

## 2018 Annual Report summary

This report summarises activities and achievements from the fourth year (January-December 2018) of the current funding period of SINAPSE – Scottish Imaging Network: A Platform for Scientific Excellence.

2018 marked SINAPSE entering its second decade as the medical imaging research network for Scotland. 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 to new appointments this year. Additionally, the SINAPSE network expanded to include Strathclyde as its 7th partner University as of January 2018, and the number of registered SINAPSE members further increased from 504 at the start of the year to 657 at the year's end.

Unfortunately, it also bears noting that uncertainty over Brexit played a role in the departure from Scotland of valued SINAPSE researchers this year. Dr Yee Lee Shing left University of Stirling for a position in Germany (taking a prestigious ERC Starting Grant with her), Dr Emilio Quaia left University of Edinburgh for a position in Italy, and Dr David Rodriguez returned to Spain after 10 years working with SINAPSE at University of Edinburgh. It is clear that the UK's preparations to leave the European Union have brought about unwelcome challenges for Scottish Universities to continue attracting and retaining world-class researchers.

Nevertheless, we have been delighted to continue supporting PhD students commencing their imaging research training at Scottish Universities. This year SINAPSE organised two welcome events: at Dundee in February, for students who started in 2017, and at Stirling in December, for students who started in 2018. Feedback has been very positive on these opportunities for early-stage students to feel part of a structured cohort, despite belonging to different PhD programmes at different institutions.



A SINAPSE welcome event in December 2018 brought together PhD students beginning imaging research projects across Scotland

### Improved facilities and infrastructure

Improvements to SINAPSE imaging facilities this year included the installation of a new interventional CT scanner and the acquisition of a fully configurable ultrasound research scanner at Dundee, a new mobile EEG system and new foot sensors used by the Mobile Cognition research group at Stirling, three new EEG systems at Strathclyde, and upgrades to imaging research facilities at Edinburgh (MRI-PET, 3T Skyra MRI, and 7T horizontal bore preclinical MRI) and at Glasgow (C11 gas handling system and cyclotron HPLC and GC modules).

Infrastructure for teaching and training in imaging research also had further development this year, including a new MSc programme in Cognition and Neuropsychology at Stirling (with training in neuro-imaging), a new Online Distance Learning course on PET-MRI at Edinburgh, and the launch of a CVS-Neuroscience network at Edinburgh bringing together academic and clinical researchers from cardiovascular sciences and neuroscience. The SINAPSE network itself increased its number of partner Universities to 7 (with Strathclyde joining this year) and its number of topic groups to 5 (with a new topic group for Neuro-oncology imaging established this year).

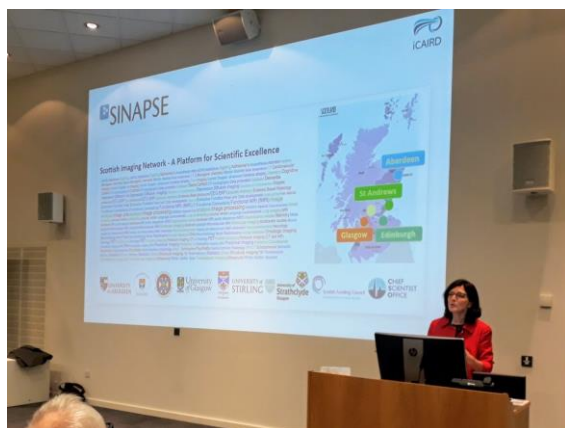
Additionally, SINAPSE was involved in new research collaborations this year on national and international levels. We supported a series of 'PET is Wonderful' meetings in Edinburgh with keynote speakers invited from the USA, Australia, and Belgium, and this year's SINAPSE-SANON meeting (linking Scottish neuro-oncologists with the imaging research community) which brought leading brain tumour researchers from London and Leeds to Glasgow to share their work. Glasgow also welcomed researchers from the UK's other 7T MRI sites as part of the UK7T Traveling Heads

study, and collaborative work continued this year with international partners in Taiwan, South Africa (GCRF project with Stirling), and India (GCRF project with Aberdeen).

