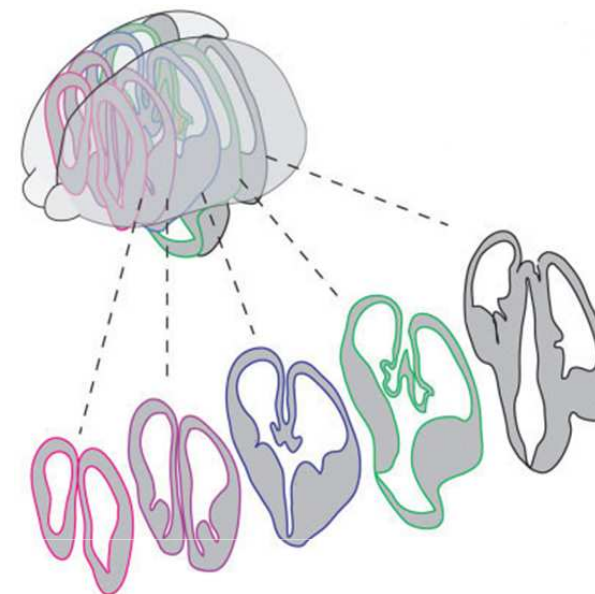
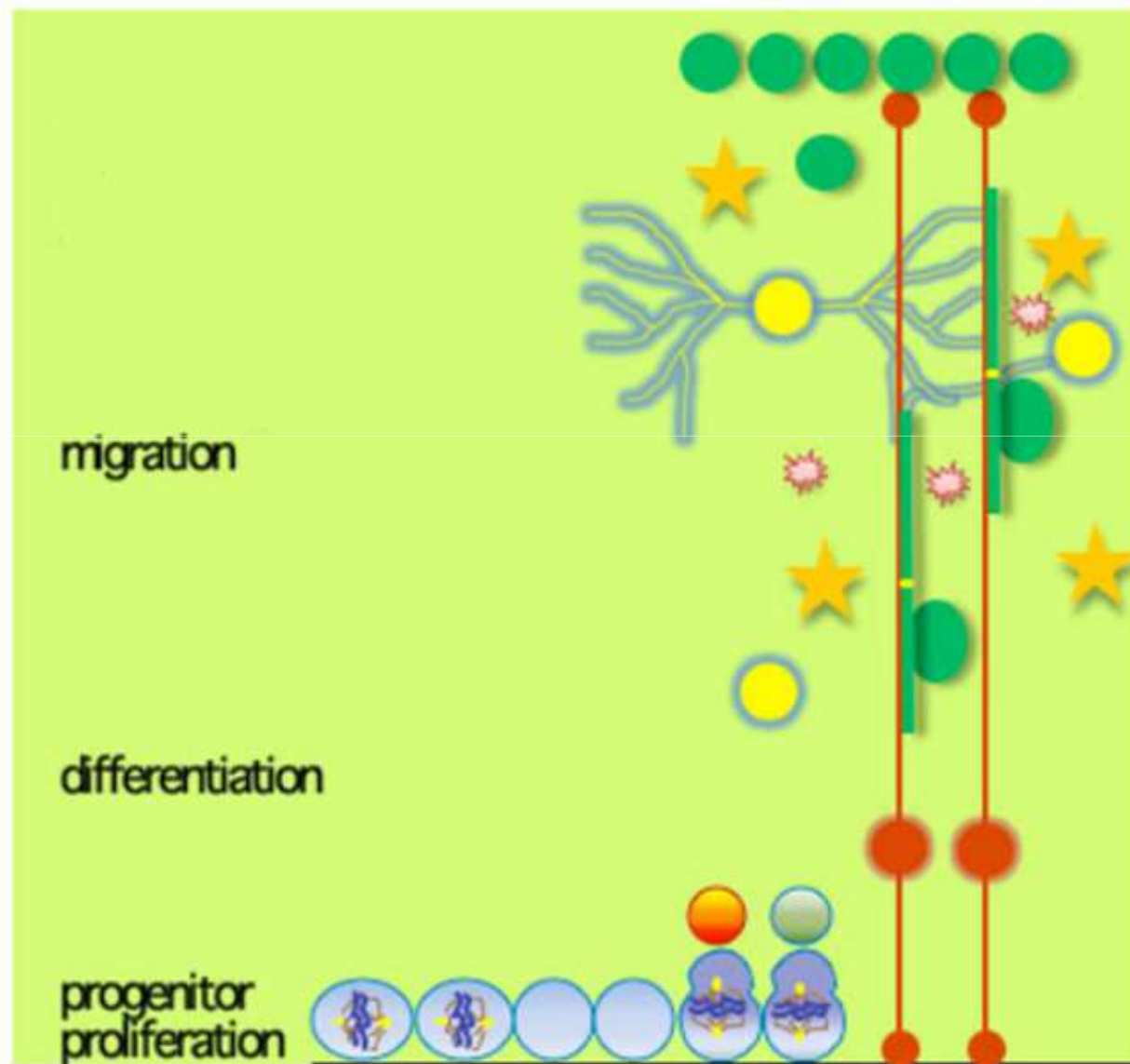
Odori

Suoni

Visione

Tatto

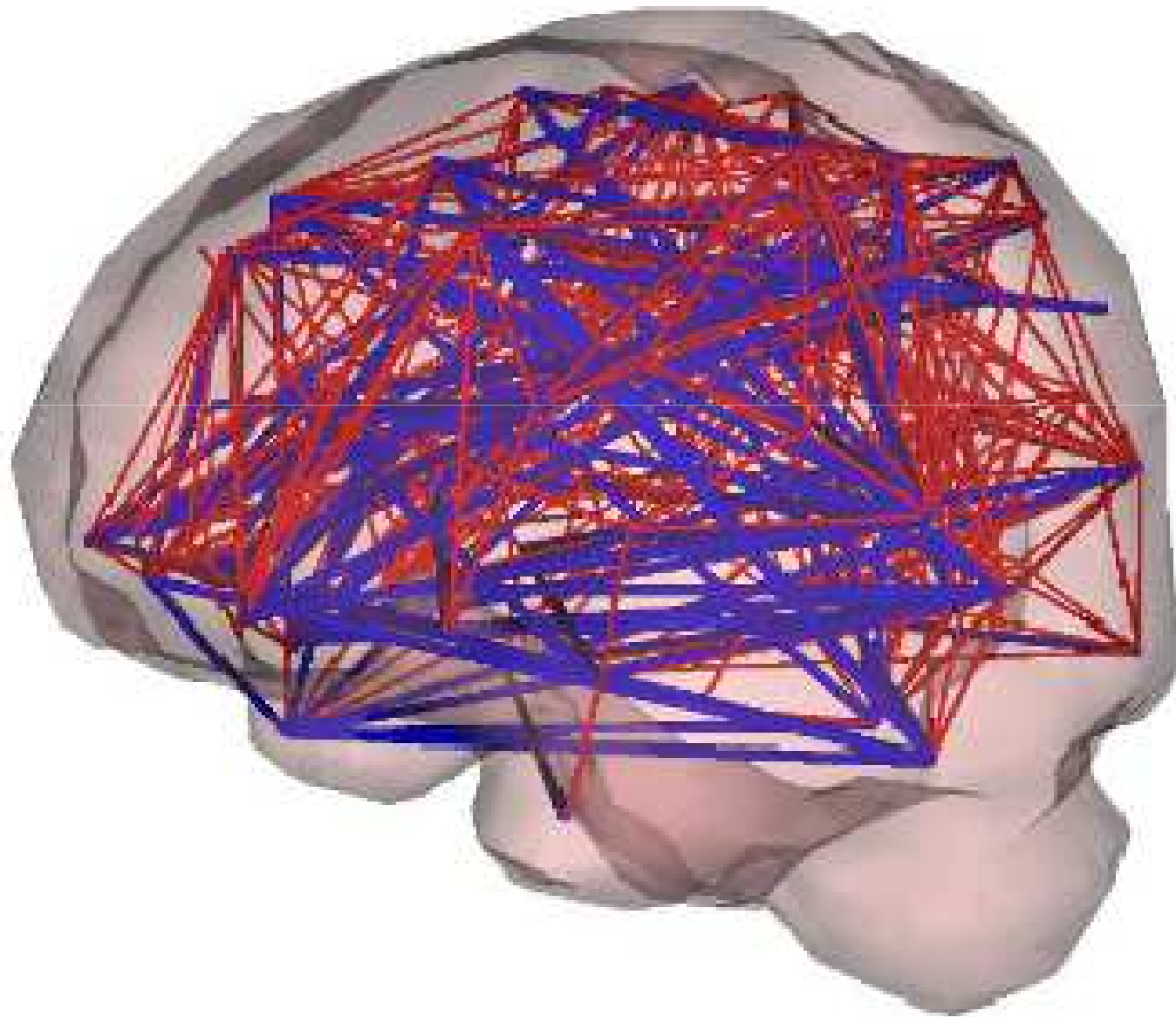
# Molti Processi di Sviluppo sono Compromessi nelle Malattie del Neurosviluppo



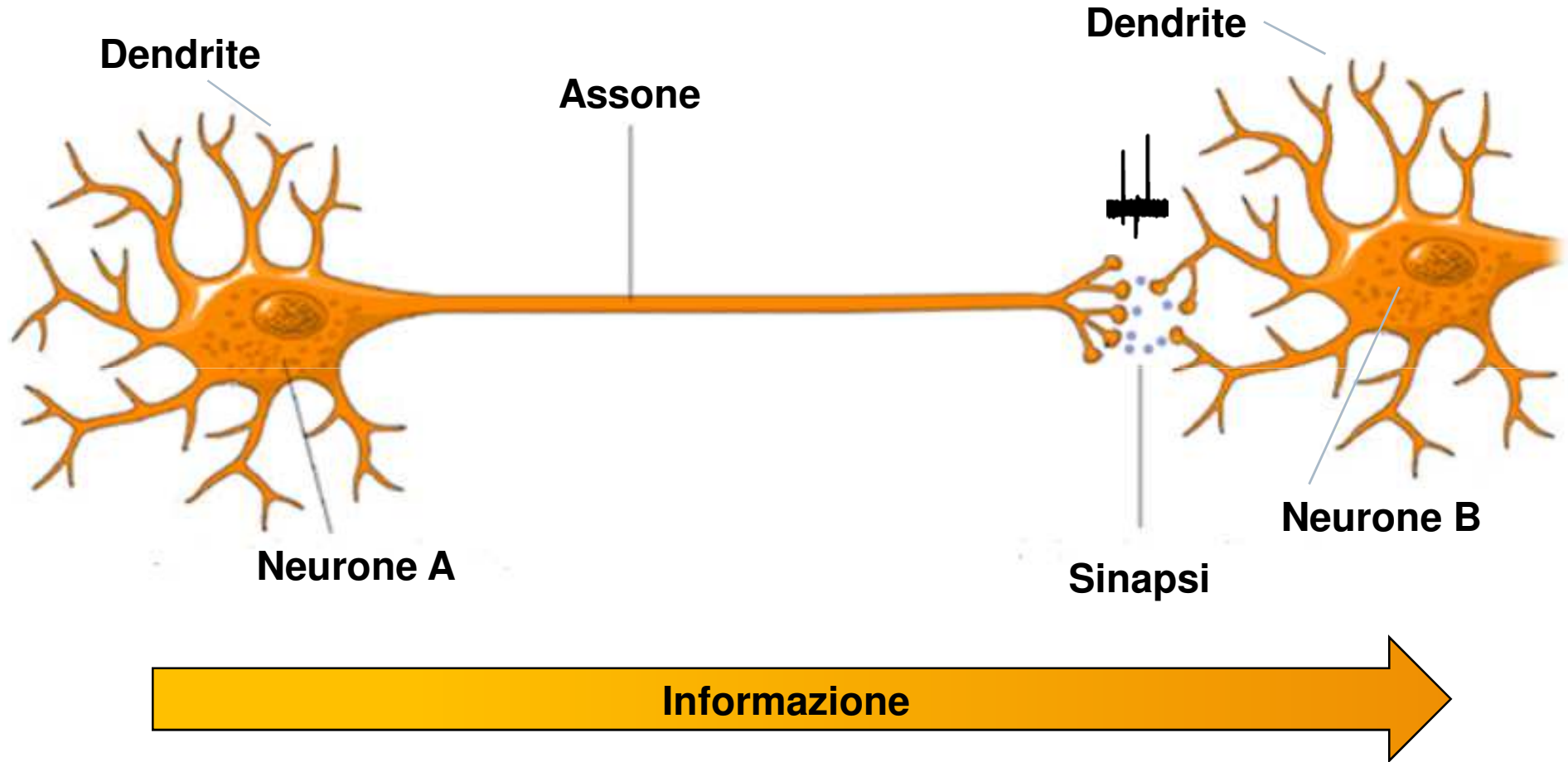
**Down Syndrome**  
**Schizophrenia**  
**DiGeorge Syndrome**  
**Autism**  
**Rett Syndrome**  
**Fragile X Syndrome**  
**Tourette Syndrome**  
**Epilepsy**  
**Cerebral Palsy**  
**Neurofibromatosis**



