TEACHING NEUROSCIENCE TO PSYCHIATRISTS

Professor Wendy Burn CBE
Contents

• Importance of integrating neuroscience into clinical practice
• Royal College of Psychiatrists (RCPsych) Gatsby/Wellcome Neuroscience Project
• Some examples of recent advances in neuroscience
Importance of neuroscience

• Neuroscience is advancing fast and will change the treatments we offer to patients
• Future workforce needs to understand basic neuroscience so that they can understand the advances as they come
• It’s interesting – attracts people to work in mental health and enjoyed by those already here
RCPsych Gatsby/Wellcome Neuroscience Project

• Launched in 2016 as a 2-year initiative led by the RCPsych to introduce a modern neuroscience perspective into psychiatrists’ clinical work

• Generously supported by The Gatsby Foundation and The Wellcome Trust

• I Co-Chair the Project Board

• Based on a USA experience
National Neuroscience Curriculum Initiative (USA)

- Making Neuroscience accessible and relevant
- Online, open-access (NIH-funded) learning resource
- www.nncionline.org
- Innovative teaching methods
Initial phase of project: Stakeholder consultation

- Spoke at conferences and meetings, ran workshops
- Trainers
- Trainees (‘residents’)
- Patients
- Medical students
Results of consultation

• Huge interest and support
• Requests for education, trainers keen not to be left behind
• Was agreed that the exam syllabus on neuroscience would be updated
• Commitment made that Psychiatry depends on the integration of the physical, psychological and social
New curriculum for core training: August 2022

• Reiterates that the biological, psychological and social aspects of a patient’s care are all of equal importance when practicing psychiatry
MRCPsych examination

• All UK trainees need to pass membership examination of RCPsych to progress in training
• Paper A – Basic sciences, including neuroscience
• Paper B – Clinical topics and Critical Appraisal
• Clinical (practical) exam
Appendix 1

Syllabic curriculum content:
Summary of Areas of Core Medical Knowledge Underpinning Specialist Training in Psychiatry

Last updated July 2018

3. Neuroscience

The trainee shall demonstrate knowledge of the neuroscience that underpins the practice of clinical psychiatry. This will include: (1) elementary knowledge of the normal structure and functioning of the nervous system as it relates to psychiatry, i.e., the generation of normal mental states and behaviours, and of the dysfunction that leads to mental disorder; (2) ability to relate the symptoms and signs of mental disorder, and the examination of the nervous system, to underlying neural structures and their activity.
RCPsych Gatsby/Wellcome Neuroscience Project

• Extended for 3 more years (2018—21)
• Focus on adoption and embedding of neuroscience in psychiatry
• Understanding what changes this will bring to clinical practice
Neuroscience Project

• Conferences
• Talks and training events
• Brain Camps: workshops to showcase cutting-edge neuroscience research and educational techniques
Brain Camps

• Hundreds of psychiatric educators have taken part to date
• Each event heavily oversubscribed
• Participants from Tewkesbury to Toronto, Hull to Hong Kong
Brain Camp format

• One-day interactive event
• Refresher on selected cutting-edge, clinically-relevant brain research topics
• Workshops on teaching strategies
• Run by researchers & educationalists
• All welcome
Example exercise: Building Play-Doh brains

• First watch a video (speeded up here)
Insert video here: Slide 16
Making PlayDoh brain

NNCI
National Neuroscience Curriculum Initiative
Neuroanatomy: A modern approach

• Active learning
• Team work
• Fun!
Neuroanatomy: A modern approach

- Active learning
- Team work
- Fun!

Insert video here: Slide 18
Men discussing model brain
Building Play-Doh brains

- Scientifically proven to educate...

