Academic Day In Addiction Medicine, Auckland – 18 March 2016

The Excitement & Challenges of Research on Diseases of the HUMAN BRAIN

Richard Faull

Centre for Brain Research
The University of Auckland
New Zealand

CENTRE FOR BRAIN RESEARCH
THE UNIVERSITY OF AUCKLAND
Te Whare Wānanga o Tāmaki Makaurau

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The MAGIC of the HUMAN BRAIN - a personal story

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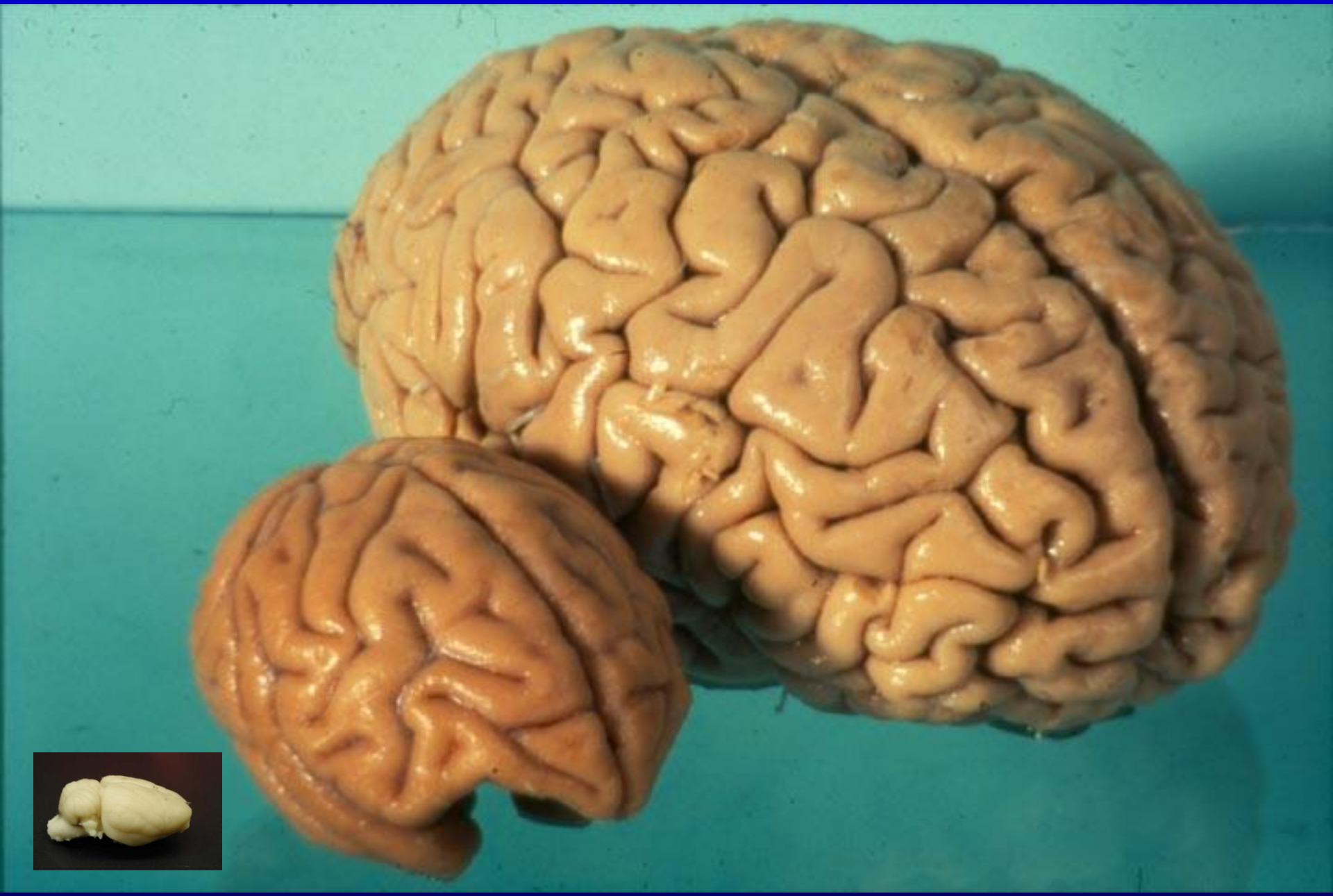

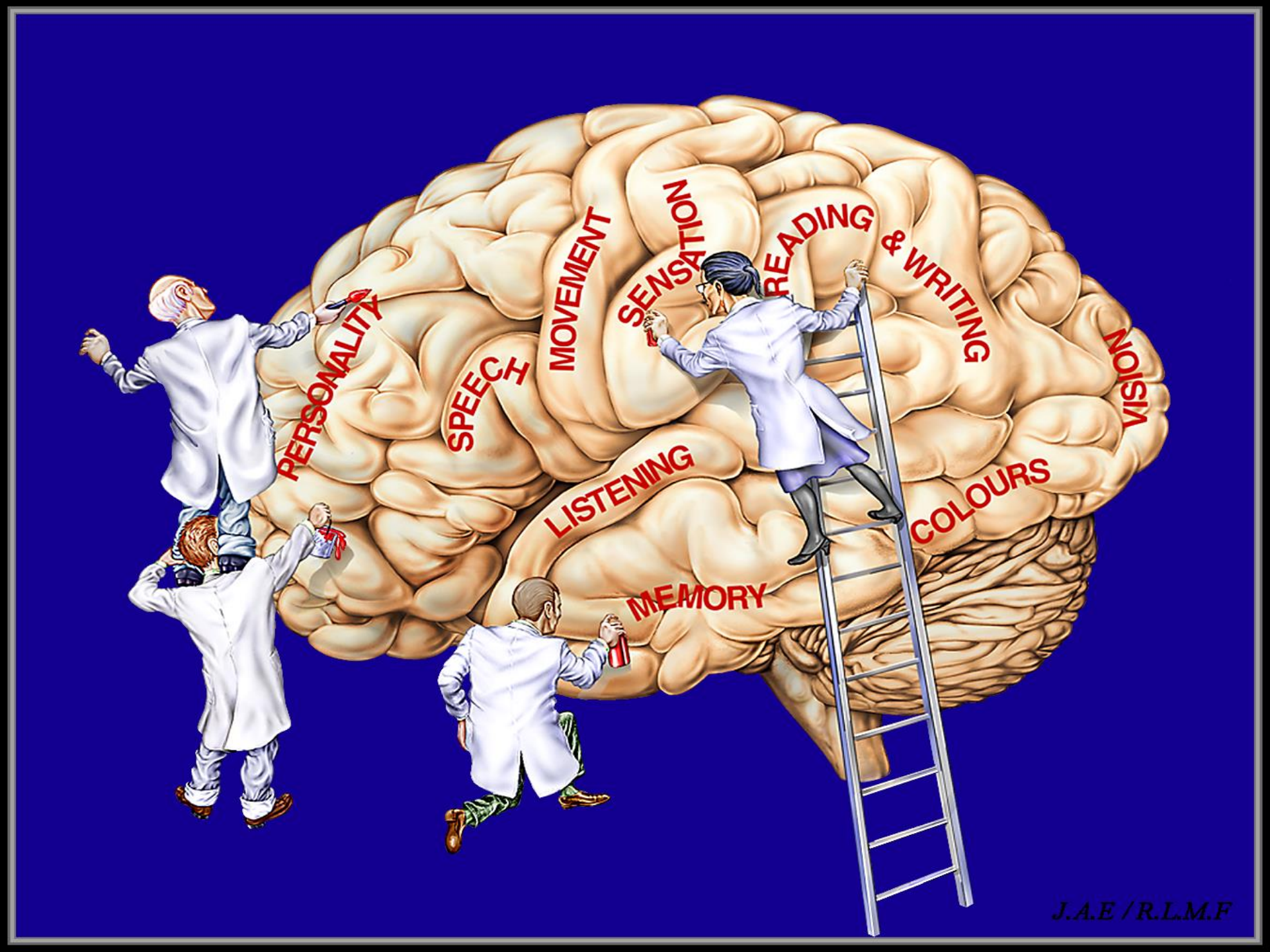
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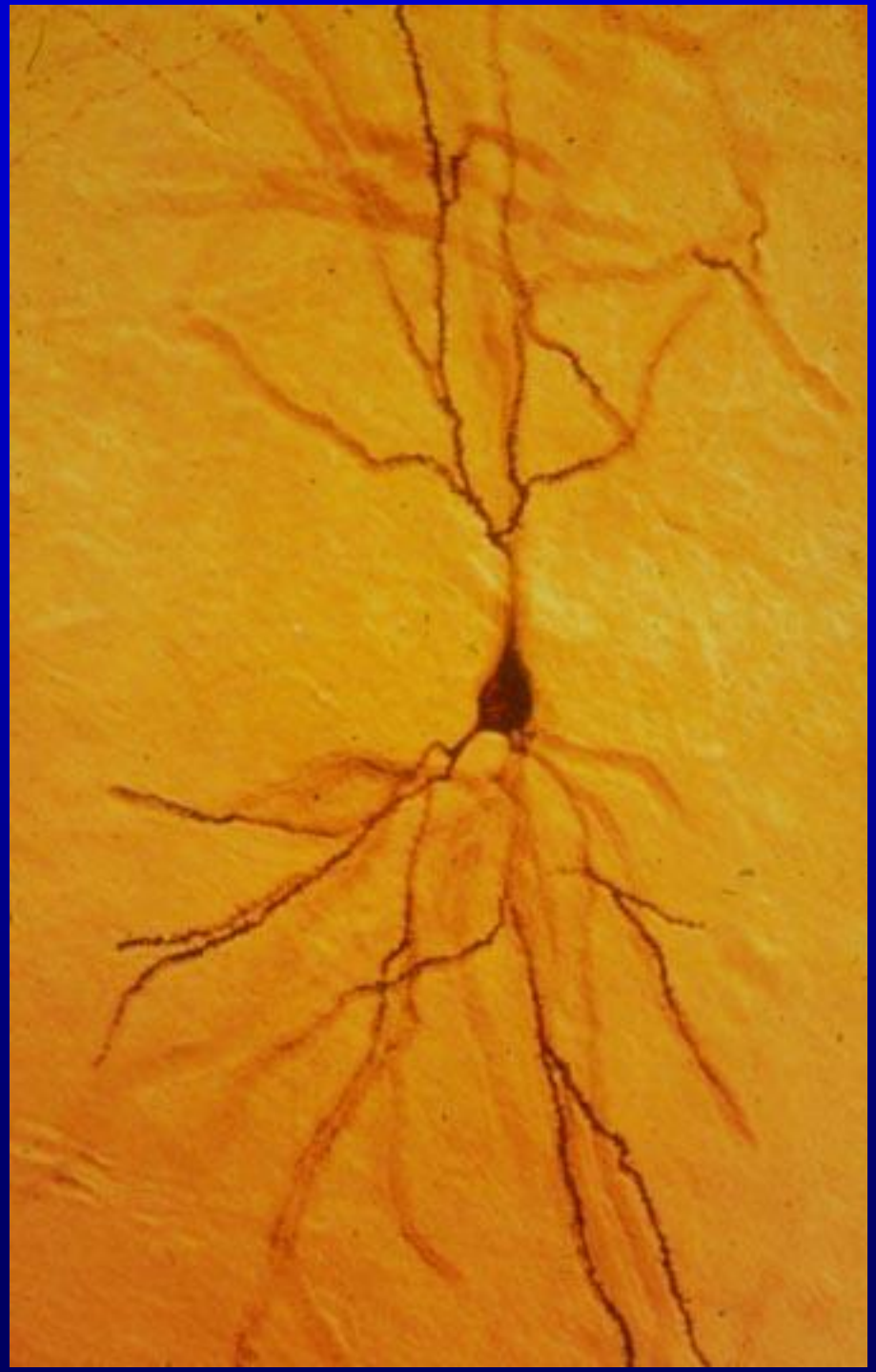
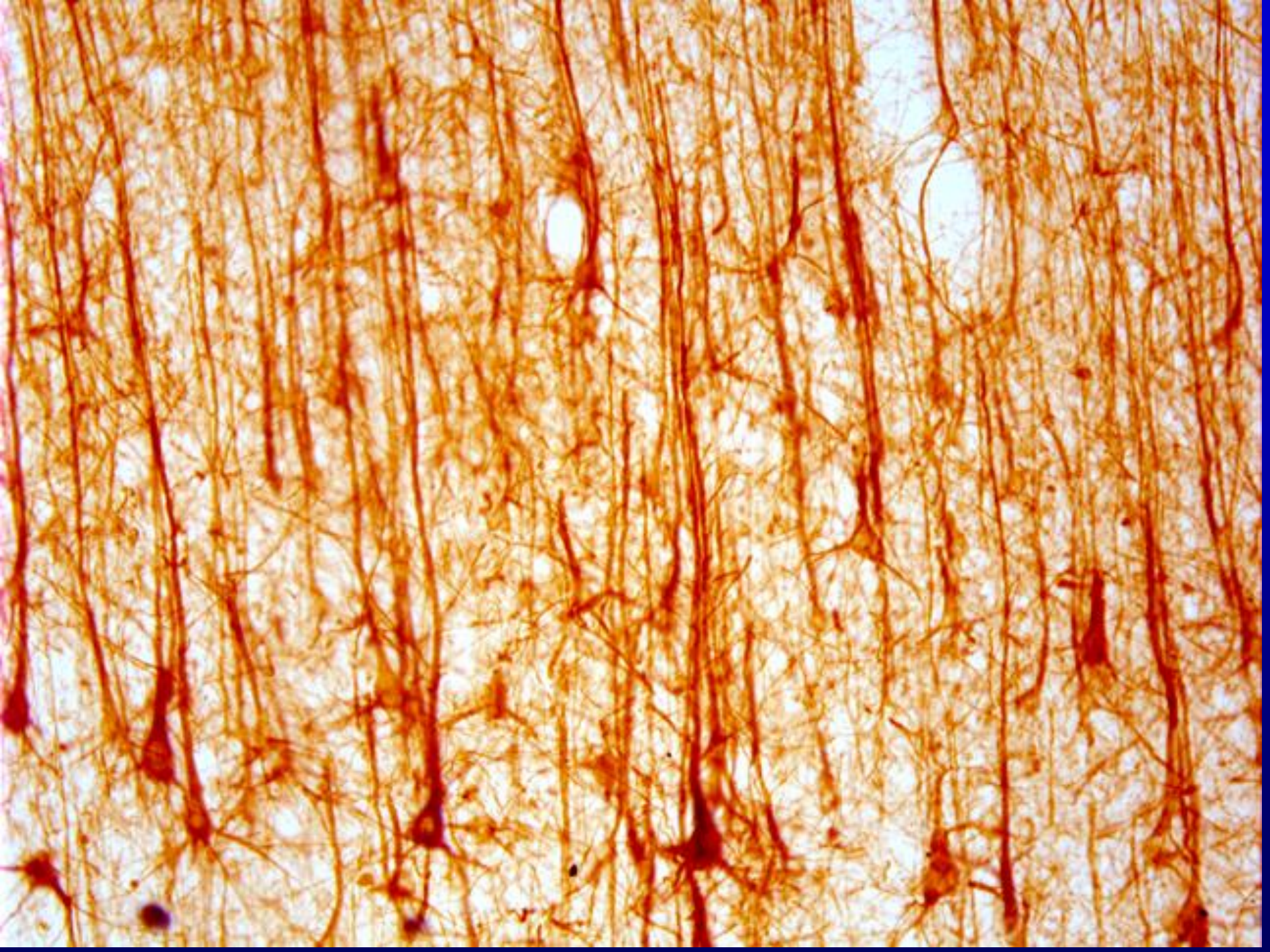
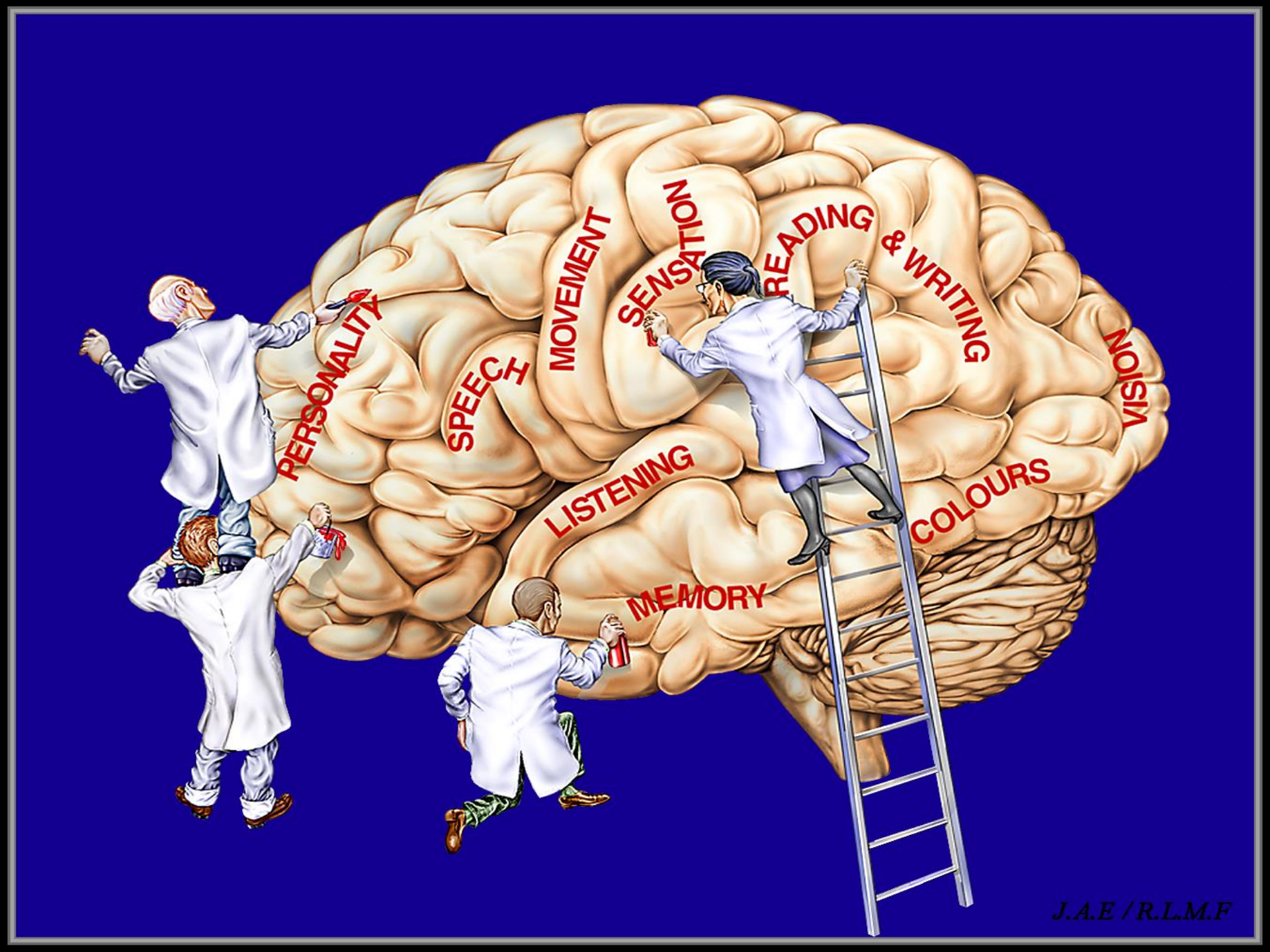
SPEECH
MOVEMENT
SENSATION
READING & WRITING
VISION
LISTENING
COLOURS
MEMORY
J.A.E / R.L.M.F



