

2020 Annual Report summary

This report summarises activities and achievements from the sixth year (January-December 2020) of the current funding period of SINAPSE – Scottish Imaging Network: A Platform for Scientific Excellence.

In spite of 2020's significant disruptions in working arrangements and research activity due to COVID-19, SINAPSE continued to support progress towards key outcomes in research, knowledge exchange and education for Scotland's imaging research community. Selected highlights from this year are detailed below.

Enhanced people capacity

The SINAPSE-related posts created and outstanding talent recruited (when still possible in early 2020) attest to how the network has helped to make Scotland a more attractive landscape for imaging researchers to work. High-profile appointments this year include Chair of the School of Psychology at Aberdeen (Prof Patric Bach), Clinical Professor of Imaging Science and Technology at Dundee (Prof Iris Grunwald) and two Professors at Glasgow's Centre for Cognitive Neuroimaging (Prof Simon Hanslmayr and Prof Maria Wimber). The number of registered SINAPSE members further increased from 767 at the start of the year to 841 at the year's end.

Improved facilities and infrastructure

Improvements to SINAPSE imaging facilities this year included new wireless EEG systems at Strathclyde, a CrystalCam portable gamma camera for real-time localization of radioactive markers at Aberdeen, the Large Animal Research and Imaging Facility (LARIF) opening at Edinburgh and the arrival of Scotland's first MR-guided focused ultrasound system at Dundee.

SINAPSE again participated in research networks and knowledge exchange partnerships this year on national and international levels. In February a launch event was held for the new Centre for Medical and Industrial Ultrasonics (C-MIU) at Glasgow, an inaugural meeting of the Scottish Ophthalmic Imaging Society took place in Edinburgh and the SINAPSE Ultrasound group hosted its annual meeting at Strathclyde.



Winning presenters at the SINAPSE Ultrasound group meeting in February 2020, with group lead Dr Helen Mulvana.

A meeting of the SINAPSE group for neuro-oncology imaging that had been scheduled for March was postponed to 2021 due to the spread of COVID-19, but events held in a virtual format later in the year, including an Organisation for Human Brain Mapping mini-conference as part of the 2020 FENS (Federation of European Neuroscience Societies) Forum and the third PET is Wonderful meeting (with keynote speakers from Denmark and the USA), enabled further strengthening of international research collaborations.

Infrastructure for teaching and training in imaging research also had further development this year, including a joint educational partnership in Biomedical Sciences, Imaging and Image Guided Therapy launched by Dundee with North Eastern University, China, and a new clinical academic training programme to Train and Retain Academic Cancer Clinicians (TRACC) initiated between the Cancer Research UK Glasgow and Edinburgh Centres. Additionally, when the COVID-19 pandemic caused imaging research activity to be suspended, SINAPSE leveraged the availability of online resources by arranging free access for all of our PhD student members to eLearning course modules from Edinburgh Imaging Academy, as a supplement to their regular training. We also supported webinars on 'Deep Learning in Medical Imaging' organised by Edinburgh-based SINAPSE researchers with industry partner MATLAB.

Further funding secured

Research income brought to Scotland by SINAPSE researchers this year includes funding from UKRI (such as BBSRC support for ultrasound therapy research at Strathclyde and £5.6M from EPSRC's Transformative Healthcare Technologies programme for developing a novel 'optical x-ray' imaging modality at Edinburgh),

from the Scottish Government (including a CSO Rapid Research in Covid-19 grant to Glasgow), from charities (awards from Wellcome Trust—including a £1M Technology Development Grant to develop new PET biomarkers at Edinburgh, MS Society—including a £1.8M MS Centre of Excellence award to Edinburgh, Cancer Research UK—including a £3.5M Radiation Research Centre of Excellence award to Glasgow, British Heart Foundation, Alzheimer’s Society, and several smaller trusts), and from international sources (such as a grant to Edinburgh from the Canada-based Weston Brain Institute and a €2M ERC Consolidator Award to Glasgow).

A major award to Glasgow this year, £38M from the UKRI Strength in Places Fund to create a Precision Medicine centre of excellence, includes funding for an Advanced Imaging workstream to deliver translational impact in end-to-end innovation from acquisition through analysis of medical imaging data.

New products and inventions created

SINAPSE researchers from Dundee and Edinburgh who co-lead the VAMPIRE retinal imaging collaboration received support from the Scottish Enterprise High Growth Spinout Programme for commercialisation of their software technology. This development followed from SFC leverage funding for a cross-pool initiative involving SINAPSE, SUPA, and SULSA to develop and expand academic-industrial collaborations in Scotland around optical imaging.

Additionally, the world’s first 16-channel transmit 96-channel receive 7T MRI head coil was engineered at Glasgow for use at University of California, Berkeley, and results were published from a phase IV biomarker evaluation trial in the Early detection of Cancer of the Lung Scotland (ECLS) study, led from Dundee, showing that a combination of blood tests followed by CT scanning reduces late stage diagnoses of lung cancer.

Engagement with external stakeholders

Knowledge transfer from SINAPSE to wider audiences this year took the form of online public engagement activities in the Glasgow Explorathon, contributions from SINAPSE neuroimaging researchers at Edinburgh to BBC’s Great British Intelligence Test, and the launch of the Scottish Clinical Optometry and Ophthalmology e-Network (SCONE) at Edinburgh including resources for patients with age-related macular degeneration.

