Artists in Residence 2024-2025

UNIVERSITY OF BIRMINGHAM | SMQB | Centre for Systems Modelling & Quantitative Biomedicine

SMQB Artists in Residence 2024-2025: Open Call

About SMQB:

The Centre for Systems Modelling & Quantitative Biomedicine (SMQB) is an interdisciplinary research centre based at the University of Birmingham. With backgrounds in mathematics, computer science, physics and biomedicine, SMQB researchers apply these approaches and collaborate with others to advance healthcare and medicine. Learn more about our work: www.birmingham.ac.uk/smqb

SMQB Artists in Residence:

UK artists are invited to apply for the next round of our artist residency programme. Artists will be paired with a research project and team of scientists at the start of the collaborative research process, kicking off with our research incubator event on the **24th and 25th of June 2024 in Solihull, West Midlands**. **Successful applicants will need to attend this 2-day event** (expenses covered). Creatives will lead on co-development and delivery of creative outputs that should respond to the science and health issue under research. However, artists insights and perspectives into wider aspects of the research project are strongly encouraged, as we believe science and art practice can impact each other.

Projects in this round include topics such as:
- Stratifying psychotic disorders using biomarkers and brain Imaging
- Developing mathematical models for seizure forecasting in epilepsy
- Mathematical modelling for predicting patient response to depression medication from brain imaging data
- Directed forgetting in human brains and artificial neural networks
- Developing machine learning models towards improving the diagnosis of acute compartment syndrome

These projects are summarized in further detail on pages 5-6 of this document.

We are open to creative proposals of all kinds; however, we encourage applicants to carefully consider how their work will drive public engagement with the research project. Each artist will spend time collaborating with our researchers over approximately a **six-month period**. Their level of involvement over this time should be self-managed and proportionate to the fee on offer and the creative work they will deliver. We obviously do not expect artists to work full time for six months or more. Most of the artists we have collaborated with previously have undertaken the residency flexibly and part-time on top of existing work or study. Successful applicants will be asked to document their collaboration through 1-2 short blog posts and brief informal presentations roughly every two months. They will also participate in some team meetings and public engagement activities alongside researchers, including an end-of-project showcase event in 2025 involving all collaborating teams and artists. **Please note, this residency does not include studio space, so you should have the ability to create work in your own studio space/at home.**

Fee on offer:

Successful applicants will receive a **fee of £2500** (inclusive of VAT where applicable), to include travel, art materials and production of the commission detailed in their proposal. This fee is paid in two instalments of £1250. Please note, it can take up to 3 months for the first payment of £1250 to be made due to university processes regulating supplier set up and the completion of necessary paperwork. **If this delay in payment would be problematic for you financially or otherwise, we do not recommend applying.** The second payment of £1250 follows the midway progress update meeting (around month 4) assuming the collaboration is progressing without any major concerns. Travel and overnight accommodation costs to attend the research incubator (June 24-25) will be covered by us separately. If childcare cover or other access barriers present an issue in attending this event, please let us know as we would like to facilitate your involvement. The research incubator provides an opportunity to refine research projects, including your creative proposal, as we anticipate you may wish to make changes to your original ideas following discussions with your team. You can apply with others (e.g. as a collective), but the fee on offer is unchanged.

How to apply:

Applications are to be made by email to the artist residency lead, Dr Caroline Gillett: c.d.t.gillett@bham.ac.uk with the subject 'AIR 2024' in the title. **The deadline for application is midnight** Sunday 9th of June 2024. **To apply, please compile the following into a single easy to read document:**

1. You name & surname; Your email & telephone number; Your website (if relevant)
2. A short biography (250 words max)
3. A brief CV (2 pages max)
4. Evidence of your practice in the form of up to 10 images max or a direct link to a showreel of film or video work (10 mins or less).
5. Proposal Idea (500 words max)
   Please describe the kind of creative work you would like to organise and your plans for ensuring it will be co-developed with your team and shaped to engage others

with the research project. If you have a strong preference for one or more of the research projects below, you can let us know here and why you would be a good fit.
6. Please also let us know if you are happy to be considered for all available projects, as we cannot guarantee you would be paired with your preferred project(s).

Candidates will be informed of shortlisting outcomes within 3 working days of the deadline and shortlisted candidates will be invited to an **informal online interview (~15-20 mins) on the afternoon of Friday 14th June, sometime between 12 noon – 5 pm.** Please let us know when you apply if it will not be possible for you to attend an online meeting on this day.