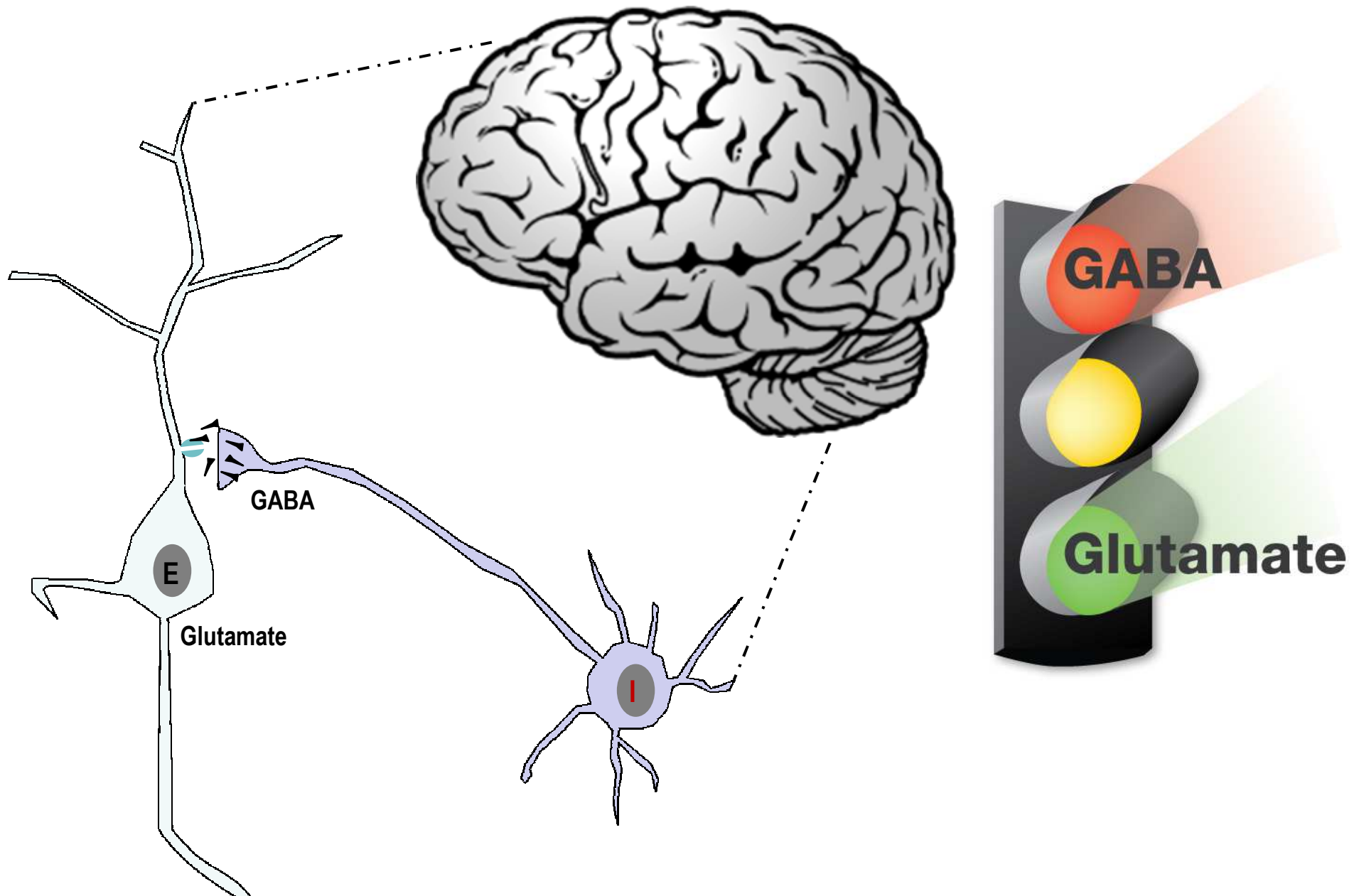
# **Are Distinct Areas of the Brain Interconnected with Each Other**



# Trasmissione Neuronale

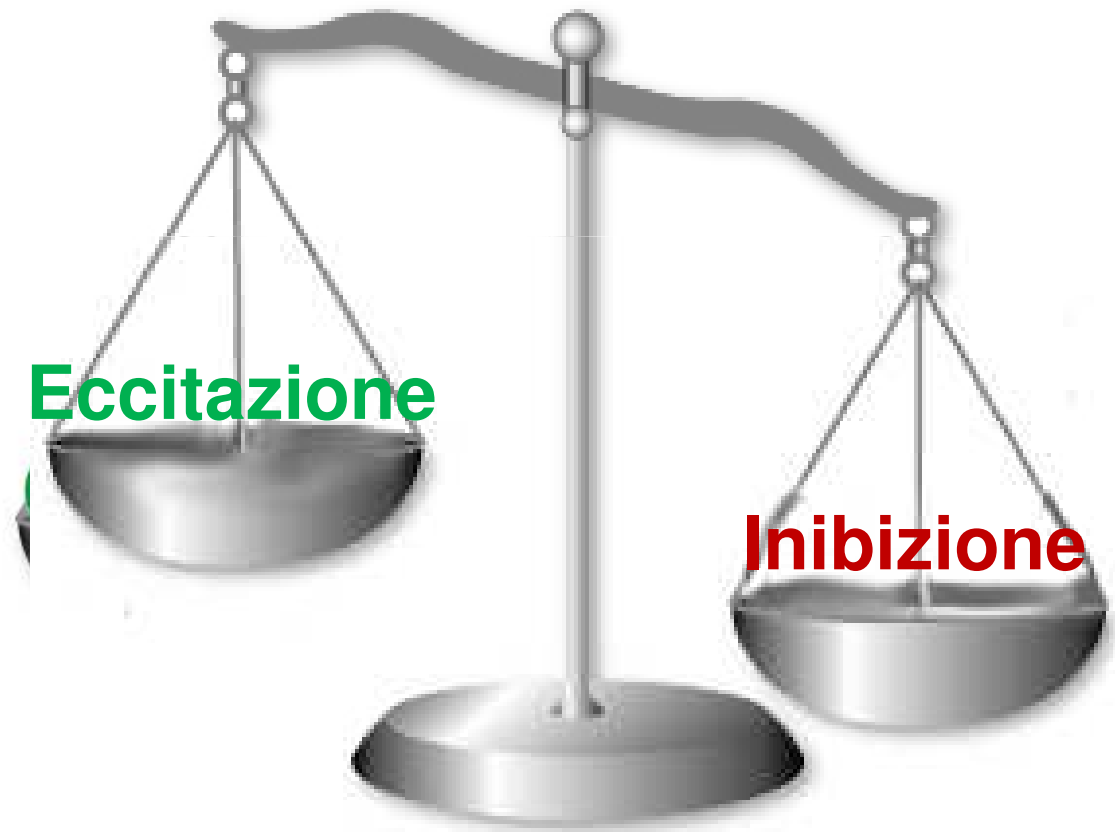


# GABA e Glutammato Regolano l'Attività del Cervello

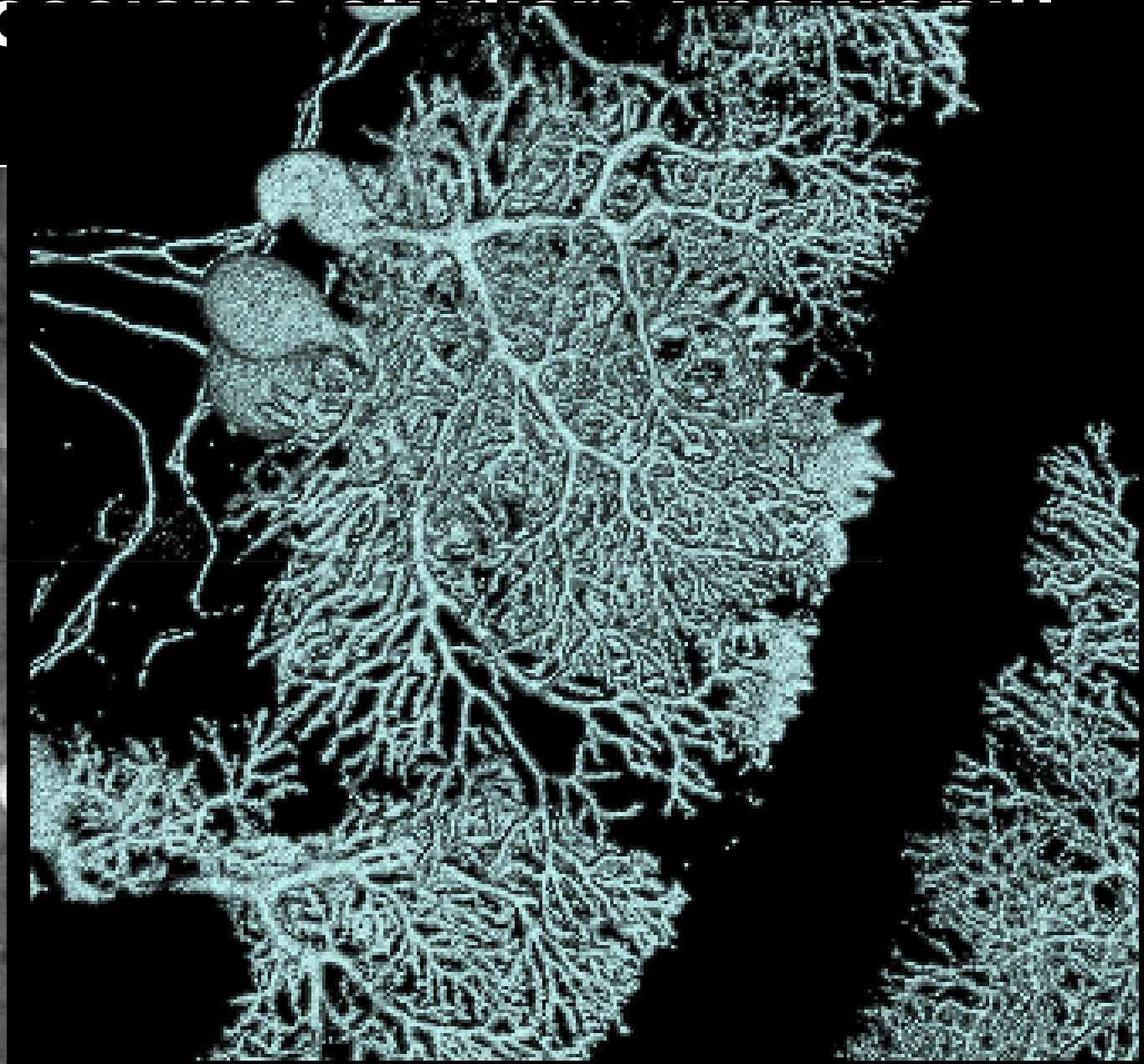
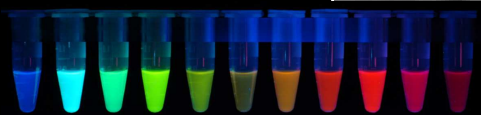
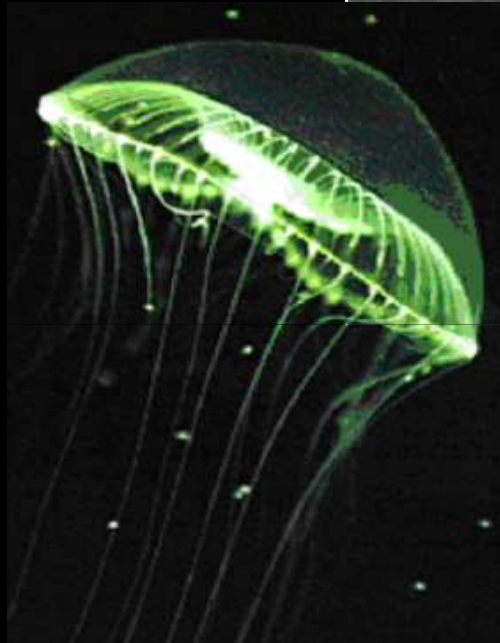


# L'Equilibrio tra Eccitazione e Inibizione è Alterata nelle Malattie del Neurosviluppo

Down Syndrome  
Schizophrenia  
DiGeorge Syndrome  
Autism  
Rett Syndrome  
Fragile X Syndrome  
Tourette Syndrome  
Epilepsy  
Cerebral Palsy  
Neurofibromatosis

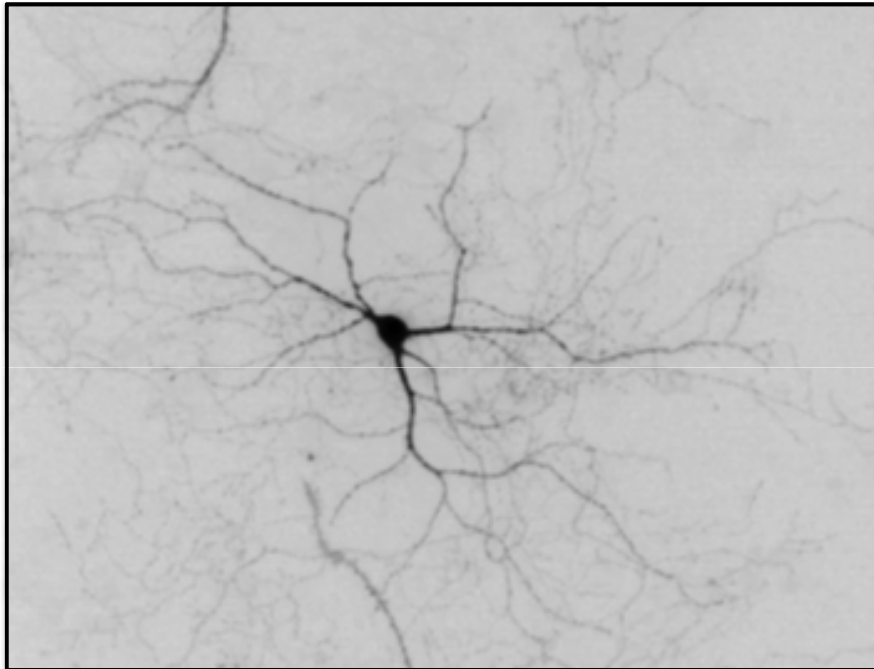


# Come possono essere utilizzati i coralli?

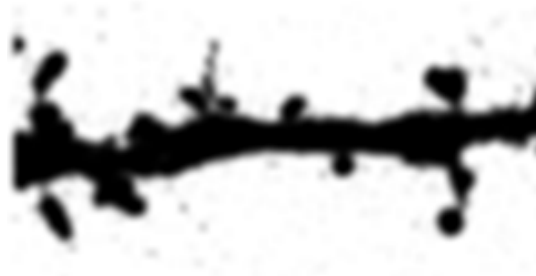
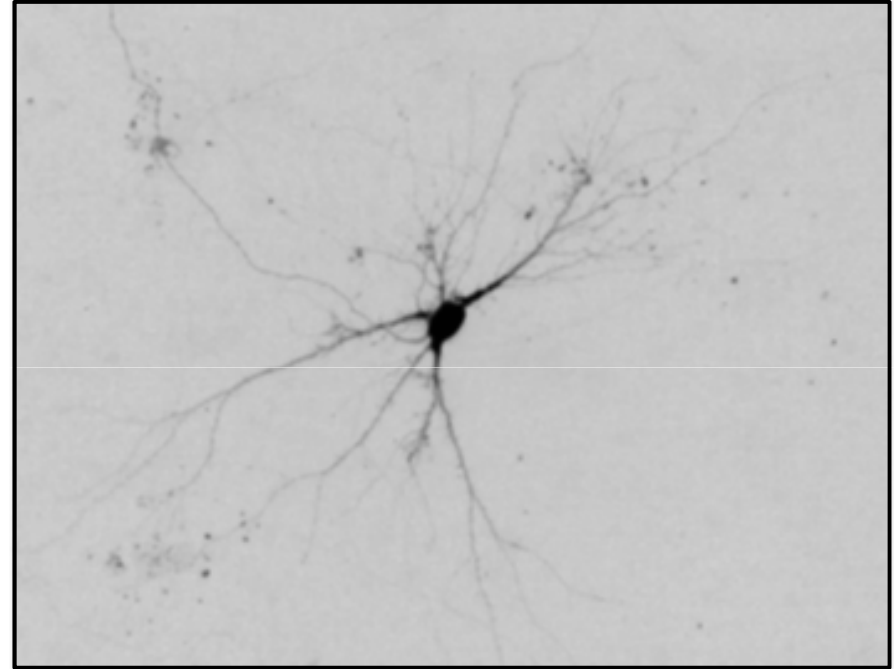


