

2017 Annual Report summary

This report summarises activities and achievements from the third year (January-December 2017) of the current funding period of SINAPSE – Scottish Imaging Network: A Platform for Scientific Excellence.

2017 was another eventful year for the Scottish imaging research community, which saw the opening of world class imaging centres in Edinburgh and Glasgow, the establishment of new SINAPSE topic groups furthering knowledge exchange and education, and the hosting of high-profile scientific meetings. Selected highlights from this year are detailed below.

Enhanced people capacity

The SINAPSE network has helped to make Scotland a more attractive landscape for imaging researchers to work, reflected in SINAPSE-related posts created and outstanding talent recruited. New appointments this year include internationally recognised imaging experts brought into Scotland to fill positions such as Professor of MR Physics at Glasgow's new Imaging Centre of Excellence (Prof David Porter) and Lecturer in Psychology with Stirling's Mobile Cognition Group (Dr Dimitrios Kourtis). SINAPSE also was delighted to welcome *back* to Scotland early career research leaders who had completed their doctoral training here and then returned this year, taking up positions in Molecular Imaging at Glasgow (Dr David Lewis) and in Image Analysis at Dundee (Dr Islem Rekik; former SINAPSE PhD student).

Improved facilities and infrastructure

Improvements to SINAPSE imaging facilities this year included a digital PET-CT scanner at Dundee, a new multi-modal retinal imaging device at Edinburgh, 5 satellite-connected ultrasound systems for a rural ambulance study at Aberdeen, and further investment in mobile cognition research at Stirling including new mobile fNIRS and EEG equipment for real-world neuroimaging and mobile insoles for gait monitoring. Additionally, PET chemistry facilities at Glasgow obtained a manufacturing IMP licence from MHRA to produce radiopharmaceuticals for clinical trials.



HRH The Princess Royal opened Edinburgh Imaging RIE and QMRI facilities in February 2017, and toured the sites of a new neuro-optimised 3T MRI (top) and Scotland's first MR-PET system (bottom)

The Edinburgh Imaging RIE and QMRI facilities which took delivery of new scanners last year (3T MRI, PET-CT, and MR-PET) were opened by HRH The Princess Royal, and in Glasgow, the opening of the new Imaging Centre of Excellence (housing Scotland's first 7T clinical MRI system) was celebrated with a year-long seminar series bringing 7T MRI experts from around the world to speak locally. SINAPSE led an initiative to facilitate Scotland-wide access to 7T MRI shortly thereafter, kicked off with a meeting in Glasgow attended by representatives from all SINAPSE partner Universities and NHS and industry colleagues.

Infrastructure for teaching and training in imaging research also had further development this year, including a Summer School on PET imaging and radiopharmaceutical development in Aberdeen, a number of clinical imaging courses in Edinburgh and Dundee, opening event symposia for Edinburgh Imaging facilities and ICE at Glasgow (both with international expert invited speakers), and updates to the SINAPSE website including a 'Training' section with links to imaging degree programmes across Scotland, imaging PhD studentship opportunities, and our eLearning modules.

Further infrastructure improvements led by SINAPSE were the creation of a topic group for Psychology imaging and the revival of a topic group for Image Analysis, both of which led to increased interaction among SINAPSE members at different centres with

common areas of research specialisation. An inaugural meeting of the SINAPSE Psychology group was held in St Andrews in January, and the SINAPSE Image Analysis group hosted its first meeting in Dundee in September. Special guest speakers at the Image Analysis meeting were visitors from Taiwan National University, with whom a collaborative project on diffusion MRI data analysis resulted from SINAPSE participation in an RSE Bilateral Exchange Programme workshop held in late 2015. Their visit to Scotland this year was funded by a successful joint application with SINAPSE researchers, which also awarded project funding in support of collaborative research using MRI data from UK Biobank to develop age-specific atlases of brain white matter tracts.

Additionally, SINAPSE was involved in new research collaborations this year on national and international levels. Edinburgh launched its coordination of a Leducq Transatlantic Network on cerebral small vessel disease in partnership with researchers in Denmark, France, Canada, and the USA, and co-established the TriBEKa Imaging Platform for dementia prevention research with partner sites in Spain and Sweden. Edinburgh also received Centre status in the UK Dementias Research Institute—the only Scottish site. Further international collaborations for imaging research were supported through ODA/GCRF funding for links with academic colleagues in India (Aberdeen) and in South Africa (Stirling).



