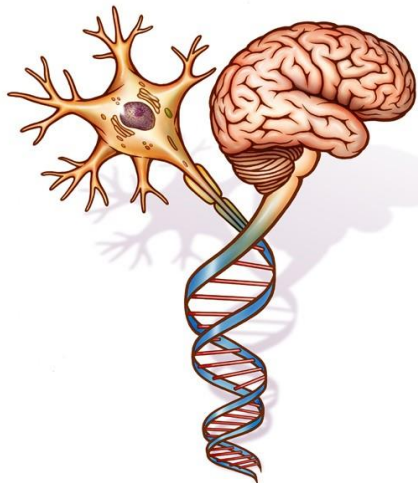


Adjusting the dials on the circuits in the human brain

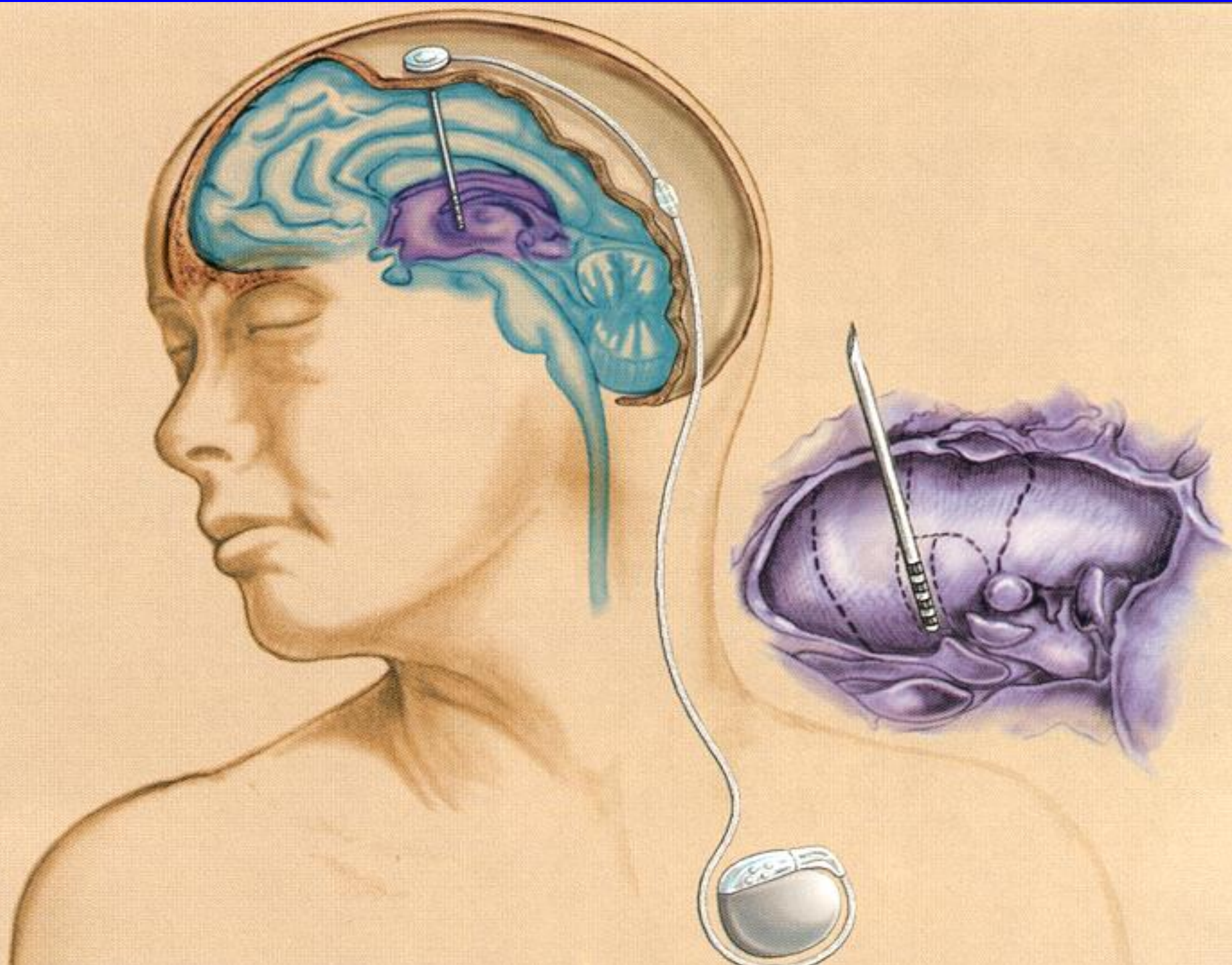


Division of Neurosurgery
UNIVERSITY OF TORONTO

Andres M Lozano MD PhD
Professor and Chair of Neurosurgery
Canada Research Chair in Neuroscience
Toronto Western Hospital
University of Toronto

