## Report on Neuro-network meeting held on 3 May 2016.

*Location: London Campus of the University of Liverpool, 33 Finsbury Square, London.*

The meeting had 64 registered attendees, of whom 49 attended, all but one for the whole day. The agenda is enclosed.

The day started with Smith outlining the aims and objectives of the day. These were to take the first step along a road that will hopefully end up with a new network that can take action to bring together different areas of neuroscience, specifically (1) clinical and experimental neuroscientists and (2) computational neuroscientists/ neuroinformaticians/ neuro-engineers.

This was followed by five talks by researchers from widely different areas of neuroscience. The first five were from different research areas within the (broadly interpreted) area of neuroscience.

Rasmus Petersen (Manchester: Neural Coding laboratory) talked about his lab's cross-disciplinary approach to interpreting what the mouse's whiskers are telling the mouse brain. This involves a careful mixture of measurement and analysis: a mix of modeling and electrophysiology, with some detailed analysis added.

Piotr Dudek (Manchester: Electrical and Electronic Engineering) put the case for how engineers can help. He considered the historical relationship between our understanding of neural systems and information processing (and game playing) machines, and then looked at the current status, reviewing SpiNNaker, BrainScales, IBM's TrueNorth, HP's Machine, Qualcomm's Zeroth, Neurogrid, ALAVLSI and COLAMN. Clearly there is a great deal of active research, and he discussed how engineers can bring the wet/experimental and engineering disciplines together, including biomedical applications.

Ari Ercole (Cambridge: Medicine) discussed the large volumes of information that are recording during critical care, focusing on how this might be used to better personalize post-brain injury critical care. Modelling is multimodal, and to make proper use of this information, we need to learn how to interpret it effectively. Medics do their best to interpret the datasets, but this is difficult from the raw data: what analyses might be most useful? How might they be found? This is an important application of Neuroinformatics in medicine.

Simon Schultz (Imperial, London: Bioengineering/Neurotechnology) spoke about the issues involved in reverse engineering parts of the brain. He was particularly interested in novel (imaging) technologies for L5 neocortical cells, and in the analysis of the results from these. He suggested that we

needed a network that both engaged with international initiatives, facilitated data exchange across scales and experimental techniques, and co-ordinated initiatives to work on major clinical problems like dementia.

Evelyne Sernagor (Newcastle: Medical Sciences) talked about Neuroinformatics and her work on retinal ganglion cells, She has had a highly successful collaboration with Stephen Eglen (Cambridge), and he has developed analysis and visualization tools for these high-dimensional datasets. Some of this work was done in the context of the CARMEN data sharing and analysis portal. Spike sorting for closely-spaced multi-electrode arrays is an area where neuroinformatics meets electrophysiology: but it is important that all sides have realistic expectations. There are also issues on intellectual credit and authorship.

The slides from these are available on the web: see http://neuroinformatics.org.uk/Network2016/meeting03052016.html#format.

These technical talks were followed by two more talks, one from Prof. Narender Ramnani (British Neuroscience Association), and one from Dr. Kathryn Adcock (MRC). Professor Ramnani's talk discussed the directions being taken by the BNA, including a new publication. Dr. Adcock's talk [hoping for web-publishable slides before long] gave a strategic perspective on where the research councils are in this relatively difficult time. She noted that a pure network proposal was unlikely to get funded. To be fundable, a proposal would need to have specific aims which were achievable, deliverable, measurable. It would need to address specific scientific questions, as well as having broader engagement. It would need to demonstrate a strategic need, and to have buy-in from the community. We might consider other ways forward, such as pilot funding.

After lunch, we had two breakout group sessions. There were five breakout groups in each session, with the first session focussed on "what particular sets of neuroscience areas have to gain from collaboration", and the second session focused on "what the obstacles to such collaboration might be, and what activities might overcome these obstacles". In fact the discussions were more wide-ranging than these issues, partially directed by the content of the morning's talks, and partly influenced by the nature of the UK INCF Node, as it was till 2015.

The rapporteurs fed back their comments to the meeting. There were some specific themes running through these rapporteur comments, such as whether a proposed network should be broad (covering a large area of neuroscience) or narrow (highly targeted, perhaps with special interest groups within the network), difficulties in identifying appropriate collaborators, how the BNA should be integrated, how exactly the research councils should be involved. A bullet-point summary of the points raised is attached to the end of this document, but a detailed analysis of these reports is still ongoing.