### Further funding secured

Research income brought to Scotland by SINAPSE researchers this year includes funding from UKRI (such as EPSRC support for cardiac MR image analysis research at Edinburgh, a £100K SBRI Healthcare award for a lung CT machine learning project at Edinburgh, £100K from Innovate UK for a new KTP project between IMV Imaging and ultrasound researchers at Dundee, and £735K from MRC for the first 7T MRI project grant at Glasgow), from the Scottish Government (including a CSO-funded PET imaging project and two SPRINT MND/MS PhD studentships at Edinburgh), and from charities (awards from Wellcome Trust—including over £1.3M in equipment grants for preclinical imaging at Edinburgh, Cancer Research UK—including £3M for preclinical imaging facilities at the Beatson in Glasgow, Leverhulme Trust, Stroke Association, Age UK, British Heart Foundation, and several smaller trusts). SINAPSE researchers also were successful in securing funding from international sources this year, including the €4.2M EU Horizon 2020 grant SARAS (£0.5M to Dundee).

A SINAPSE-led initiative to facilitate Scotland-wide access to 7T MRI in Glasgow has produced a funded collaboration for brain tumour MR spectroscopy with researchers at Edinburgh (£51K from Clerk Maxwell Cancer Research Fund awarded this year), and a collaborative pilot project in development with researchers at Stirling studying sub-concussive sport-related head impact.



Prof Alison Murray presented to the NHS Health & Social Care Innovation Network on the contribution of SINAPSE in proving established links between iCAIRD's academic and clinical partners

A major development came at the end of the year with the announcement of Innovate UK funding awarded to a SINAPSE-supported bid for a Scottish centre of excellence in medical imaging and digital pathology with artificial intelligence. iCAIRD (Industrial Centre for Artificial Intelligence Research in Digital Diagnostics) will launch in 2019 as a pan-Scotland collaboration spanning academia [4 SINAPSE partner Universities], industry, and NHS Scotland, in which an investment of £10M from the Industrial Strategy Challenge Fund will be supplemented with over £5M of additional funding from industry partners Canon Medical Research Europe and Philips, along with six SMEs. Centred in Glasgow, iCAIRD will bring benefits to the Scottish economy and to healthcare delivery in Scotland, including SINAPSE-related research to develop solutions for more rapid treatment for stroke, expert chest x-ray reading, and partly automated mammogram analysis for breast cancer screening.

### New products and inventions created

SINAPSE researchers from the Universities of Glasgow and Edinburgh developed an automated image analysis method, combining MRI measures of brain atrophy and small vessel disease to produce a single 'brain health index' measure, that reliably predicts cognitive function in stroke patients at one year post-stroke. European Society for Vascular Medicine PAD clinical guidelines included contributions by SINAPSE researchers from the University of Dundee.

The limited edition imaging-inspired Scottish craft gin created as a collaboration between SINAPSE and Strathearn Distillery, 'ImaGin', proved to be a popular purchase by SINAPSE members and also a memorable gift for invited speakers to Scotland and for hosts of exchange visits from Scotland. To date, gifted bottles have helped to promote SINAPSE to imaging research colleagues in England, Wales, France, Norway, the Netherlands, the USA, India, and Taiwan.

Another creative partnership with a small Scottish company beyond the boundaries of imaging research emerged this year, as SINAPSE was delighted to collaborate with the Scottish design brand Charcot which creates artwork based upon MRI scans. We commissioned a Charcot design that used MRI scans of the brain, heart, and spine, from which commemorative conference bags were produced for the 10th anniversary SINAPSE Annual Scientific Meeting.

## Engagement with external stakeholders

Knowledge transfer from SINAPSE to wider audiences this year took the form of public events including a Tayside Clinical Research Centre 10th anniversary Open Day in Dundee, talks as part of the Edinburgh International Science Festival, and Pint of Science in Glasgow, a presentation to the Glasgow Neuroscience Society about brain imaging research and career paths and an invited talk on Stirling's mobile EEG research at the sportscotland Annual High Performance Conference, and contributions to a new 'Medical Marvels' exhibit at the Dundee Science Centre.

SINAPSE also was frequently engaged with industry partners and other Scottish networks. Exhibitors at the 2018 SINAPSE Annual Scientific Meeting were Bartec, Canon Medical, Charcot, Imaging Equipment Ltd., NHS Research Scotland (NRS), NRS Mental Health Network, and Sectra Ltd. Relationship building beyond the imaging research community this year included discussions with Dundee's Health Informatics Centre around plans for delivering the Scottish Medical Imaging project, and SINAPSE participation in interdisciplinary events such as the UK Brain Tumour Symposium and the Scottish Dementia Research Consortium conference in Glasgow and an EPSRC Healthcare Technologies Conference in Edinburgh followed by a reception at Scottish Parliament. We also were delighted to receive support from SFC for a new cross-pool initiative involving SINAPSE, SUPA, and SULSA to develop and expand academic-industrial collaborations in Scotland around optical imaging.