# Attraverso la Morfologia si Possono Distinguere Neuroni Sani da Neuroni Malati

**Topo non modificato**



**Topo Sindrome Down**





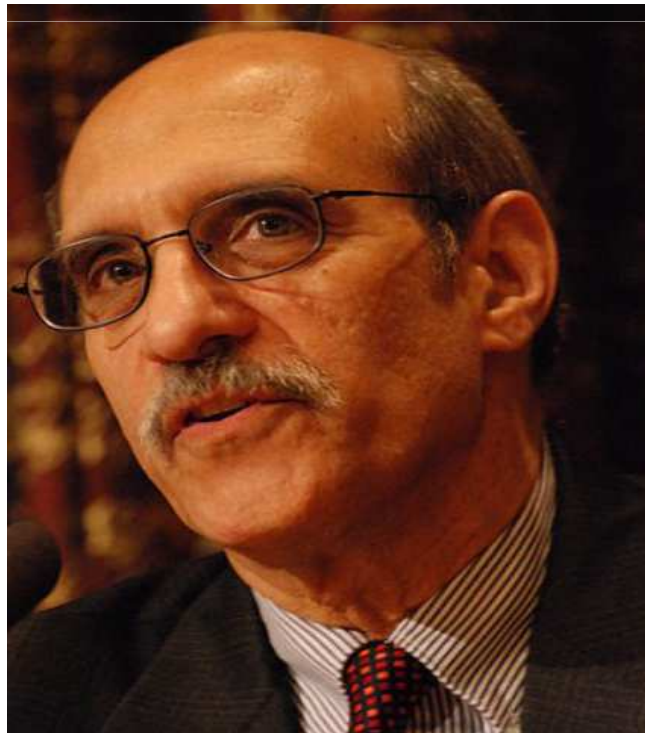
# Il Premio Nobel per la Chimica 2008 è Stato Assegnato agli Scopritori della GFP



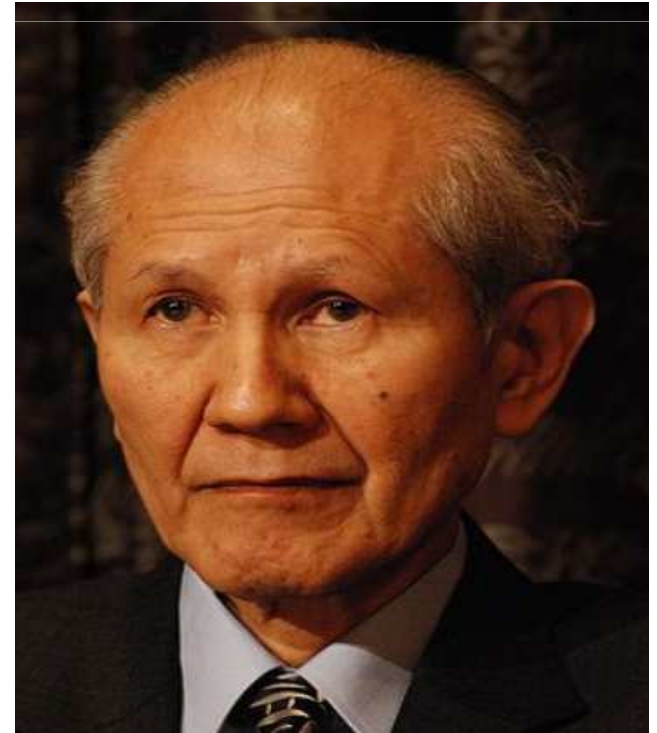
**Roger Y. Tsien**



**Martin Chalfie**

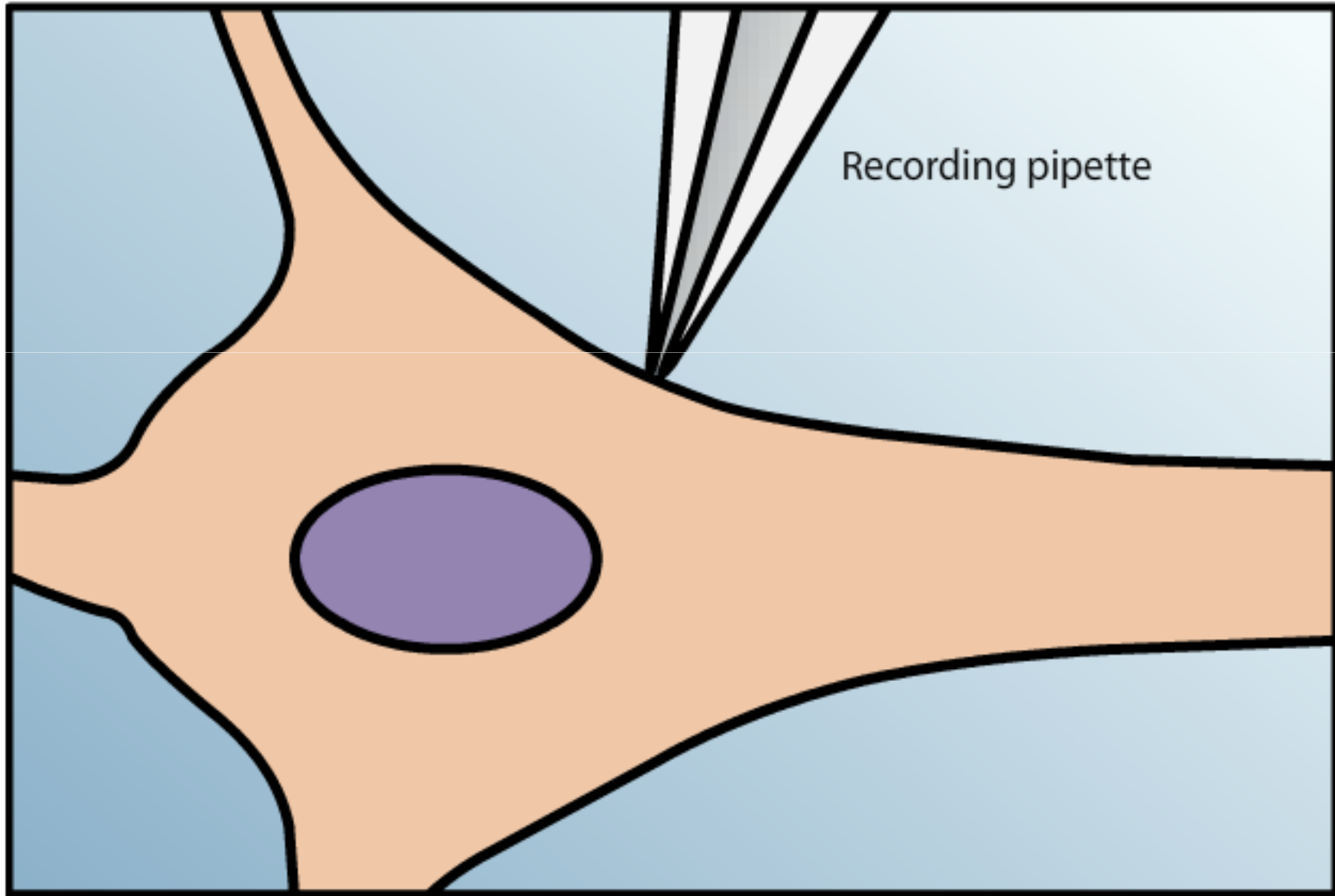


**Shimomura Osamu**



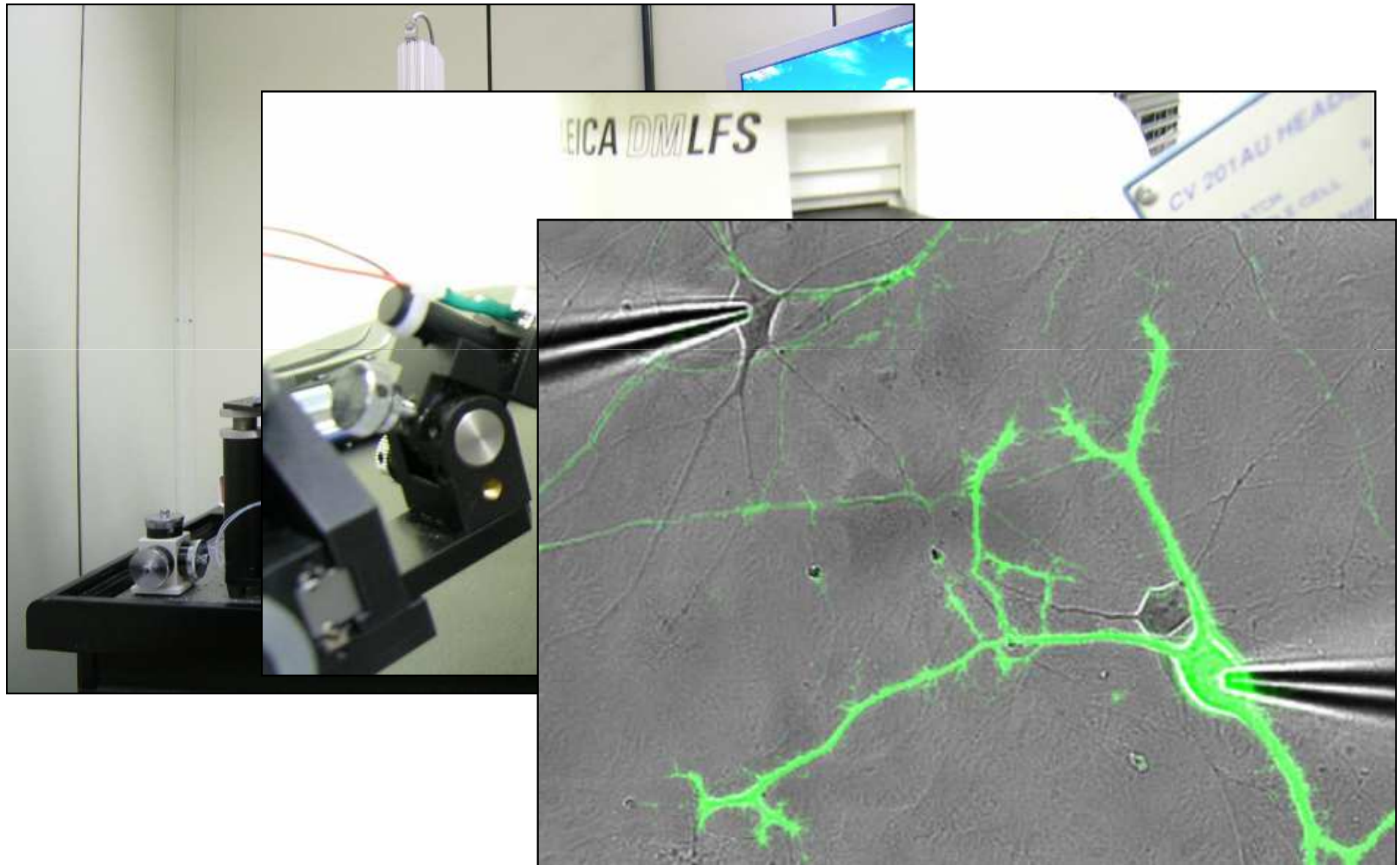
# Come Possiamo Studiare i Neuroni?