The meeting ended with a summing up, and agreement that we should attempt to take the proposed network forward, Specific collaborators (investigators) were identified, namely Brown, Casson, Dudek, Eglen, Ercole, Gleeson, Halliday , Kohli, McDaid, Petersen, van Rossum, Sernagor, Smith. There is interest also from the BNA (Ramani).

We thank eFutures for funding and for helping to organise the meeting, and the Wellcome Trust for funding.

*Report prepared by Leslie Smith, Stephen Eglen, updated 4 June 2016.*

**Towards a New Neuro- Network meeting**
**3 May 2016, University of Liverpool Campus, London**

## Final Programme

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| 09:30 -10:00 | Registration and coffee<br>*7th Floor social space* | |
| 10:00 -10:10 | Meeting aims & objectives<br>*Lecture Theatre Rm 4, Floor 2* | Prof Leslie Smith |
| 10:10 –12:45 | *Session 1*<br>Setting the scene: the need for collaboration across the neuro-area. | Dr Rasmus Petersen (10.10)<br>Dr Piotr Dudek (10.30)<br>Dr Ari Ercole (10.50) |
| 11:10 –11:25 | Coffee | |
| 11:25 – 12:45 | Session 1 - continued | Dr Simon Schultz (11.25)<br>Dr Evelyne Sernagor (11.45)<br>Prof Narender Ramnani (12.05)<br>Dr Kathryn Adcock (12.25) |
| 12:45 –13:00 | Introduction to the breakout sessions | |
| 13:00 –13:45 | Lunch -*7th Floor social space* | |
| 13:45 –16:45 | *Session 2*<br>Breakout sessions & discussion<br>Two sets of breakout groups ;<br>1) What particular sets of neuroscience areas have to gain from collaboration?<br>2) What might the obstacles to such collaboration be & what activities might overcome these obstacles? | |
| 15:15 –15:40 | Coffee | |
| 15:40 –16:20 | Reports back from rapporteurs. | |
| 16:20 –16:45 | Discussion (and decisions) on how to go forward.<br>*Lecture Theatre Rm 4, Floor 2* | |
| 16:45 | Close of meeting | |

**Session 1: Setting the scene: the need for collaboration across the neuro-area.**
(Speaker list and title of talk)

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|---|---|---|
| 10:10 | **Dr Rasmus Petersen**<br>Leader of the Neural Coding Laboratory, Faculty of Life Sciences, University of Manchester | *Predicting neural activity during natural behaviour: cross-disciplinary research in sensory neuroscience* |
| 10.30 | **Dr Piotr Dudek**<br>School of Electrical and Electronic Engineering, University of Manchester | *From new experimental technologies to neuromorphic computing – Engineers are here to help, honest* |
| 10.50 | **Dr Ari Ercole**<br>Lecturer and Consultant Anesthetist, Department of Medicine, University of Cambridge | *Informatics and neurosciences critical care* |
| 11:10 | Coffee | |
| 11:25 | **Dr Simon Schultz**<br>Reader Neurotechnology, Dept Bioengineering, Imperial College, London | *In vivo and ex vivo imaging of neural circuits: opportunities and challenges*. |
| 11:45 | **Dr Evelyne Sernagor**<br>Reader on Developmental Neuroscience, Institute of Neuroscience, University of Newcastle | *Population recordings from the retina: lessons learned for better collaboration in neurophysiology* |
| 12.05 | **Professor Narender Ramnani**,<br>Pofessor of Psychology, Royal Holloway & British Neuroscience Association | *Tbc* |
| 12.25 | **Dr Kathryn Adcock**<br>Medical Research Council | *A strategic perspective* |

**Summary of breakout group reports.**

Updated 31 5 2016.

Below, I have attempted to summarise the comments from each group under a number of headings. g*i* refers to the breakout group number.