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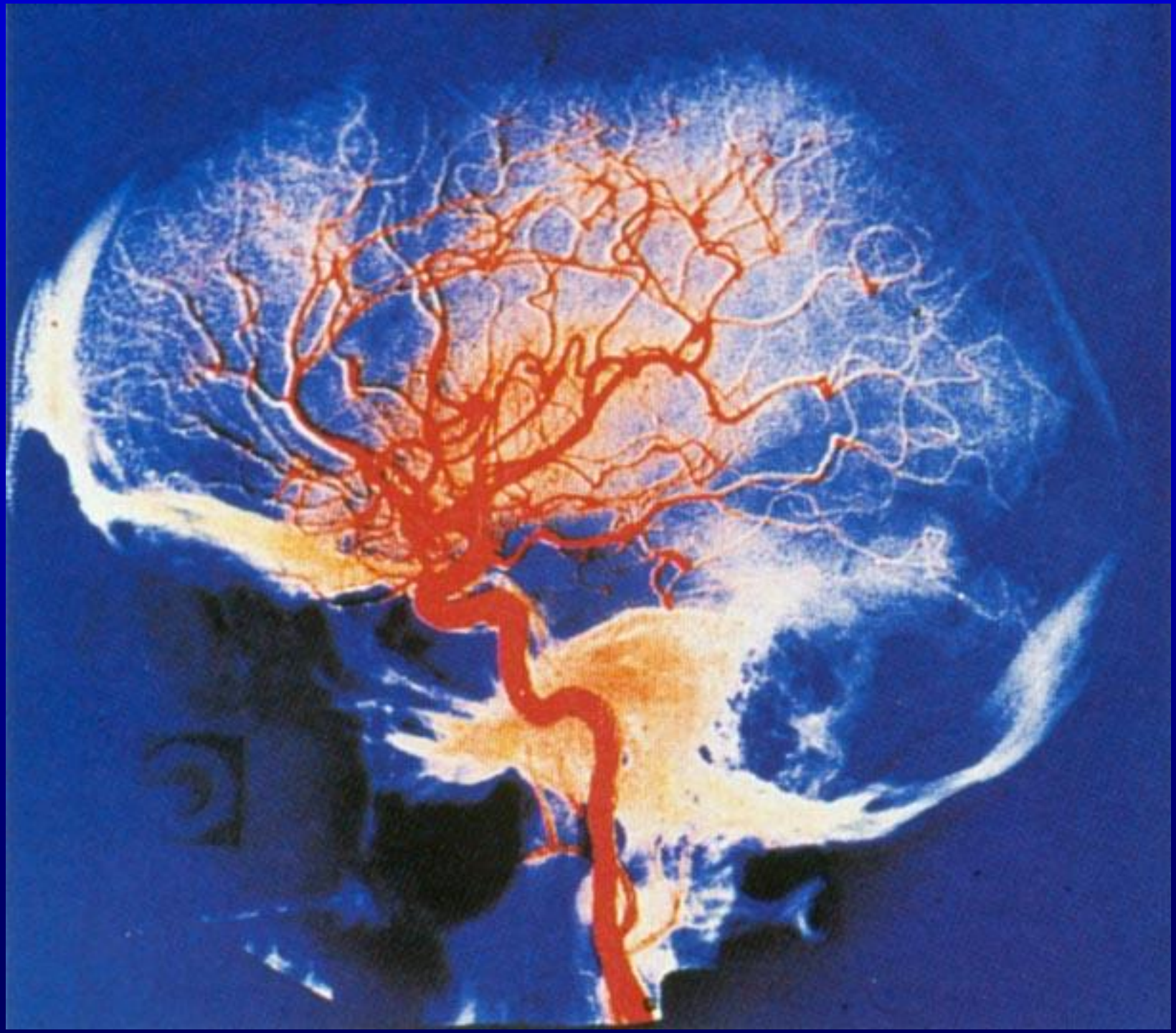