Brain Functions are localized within circuits

- Movement Parkinson's disease
- Vision
- Appetite
- Mood/Happiness/sadness Depression
- Love/hate
- Drive/ambition
- Judgement, Empathy
- Memory and Cognition Alzheimer's



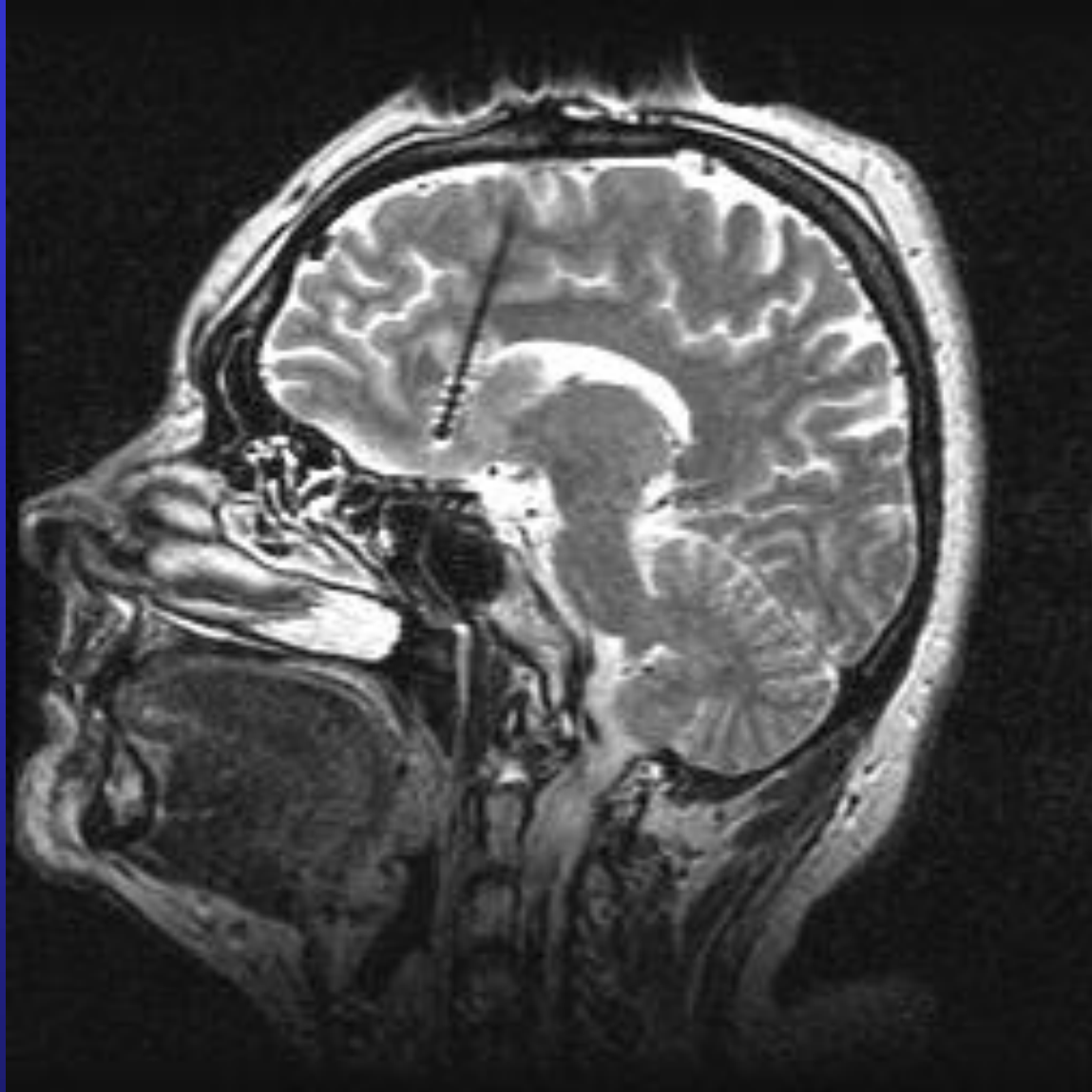


Figure 1. Sagittal
MRI showing position of
DBS electrode in Subcallosal cingulate gyrus