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Active learning by play dough modeling in the medical profession

Anita Herur, Sanjev Kolagi, Surekharani Chinagudi, Manjula R, and Shailaja Patil
Departments of Physiology, Anatomy, and Community Medicine, S. Nijalingappa Medical College, Bagalkot, Karnataka, India

Submitted 27 July 2010; accepted in final form 15 February 2011

Learning the nervous system has always been a difficult task for undergraduate students. In particular, the complexity of the system and the condensed time available present a difficult challenge. Regardless of audiovisual aids (blackboard, PowerPoint presentations, ready-made models, or CD-ROMs), deep learning is difficult to achieve. Therefore, we developed an active learning component to teach about the nervous system based on the Chinese proverb “When I hear, I forget; when I see, I remember; and when I do, I understand.”
Regional networks: ‘NeuroNets’

- Regional **excellence** in neuroscience and teaching
- Brain researcher—psychiatrist **collaboration**
- **Support** for trainers

**In place:**
- Scotland
- SW England
- Pan-Midlands
- Yorks & Humber

**Coming this year:**
- SE England
- Eastern England
- NW England + N. Ireland
- Wales
Local programmes by Neuro Nets

The Neuroscience in Psychiatry Course 2019

To all Medical Colleagues:
We would like to invite you to NIP, a new and exciting course that has been designed to inspire collaborative learning of neuroscience concepts and shape our understanding of mental illness.

Explore The Role Of Neuroscience In Psychiatry
The course is inspired by the RCPsych Neuroscience Project, which aims to focus psychiatry's attention on advances in basic and clinical neuroscience so that psychiatrists "are better equipped to provide the future".

An Interactive And Innovative Teaching Programme
This is a peer-led course packed with clinically relevant teaching resources, interactive learning, and expert participation from leading figures in the field. The programme includes material from the high-Neuroscience Curriculum Initiative but is highly tailored to 2gether doctors.

Not Just "Biological Psychiatry"
We’ll be thinking about how neuroscience can complement our thinking about all aspects of psychiatric illness and clinically focused, with skills to take to the clinic.

Three-week course by SWNeuroNet

Monday 4th March, 2-5pm
Neuroscience Refresher
Exploring the Role of Neuroscience In Psychiatry
Neuroanatomy Refresher
A Quick Guide To Research Techniques In Neuroscience

Monday 11th March, 2-5pm
Applications in Clinical Psychiatry
New Insights Into Schizophrenia And Depression
Integrating Neuroscience Into Conversations With Patients
Developing New Treatments

Monday 18th March, 2-5pm
The Bio-Psychosocial Interface
Visualising Psychotherapy Through Neuroimaging
EpiGenetics: Trauma and the Brain
A Neuroscience Model Of Personality Disorder

Course Facilitators:
Dr George Morris, Dr Lindsey Simicat, Dr Nick Bhandari,
Dr Emma Phillips, Dr Kim Humby, Dr Clara Martinez, Dr Adrian Yan
Recent Conference in Wales

• Free to attend

- Showcasing world-class neuroscience research in Wales
- Highlighting opportunities and sharing ideas to integrate neuroscience, psychiatry and mental health
Spring Conference 2017—2021

- Numbers have grown each year
- Virtual format allowed us to invite speakers from around the world

![Bar chart showing participants from 2017 to 2021]

- 100% subsidy from Gatsby/Wellcome
- 50% subsidy
- Self-financing
Neuroscience Champions: Our ambassadors

- Scheme launched March 2019
- 28 trainees from across the UK
Neuroscience Champions: Activities

- **Communications:**
  Newsletter co-production; cascade of inspiration, information and opportunities

- **Events development:**
  Local training (Brain Camps, Neuroscience Days, short courses) with NeuroNets
‘PSynapse’: Our neuroscience newsletter

- Quarterly
- Informing and keeping up-to-date
Resources on RCPsych website

- Information and education
- https://www.rcpsych.ac.uk/training/neuroscience-in-training-project
TrOn (Trainees Online) Updated

- RCPsych online learning resource
- Produced by higher specialist trainees and junior consultants who have recent knowledge of the examinations themselves
TrOn

• Modules checked by an expert in the topic
• Also checked by a member of the exams committee
• Acts as an expanded syllabus for Paper A, covers the basic sciences to the standard required
TrOn updates

• Existing modules revised, new modules commissioned
• 3 Trainee psychiatrists appointed TrOn Neuroscience Editors
• Supported by Neuroscience Project Manager
TrOn