Testimonials and previous collaborations:
You can find out more about the work of previous artists through reading their blogs here, viewing the virtual exhibition here and watching some of their individual video presentations linked below and a panel discussion involving all artists here. We also have a short video showing a previous exhibition here: www.birmingham.ac.uk/sciart. Our latest exhibition will also be live between 7 – 22 June at Centrala gallery in Digbeth, Birmingham. You would be welcome to join our launch night on June 7th at 6pm onwards.

Carol Breen, artist – view video here
"Working with SMQB has been a fantastic experience. I learned a lot about the different ways in which images are created and produced in various scientific contexts. I was provided with a tour of the labs at Birmingham University which gave me insight into calcium imaging, and other microscopy techniques. Collaborating with the team of researchers was such a valuable experience for me. I am also keen to experiment more and develop future work based on the experiments I created during this residency. I have started to collate research which relates to conversations that arose from the final online public sharing event, as well as reflecting on the valuable conversations I have had with the research team on the slack channel we shared over the course of the project. The interactions I had during the research incubator and meetings during the residency with the other artists were also beneficial. I would highly recommend other creatives apply to this residency."

Mellissa Fisher, artist – view video here
"From this experience, I met amazing new collaborators & scientists doing impactful research and I also got a step towards the direction I wanted my artistic practice to go. Possibly the easiest and nicest people I've ever worked with, really inspired by learning about artists as well as expressing what science they want to communicate. Brilliant team, I'm sad to be at the end of my residency with them, I wish I could do it again. This has informed my practice substantially and taken me to realms of my practice I didn't know existed, I managed to get an Arts Council England grant from the development of this collaboration as it is a theme I will be continuing."

Vicky Roden, artist – view video here
"The SMQB residency was a fantastic experience – it gave me the opportunity to meaningfully engage with a subject that I had a great passion for, significantly push myself creatively and has enabled me to forge relationships with organisations that previously wouldn't have been possible. As a previous hyper-thyroid patient who was treated at the QE

hospital the process enabled me to both give something back to the facility which ultimately resolved my condition and taught me a lot of things about the condition that I was previously unaware of. This has given me a lot of closure about issues I experienced at the time, enabling me to move past previous problems. Throughout the project I have very much been treated as part of the team, with valuable contributions to make, rather than a public engagement afterthought tacked on after the bulk of the work had been done ... In short, the residency has been an incredible, supportive, fulfilling and steep learning curve, and I would absolutely recommend anybody apply for future opportunities with SMQB."

Tom Ellis, artist – view video [here](#).
"This residency gave me a great opportunity to jump into a completely new and inspiring world. Collaborating with people who are refreshingly passionate and talented within a subject I knew so little about. The result personally meant I could create something really challenging, different and ultimately immensely rewarding."

Common FAQ:

I'm an international artist or UK artist based abroad, can I apply?
Sorry but this opportunity is open to artists who are currently resident in the UK only.

Do I have to live in Birmingham?
We have worked with artists from all over the UK. However, you will need to factor in travel / accommodation costs into your budget as we can no longer accommodate these. Therefore, you would be welcome to apply with an understanding that you would need to cover your own costs to meet with collaborators as required. The residency may therefore be better suited to those in the West Midlands region. We only cover travel/accommodation for the 2-day research incubator event and for exhibition launch where relevant.

Can I apply for more than one project?
Yes, but make it clear if you have a preference. It is also highly unlikely that you would be selected to take forward two projects at the same time. You can either apply for your favourite project and simply indicate whether you would be open to any of the others or you can submit separate proposals if you are especially keen on particular projects.

Can I re-apply?
Yes in theory, though it is highly likely that we would prioritise new or previously unsuccessful applicants to create more inclusive opportunities open to a wider diversity of artists.

Does the residency come with studio space?
No, you should be able to create your work in your own studio or home environment, otherwise factor the costs of hiring an appropriate space into your budget.

I cannot make the June 24-25 event, is that OK? Please do not apply if you cannot make this event. This research retreat is essential as this is where you will spend 2 days with your science collaborators developing the research and creative art ideas and getting to know each other.

Project 1: Learning to Stratify Psychotic Disorders using Neuroinflammatory Biomarkers and Brain Imaging

Psychotic disorders are costly conditions, with billions spent on healthcare and over £18 billion annual economic impact in the UK. Early diagnosis improves recovery and reduces burden, but psychosis patients present diverse symptoms, characteristics, and treatment responses. Classifying patients into subgroups enables identifying tailored treatment options to improve outcomes. This project aims to predict which high-risk individuals will develop psychosis by analysing blood biomarkers combined with brain imaging data. We also seek to understand factors contributing to variability among psychosis patients to facilitate earlier intervention and personalised treatments.