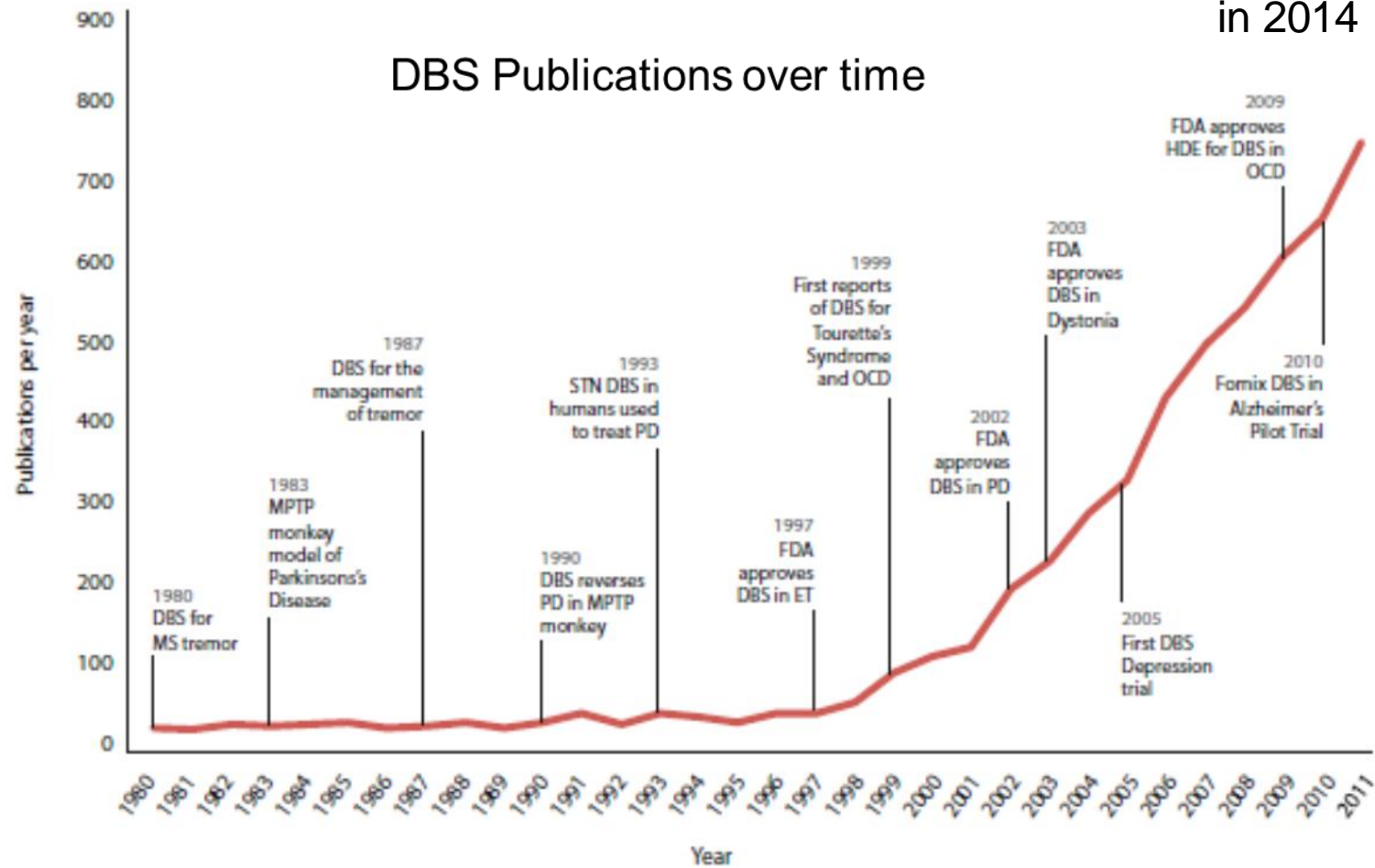
Neuron 2013

Probing and Regulating Dysfunctional Circuits Using Deep Brain Stimulation

Andres M. Lozano^{1,*} and Nir Lipsman¹

¹Division of Neurosurgery, Department of Surgery, Toronto Western Hospital, Krembil Neuroscience Center, University of Toronto, Toronto, ON M5T 2S8, Canada

1041 in PUB MED
in 2014



Emerging Indications- over 20 in gov.trials registry over 30 in litterature

Phase I

93 Trials

37 Parkinson's Disease
8 PD+
7 Major Depression
6 Obsess. Comp. Diso.
5 Alzheimer's Disease
4 Dystonia
3 Epilepsy
2 Addiction
2 Cluster headache
2 Essential tremor
1 Anorexia nervosa
1 Bipolar Disorder
1 Chronic pain
1 DLB
1 Huntington's Disease
1 Tourette's Syndrome
1 Traumatic Brain Injury
1 Obesity
1 MS Tremor
1 Urinary Function
1 "Movement disorders"