*Research councils:*
Which RC to go for? (g4)
There is a funding gap between MRC (very clinical: e.g. Lifelong Health and well-being) and EPSRC (not clinical enough): BBSRC's attitude is unclear (g1)
Need to address MRC concerns: what to achieve, how to demonstrate this. (g2)
MRC (Kathryn): day of the network is probably gone: it would have to be a very good idea to get it funded. (g5)
What are RC requirements: standards, mechanisms, deliverables. (g4)
General inefficiencies in grant application: bureaucratic, lack of good referees, impact can be difficult in some areas. (g1)
Identifying topics relevant to RCs (i.e. to each RC): chase the money. (g3)
RC data publishing could help us, because the RC's are officially committed to this (g4)

*Collaborators and expertise:*
Experts should be at state-of-the-art in their own discipline. (g1)
Clinical: clinicians have expertise in the ethical process, and in how to organise clinical trials. (g1)
It can be difficult to identify collaborators, particularly clinical ones. (g1)
Hard to find relevant expertise: that is those with one expertise type find it hard to find those with complementary expertise. (g3)
Any network proposal needs to have buy-in from a range of backgrounds, including clinical and psychology. (g2)
Need to have relationships with potential collaborators: bootstrapping at the beginning is required. Informal conferences could be one way forward (g1)
Need expertise in both theoretical and practical aspects. (g3)
Do wet neuroscientists really need theoreticians, modellers, neuroinformaticians, neuro-engineers? Are they simply unaware what these people can do? The experimentalists need to see some return (g4).
The area is wider than simple wet/computational collaborations: we need psychologists and cognitive neuroscientists as well. (g4)
Need more clinicians: not just trauma, but dementia. Translational Medicine would be a very good target (g1, g5)
Data overload is a serious problem in experimental and clinical neuroscience: neuroinformatics can help to tackle this (g2)
We need to understand the quality issues both in data and metadata (g3)
Need to get early career researchers interested: they are the people who will carry the cross-disciplinary work forward. (g1)

*Focus areas: wide vs. narrow*

Is a specific goal best (like in CERN and the Higgs boson)? (g1)

A single goal, or alternatively a set of identified goals that fit RC priorities. (g3)

Possible specific goals include:

Experimental neuroscience interacting with machine learning. (g2)

Multi-scale modelling (g2)

(Multi-level issues: behavioural all the way to cellular: technical challenges of multi-modal approaches) (g2)

Targetting specific disorders (g2)

Targetting possible therapeutic interventions (g2)

Showcase projects (g4)

Is broad coverage a strength, or a lack of focus: if it is a strength, why this is the case needs needs to be made clear ? (g2)

Is multidisciplinarity a problem or strength (g2)

Promoting (enforcing?) data sharing in the UK, making what's required clear (g4)

Develop a mobile data training workshop: train the trainers (g5)

Is there a role for computational people in experimental labs (but top labs have everyone within them) (g5)

Understanding the nature of results across very different areas of neuroscience: what to believe and what to treat purely as possible evidence. (g5)

*Role of INCF:*

Meeting people is key: can INCF help? The UK is still an associate node.

How did other countries sell their (INCF) nodes and get funding for them? Health applications (g5)

INCF can still have a major role in training (g5)

INCF can help to discover and promote international linkages

*Role of BNA:*

Seen as a successful organisation, with a long history (g2)

BNA database initiative could be relevant and useful (g2)

BNA can help to engage researchers, particularly in the experimental field (g4)

BNA can help with meeting people and that is key (see bootstrapping above) (g4)

We could attempt to start a SIG on data sharing (or on Neuroinformatics) in the BNA (g4)

BNA has very little computational neuroscience or neuro-engineering, currently (g5)

*Mechanisms:*

Money is critical(g1)

Summer schools (g5)

Internships (shorter and longer: 6 months plus) (g5, g3)

Computational training for experimentalists (g5)
Competitions (like Machine Learning grand challenges) (g5)
Rent-a-geek concept: send the computational neuroscientists and analysts into wet neuroscience labs (g1)
Access to electronic and hardware implementations (g1)
Links with industry: big Pharma, implantable devices, medical devices (like DBS for Parkinsons)
Lobbying for special calls? Or for research that requires multi-disciplinary work. (g4, g5)
Specific use-cases will help to get ideas funded (g4)
Use data as a common theme (g2)
Get NC3Rs (https://www.nc3rs.org.uk) on side (since we are talking about better use of experimental, clinical datasets) (g2)