- Free for Pre-Membership Psychiatric Trainees registered with RCPsych
- All UK trainees have to register, those from overseas can choose to register, fee depends on country of origin
- TrOn available to purchase for £50 for 12 months
• The project has used examples of recent progress in neuroscience to stimulate interest
• Dr Madeline Lancaster, University of Cambridge
• Modelling human brain development and connectivity in “mini brain” organoids’
Brain organoids

- Brain organoids are lab-grown groups of cells that self-organise to a pea-size object that resembles an organ
- She made this video about her work...
Schizophrenia and brain development

• Group from Stanford used organoids to investigate origins of schizophrenia

• https://www.nature.com/articles/s41591-020-1043-9
Schizophrenia and brain development

• One in every 3,000 people carries the genetic defect called 22q11.2 deletion syndrome, or 22q11DS

• People carrying 22q11DS are at a 30-fold risk for schizophrenia compared with the general population

• 30%—40% of individuals with this deletion receive a diagnosis of autism spectrum disorder early in their lives
Schizophrenia and brain development

• Brain organoids generated from skin cells taken from 15 different 22q11DS carriers and 15 healthy control subjects

• Cortical neurons derived from 22q11DS carriers were more excitable, spontaneously fired 4 times as frequently as controls

• Treating these neurons with antipsychotic drugs reversed the defects in resting membrane potential and calcium signalling, and prevented these neurons from being so excitable
Brain organoids

- Work on these will enable better understanding of mental illnesses and then will lead to better treatments
• Professor Karl Deisseroth
• Talk at Neuroscience Spring Conference 2021: Inner workings of channelrhodopsins and brains: a new way of looking at the mind in action
• What happens in the brain during dissociation?
Dissociation

• Strange, common and important experience
• Feeling of disconnection from thoughts, feelings, memories, and surroundings
• Causes include PTSD, drugs, trauma, epilepsy
• “If my mind is a car, I’m in the passenger seat watching myself driving”
Dissociative state explored in mice

• Used ketamine or phencyclidine

• Imaging of neural activity showed these dissociative agents elicited a 1–3-Hz rhythm in layer 5 neurons of the retrosplenial cortex
The Retrosplenial Cortex (RSC)

- RSC is a cortical area in the brain comprising Brodmann areas 29 and 30
- It is secondary association cortex, making connections with numerous other brain regions
Dissociative states in mice

- Electrophysiological recording showed rhythmic coupling of the retrosplenial cortex with thalamus circuitry, but uncoupling from most other brain regions was observed.
Patient with focal epilepsy

- Simultaneous intracranial stereoencephalography recordings from across the brain found a similarly localised rhythm in the homologous deep posteromedial cortex
- Correlated with pre-seizure self-reported dissociation
- Local, brief electrical stimulation of this region elicited dissociative experience

• Understanding the physical processes that underly dissociation will help us to find new treatments
Serotonin transporter availability increases in patients recovering from a depressive episode

- Jonas E. Svensson, Cecilia Svanborg, Pontus Plavén-Sigray, Viktor Kaldo, Christer Halldin, Martin Schain & Johan Lundberg

- *Translational Psychiatry*
  https://www.nature.com/articles/s41398-021-01376-w
Used positron emission tomography (PET) scanning

• Looked at levels of 5-HTT, the serotonin transporter
• 5-HTT is the target of many antidepressant medications of the SSRI and tricyclic antidepressant classes
• Measured in depressed, medication-free patients before and after CBT
• Prior to treatment, the individuals with depression had roughly the same average level of 5-HTT as a control group of 17 healthy individuals
• Levels of 5-HTT in those with depression were on average 10% higher after three months’ treatment
Insert video here: Slide 49 PET scan
Conclusions

- Neuroscience is advancing rapidly
- We will see major advances in the coming years
- Psychiatrists need to have an understanding of the basics so that they can integrate neuroscience into their clinical practice as these advances are made
• Thanks to Dr Gareth Cuttle, Project Manager

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