SINAPSE also maintained frequent engagement with industry partners and other Scottish networks. Exhibitors at the 2020 SINAPSE Annual Scientific Meeting were Bartec, Canon Medical, NHS Research Scotland (NRS), NRS Mental Health Network, Siemens Healthineers and TherMidas. In March we participated in what turned out to be one of the last in-person events of the year, a ‘Technology Innovations for Healthcare’ meeting co-organised by CENSIS and DHI.

Relationship building beyond the imaging research community this year included close working with other research pools to develop the Research Innovation Scotland initiative, intensifying a national effort around interdisciplinary research and innovation. In early October SINAPSE led organisation of a cross-pool session in the 2020 SICSA Conference (together with SICSA, SULSA, and the Scottish Dementia Research Consortium) addressing multidisciplinary challenges in the early detection of neurodegenerative conditions such as Alzheimer’s disease, and new opportunities to build capacity in Scotland by integrating data science with brain health research areas of neurobiology and neuroimaging. The session introduced, and welcomed early engagement in, a new Scottish network crossing the disciplinary boundaries of clinical brain research, preclinical brain research, and computing science.



Research pool representatives from SULSA, ScotCHEM and SINAPSE congratulate the organisers and speakers from the ‘Breaking Barriers in STEM’ online workshop in October 2020

Another successfully co-organised activity we were delighted to support this year was the ‘Breaking Barriers in STEM’ online workshop in late October, led by SULSA, which aimed to explore where inclusion and diversity in STEM can improve and identify actions to take forward for change. Richard Lochhead, Scottish Government Minister for Further Education, Higher Education and Science, delivered opening remarks. Four exceptional early career panellists then gave short talks on some of their personal experiences

being part of and working with minority groups in STEM, and the event concluded with breakout sessions to discuss actions that can be taken forward to make impactful and sustainable change in academia and the broader society.

Other significant achievements

SINAPSE welcomed Dr Jennifer Macfarlane at Dundee into the office of SINAPSE Director, which she took over from Prof Alison Murray in April.

Further to successful outcomes from SINAPSE Seed Fund PhD studentships initiated in 2016, this year we awarded seed funding for Innovation Partnership Fund projects, and a CSO Award for Clinical Imaging Innovation and Partnership, across SINAPSE partner institutions. Imaging developments supported by this funding involve external collaborators ranging from local clinical research teams to international medical research centres to industrial partners.

Wider recognition for the work of SINAPSE members this year included Prof Emanuele Trucco (Dundee) being awarded a Distinguished Fellowship of the British Machine Vision Association and Prof Margaret Lucas (Glasgow) being awarded an IET Achievement Medal for Ultrasonic Technology for her world-leading ultrasound research. Of special relevance during the pandemic, Prof Edwin van Beek (Edinburgh) served in a group of clinical experts commissioned by the National Institute for Public Health of the Netherlands to provide guidance for the imaging workup and treatment of thrombotic complications in patients with COVID-19, and a 2020 Principal's Medal for Exceptional Contribution was awarded to Dr Antoine Vallatos (Edinburgh) for playing a critical role in the University's response to the COVID-19 crisis.

Throughout the pandemic, SINAPSE has sought to support Scotland's imaging research community as fully as possible. The suspension of imaging research work this year had a significant negative impact on SINAPSE members, both for PhD students and postdocs unable to progress with data collection according to their project timelines and for research grant holders unable to proceed with studies addressing critical clinical and scientific questions. With the unique position of SINAPSE as the only research pool involving NHS Scotland (in addition to academic partner institutions), we were able to collate a variety of resources for our members

integrating expert guidance for *clinical* imaging during COVID-19 to assist with planning for safely resuming *research* imaging.

Learning and development

SINAPSE ensures access to high quality training and support for students and early career researchers. The 2020 SINAPSE Annual Scientific Meeting was held as a virtual event for the first time, and we found the live online format facilitated attendance by more delegates (285) than in any previous years' in-person ASMs. The meeting programme featured a keynote address by Prof Uta Noppeney from Radboud University, a topical invited talk on chest imaging in COVID-19, updates on the pan-Scotland iCAIRD and PICTURES projects and a wide array of proffered talks and poster presentations. Our learning experience of organising a virtual event was shared with the cross-pooling community and will continue to inform our own approach to organising future training activities.

SINAPSE also is 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. This year we contributed to a successful bid for Glasgow to host the 2022 annual meeting of the Organisation for Human Brain Mapping. Unfortunately, COVID-19 led to two major international meetings that were scheduled to be held in Glasgow with SINAPSE involvement this year to be moved to a virtual format instead: the 2020 FENS Forum and the 2020 European Conference on Computer Vision.

No PECRE funding could be awarded for international research exchanges this year because of travel and social distancing restrictions imposed by the pandemic. Nevertheless, we were delighted for outcomes of past years' exchanges to be shared with the wider Scottish imaging research community (including industry partners) at the 2020 SINAPSE ASM, hopefully helping to inspire future applications for this valuable training and development opportunity for young investigators in the SINAPSE network.

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