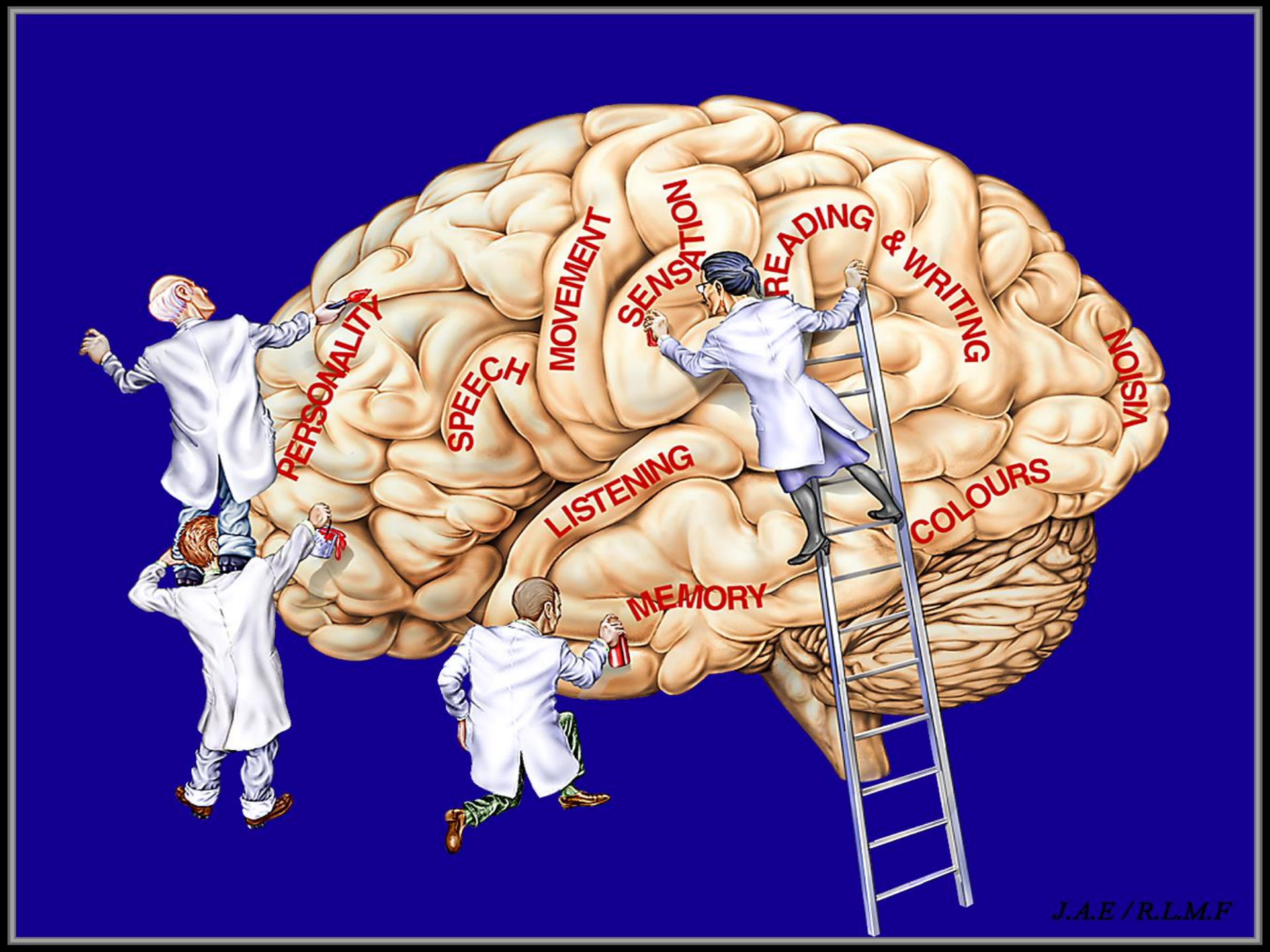
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NEURODEGENERATIVE DISEASES

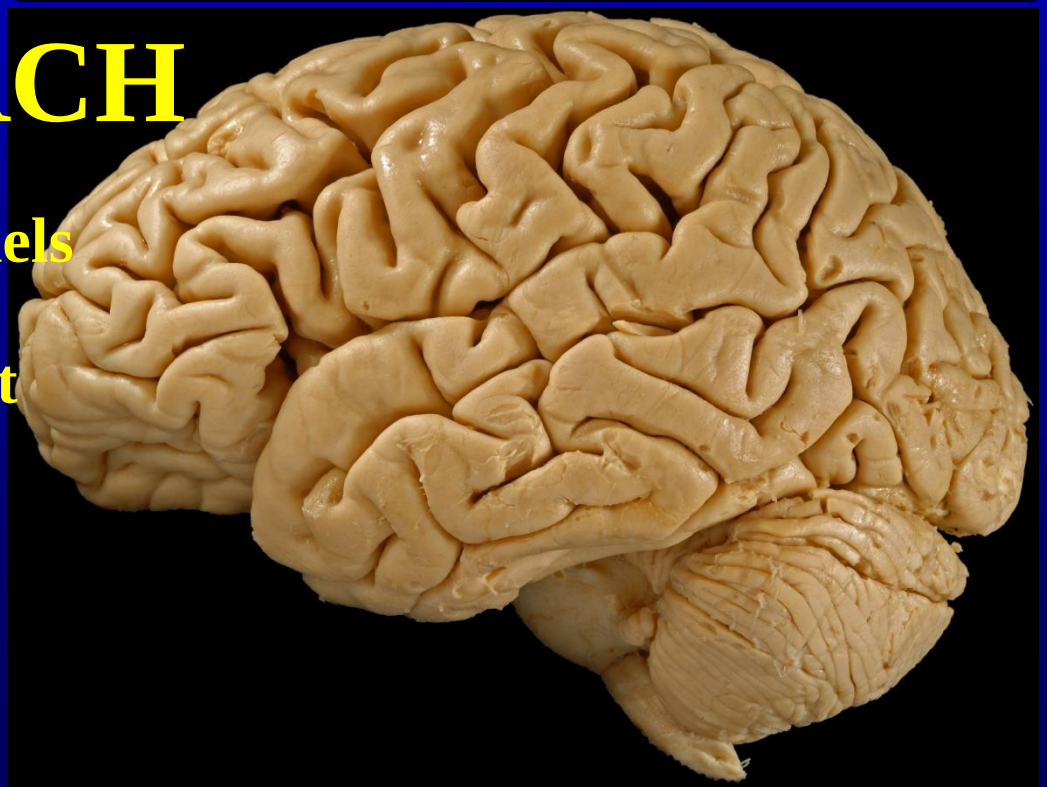
Major health problems

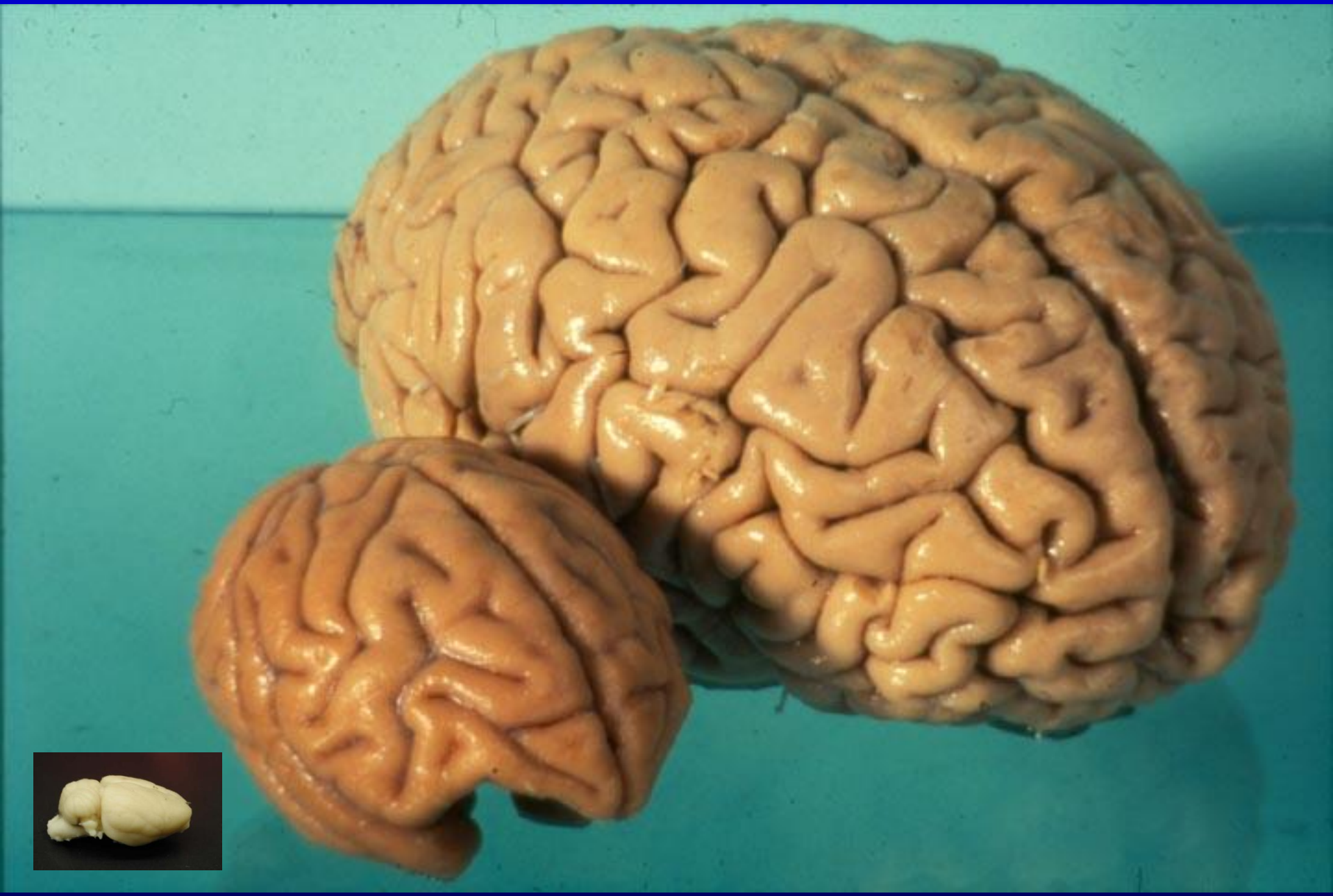
- Alzheimer's Disease
- Parkinson's Disease
- Huntington's Disease
- Epilepsy
- Motor neuron Disease

Characterised by a specific pattern of cell death affecting different regions of the brain

THE CHALLENGE OF RESEARCH

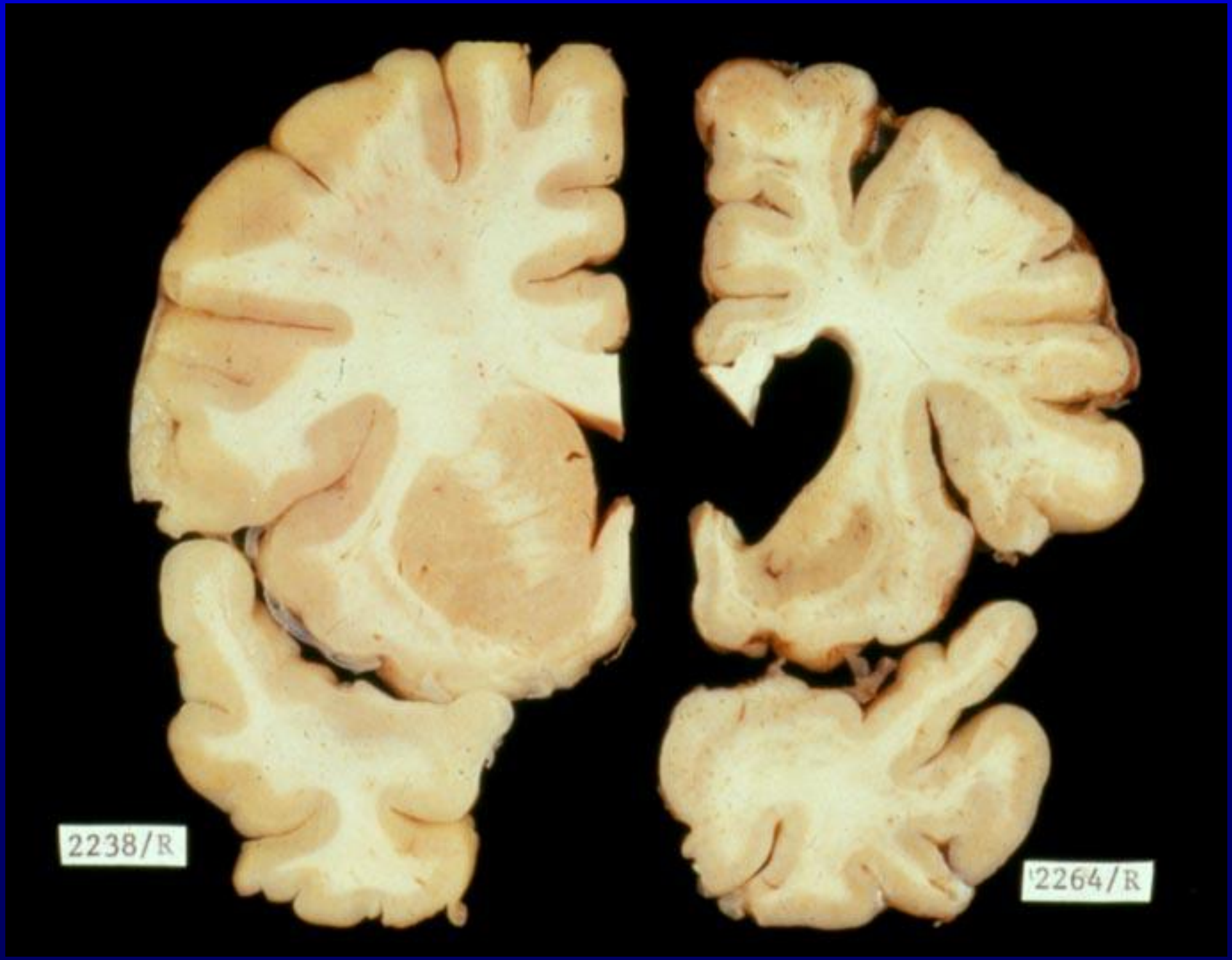
- Must use animal models
- Critical to also look at the human brain