## (2) Registrazioni elettrofisiologiche





# Patch-Clamp Setup



# Attraverso l'Elettrofisiologia si Possono Distinguere Neuroni Sani da Neuroni Malati

## Topo non modificato



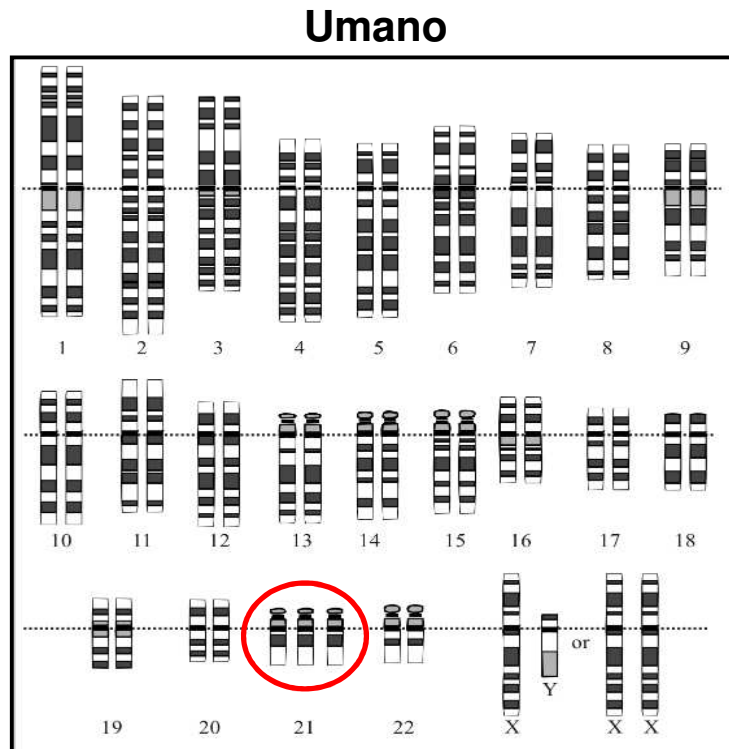
## Topo con Sindrome di Down



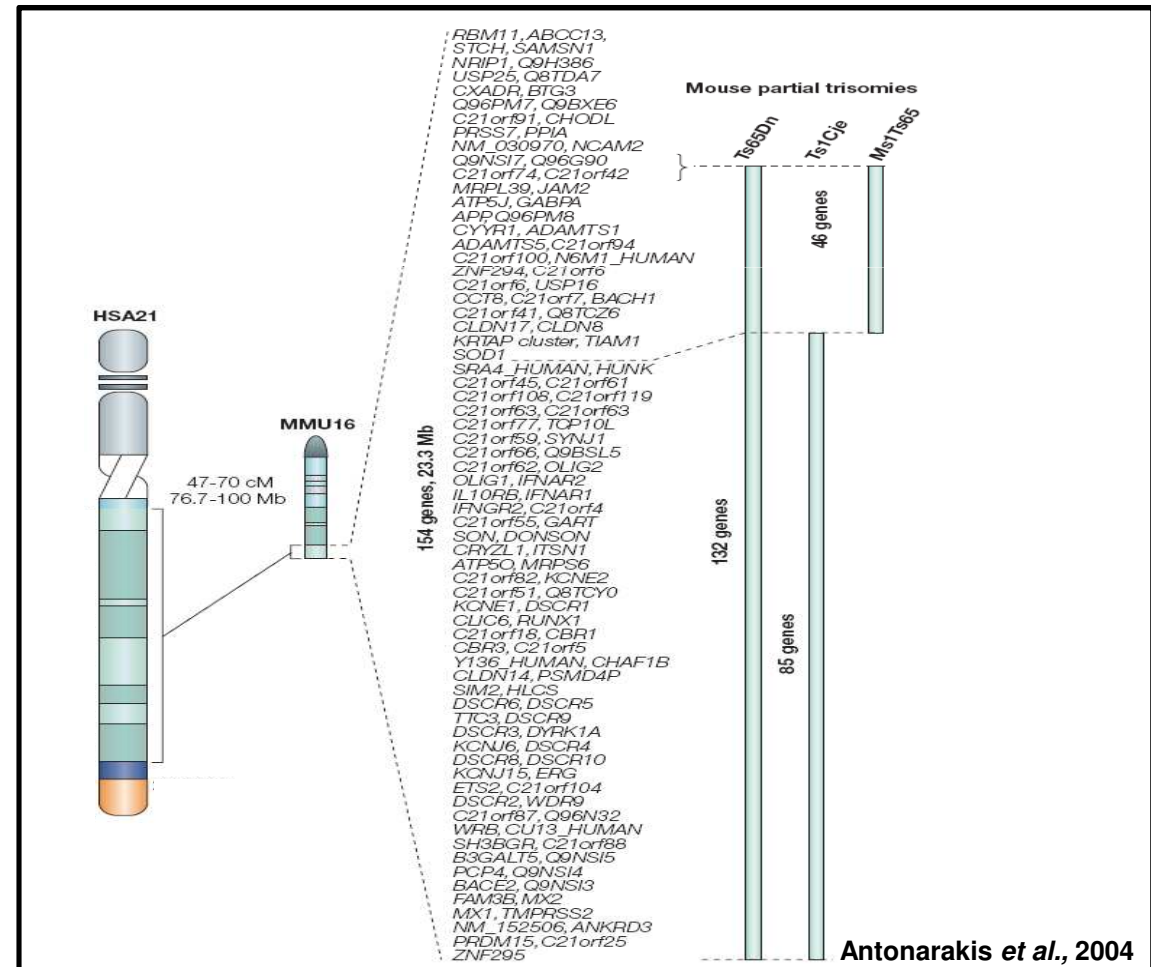
# Come possiamo Studiare i Neuroni?

## (3) Studi comportamentali su modelli animali

### Sindrome di Down



### Modello murino



# Come possiamo Studiare i Neuroni?

## (3) Studi comportamentali su modelli animali

Non modificato **Sindrome Down**

### Multisistemico:

- taglia minore
- alterazioni allo scheletro cranio-facciale
- alterazioni immunologiche
- difetti cardiaci

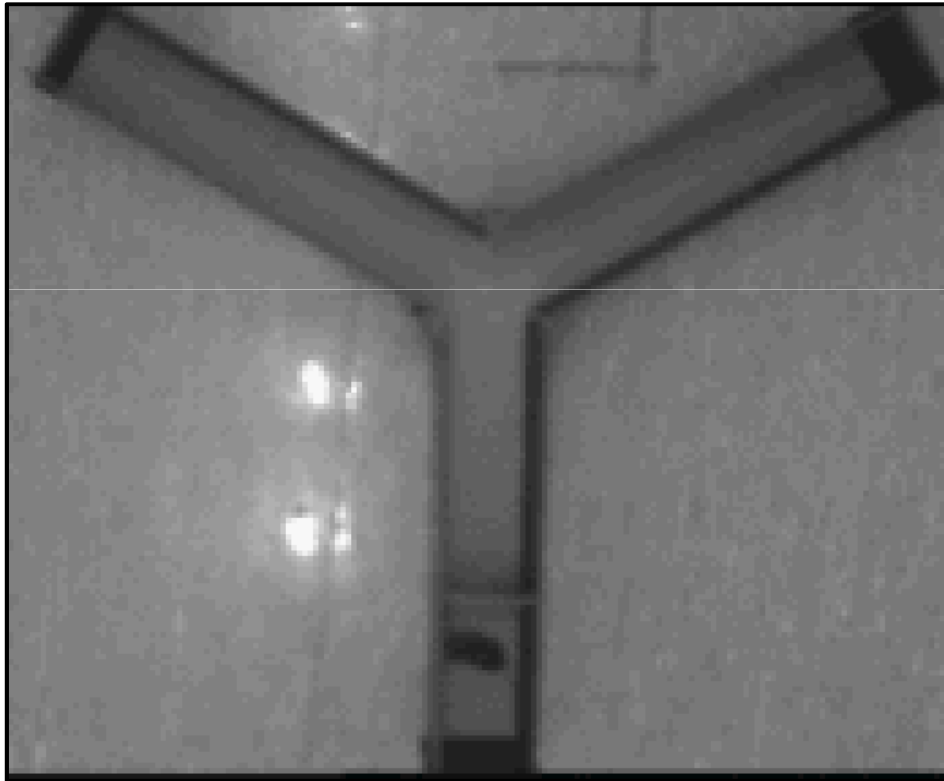
### Cervello:

- aumentata suscettibilità alle crisi epilettiche
- ansia
- ipercinesisi
- problemi di sonno
- leggera degenerazione tipo Alzheimer's

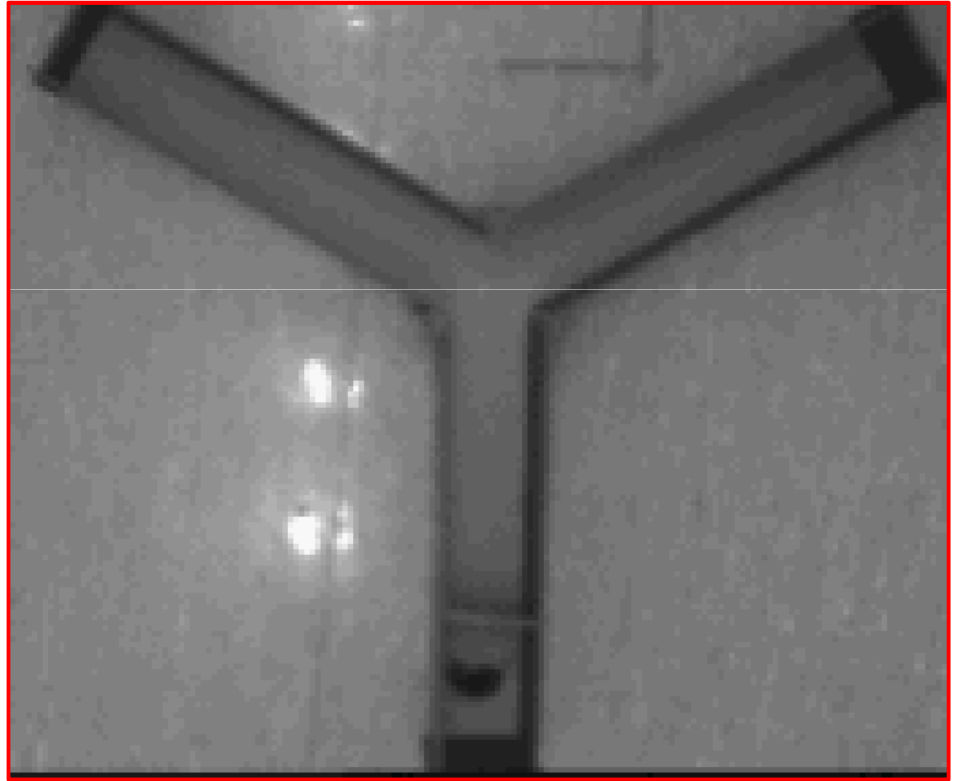


# I Topi con Sindrome di Down sono Iperattivi

Topo non modificato



Topo con Sindrome di Down



# **Ad Oggi non C'e' Nessun Farmaco per Trattare i Sintomi Cognitivi nella Sindrome di Down**



**Topo Sindrome Down**

**Trattamento:**

**Interventi Educazionali  
Precoci**

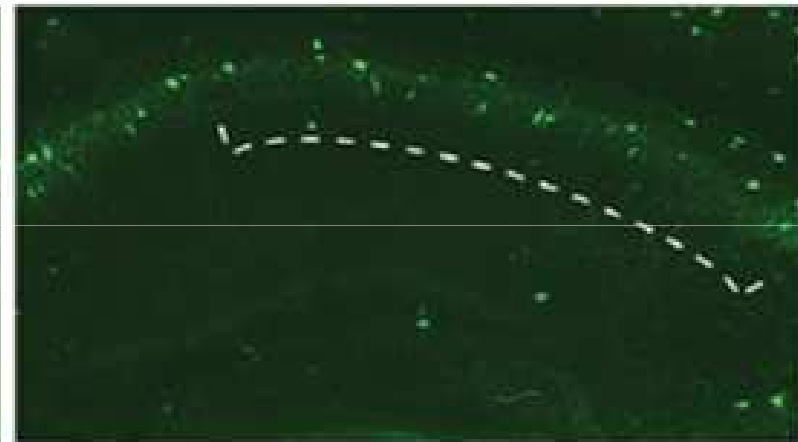
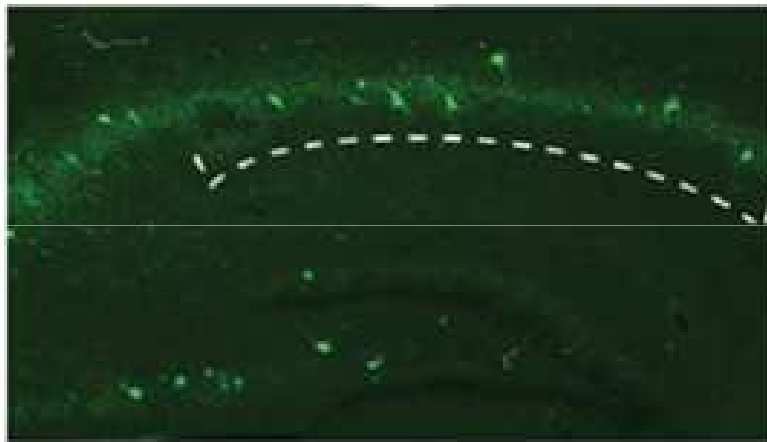
# I Topi con Sindrome di Down hanno Troppo GABA



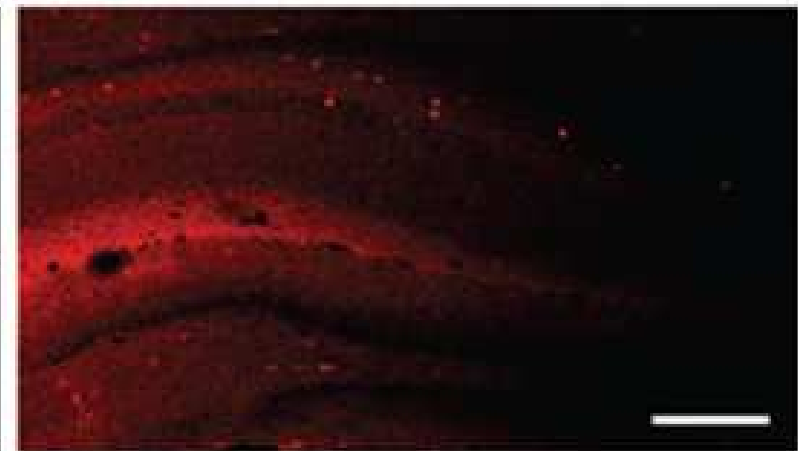
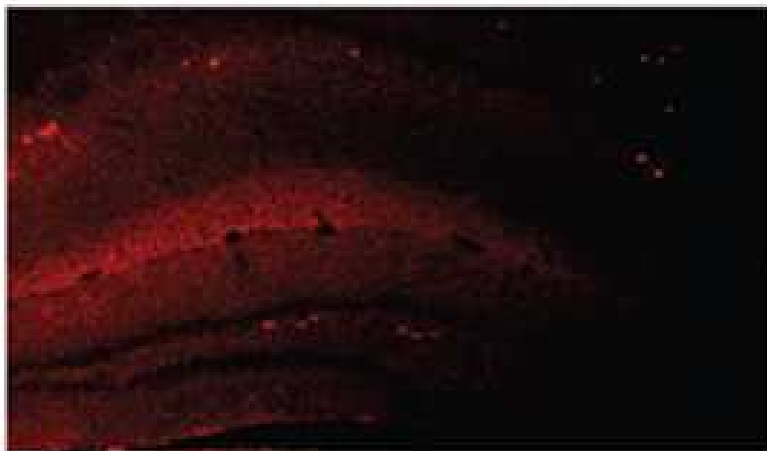
Non modificato

Sindrome Down

Cellule GABA  
(tipol)



