



2015 Annual Report summary

In the first year of the current funding period of SINAPSE [Scottish Imaging Network: A Platform for Scientific Excellence], significant progress has been made towards key outcomes in research, knowledge exchange, and education.

- SINAPSE serves as the node for research imaging activity in Scotland by maintaining a strong, dynamic network that pools facilities, resources, and skills.
- SINAPSE provides direct access to outstanding imaging expertise for the benefit of the pharmaceutical industry, manufacturers of imaging equipment, and academic and clinical researchers, and increases public awareness and understanding of imaging.
- SINAPSE ensures access to high quality training across the wider imaging research community, and encourages and facilitates individuals from different disciplines to be part of a larger imaging collaboration.

Administration

The post of Lead Scientist, which is central to the functioning of SINAPSE, was advertised internationally and Dr Kristin Flegal took up the appointment on 1 June. Dr Flegal has a PhD in Psychology with a concentration in Cognitive Neuroscience, and she came to SINAPSE after completing a postdoctoral fellowship at the University of California, Davis. Her post is based at the University of Glasgow, where she is dividing her time between coordinating SINAPSE network activities and continuing her own research programme using behavioural and fMRI methods to investigate the mechanisms of cognitive training and associated changes in patterns of brain activity.

Further development of the network

Dr Flegal and SINAPSE CEO Prof David Wyper have visited the partner Universities to discuss the next phase of SINAPSE, promote research collaborations across the network, and increase membership. In

tandem, the SINAPSE website has been further developed as an active online base for the network, enabling more topic-specific groups and content editors. The ongoing growth in SINAPSE membership is reflected by over 280 member accounts as of the end of this year. There are now JISC mailing lists for three SINAPSE subject areas: MRI, Molecular Imaging, and Psychology. Additionally, a monthly SINAPSE e-mail newsletter has been launched and a SINAPSE Twitter account (@SINAPSECENTRE) is in active use.

Activities within Scotland

In response to an invitation from the Scottish Funding Council to identify the one item of capital equipment that would make the greatest collective contribution in our Research Pool, the SINAPSE Executive Committee submitted a proposal requesting £4.45M to establish a Scottish National MR Guided Focussed Ultrasound (MRgFUS) Unit. In addition to its impact on leading academic research in Scotland, this facility would be of enormous potential benefit to the NHS in Scotland, leading to clinical trials that would ultimately translate to clinical service delivery.

About 25% of SINAPSE members are NHS employees. A good example of the links we support between academic and NHS research in Scotland is joint meetings with SANON [Scottish Adult Neuro-Oncology Network] which directly address NHS issues such as better use of PET by the introduction of more selective tracers and harmonising fMRI protocols to inform treatment planning. On 8 October, the annual SINAPSE-SANON Meeting was held in Dundee. Dr Sally Pimlott, Lead for the SINAPSE Molecular Imaging Group, presented data on current activity around the world on tracer development for detection or staging of brain tumours. Amino acid tracers are showing signs of being much better for patient stratification, but there are several to choose from and the technical challenges of synthesis and delivery around Scotland will have to be addressed. A subgroup has been set up to explore the rationale for a multicentre study across Scotland. Once this has been prepared it will form the basis of a clinically driven funding application.

Not all SINAPSE partner Universities have medical schools – and in these centres, Psychology is at the heart of the network. One major innovation from Psychology at Stirling has been the emergence of mobile cognition, an entirely new approach to

recording brain activity during real-world activity. The recent increase in cognitive neuroscience staff at Stirling (itself due to the influence of SINAPSE) has been partnered with local investment in mobile EEG and eye-tracking technology. As a result, this year researchers in Stirling developed a new centre focused on mobile imaging, installed new cutting edge mobile EEG and eye-tracking equipment, and published an influential review on mobile EEG in sports (rated in the top 5% of all papers tracked by Altmedia). Mobile brain imaging looks set to grow – not least because it opens up new areas of investigation – and SINAPSE is well placed to take an international lead in driving mobile EEG research.

UK activities

In response to a UK-wide call for the 2016 UK PET Chemistry Meeting, an application to hold the event in Edinburgh was drafted by an organising committee led by Dr Pimlott, Prof Edwin van Beek, and Dr Christophe Lucatelli, and submitted by Prof Wyper on behalf of SINAPSE. The bid was successful, and the meeting will be held at the National Museum of Scotland next year, featuring keynote presentations from Prof David Newby (University of Edinburgh) and Prof Paul Matthews (Imperial College London).