HUNTINGTON'S DISEASE

- 5.6 / 100,000 in New Zealand
- Onset mid-life (35-45 years)
- **Symptoms (Variable - Heterogeneous)**
  - **Motor** (involuntary choreiform movements)
  - Cognitive (memory, attention)
  - **Mood** (depression, anxiety, irritability, paranoia)
- Dominant genetic disorder (couldn't test for the gene)


2238/R
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HUMAN BRAIN BEQUESTS

- Brain donation is always initiated from the families
- Throughout New Zealand (mainly Auckland) - air freighted on ice
- **Post-mortem delay 2 - 12 hours**
- **Maintain close contact with families** – report findings & collect clinical history
- **Most invaluable gift to science**
- **Our research is a unique partnership with the families and the community**

The Neurological Foundation of New Zealand Human Brain Bank

- Alzheimer's Disease
- Parkinson's Disease
- Huntington's Disease
- Epilepsy
- Motor Neuron Disease

SUPPORTED BY:

- Alzheimers Auckland
- Alzheimers New Zealand
- Parkinsons New Zealand
- Huntington's Disease Association
- Epilepsy Association of New Zealand

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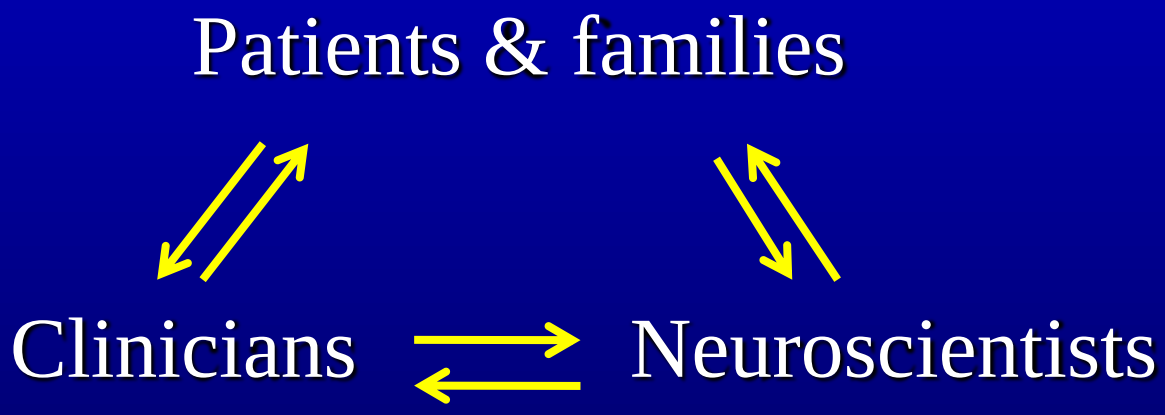
Over the years we have begun to develop MULTIDISCIPLINARY RESEARCH

Unique partnership with the community

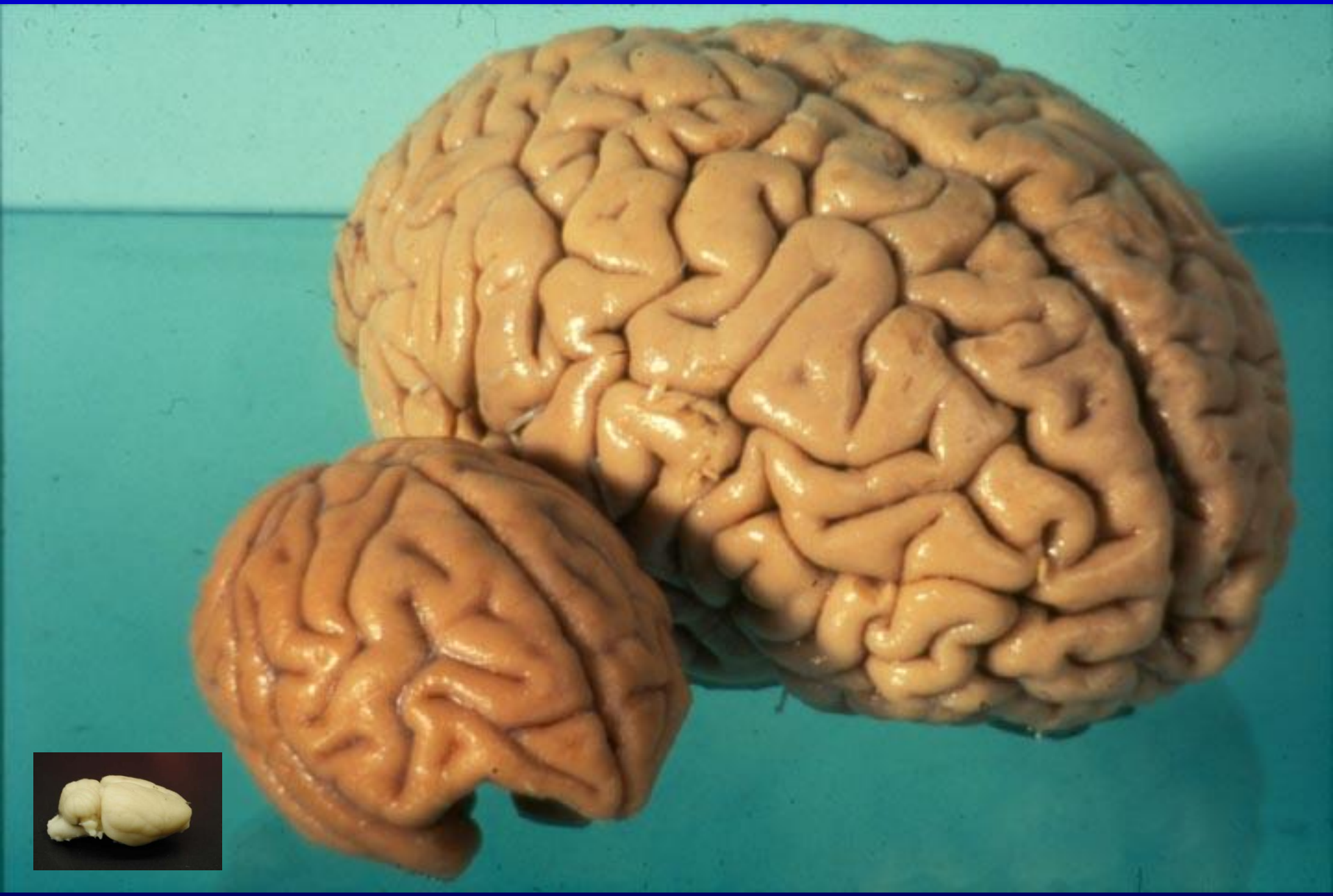


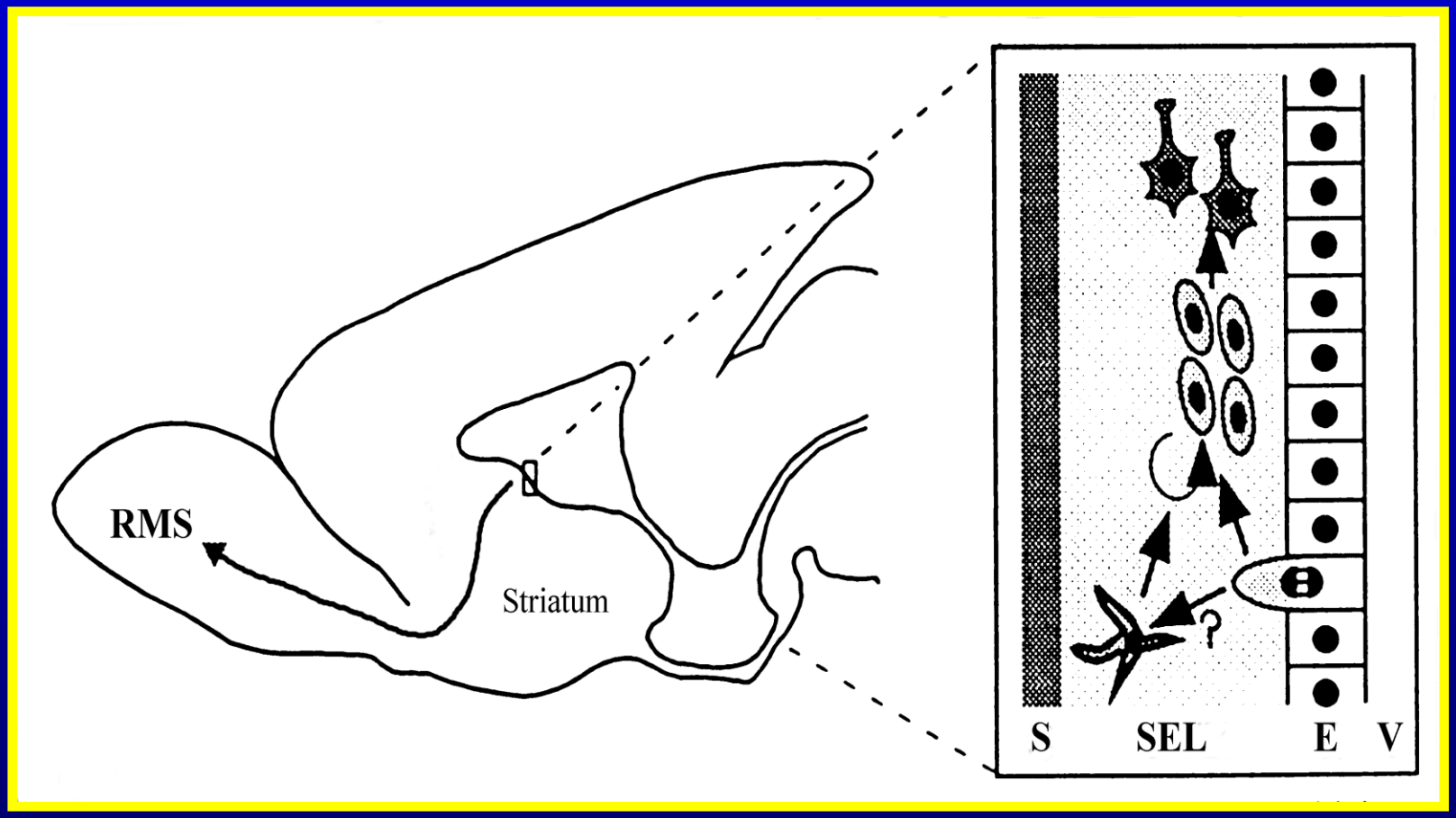
Unexpected findings from human brain research

THE CHALLENGE OF RESEARCH

- we found unexpected evidence suggesting that the human brain can make new brain cells