Phase II

7 Trials

3 PD
1 OCD
1 MDD
1 Dystonia
1 Alzheimer's

Phase III

10 Trials

4 PD
2 OCD
3 Dystonia
1 Tourette's

Phase II/III

6 Trials

2 Dystonia
1 Bipolar
1 Epilepsy
1 ET
1 PD/ET/
Dystonia

Phase III

15 Trials

5 PD
4 MDD
2 Dystonia
2 Epilepsy
1 OCD
1 TS





3 months
post-op

January 1997



WORLD HEALTH ORGANIZATION

FIFTY-FIFTH WORLD HEALTH ASSEMBLY
Provisional agenda item 13.13

A55/18
11 April 2002

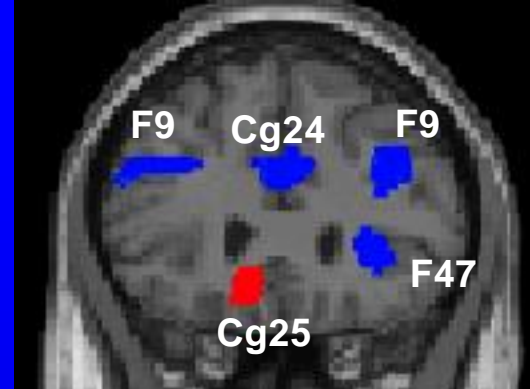
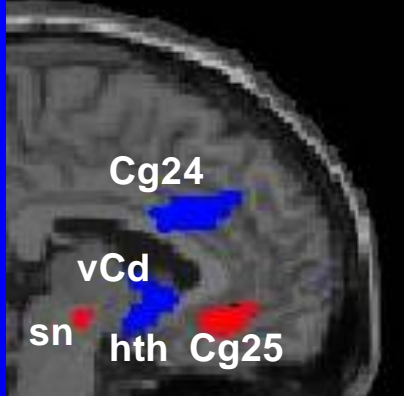
Mental health: responding to the call for action

Report by the Secretariat

DEPRESSION

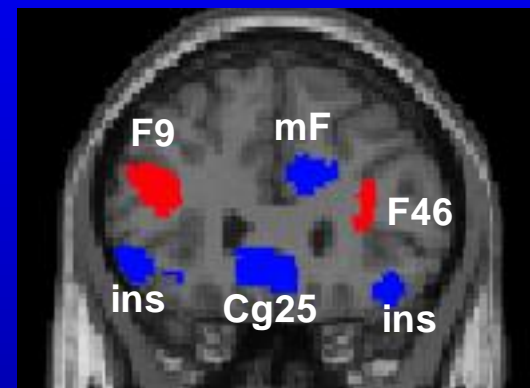
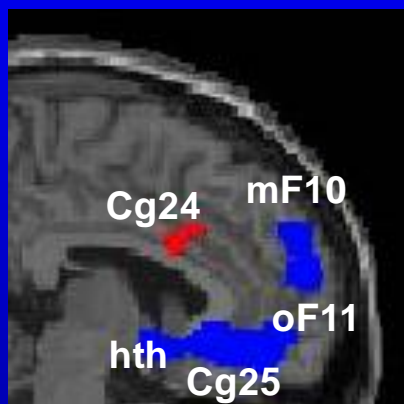
- 9% incidence women 6% Men
- Depression is the leading cause of disability-121 million, increasingly affecting young people
- 800,000 suicides per year
- 10-20% fail medications, psychotherapy and electroconvulsive therapy- treatment resistant depression

**Baseline
CBF PET
N=5**



L

**3 months
DBS
R=3**

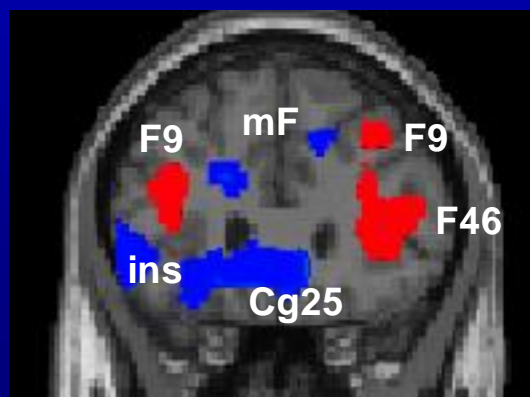
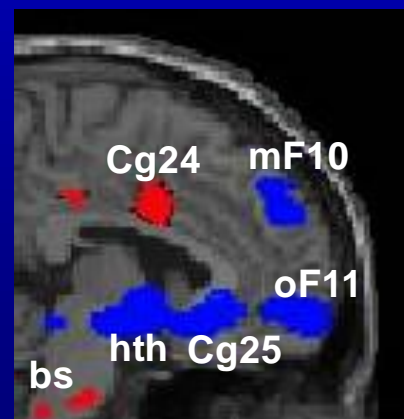