PEER funding awarded this year to support SINAPSE members' engagement in European research included travel to Rotterdam, Netherlands, by key researchers from Aberdeen to develop a collaboration in birth cohort longitudinal imaging research.

## Other significant achievements

Our Annual Scientific Meeting this year was a special anniversary event celebrating 10 Years of SINAPSE. Highlights from the programme included two keynote addresses from internationally recognised imaging experts, and presentations from SINAPSE Directors past and present, reflecting on the phases of network establishment (Prof Joanna Wardlaw), development (Prof David Wyper), and continuation (Prof Alison Murray) over which they have presided.



Prof Joanna Wardlaw, Prof David Wyper, and Prof Alison Murray celebrated 10 Years of SINAPSE at the 2018 ASM in Edinburgh

Based at Glasgow, SINAPSE Lead Scientist Dr Kristin Flegal secured funding from the Neurosciences Foundation and the Sackler Foundation for an interdisciplinary PhD studentship project with new collaborators from Clinical Neuropsychology at Glasgow, using behavioural and fMRI methods to evaluate a novel cognitive training intervention for individuals with acquired brain injury.

Wider recognition for the work of SINAPSE members this year included Prof Joanna Wardlaw (Edinburgh) receiving the Karolinska Stroke Award for Lifetime Contribution to Excellence in Advancing Knowledge in Stroke at the 2018 Karolinska Stroke Update Conference and the William M. Feinberg Award for Excellence in Clinical Stroke at the 2018 International Stroke Conference, Prof Alison Murray (Aberdeen) being appointed Fellow of the Royal Society of Edinburgh, Dr Roger Staff (Aberdeen) receiving the 2018 BNMS Norman Veall medal for outstanding contribution to the science and/or practice of nuclear medicine in the UK, and an ultrasound technique applied in prostate cancer diagnosis and management (Dundee) winning Research Project of the Year at the 2018 Herald Higher Education Awards.

Multiple opportunities were explored this year for income generation and arrangements to sustain continued development of the SINAPSE network beyond the current funding period. On the possibility of driving bids for Centres for Doctoral Training to secure more imaging-related PhD studentships, SINAPSE coordinated a joint proposal from the Universities of Aberdeen and Glasgow for an EPSRC-funded CDT; unfortunately this bid was not successful (although the development process in itself had the positive outcome of reaffirming research strengths and collaborative opportunities within our network).

On the possibility of capitalising on image analysis expertise in our network to develop a marketable Scotland-wide medical image analysis resource, we obtained funding for a consultancy project to begin exploring this by assessing the image analysis assets within SINAPSE and the market demand.

### Learning and development

SINAPSE ensures access to high quality training and support for students and early career researchers. The 2018 SINAPSE Annual Scientific Meeting held at Edinburgh in June included keynote addresses by Prof Marion Smits from Erasmus University Medical Centre, Rotterdam, and Prof David Kiely from the Sheffield Pulmonary Vascular Disease Unit, invited talks by local experts in clinical and preclinical imaging, and a wide array of proffered talks and poster presentations.

Additionally, SINAPSE offered training and networking opportunities this year for students from different centres in Scotland with common research interests. The 2nd meeting of the SINAPSE Psychology group was held in Glasgow in May, with an invited speaker from Cardiff University presenting on fMRI and EEG work, and the 1st Scottish Molecular Imaging Meeting took place in Glasgow in September, with Prof Mark Lythgoe from UCL and Prof Bertrand Tavitian from INSERM, France, as keynote speakers.



SINAPSE arranged for Biomedical Engineering undergraduate students to visit ICE in Glasgow, including its MRI coil laboratory

In February, SINAPSE organised a visit to Glasgow's Imaging Center of Excellence (ICE) for undergraduate students on the University of Glasgow Biomedical Engineering degree course, with presentations on imaging research in academia, NHS, and industry.

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 2018 Consortium of European Research on Emotion in Glasgow, the 2018 British Society of Cardiovascular Imaging meeting in Edinburgh, the 2018 Society for Magnetic Resonance Angiography international conference in Glasgow, the 2018 British Association for Cognitive Neuroscience annual scientific meeting in Glasgow, and a tri-annual meeting of the EPSRC Image Guided Therapies Network+ in Dundee.

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 Belgium, Italy, Canada, and the USA. Moreover, outcomes of the exchange visits were shared with the wider Scottish imaging research community (including industry partners) at the 2018 SINAPSE Annual Scientific Meeting.

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