Prof Wen-Yih Tseng reviewed exchange visits between Scotland and Taiwan while presenting to the SINAPSE Image Analysis group

Further funding secured

Research income brought to Scotland by SINAPSE researchers this year includes funding from UK research councils (such as BBSRC support for cognitive neuroimaging work at St Andrews, MRC support for the first 7T clinical MRI project at Glasgow, and over £12M from MRC for the new UK Dementias Research Institute centre at Edinburgh) and Innovate UK (including £1M for commercialisation of a quantum entanglement method in PET imaging at Edinburgh), from the Scottish Government (to Aberdeen and Edinburgh for a study on the neural mediators of fatigue, and to Edinburgh for projects on TIA imaging, MS cohort image analysis, and novel radiotracer development), and from charities (awards from Alzheimer's Research UK, British Heart Foundation, Stroke Association, Cancer Research UK, Medical Research Scotland, Neurosciences Foundation, and several smaller trusts).

SINAPSE researchers also were successful in securing funding from international sources this year, including large consortium grants such as the €27M EU Innovative Medicines Initiative AMYPAD project (£1.2M to Edinburgh) and £1.9M from the US-based Alzheimer's Association for TriBEKa Imaging Platform (£0.6M to Edinburgh).

New products and inventions created

A range of imaging research applications benefitted from new products and inventions created by SINAPSE researchers this year. Software products and tools include methods introduced at Stirling to trigger stimulus presentation from eye-tracking data used in EEG research, and image analysis packages developed at Edinburgh, one involving a method for detecting hypertension from retinal images. In molecular imaging, a SINAPSE-supported collaboration between Edinburgh and Glasgow has yielded a novel PET tracer for imaging TSPO. Dundee has been involved in early prototype device development in renal access surgery (with two UK SME partners), bespoke 7T MRI RF coils are being engineered at Glasgow, and the Sonopill capsule ultrasound programme at Glasgow created two inventions. Fast field-cycling MRI has continued to be tested in clinical pilot studies at Aberdeen.

Just in time to supply spirit for the festive period at the end of the year, a collaboration SINAPSE initiated

with the Scottish craft gin makers at Strathearn Distillery produced 'ImaGin', a limited edition gin distilled with botanicals inspired by imaging, from which every bottle sold contributes a donation to support imaging research in Scotland.

Engagement with external stakeholders

Knowledge transfer from SINAPSE to wider audiences this year took the form of public engagement activities organised around the Alzheimer's Research UK Research Meeting hosted in Aberdeen and the Human Brain Project summit hosted in Glasgow, participation in a Medical Visualisation Product Forge 'hackathon' event in Edinburgh, a guest blog post on SINAPSE for the SFC website, and public events such as Pint of Science in Glasgow, Café Scientifique at Aberdeen, and reunion of Aberdeen Children of the 1950s at Aberdeen.



Research volunteers from the Aberdeen Children of the 1950s cohort posed with their brain scans at a public engagement event

SINAPSE researchers also received high-profile media coverage this year, including the BBC documentaries "Andrew Marr: My Brain and Me" which featured stroke imaging trials at Glasgow, and "Alan Shearer: Dementia, Football and Me" which featured research at Stirling on brain changes following football heading.

SINAPSE also was frequently engaged with industry partners and other Scottish networks. Exhibitors at the 2017 SINAPSE Annual Scientific Meeting were Siemens, Imaging Equipment, Bracco, Bayer, Bartec, DD Analytics Cubed Ltd., NHS Research Scotland (NRS), and NRS Mental Health Network. Relationship building beyond the imaging research community this year included SINAPSE participation in a CENSIS event on collaborative R&D opportunities in Aberdeen, Scottish Crucible Forum in Edinburgh, and "Imaging, Innovation and Impact" Industry Day in Glasgow. Additionally, SINAPSE interacted with stakeholders from HE sector strategic bodies in a 'Developing

graduate schools and other doctoral structures in Scotland' policy forum organised by the Researcher Training Sub-Committee of Universities Scotland, and SINAPSE molecular imaging leads participated in a Scottish working group on national strategy for funding PET infrastructure and Gallium tracer supply.