z = +4



z = -4

**6 months
DBS
R=3**



x = -4

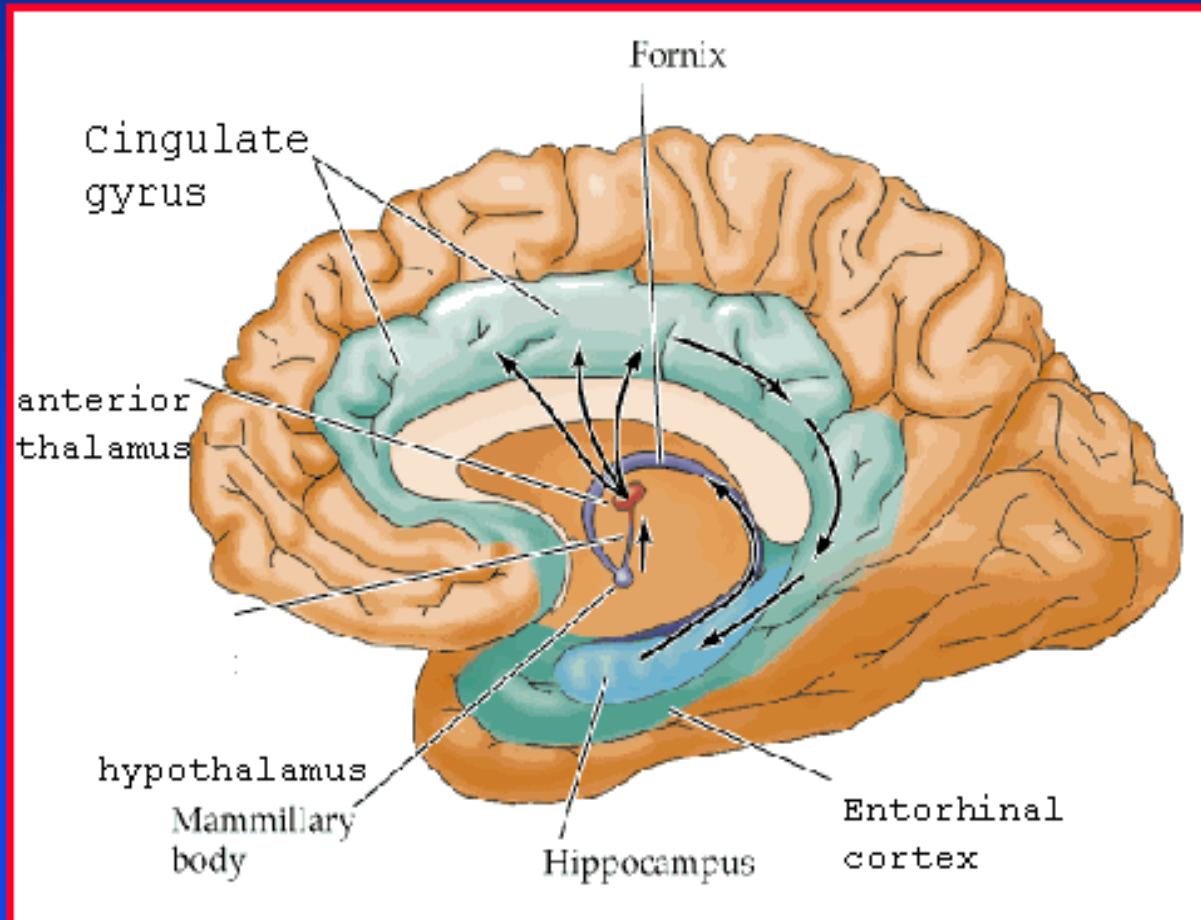
Alzheimer's disease

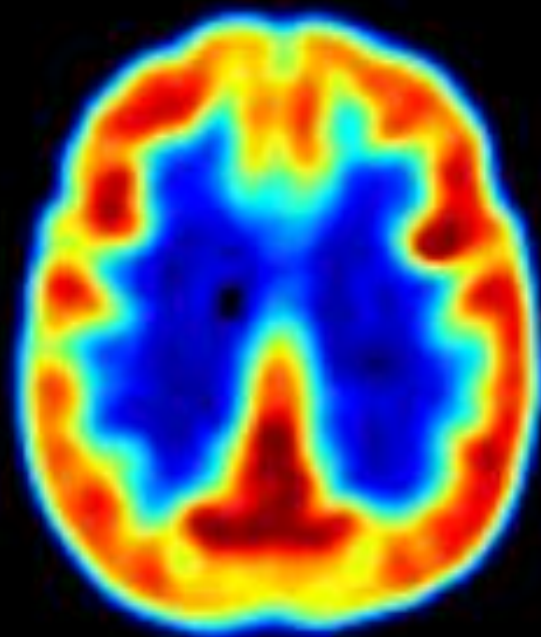
- 44.35 Million people worldwide 2015
- 75.32 Million people in 2013
- 135.46 Million people in 2015