-Experts said NO WAY

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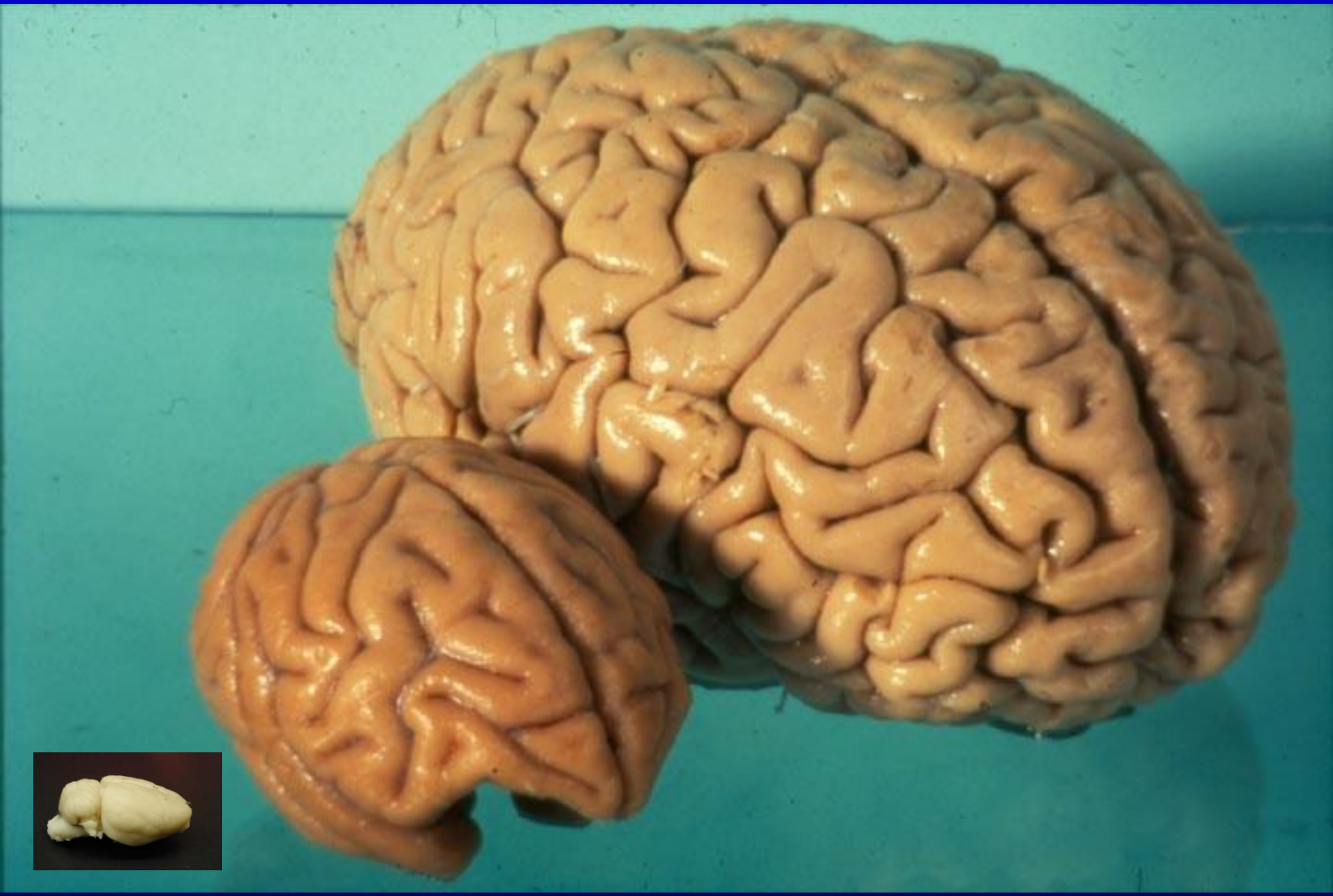
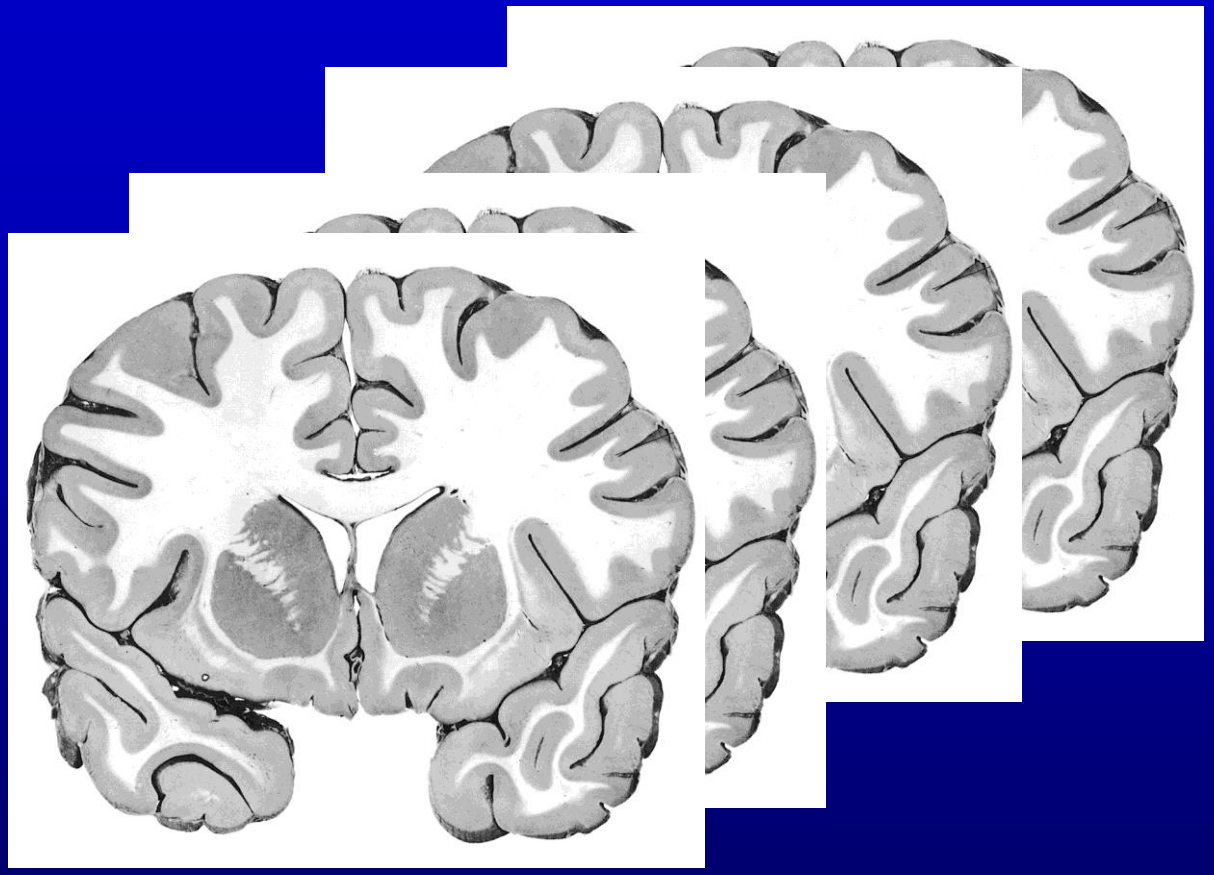
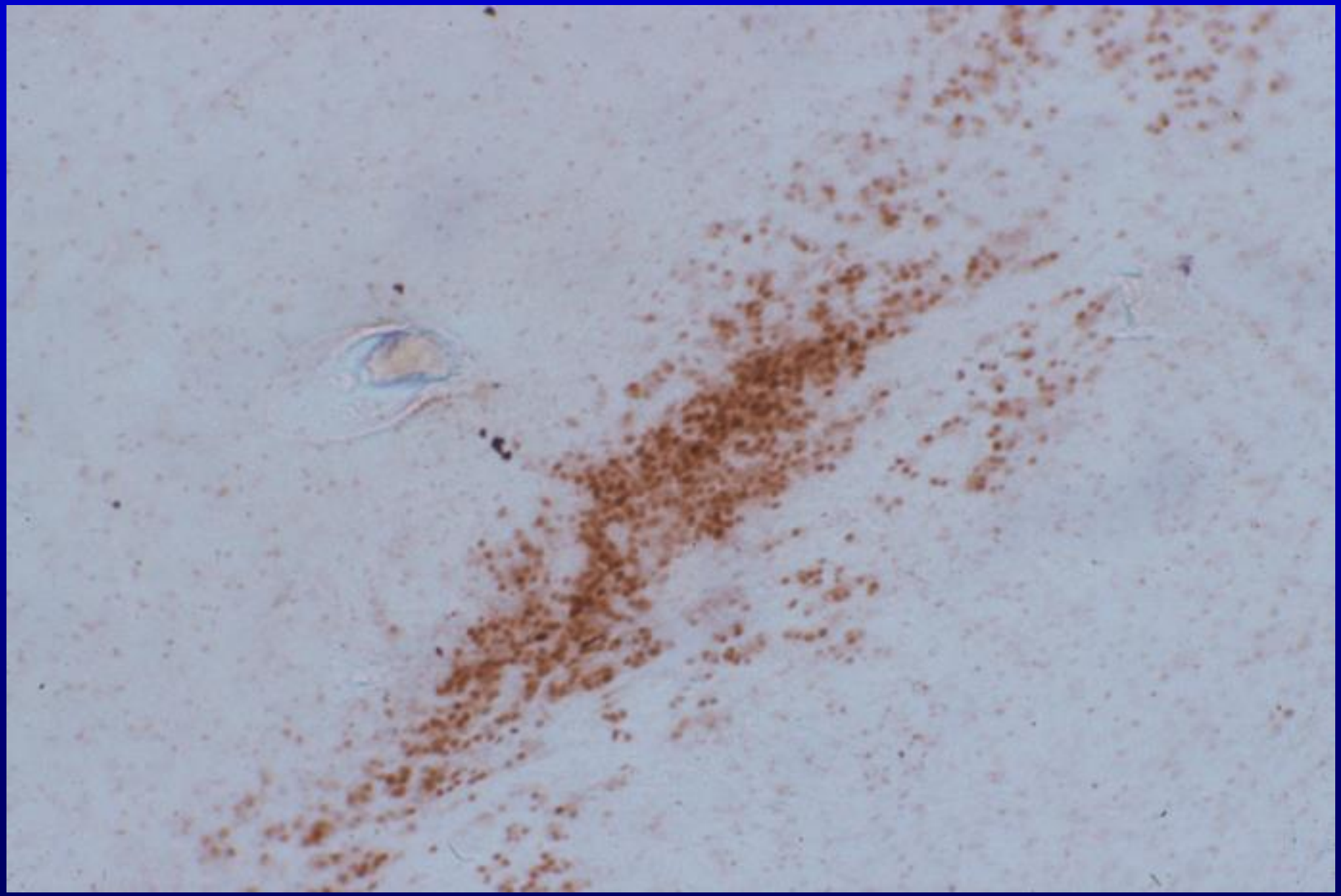


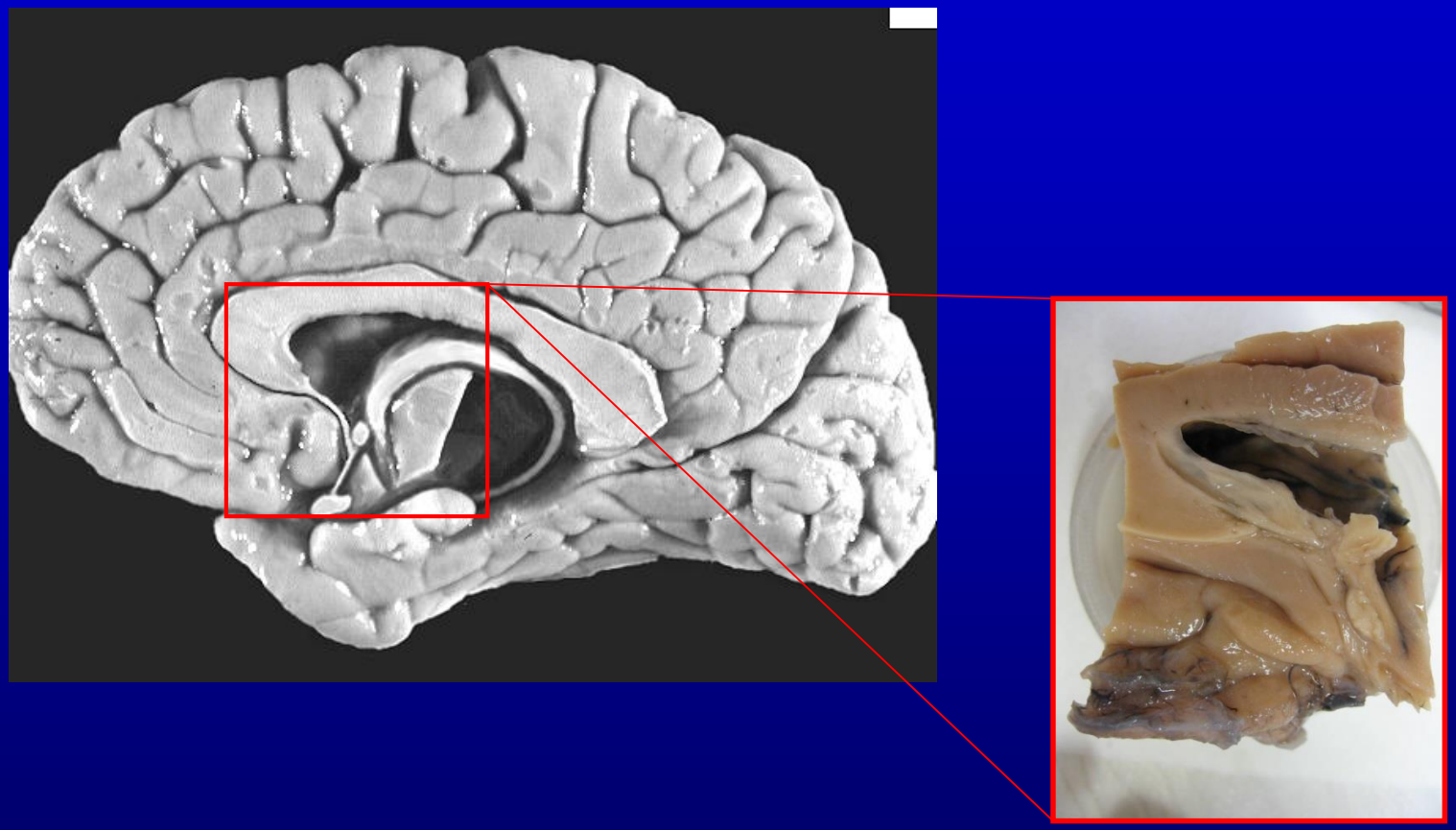
Where is it?