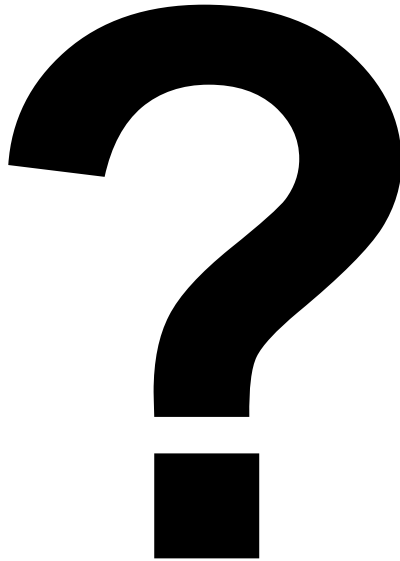
Cellule GABA  
(tipoll)





**GABA**

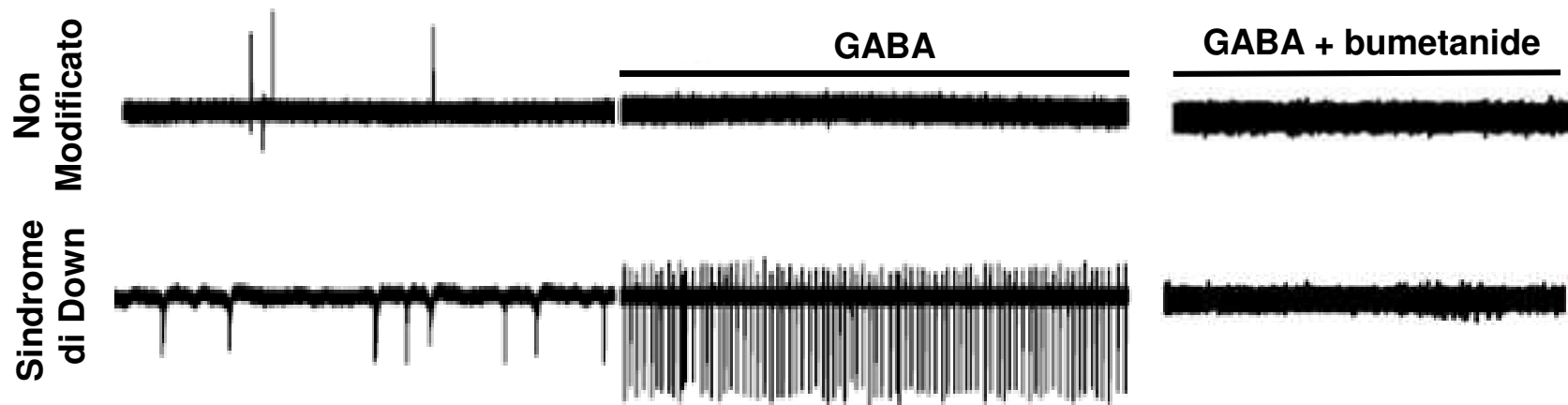
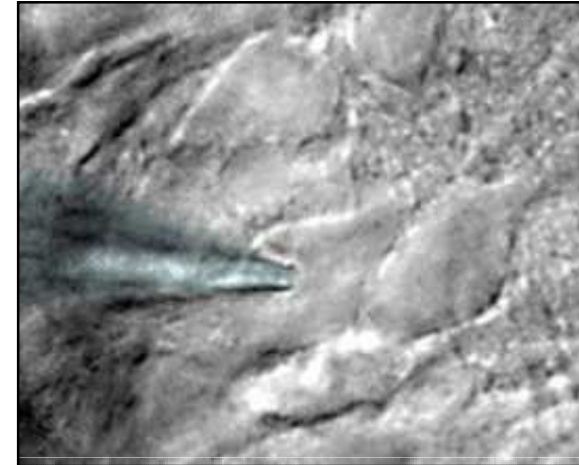
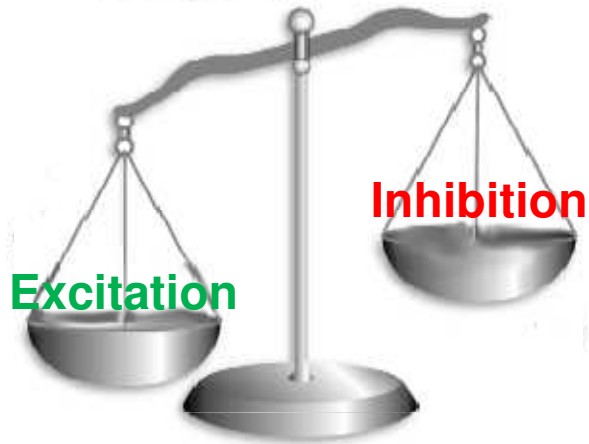
**Inibizione**



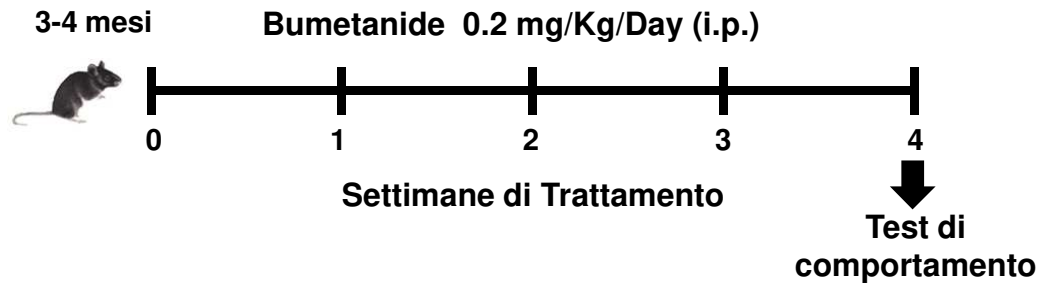
**Epilessia**  
**Ipercinesia**  
**Ansia**



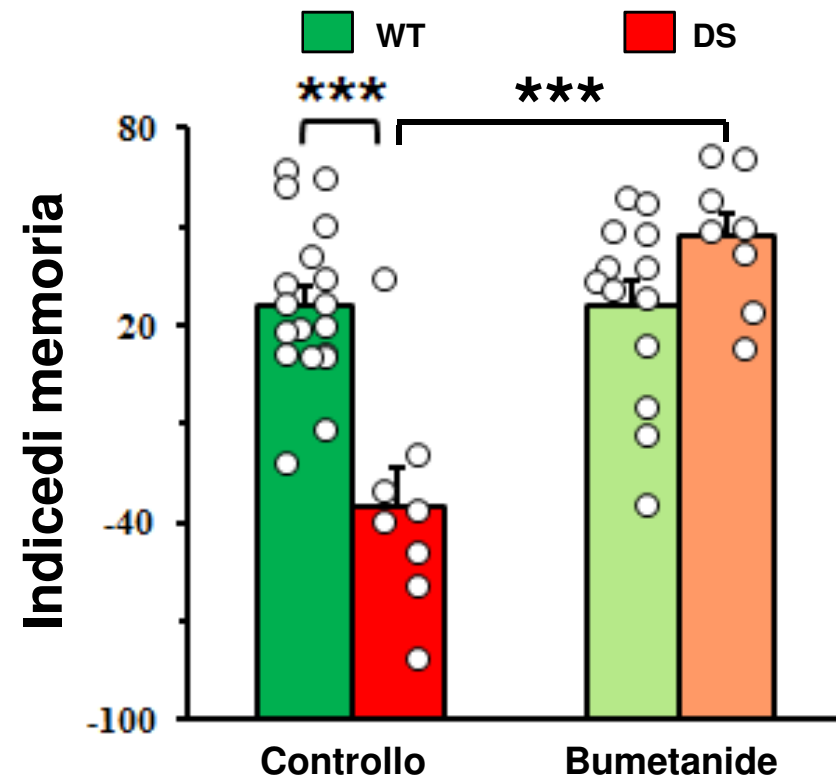
# Il GABA è Eccitatorio nella Sindrome di Down



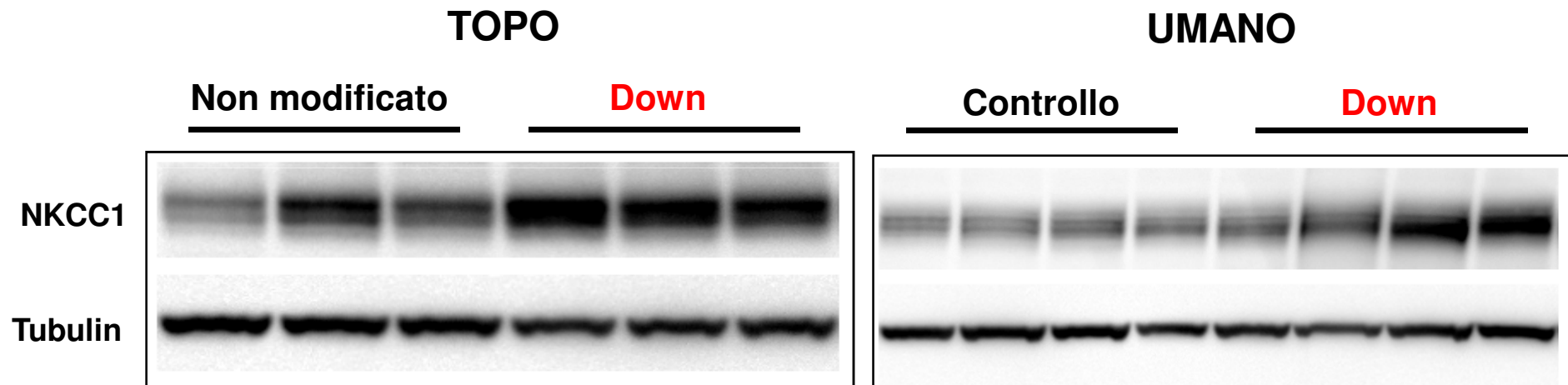
# Bumetanide Migliora le Capacità Cognitive dei Topi con la Sindrome di Down



## Test cognitivo comportamentale



# L' Espressione di NKCC1 è Aumentata nei Modelli Murini ed in Pazienti con Sindrome di Down





**In collaboration with Dr. Vicari, Bambino Gesù', Rome, Italy**

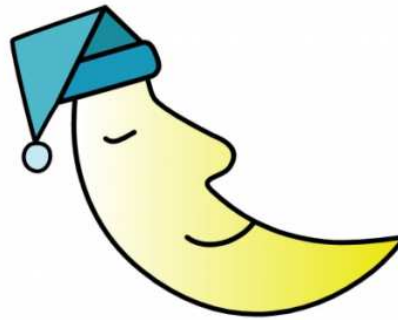
# Direzioni Future

## (1) Effetti di Bumetanide su altri sintomi (animali adulti)

**Ansia**



**Sonno**



Collaborazione con V. Tucci, IIT

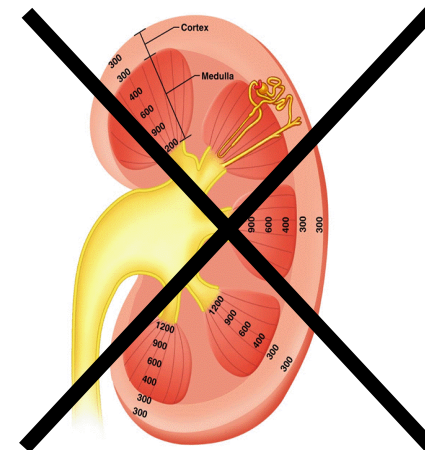
## (2) Trattamento nell'infanzia



## (3) Sviluppo di un nuovo farmaco non diuretico



**Disegno di farmaci  
al computer**



Collaborazione con M. De Vivo, IIT

# Conclusioni

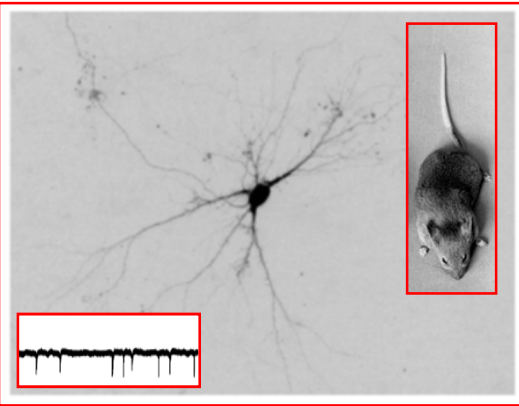
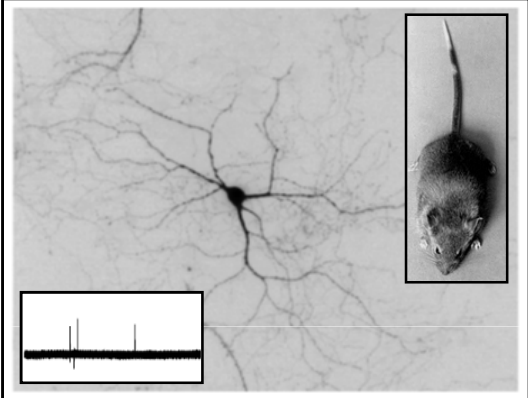
Sviluppo