(Alzheimer's Disease International, 2013)

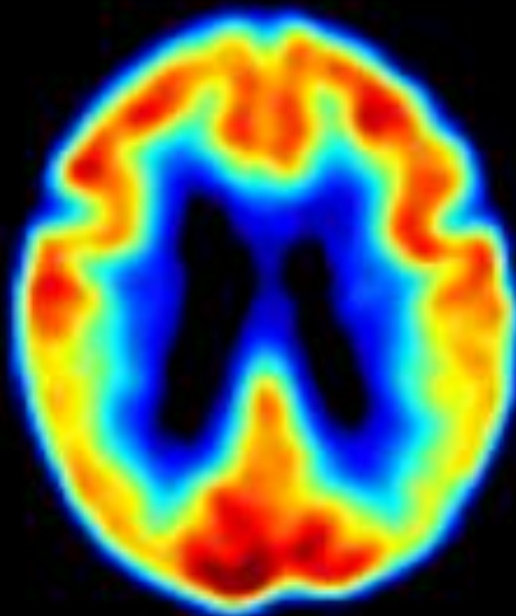
- 604 billion Worldwide cost in 2010
- (Wimo et al., 2013)

The Anatomy of Memory

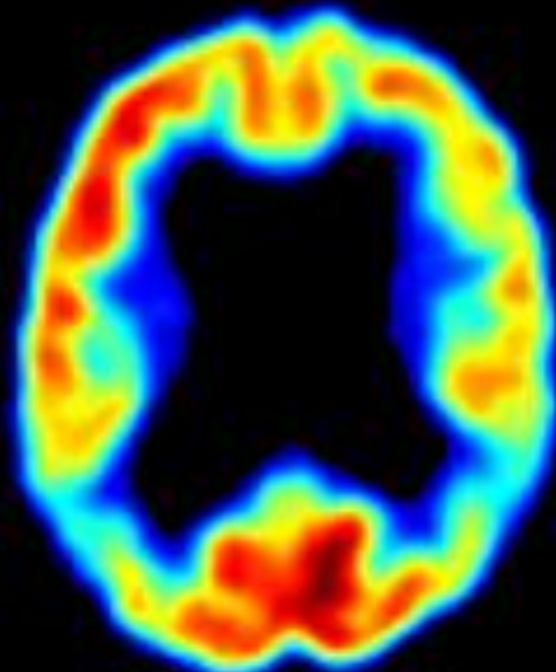




Normal

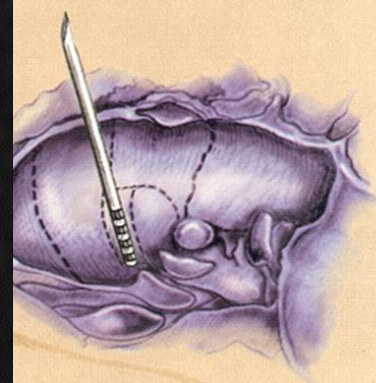
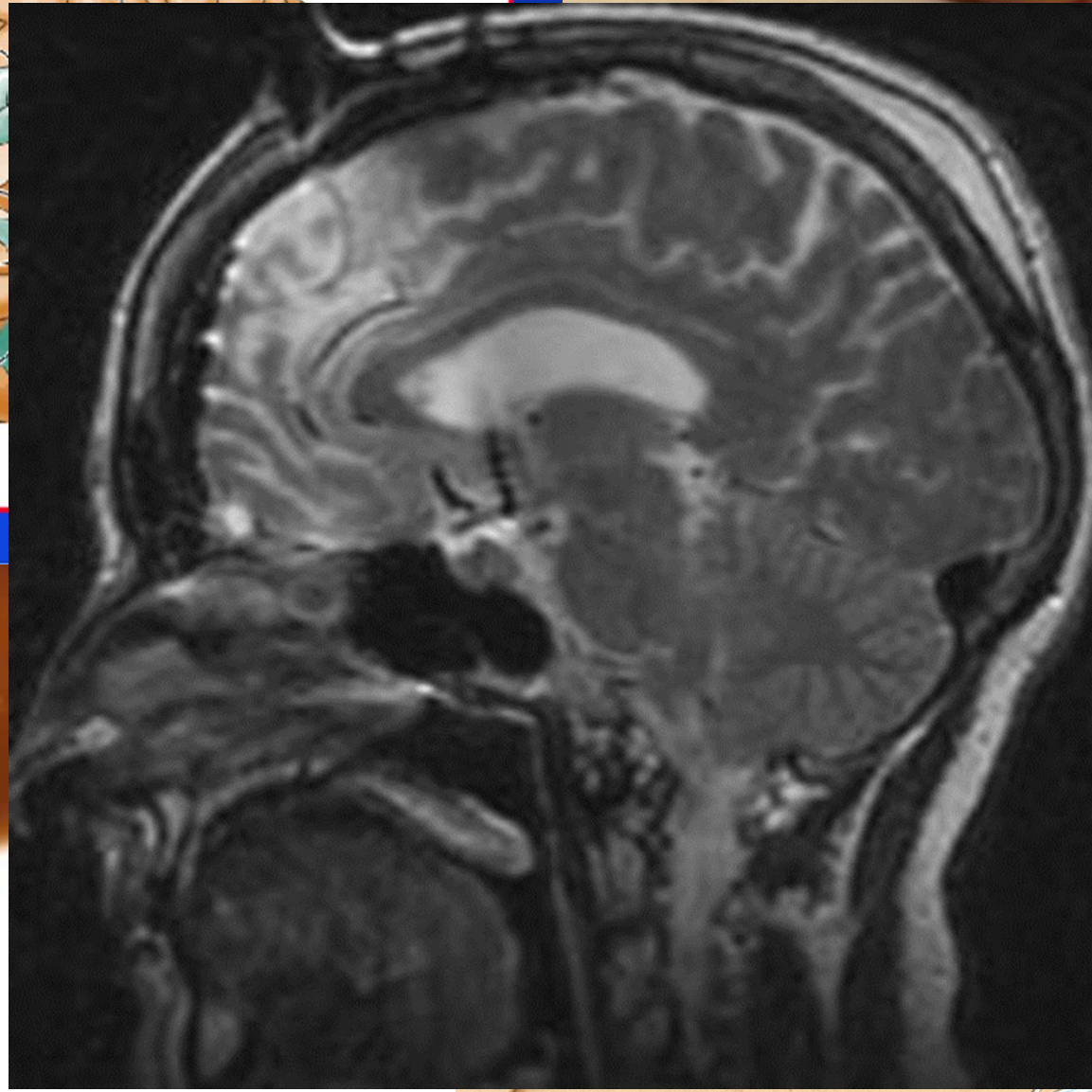
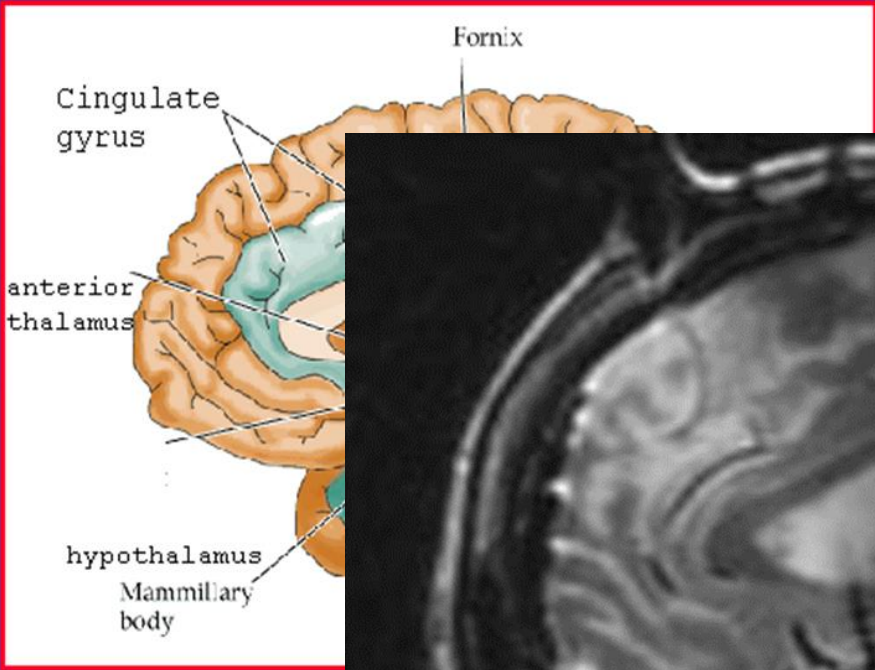