Maurice Curtis (Postdoc – Goteborg)

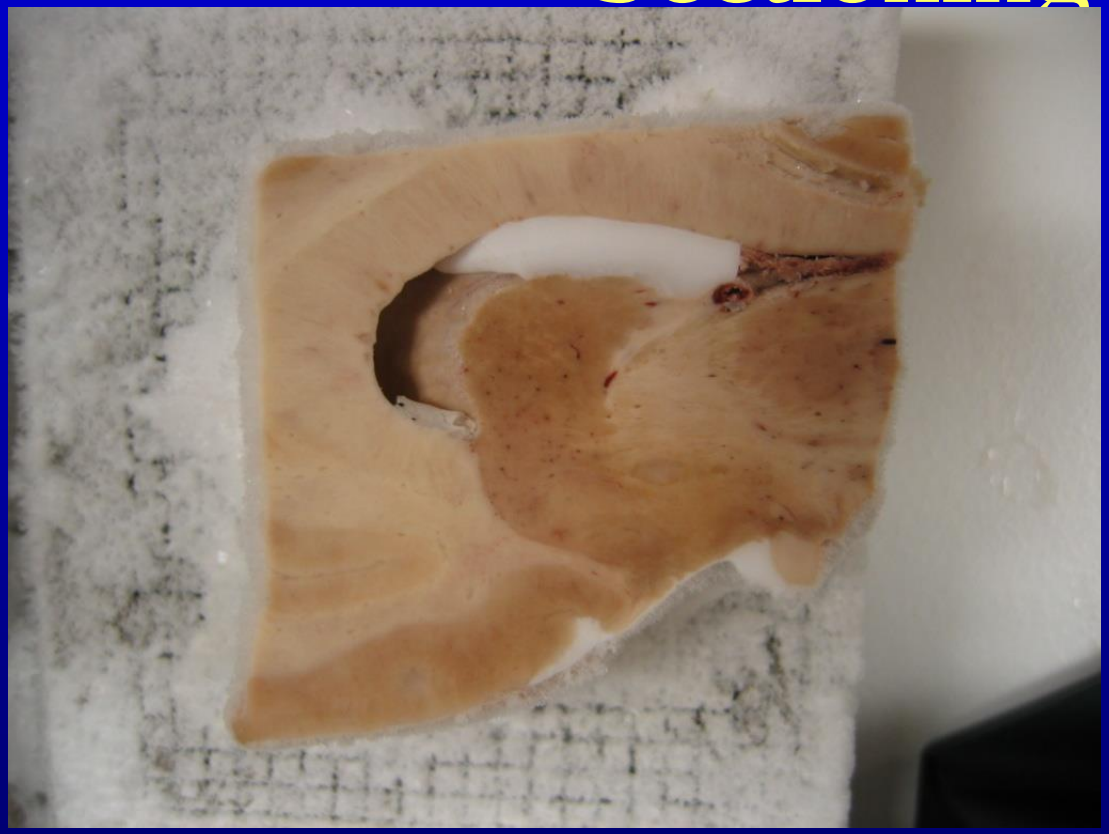
Monica Kam (PhD student – Auckland)