~~Proliferazione  
Differenziamento  
Migrazione~~

Cervello sano

Trattamento farmacologico

Cervello Malato

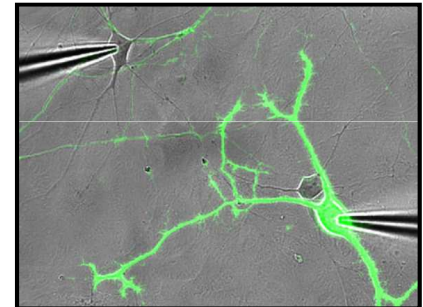


# Cosa Posso Fare per Voi?

**Le basi del funzionamento del cervello**



**Panoramica sulle tecniche sperimentali in neuroscienza**



**Risultati sperimentali su modelli animali di sindrome di Down**



# Cosa Potete Fare Voi per Noi?

## Credere nella ricerca di base

Troveremo studenti migliori

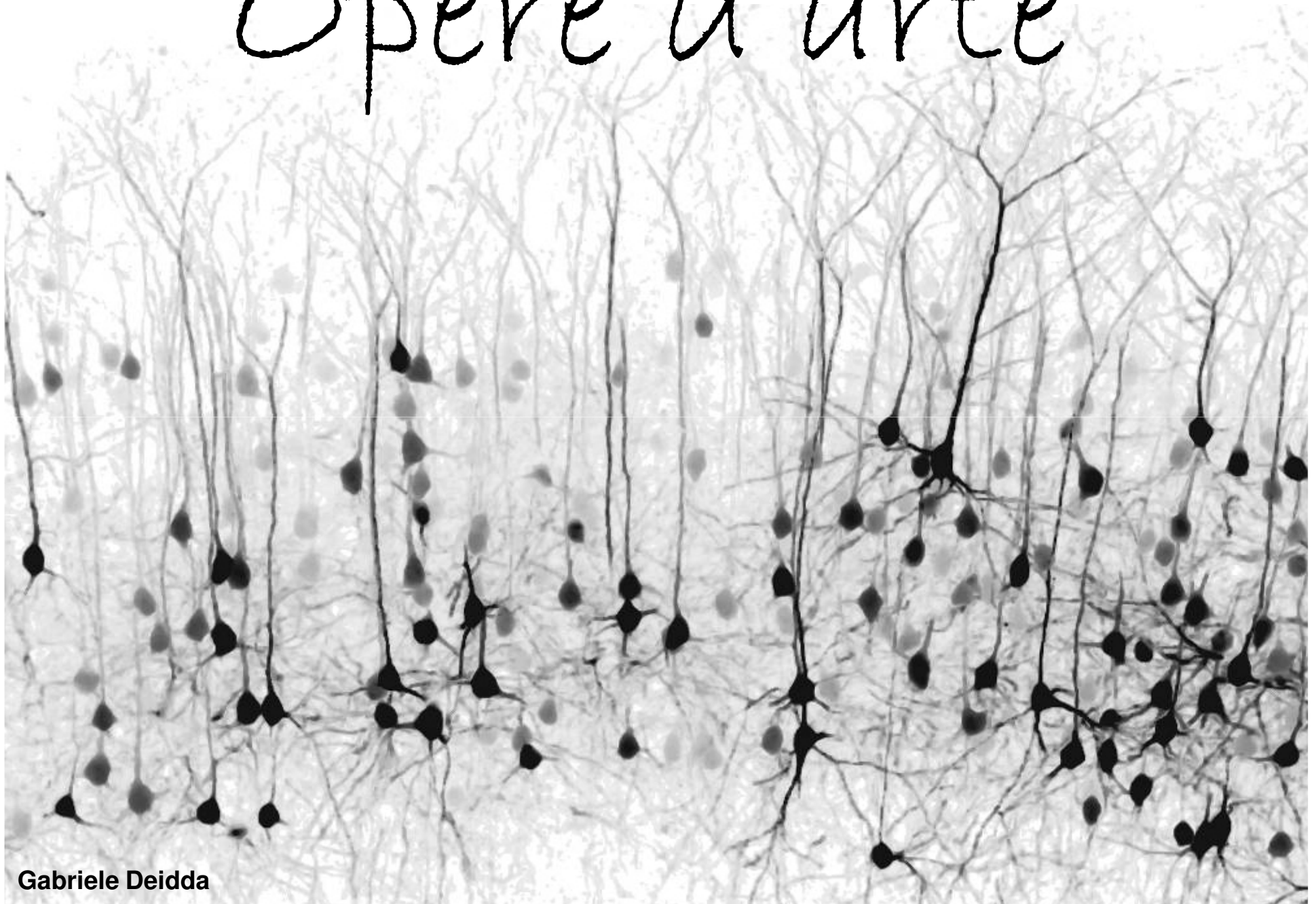


Garantirete il supporto alle fondazioni benefiche





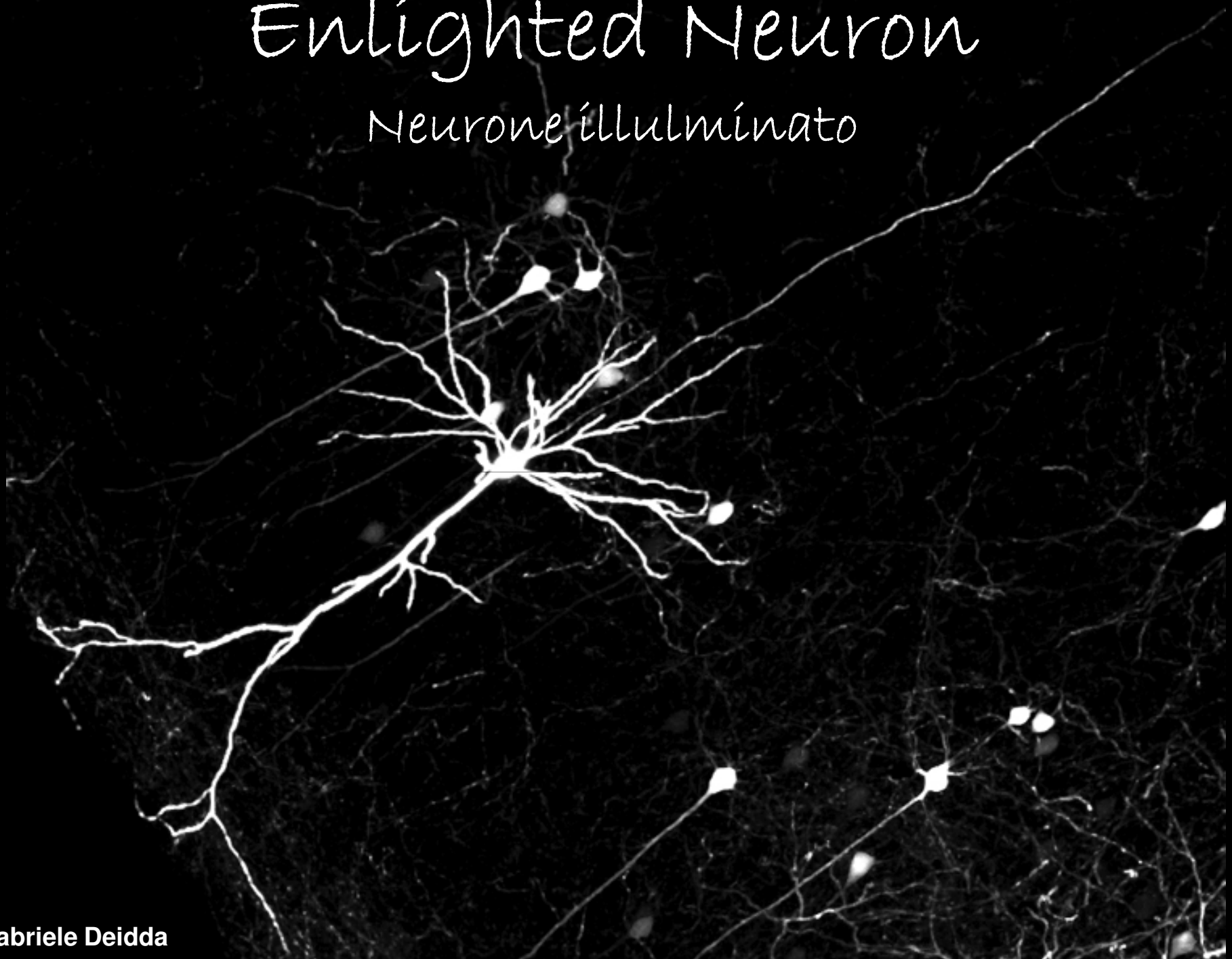
# Opere d'arte



Gabriele Deidda

# Enlightened Neuron

Neurone illuminato



# Liquid Neurons

Neuroní líquidí