As part of the MRC Dementias Platform UK (DPUK), Edinburgh led the procurement of five state-of-the-art PET-MRI scanners which will be installed at Edinburgh, Cambridge, Imperial College London, Manchester and Newcastle, to create a national imaging network for dementia research. Prof Joanna Wardlaw (founding Director of SINAPSE) leads the DPUK experimental medicine theme of Vascular Disease Mechanisms.

Imaging expertise in SINAPSE supports several UK multicentre trials. Those led from Glasgow include PISTE (Prof Keith Muir; funded by Stroke Association and NIHR HTA), ATTEST (Prof Muir; funded by Stroke Association and BHF), PRACTISE (Prof Muir; funded by NIHR EME) and XILO-FIST (Dr Jesse Dawson; funded by Stroke Association and BHF), and those led from Edinburgh include LACI 1 and 2 (Prof Joanna Wardlaw; funded by BHF and Alzheimer's Society) and RESTART (Dr Rustam Al-Shahi Salman; funded by BHF).

International activities

To help promote and increase participation in EU funding bids, Dr Flegal attended a workshop for the

launch of the Horizon 2020 Health, Demographic Change and Wellbeing work programme held at the University of Glasgow on 14 October, and gathered information of interest to SINAPSE members about call topics with a focus on clinical studies and personalised medicine.

Prof Wyper and Dr Flegal were invited to represent SINAPSE at a workshop in Taiwan the first week of November, for the Bilateral Exchange Programme sponsored by the Royal Society of Edinburgh (RSE) and the Ministry of Science and Technology, Taiwan. With the objective of soliciting interest in collaborative research, they presented SINAPSE neuroimaging research on the topics of clinical applications and development of novel technologies, and applications in psychology research. By using a pooling group in the activity, the work of 15 leading Scottish academics was presented. In the course of the workshop, potential collaborations with Taiwanese researchers working in neuroimaging were identified which could be of value to SINAPSE. We successfully obtained RSE International Exchange Grant funding for Dr Gordon Waiter from Aberdeen and Dr David Dickie from Edinburgh to travel together to Taipei in 2016 for a short exchange visit in the lab of Prof Wen-Yih Tseng at National Taiwan University, who is developing novel techniques for diffusion MRI analysis.



Prof David Wyper and Dr Kristin Flegal presented SINAPSE neuroimaging research at a workshop in Taiwan in November 2015.

The annual scientific meeting of the European Society of Magnetic Resonance in Medicine and Biology saw over 1000 international delegates at the Edinburgh International Conference Centre at the start of October. Prof Ian Marshall from the University of Edinburgh served as meeting president, with several other SINAPSE members in the local organising committee. The ESMRMB meeting immediately followed the 7th International Workshop for Pulmonary Functional Imaging, which was held at the University of Edinburgh, with Prof Edwin van Beek as meeting president. This meeting saw 170 delegates from the USA, Canada, South Korea, Japan and around the EU present their latest research in the field,

covering PET, MRI and CT imaging modalities, while 80 internationally renowned faculty presented a background course on the topic. Both meetings were successful and brought significant revenue to the Scottish economy. Figures provided by the Edinburgh Convention Bureau indicate that ESMRMB 2015 was responsible for more than £1M in economic benefit.

Prof Matteo Zanda at the University of Aberdeen is Head of Unit in the recently funded Horizon 2020 MSCA-ITN-2015 European Joint Doctorate project "MOGLYNET" (Modulation of glycolytic flux as a new approach for treatment of atherosclerosis and plaque stabilization: a multidisciplinary study), in which Aberdeen will be one of five European universities to take on 12 international PhD students studying new therapies for atherosclerosis and new ways of diagnosing the condition at an earlier stage. The role of Aberdeen in the project is to develop candidate therapeutics and diagnostics (PET and optical imaging).

Knowledge exchange

The SINAPSE Seed Fund provides part-funding for five PhD studentships to enhance engagement with industry. Our call for studentship applications was advertised through SINAPSE channels and around industry partners, and eight strong proposals were received. In deciding on release of funds, to strengthen ties with Scottish industry, priority will be given to applications involving companies based in Scotland. The decision on submitted applications will be made in January so that awarded studentships may be advertised shortly thereafter, for starting dates around August 2016.

On 24 September, the University of Glasgow Future of Biomedicine Industry Day was held at the new Queen Elizabeth Teaching and Learning Centre. Prof Keith Muir spoke during a workshop titled 'Focus on Industry, NHS and Academia' and Dr Flegal represented SINAPSE in a 'College Pod' organized by the College of Medical, Veterinary and Life Sciences. The event was successful in promoting SINAPSE research and informing potential academic and industry partners about current KE opportunities including the Seed Fund studentships.