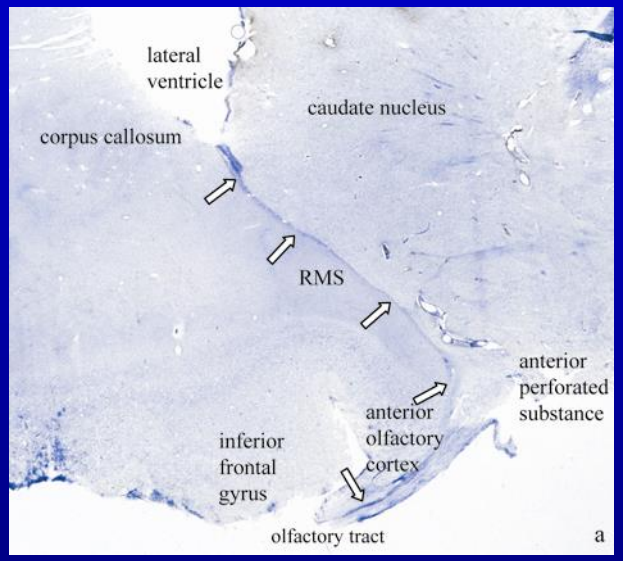
Sectioning



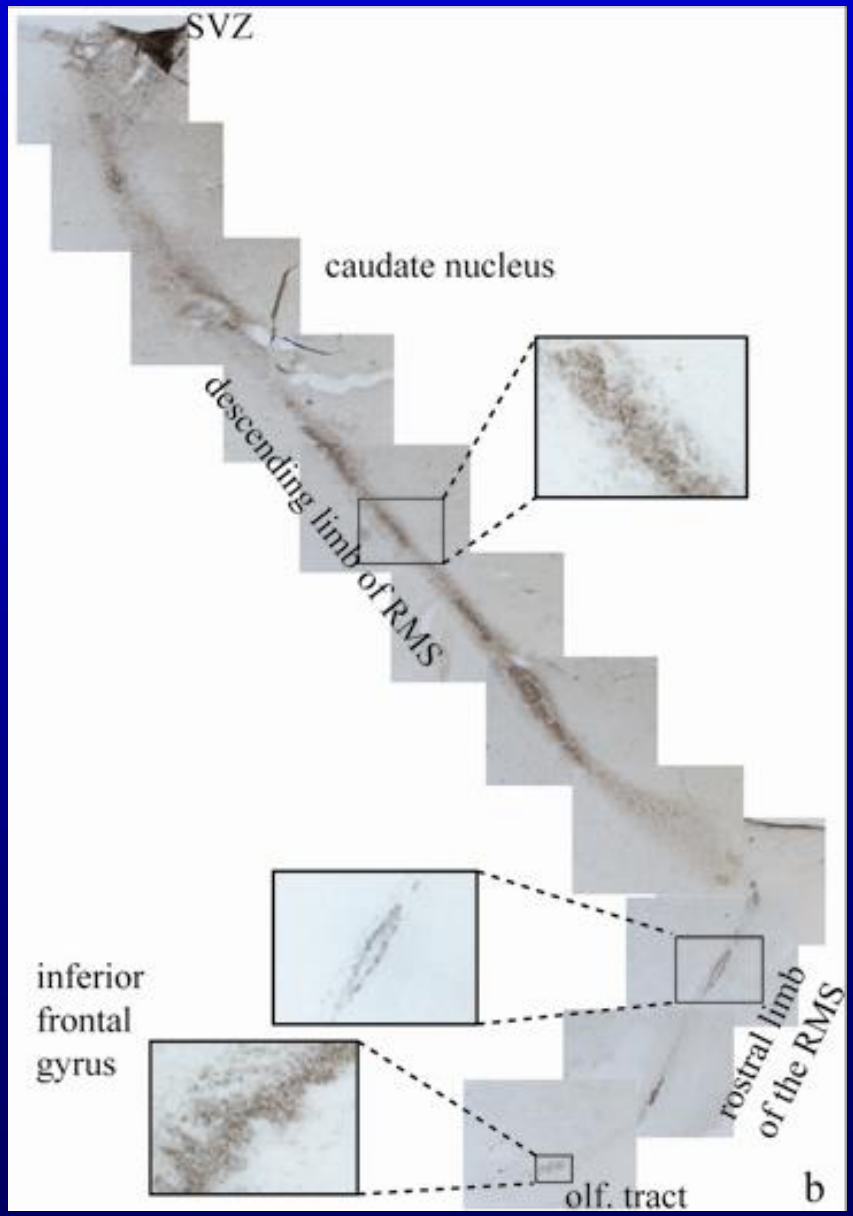
Freezing Microtome

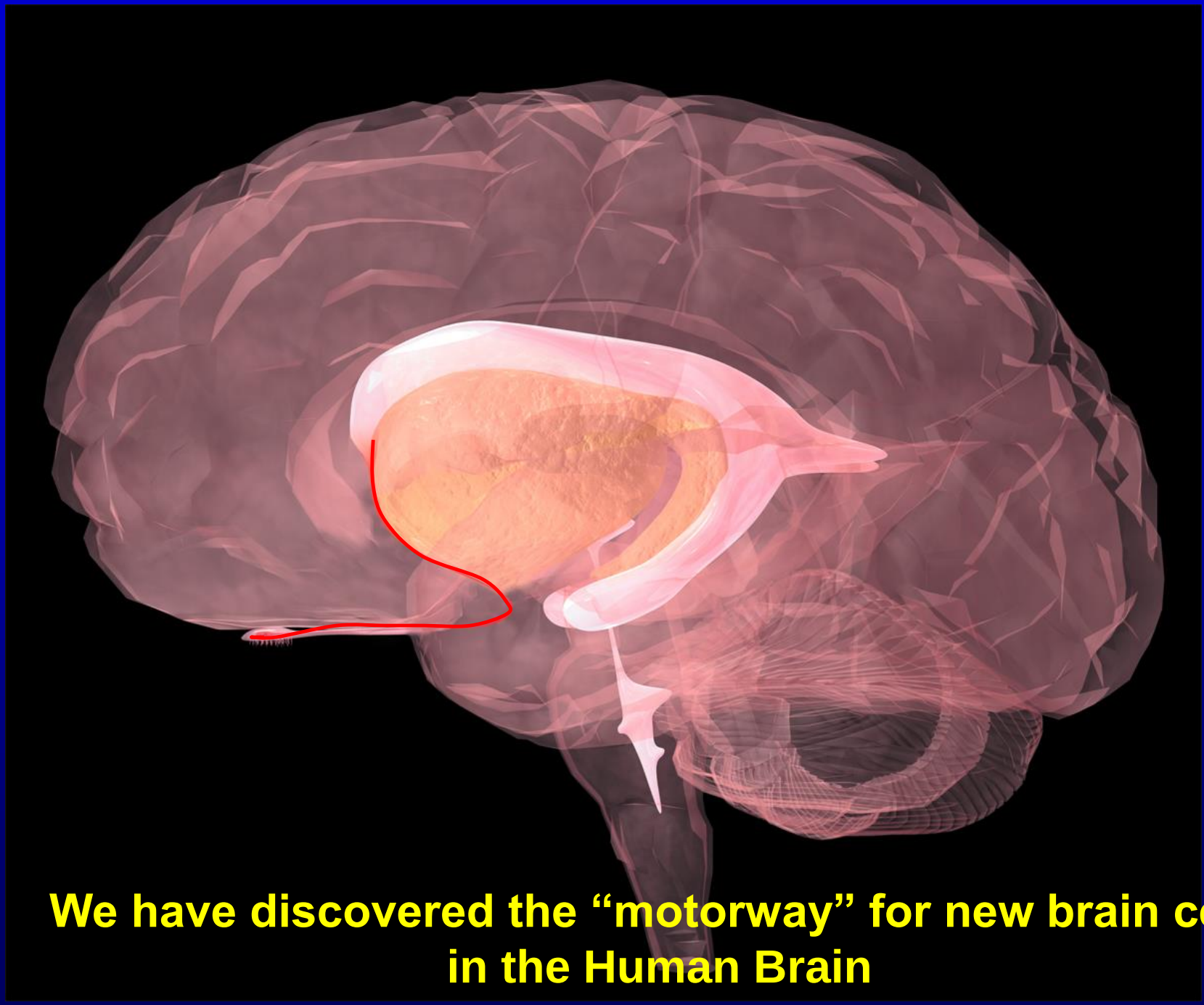
50 μm

Nissl staining

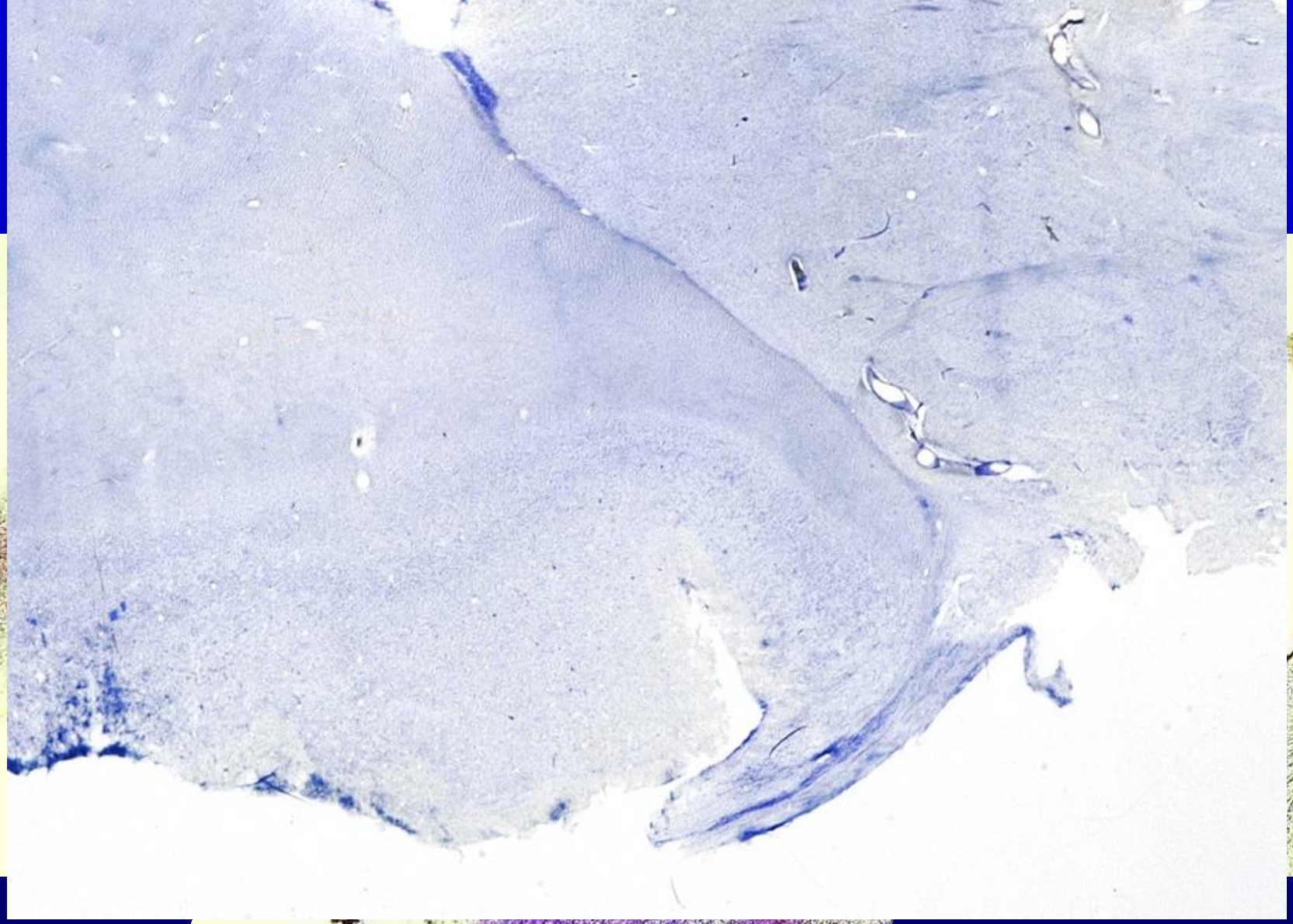


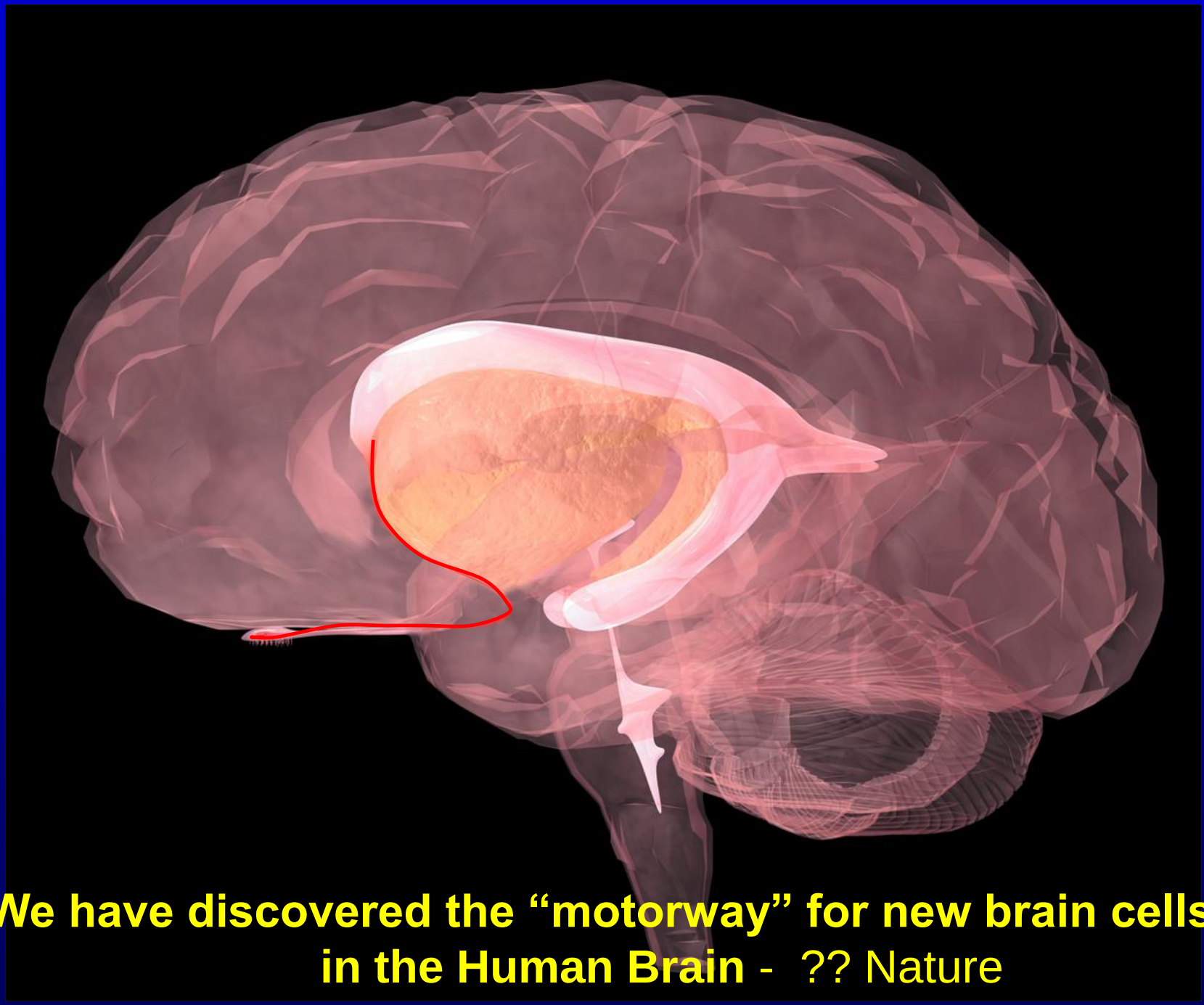
PCNA staining





We have discovered the “motorway” for new brain cells in the Human Brain





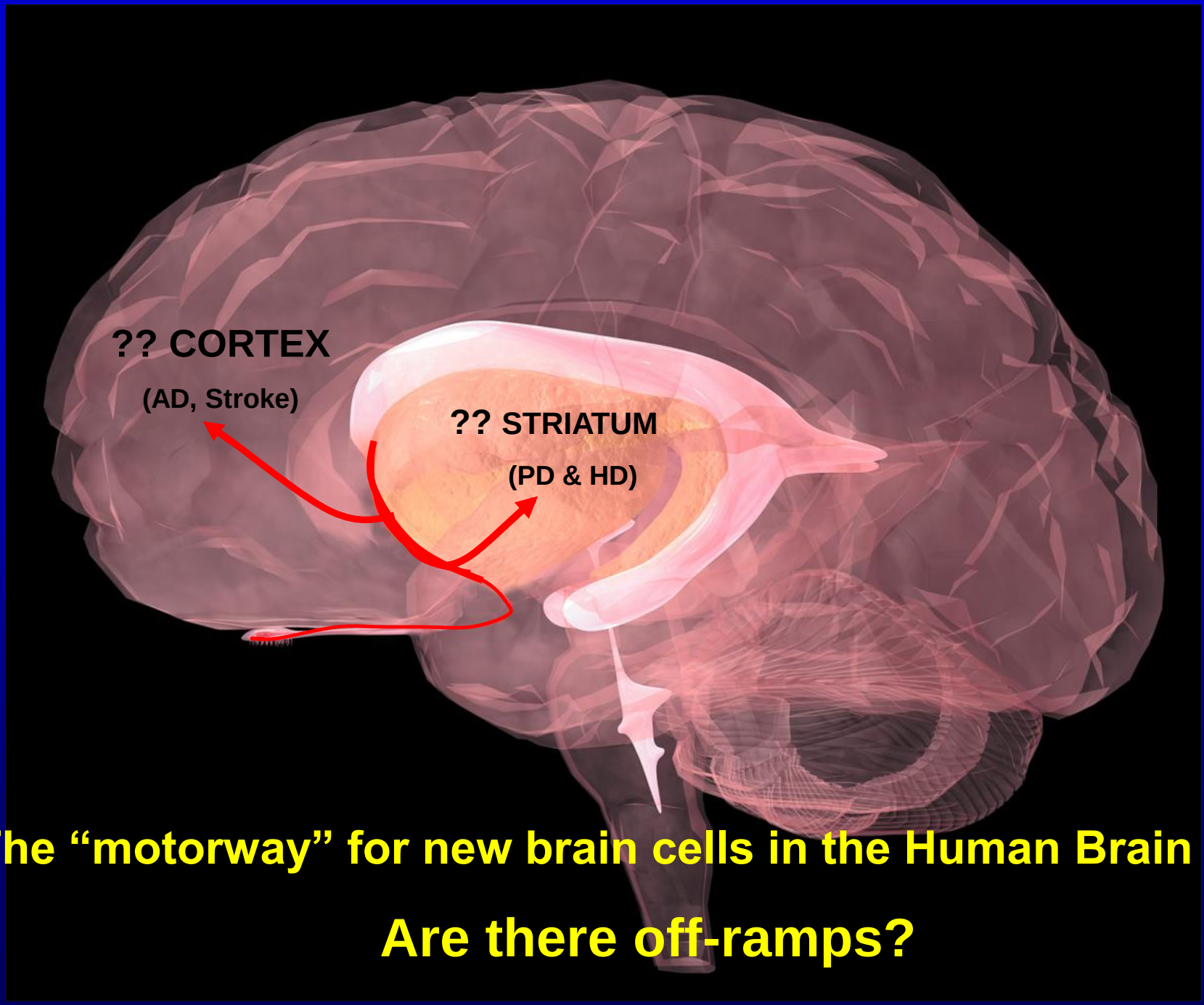
We have discovered the "motorway" for new brain cells in the Human Brain - ?? Nature

Our discovery was presented in a top international Journal

This is of global significance for neuroscience

GENERAL CONCLUSIONS

- The adult Human Brain makes new brain cells NEUROGENESIS - EXCITING !!!!
  – this is revolutionary & controversial !!
- The Human Brain can repair itself just like all other organs in the human body – too little, too late
- Animal studies suggest that enhanced and stimulating environments, and physical exercise result in increased numbers of new brain cells
- The brain is plastic – it changes minute by minute
- **"USE IT OR LOSE IT"**

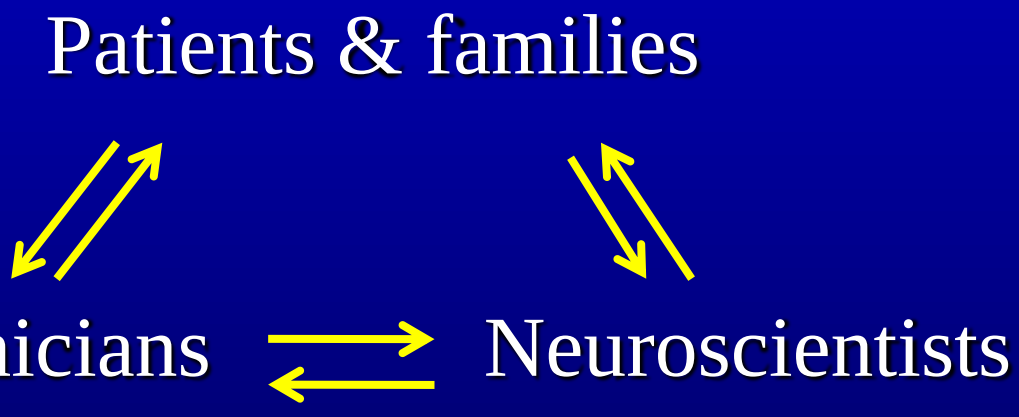


The "motorway" for new brain cells in the Human Brain

Are there off-ramps?