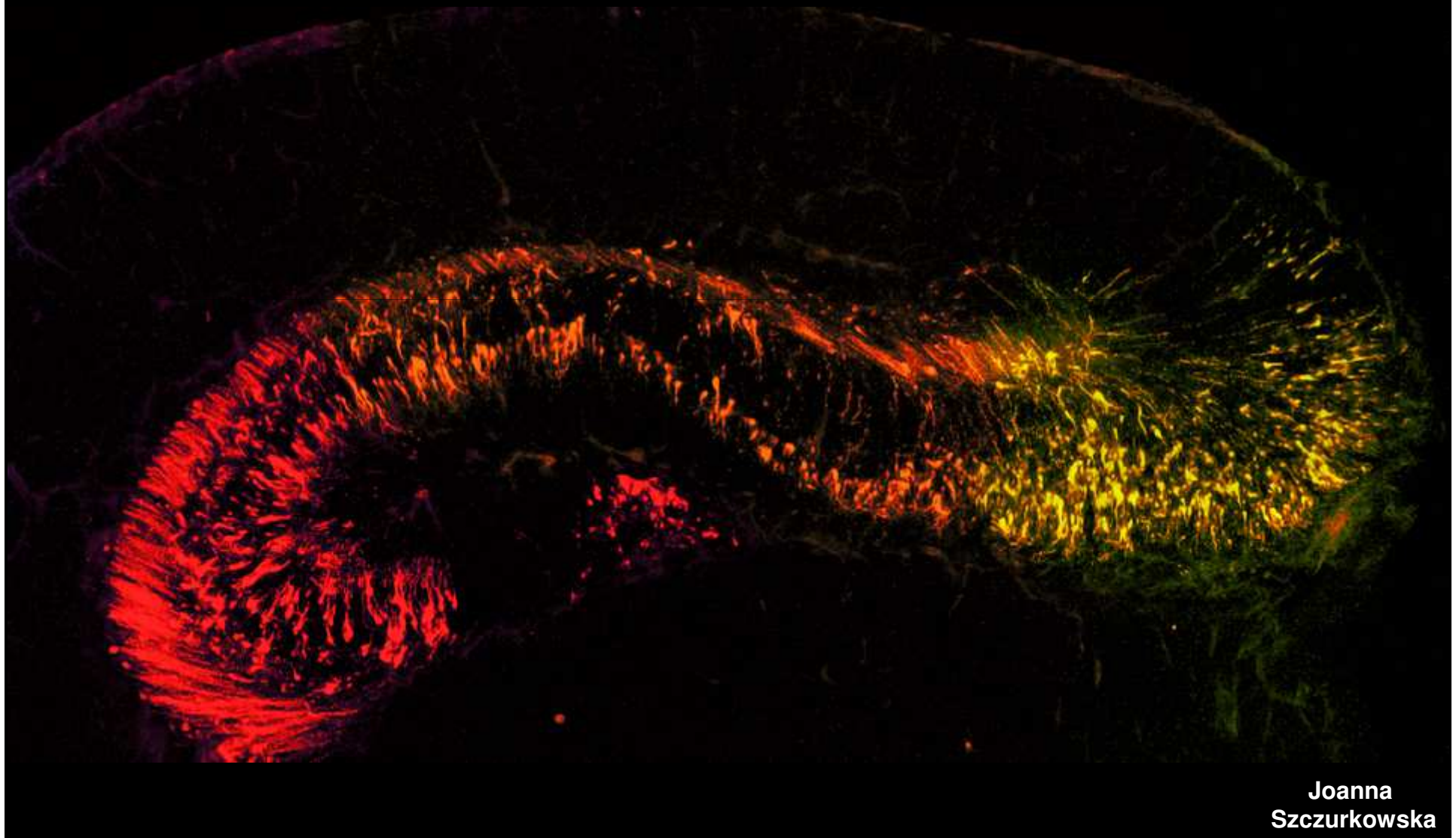


Joanna  
Szczurkowska



# Hippocampus on fire

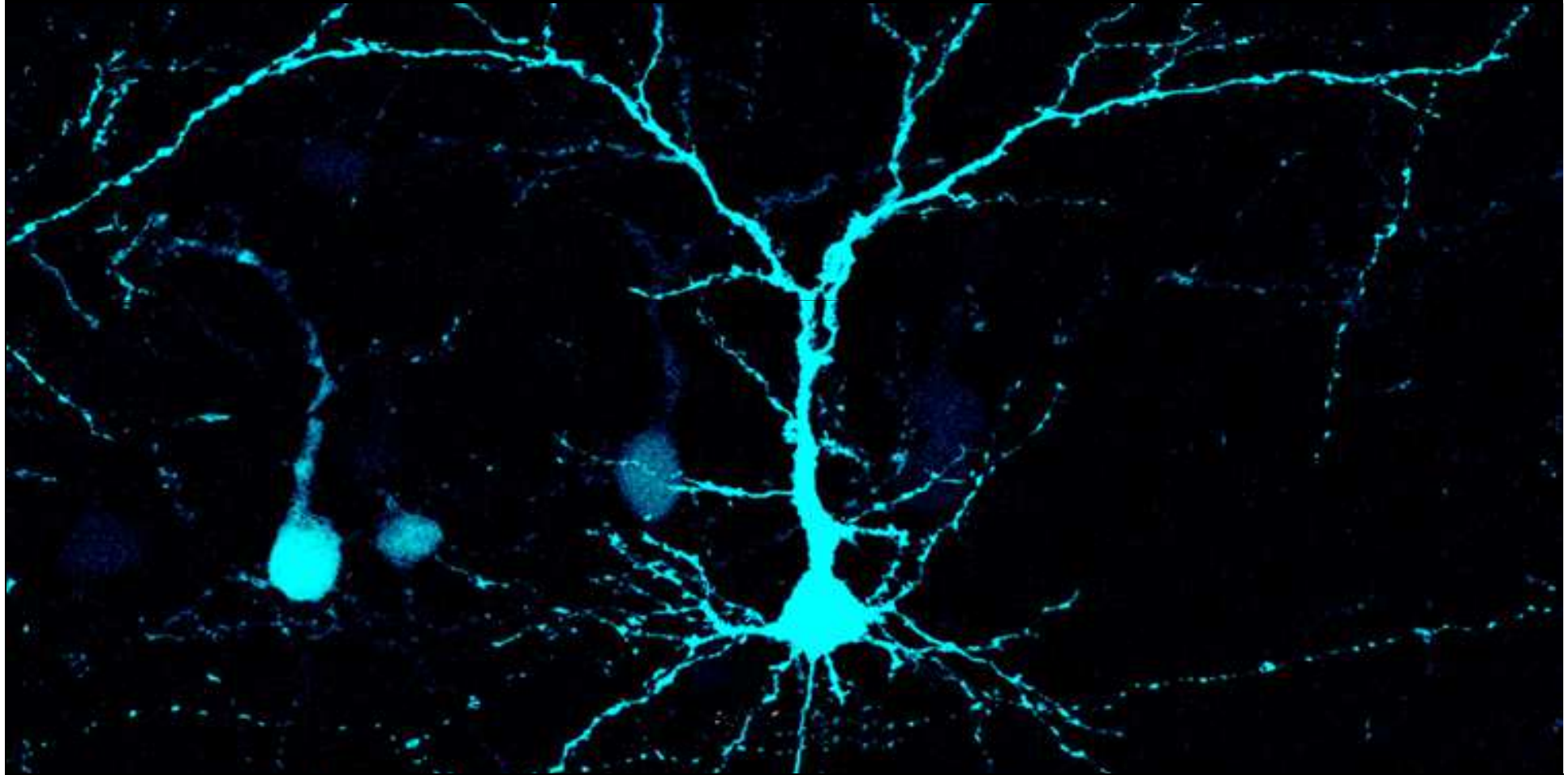
Ippocampo in fiamme



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Szczurkowska

# Lightning at Night

Fulmine di notte

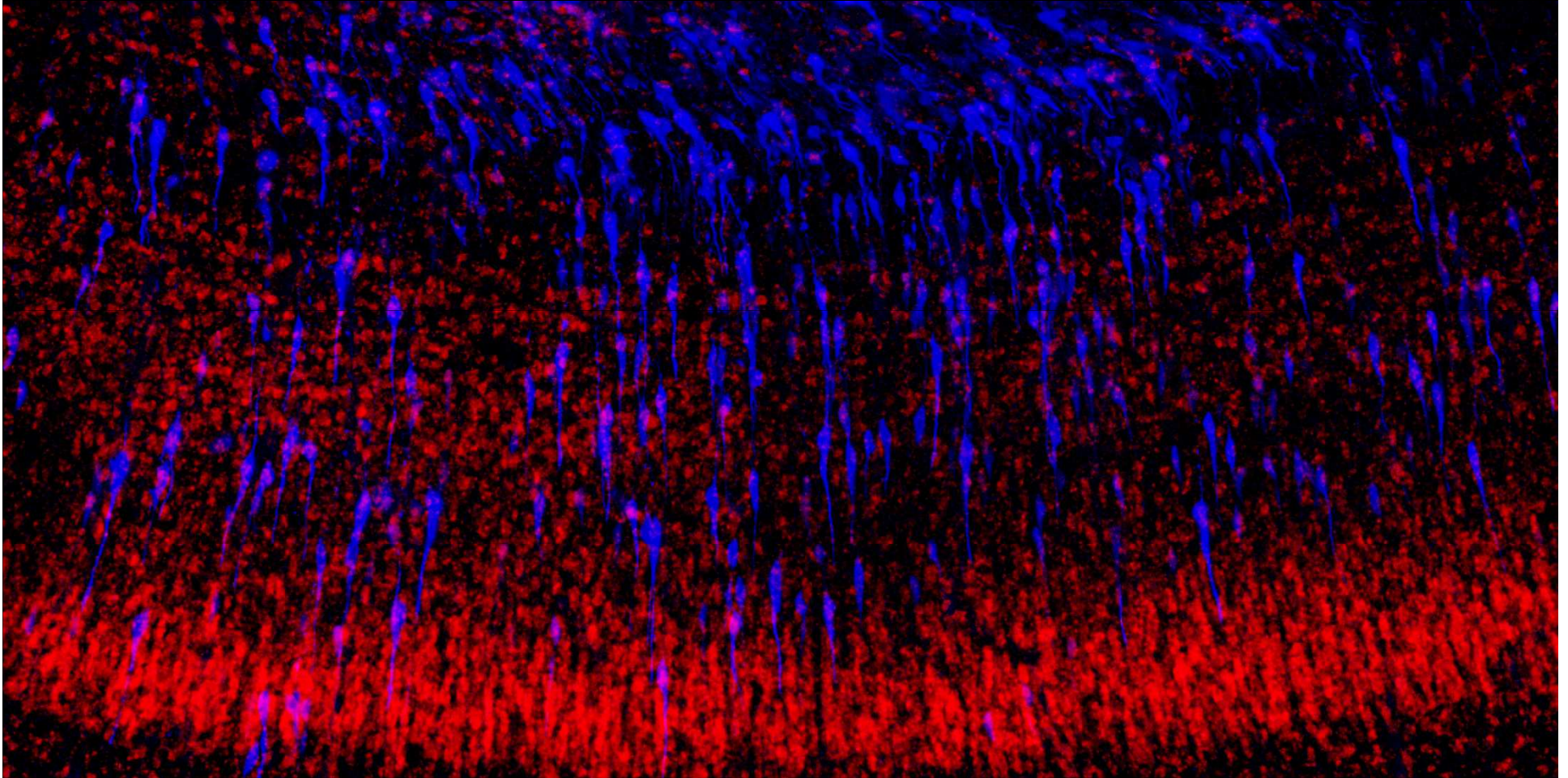


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Rain at Sunset

Pioggia al tramonto

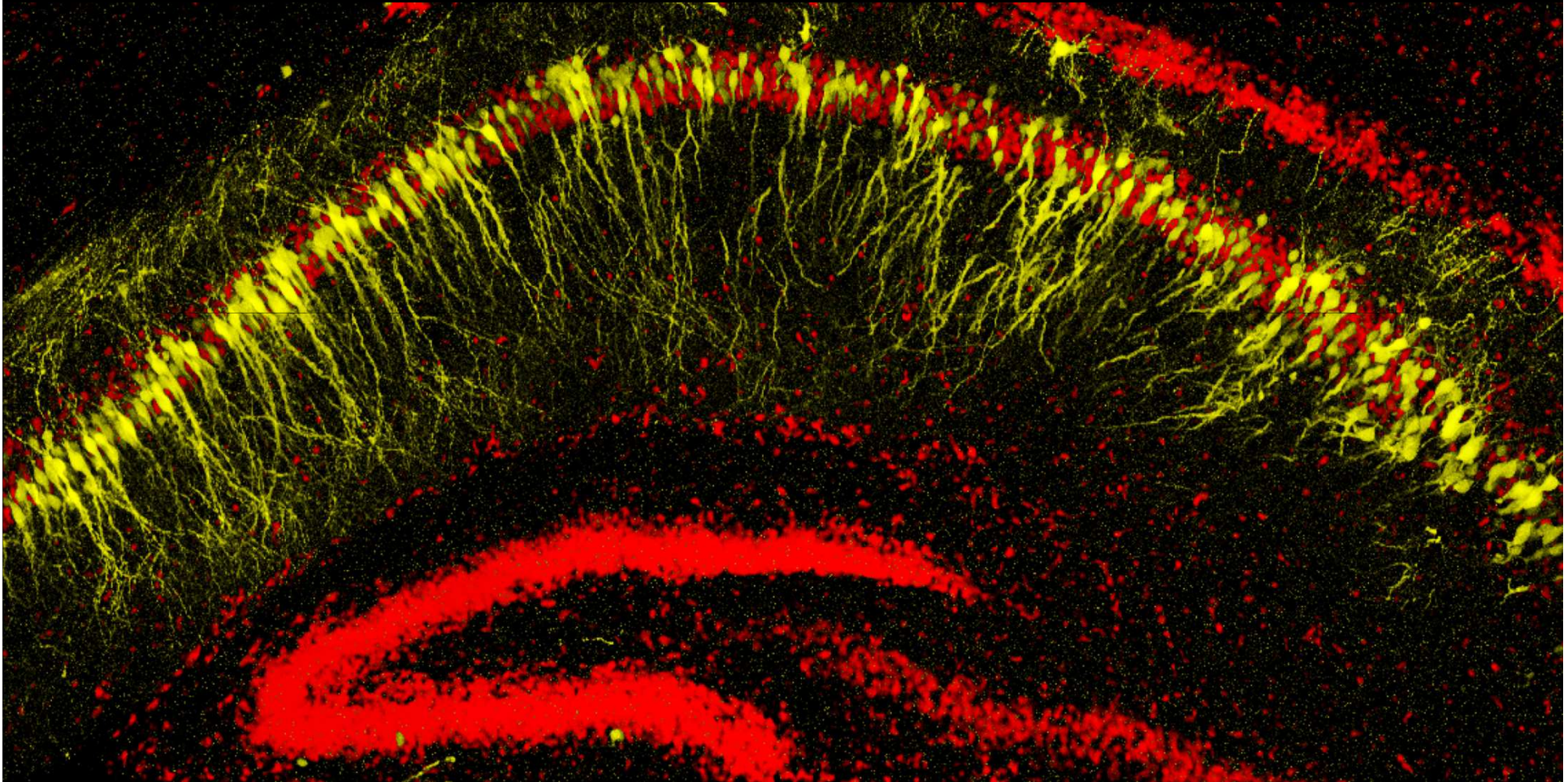


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Szczurkowska



# Neurotic Híppocampus

Ippocampo nevrotico



Joanna  
Szczurkowska



# A New Andy in Scientific Art

un nuovo Andy nell'arte della scienza

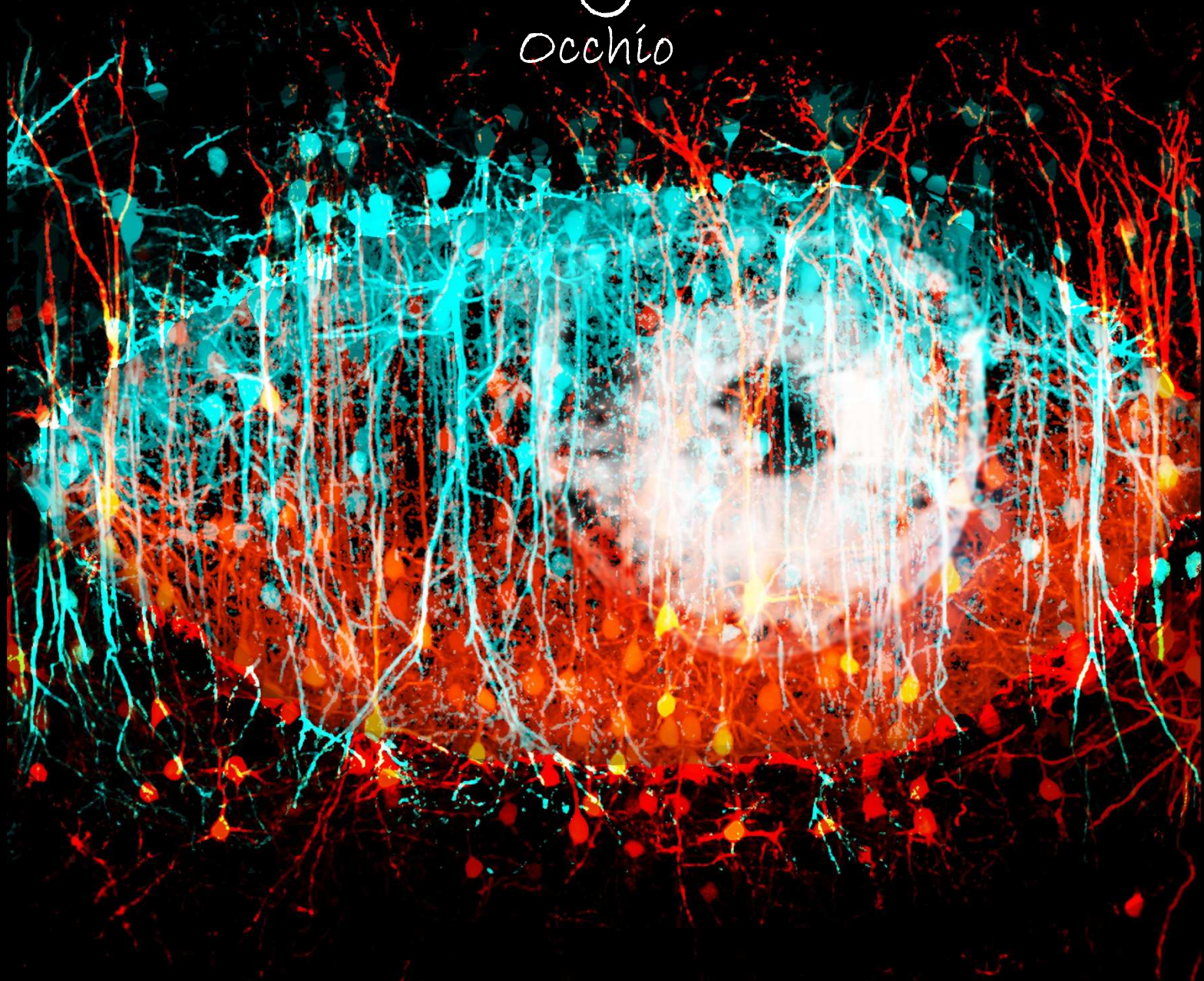


Andy Cwetsch



# Eye

occhio