On 1 October, the CENSIS 2nd Technology Summit and Conference was held in Edinburgh. Prof Wyper chaired an Image Processing session and Dr David

Dickie exhibited work from a major SINAPSE collaboration project, the Brain Images of Normal Subjects (BRAINS) Bank. Many delegates visited the exhibition stand, and queries and comments were on a wide range of SINAPSE activities – not limited to the BRAINS Bank – including opportunities for technology developed within SINAPSE to be developed commercially and applied in clinical practice.

SINAPSE membership is open to industrial partners, and industry members currently include Optos, Holoxica, Toshiba Medical Visualization Systems Europe, and Edinburgh Molecular Imaging. Industry participation in the 2015 Annual Scientific Meeting came from Imaging Equipment Ltd, Siemens, GE Healthcare, Bracco, and Philips Medical. Further engagement with non-academic partners this year included NHS participation in the SINAPSE launch events in Edinburgh and Glasgow reported above.



Dr David Dickie staffed an exhibition stand showcasing SINAPSE image processing technologies at the CENSIS Technology Summit and Conference on 1 October. Credit: Angus Forbes Photography

Links with other networks

The NHS has a PET Network that enables members to share their experiences on the delivery of clinical services. SINAPSE has a Molecular Imaging [PET] Group that focuses on radiopharmaceutical development. There is a degree of overlap as issues such as cyclotron performance and clinical trials that require novel radiopharmaceuticals concern both groups. It is clearly important that we communicate and so we have identified two PET specialists who are members of both groups and in addition we have agreed to share minutes of our respective meetings.

Along with SUPA [Scottish Universities Physics Alliance] we were successful in obtaining an STFC Grand Challenge Exploration award of £10K to hold a series of workshops on the potential medical imaging application of physics technologies.

On 27 March, a Medical Image Analysis Workshop was organized by the Computer Vision and Image Processing Group at the University of Dundee in conjunction with SICSA [Scottish Informatics and Computer Science Alliance]. Prof Wyper delivered a keynote address on the role of functional imaging in the study of neurological and psychiatric disease.

Public engagement

Several SINAPSE members, including SINAPSE PhD students, have registered as STEM Ambassadors.



Dr Chris McCabe and several colleagues in Glasgow are STEM Ambassadors. They have participated in events such as the recent Science Fair at Williamwood High School on 7 October.

This year SINAPSE PhD student Michael Stringer from the University of Aberdeen reached the Scottish final of FameLab, an event promoting public awareness of science, with an entertaining presentation on James Clerk Maxwell, the Scottish mathematician and physicist who formulated the classical theory of electromagnetic fields.

SINAPSE teamed up with the Institute of Physics in Scotland, together with SUPA and SULSA [Scottish Universities Life Sciences Alliance], to take part in an International Year of Light project asking post graduate students and early career researchers to send in videos explaining how light is used their research. The broad definition of 'light' is being used – anything in the electromagnetic spectrum including PET, SPECT, MRI and optical imaging. An excellent submission from Dr James Cameron at the University of Edinburgh, in which he discussed his retinal imaging research, was selected as the winning entry from SINAPSE. The runner-up entry from SINAPSE came

from University of Glasgow PhD student Tim Morgan, who provided an impressively accessible overview of his PET imaging research. These videos can be viewed on the SINAPSE website (www.sinapse.ac.uk).

Learning and development

The Postdoctoral and Early Career Researcher Exchanges (PECRE) fund provides research training and development opportunities for outstanding young investigators while at the same time building experience of international collaboration with academia and/or industry. The funding allocated in 2015 has been committed to support exchange visits to partner sites in Italy, Germany, France, the Netherlands, and the United States.

In November, Dr Flegal was invited to speak to the University of Glasgow undergraduate Neuroscience Society about neuroimaging research and career paths. She discussed the training opportunities available for students through the SINAPSE network, and promoted SINAPSE resources including the online eLearning modules about medical imaging techniques.

The 2015 SINAPSE Annual Scientific Meeting was held in Aberdeen on 12 June, with an excellent keynote address delivered by Prof Bill Jagust from the University of California, Berkeley; the result of a connection developed through a PECRE exchange undertaken by SINAPSE PhD student Dorota Chapko. Prof Jagust is one the world's leading authorities on the role of amyloid and tau in Alzheimer's Disease, and the opportunity for the leading dementia imaging researchers in Scotland to debate with him directly was invaluable. Other highlights from the programme included updates on the VAMPIRE optical imaging collaboration led by Dundee and Edinburgh, talks on treatments for dementia from SINAPSE researchers at Aberdeen and Edinburgh that dovetailed splendidly with Prof Jagust's keynote, and well-attended student poster sessions.

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