MULTIDISCIPLINARY RESEARCH is the way forward

Partnership with the community



We need to further develop team research

Form a Brain Research Club – The “All Blacks” of Brain Research

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University of Auckland

Research

Community

Clinical

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Brain Research at The University of Auckland

- Neurological Foundation Human Brain Bank

- 64 different research groups across the University
  - Clinical Neuroscience
  - Cognitive Neuroscience
  - Molecular and Cellular Neuroscience
  - Sensory and Motor Neuroscience

- More than 450 researchers in the Centre

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Clinical Research at the Auckland Hospitals

- Neurologists
- Neurosurgeons
- Geriatricians
- Psychiatrists
- Neuropathologists

- **Develop New Treatments**
  - Drug trials (AD)
  - Deep brain stimulation (PD)
  - Stroke rehabilitation

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Community Partners

- Alzheimers Auckland Charitable Trust Inc
- Alzheimers New Zealand Inc
- Parkinsonism Society Auckland Inc
- Parkinsonism Society of New Zealand Inc
- Epilepsy New Zealand Inc
- Huntington's Disease Association (Auckland and Northland) Inc
- Motor Neurone Disease Association of New Zealand Inc
- Multiple Sclerosis Society of Auckland and the North Shore Inc
- Multiple Sclerosis Society of New Zealand Inc
- Muscular Dystrophy Association of New Zealand Inc
- Stroke Foundation of New Zealand Inc
- Stroke Foundation Northern Region Inc

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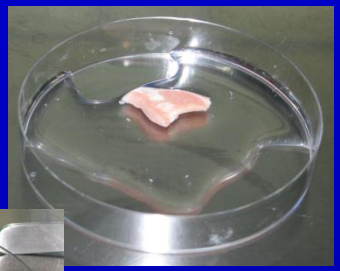
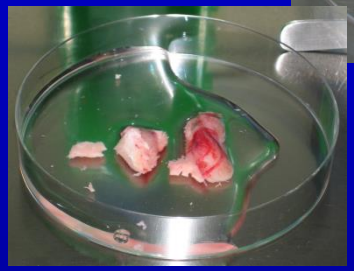
Collaborated with neurosurgeons/neurologists

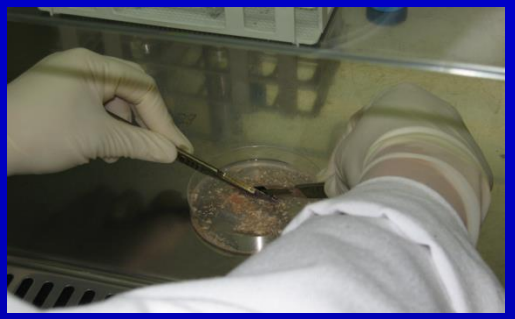
Human tissue (from temporal lobectomies, & pm brains etc)

Dissection



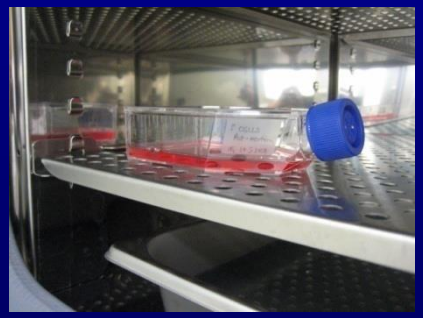


Dicing

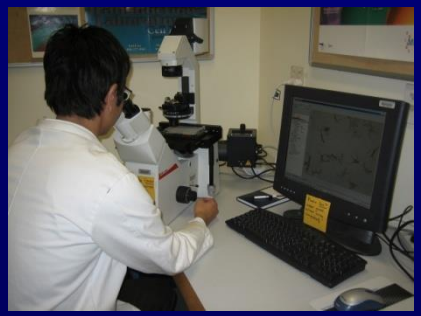


Digestion

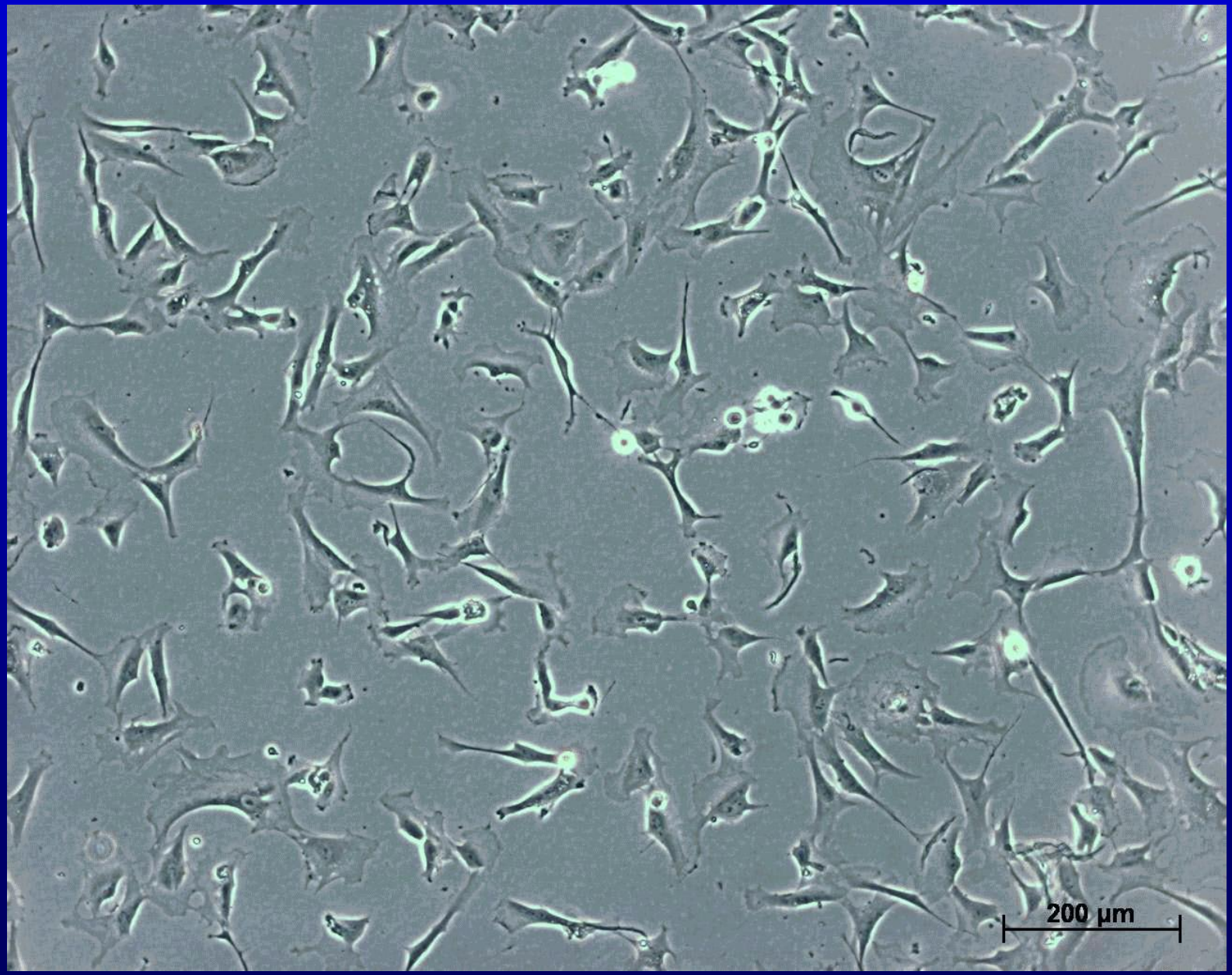
Cell culture



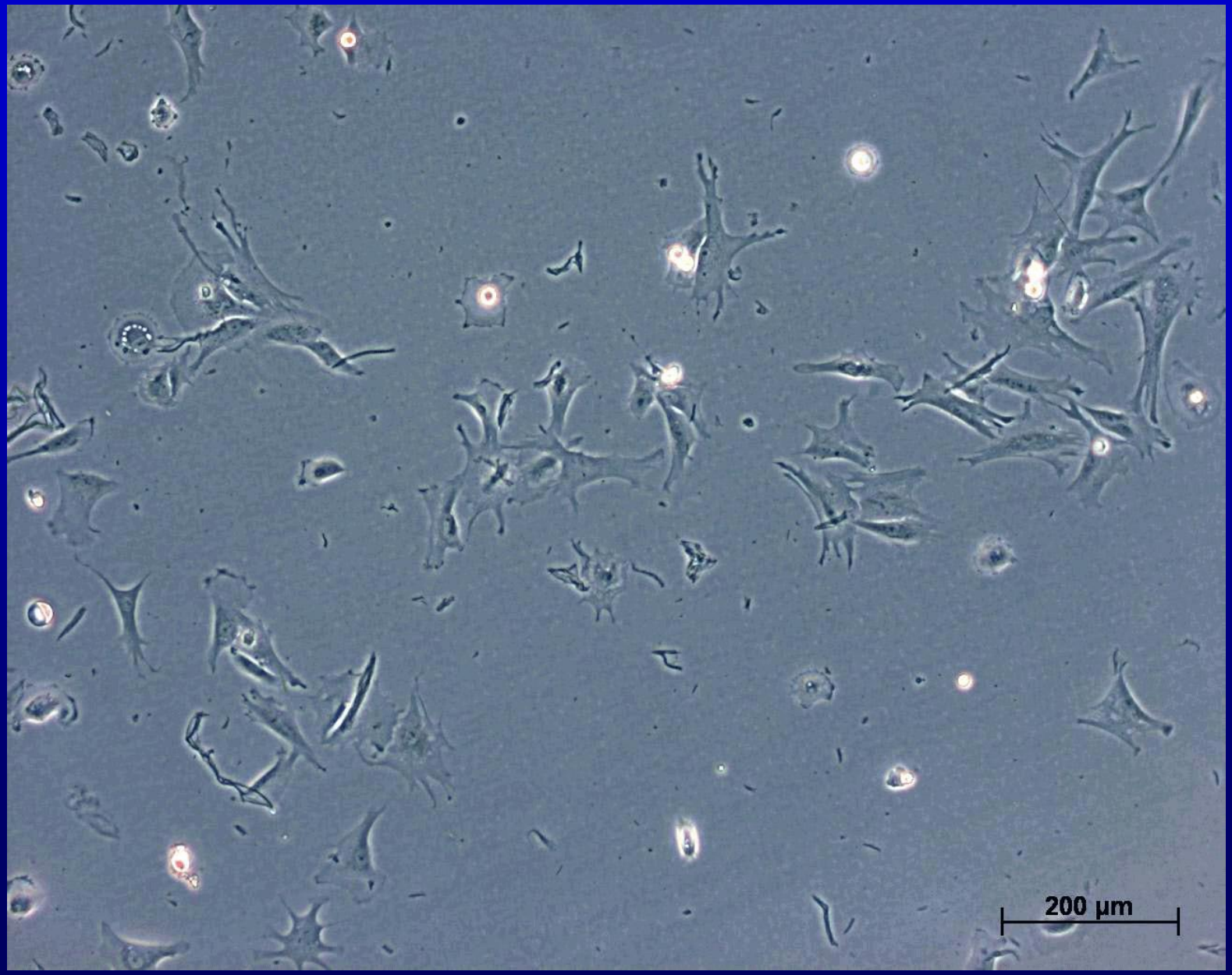
Experiments and Analysis



Healthy Human Brain Cells growing



Diseased Human Brain Cells in Alzheimer's Disease



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