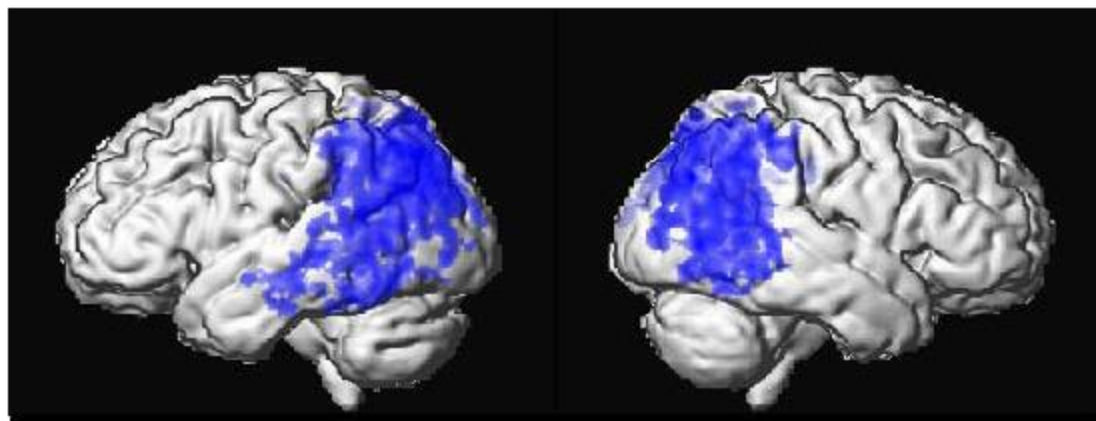
Mild cognitive
impairment



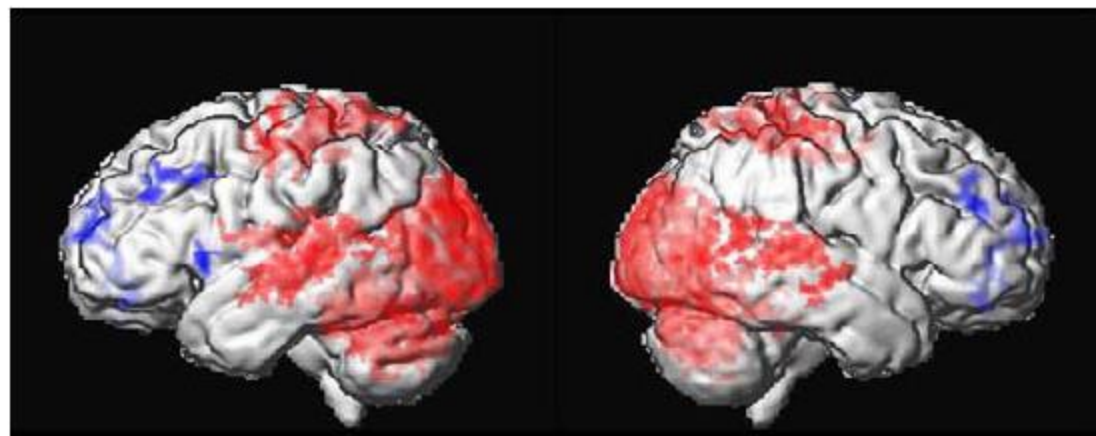
Alzheimer's
disease



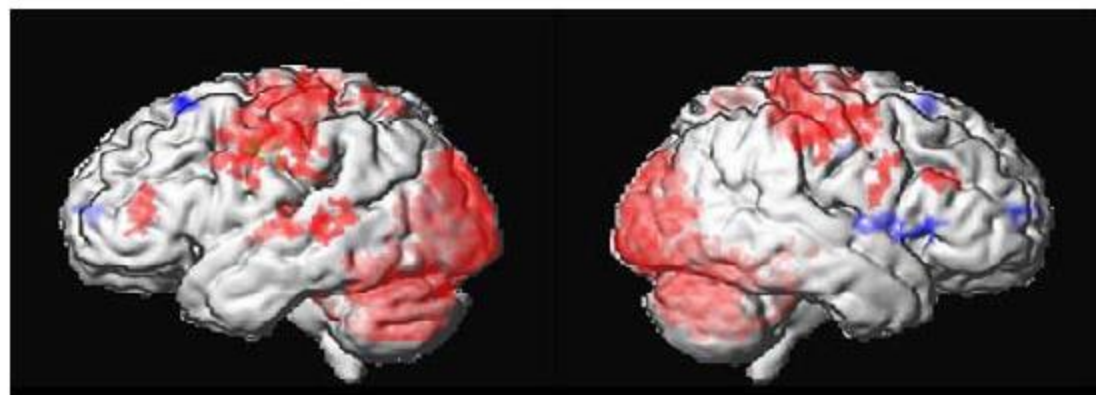




Decreased metabolism in AD
compared to Controls



One month of DBS compared
to baseline



One year of DBS compared
to baseline

Conclusion

- Large unmet need in neurological and psychiatric disorders
- Brain circuits are accessible.
- Their activity can be modulated.
 - Motor, Mood, Cognitive
- Expansion of indications
- Multidisciplinary convergence of technology and biology essential
- The hope is to help more patients.