Our analysis integrates inflammatory biomarker measurements and brain MRI scans. Advanced statistical techniques will study connections between biomarkers and brain functioning. AI and computer science methods will create predictive models classifying patients based on biomarker levels and brain imaging features. This classification can guide understanding of which treatments are most effective for different subgroups. This novel approach offers a personalised, proactive strategy for early psychosis intervention by accounting for disorder heterogeneity. Integrating blood biomarkers with brain imaging has the potential to revolutionise treatment outcomes through tailored care from the earliest stages.

Project 2: Developing mathematical models for seizure forecasting in epilepsy

Epilepsy is a condition that affects the brain, causing repeated seizures. Epilepsy affects around 630,000 people in the UK. Epilepsy can have a big impact on people's lives. It puts people at greater risk of injury and premature death, and it can affect people's social life, work life, and mental health. People living with epilepsy say that the unpredictability of seizures is one of the biggest problems. We believe that technology can predict when an epileptic seizure is likely to occur. You could think of it as being similar to a weather forecast. Seizure forecasts could provide people with epilepsy with a forecast about their risk of having a seizure in the near future. This forecasting would rely on us collecting a range of information about people living with epilepsy. Information such as sleep quality, stress levels and what medication they take. These are required as they are well known as 'triggers' which increase the likelihood of a seizure happening. All your data would be used as input to our system. Our system would then crunch the numbers, using advanced mathematics, and output an estimation of how likely you are to have a seizure. Over time, the estimations are likely to get more accurate. As the system gets to know the person living with epilepsy.

Project 3: A pseudospectral method for predicting patient response to depression medication from fMRI data

Depression is a major mental health disorder which affects about one in twenty people. It can be treated, often through a combination of psychotherapy and medication, but not everyone responds well to every drug, so there is a great need for methods which would

help us to guide treatment. We have data from a drug trial which compared the effects of a standard antidepressant with a natural hallucinogenic compound, including brain scans using functional magnetic resonance imaging (fMRI). In previous research we have transformed these images into networks representing the flow of information in the brain, and shown that the effect of each drug can be seen in changes to network structure. We now wish to build on this work by applying mathematical techniques (such as computing the pseudospectra) which can tell us how a system will respond to perturbations - for example, to a medicine. Our aim is to develop a way of helping clinicians and patients to decide which treatment would be best in each case. We also hope this work will improve our understanding of how different drugs affect our mental states, and open up new avenues of research for brain imaging to inform psychiatry.

Project 4: Directed forgetting in human brains and artificial neural networks

Working memory describes the ability to remember and manipulate information that is no longer available in the environment. It provides a flexible mental workspace that scaffolds most higher mental functions. A key feature of human working memory is its limited capacity: we can only hold on to a small amount of information at any given moment. To make the most of this precious resource, a mechanism is needed that rapidly removes memories when they are no longer needed. Remarkably, however, humans often struggle with this. Difficulties in goal-directed forgetting are particularly have been linked with the risk of developing some forms of mental illness and may also contribute to age-related memory deficits. However, the mechanisms that underpin directed forgetting remain unknown. To fill this gap, we plan to study how artificial neural networks from machine learning form and remove memories in the same tasks that are used to study humans. These networks provide a unique window to reveal information processing mechanisms, as the activity of every single neuron is known and can be manipulated. We will leverage this virtue to reveal how neural circuits implement directed forgetting and develop testable new predictions for aberrant memory removal in mental illness.

Project 5: Developing machine learning probabilistic models towards improving the diagnosis of acute compartment syndrome

Acute compartment syndrome (ACS) is an emergency medical condition in which a high-impact trauma such as a fracture or crush injury causes pressure build-up within the limb which obstructs blood flow to the muscles of the limb. As the limb is dying slowly due to lack of oxygen and nutrients, the surgeon is attempting to diagnose the condition accurately. Due to lack of objective methods, clinicians depend upon subjective methods of diagnosis such as pain experienced by the patient upon stretching the affected limb. Such subjective assessments can be difficult even for experienced surgeons and can have serious consequences to patients such as having them to undergo a highly invasive surgery as a result of misdiagnosis or overdiagnosis. The current project aims to develop ML-driven ACS diagnostic tools that will help clinicians make informed decisions. We aim to develop ML models based on the ACS patient data that we have obtained in order to decipher the most sensitive/specific parameters that will aid in accurate diagnosis. We then aim to test the accuracy of our ML models against the current diagnostic methods. Finally, we aim to develop the ML models into a web application for wider dissemination among surgeons.