PEER funding awarded this year to support SINAPSE members' engagement in European research included travel to Germany to investigate imaging datasets of brain tumour patients and advance a research collaboration around radiological patterns of recurrence in glioblastoma, travel to the Netherlands to establish a new research collaboration around 7T MRI cardiovascular imaging, and travel to Switzerland to establish a new research collaboration around spinal cord imaging, including import of high resolution MRI protocols to newly opened imaging facilities in Scotland.

Other significant achievements

SINAPSE was delighted to welcome Prof Alison Murray at Aberdeen into the office of SINAPSE Director, which she took over from Prof David Wyper in April.

Based at Glasgow, SINAPSE Lead Scientist Dr Kristin Flegal received a Neurosciences Foundation project grant to further develop her research programme – using behavioural and fMRI methods to investigate the mechanisms of cognitive training interventions – in a new collaboration with researchers at Strathclyde.

As SINAPSE serves as a representative body for imaging researchers across Scotland, further development of the network has remained a priority. The SINAPSE website (www.sinapse.ac.uk) continues to operate as an active online base for the network, with membership growth from 111 member accounts in June 2015, to over 350 in June 2016, to over 500 by the end of this year. All SINAPSE members receive a monthly e-mail newsletter sharing SINAPSE news and events, SINAPSE JISC mailing lists now facilitate communication and collaboration in the subject areas of MRI, Molecular Imaging, Psychology, and Image Analysis, and SINAPSE maintains an active social media presence with both Twitter ([@SINAPSECENTRE](https://twitter.com/SINAPSECENTRE)) and LinkedIn accounts to bring members together.

Wider recognition for the work of SINAPSE members this year included the 2017 IPEM Academic Gold Medal awarded to Prof David Lurie (Aberdeen) for

outstanding contribution to the advancement of academic practice in medical physics and the 2017 European Stroke Organisation Presidential Award to Prof Joanna Wardlaw (Edinburgh) for outstanding contribution to stroke research and associated small vessel diseases. A further honour for Prof Wardlaw was being selected to represent the Royal College of Radiologists in a 'Women in Medicine' exhibition organised by the Royal College of Physicians London. In addition, recognition went to a full team of imaging researchers from the University of Edinburgh and NHS Lothian as winners of 'Imaging Team of the Year' at this year's BMJ Awards, the UK's leading medical awards, for their work on the SCOT-HEART trial.

Learning and development

SINAPSE ensures access to high quality training and support for students and early career researchers. The 2017 SINAPSE Annual Scientific Meeting held at Glasgow in June included a keynote address by Prof Arno Villringer, Director of the MPI for Human Cognitive and Brain Sciences in Leipzig, invited talks by local experts in 7T MRI and MR-PET, and a wide array of proffered talks and poster presentations.

SINAPSE also was proud to help create value for the Scottish economy, as well as enhance training and dissemination opportunities for our early career researchers, through involvement in high-profile scientific meetings hosted locally. Such events this year included the 2017 Medical Imaging Understanding and Analysis conference in Edinburgh (the 3-day programme attracted its largest ever attendance, from the UK and from overseas, and included a SINAPSE workshop showcasing recent image analysis advances from SINAPSE members at Edinburgh,

Glasgow, and Dundee), the 2017 UK Clinical Research Facilities Conference in Glasgow, and the 2017 ARUK Research Meeting (the UK's largest dementia research conference) in Aberdeen.

PECRE funding awarded this year for international research exchanges supported valuable training and development opportunities for young investigators in the SINAPSE network. The exchange visits established and strengthened institutional collaborations between SINAPSE partner Universities and sites in the Netherlands, USA, and Canada. Moreover, outcomes of the exchange visits were shared with the wider Scottish imaging research community (including industry partners) at the 2017 SINAPSE Annual Scientific Meeting.



Edinburgh Imaging's CT team and the SCOT-HEART trial won 'Imaging Team of the Year' at The BMJ Awards 2017

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