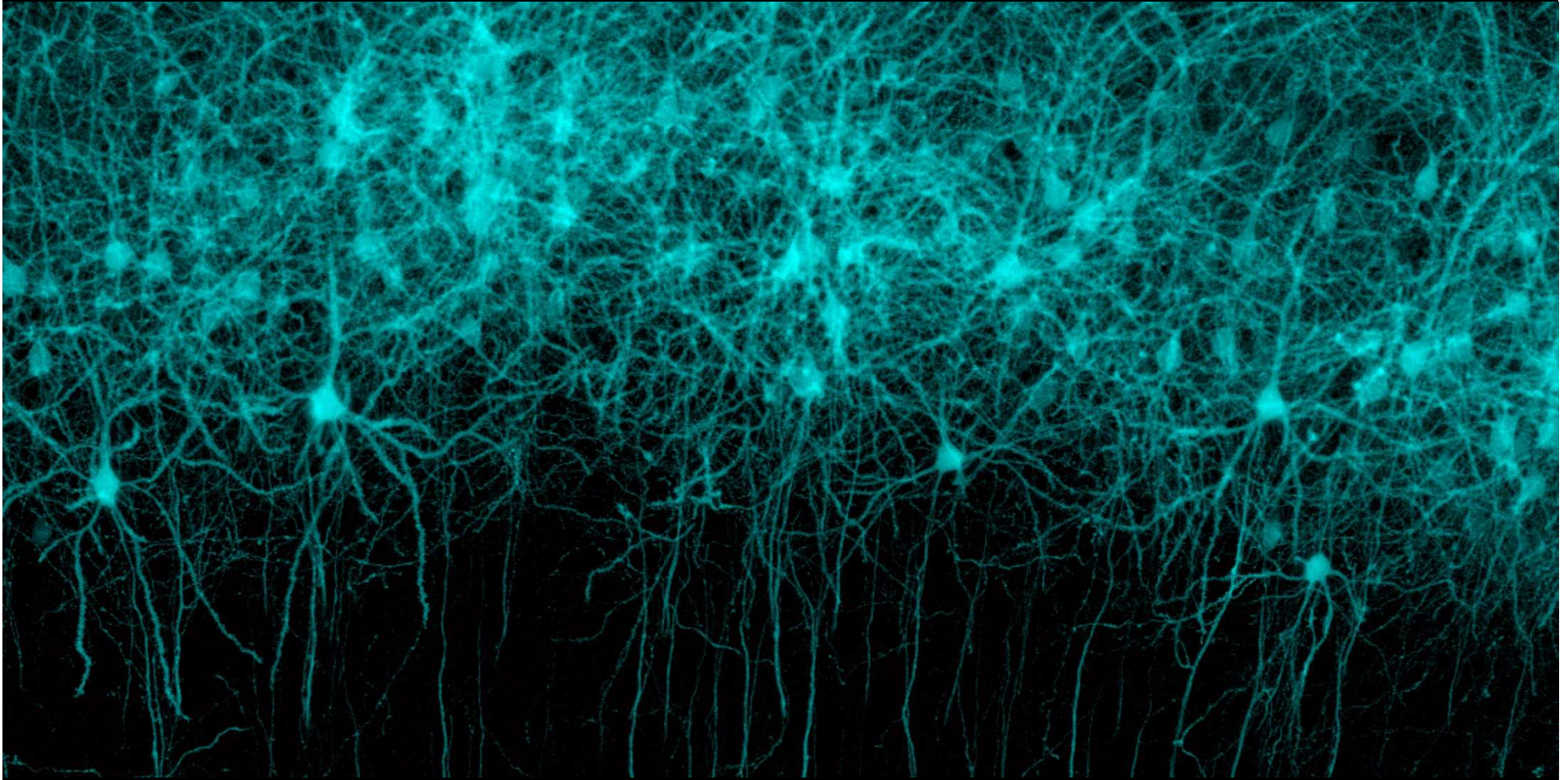


Gabriele  
Deidda



# Brain Forest

Foresta del cervello

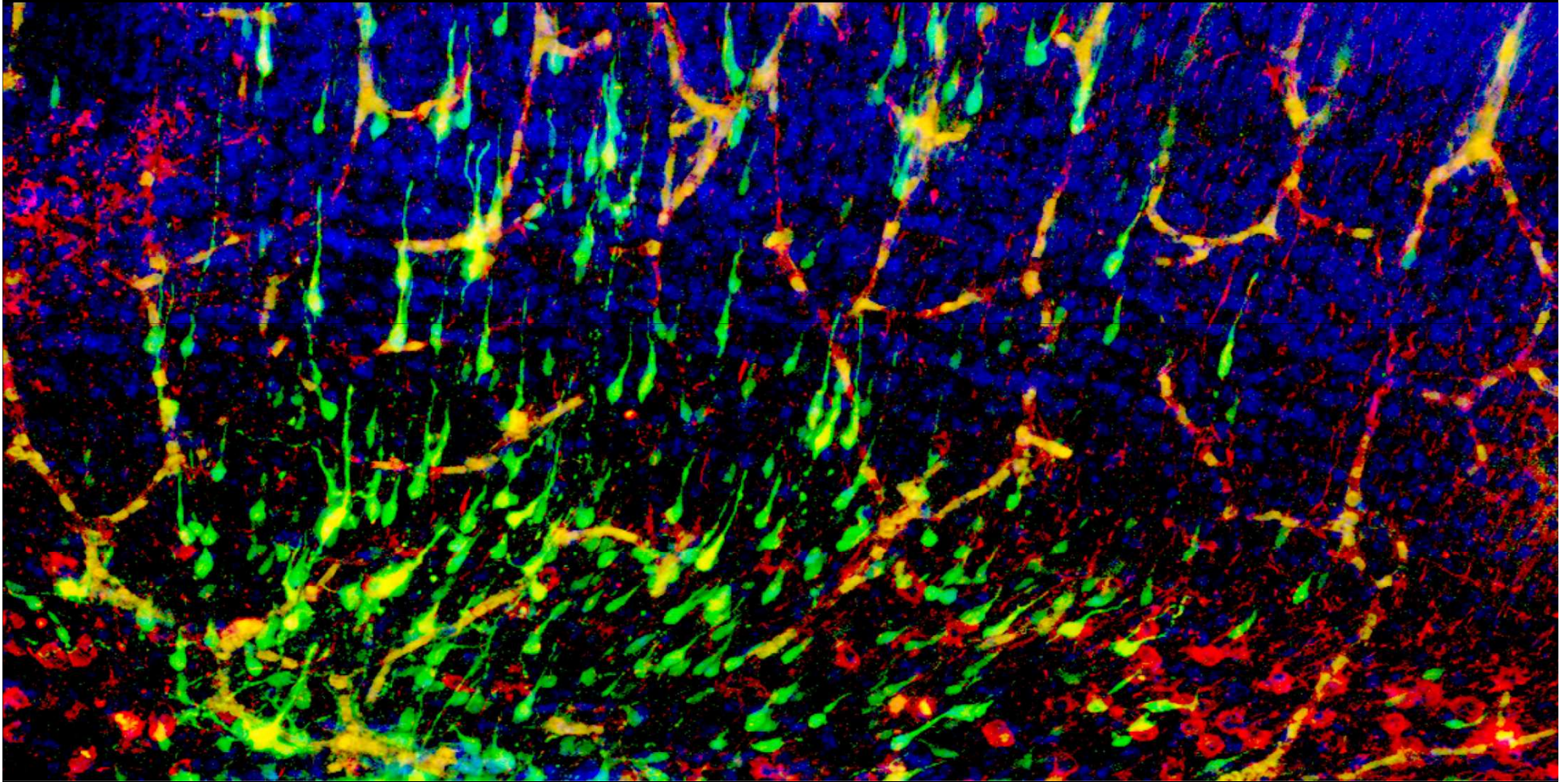


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Szczurkowska



# Climbing the Brain

scalando il cervello

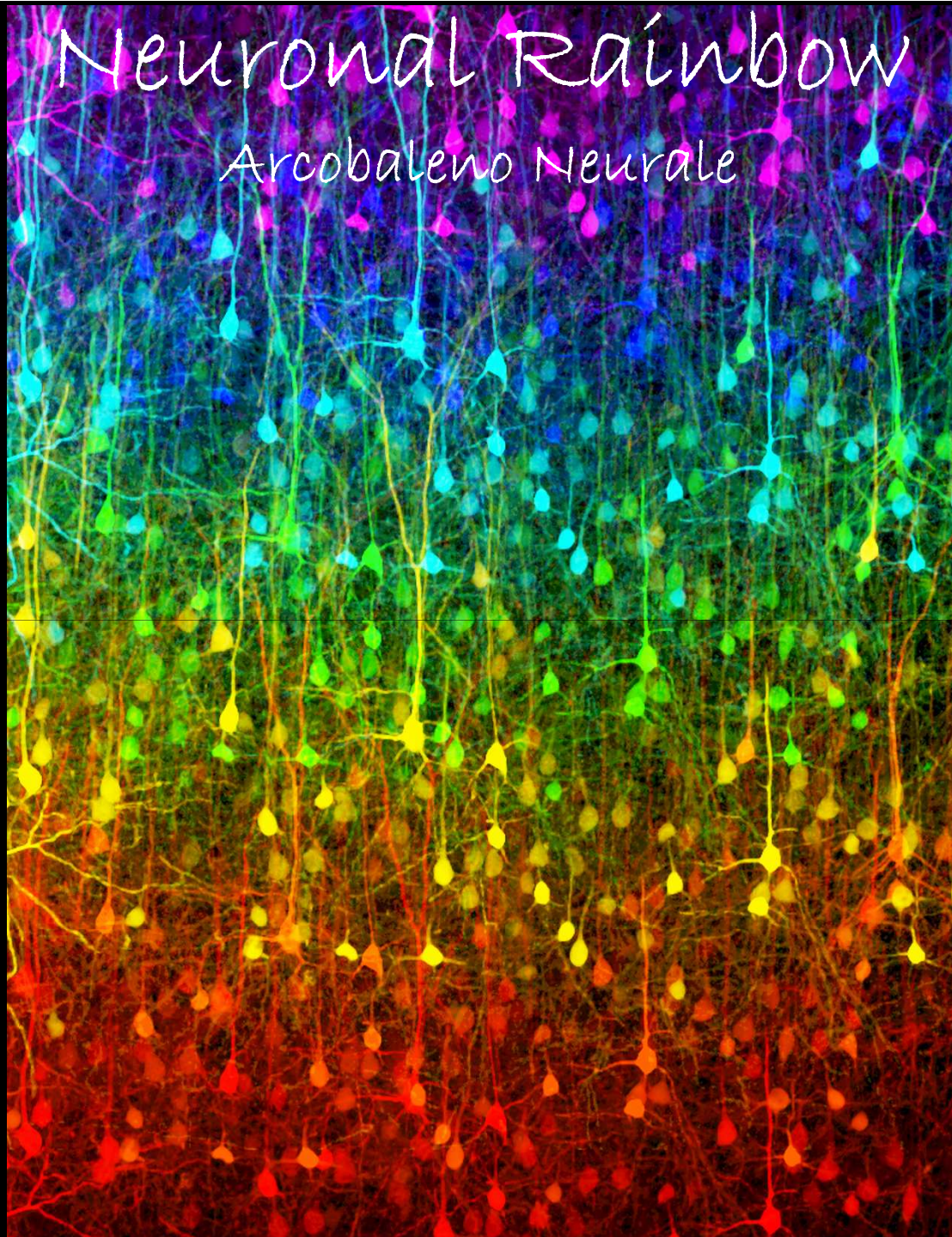


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# Neuronal Rainbow

Arcobaleno Neurale

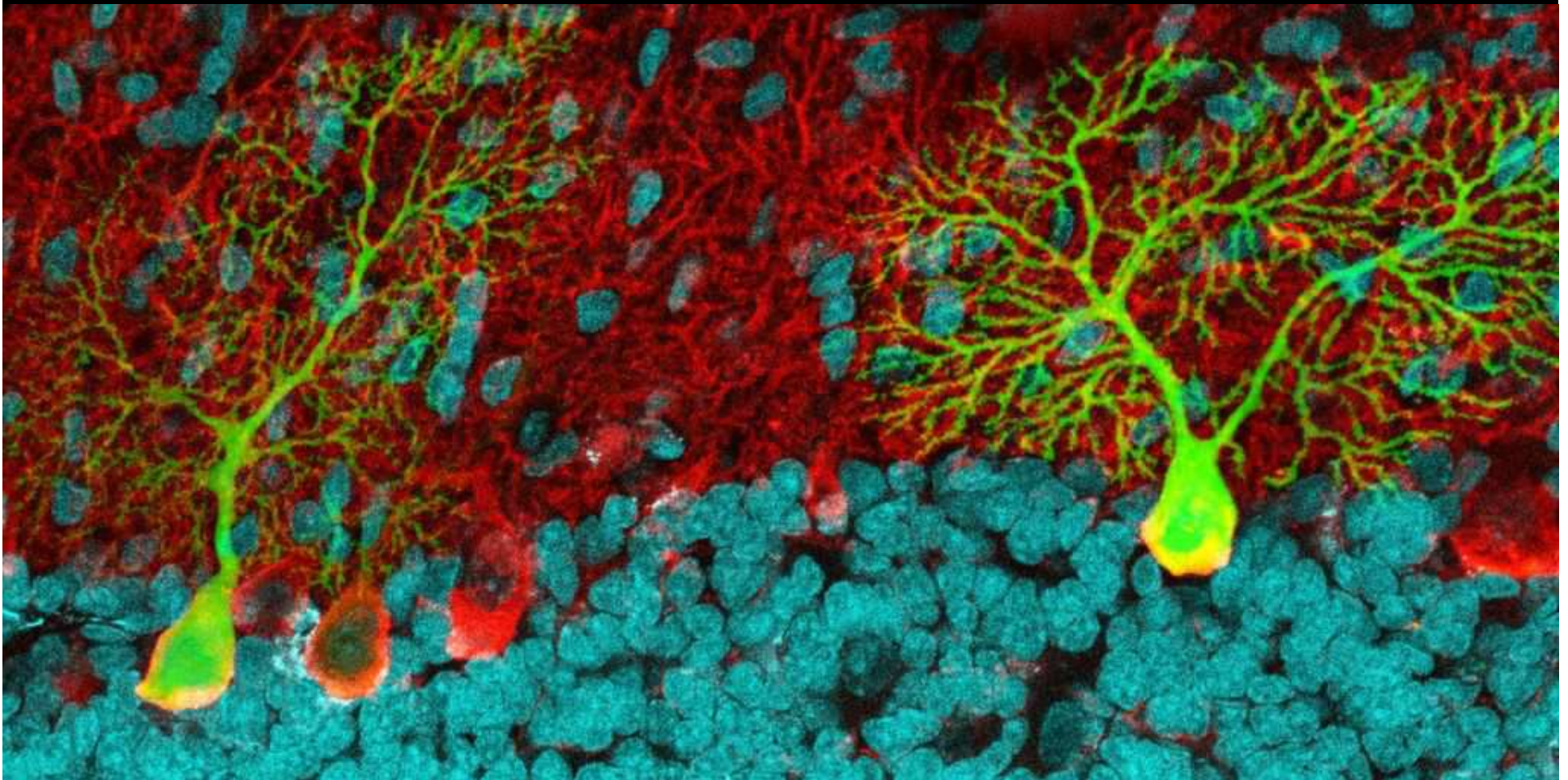


Gabriele Deidda



# Coral Reef

Barriera corallina



# Morale della Storia

**Anche la ricerca di base ha il potenziale necessario  
per influenzare la vita dei pazienti**





# Morale della Storia

**Tutti possono diventare bravi scienziati**



**Le neuroscienze sono bellissime**

