About SMQB:
The Centre for Systems Modelling & Quantitative Biomedicine (SMQB) is an interdisciplinary research centre based at the University of Birmingham. SMQB comprises a group of research innovators with backgrounds in mathematics, computer science, physics and biomedicine, who use such approaches to advance healthcare and medicine. We are passionate about delivering transformative research that impacts upon lives.

Find out more about us at [www.birmingham.ac.uk/smqb](http://www.birmingham.ac.uk/smqb)

SMQB Artists in Residence:
We are delighted to announce an exciting opportunity for UK-based artists/creative practitioners to collaborate with SMQB. Both emerging and established artists are welcome to apply. We also strongly encourage applications from artists with lived experience relevant to the research subject matter. Two or more artists can also apply together, but the fee of offer is unchanged, so please bear this in mind if you wish to apply as a collective. In this round, the research projects cover the following areas:

- Project 1: Pituitary tumours
- Project 2: Degenerative eye disease
- Project 3: Antimicrobial resistance
- Project 4: Nanotherapies
- Project 5: Leprosy

These projects are summarized in further detail on pages 4-5 of this document.

Each research project involves a six-month focused period of research where investigators from complementary disciplines, as well as other stakeholders are paired with one of our Centre Fellows. Our aim with the artist residency is to embed creative practitioners at the very beginning of this research process, helping bring on board new perspectives and insights as part of the team. Artists will lead on new creative outputs linked to the project.

We are seeking applications from self-motivated artists who are interested in responding creatively to one of the research projects being taken forward for our research incubator in June 2022. **We are open to proposals of all kinds**; however, we encourage applicants to carefully consider how they will drive public engagement with the research itself as well as their creative practice e.g. through delivery of participatory workshops or other types of public events and activities.
Each artist selected on to the programme will spend time collaborating with our researchers over the next six months. 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 as per their application. We obviously do not expect artists to work full time for six months. Most of the artists we have collaborated with previously have undertaken the residency flexibly and part-time on top of existing work or study responsibilities.

Successful applicants will be asked to document their collaboration through short blog posts and brief presentations roughly every 6-8 weeks. They will also be asked to take part in some team meetings and public engagement activities alongside our researchers, including an end-of-project showcase event later this/next year involving all collaborating teams and artists.

**Fee on offer:**
Successful applicants will receive a **fee of £2500** (including VAT where applicable), to include travel, materials and production of the commission detailed in their proposal.

Each research incubator kicks off with a two-day meeting that brings all stakeholders together to map ways of working and project milestones. **This two-day meeting will take place at Hogarths Hotel in Solihull over the 29-30th June, 2022. Successful applicants will be required to attend this meeting.** We will separately arrange and pay for your travel and overnight accommodation to attend this meeting. If childcare cover or other access barriers present an issue in attending, please let us know as we would like to facilitate your involvement. The meeting provides an opportunity to refine project proposals, as we anticipate that artists may wish to make some changes to their initial ideas following discussions with their research team over these two days.

**Applying:**

Applications are to be made by email to the Community & Public Engagement Manager, Caroline Gillett at: c.d.t.gillett@bham.ac.uk with the subject ‘AIR 2022’.

**The deadline for application is Thursday 9th June 2022.**

To apply, please compile the following into a single PDF:

1. A completed copy of the application form (see page 6) outlining your proposal idea
2. An up-to-date CV (2-4 pages is fine)
3. Evidence of your recent practice in the form of up to 10 images or a direct link to a showreel of film and video work (maximum duration of 10 mins).

Candidates will be informed of shortlisting outcomes within a week of the deadline and shortlisted candidates will be invited to an informal interview on the afternoon of **Tuesday 21st June, sometime between 12 noon - 5 pm.** Please let us know when you apply if it will not be possible for you to attend in person or online on this day. If you are interested in applying, but have further questions, please contact Caroline on email.

Shortlisting and informal interviews will be conducted by SMQB Director, Professor John Terry and Community & Public Engagement Manager, Dr Caroline Gillett, in partnership with Centre Fellows (researchers) and one or more previous SMQB artists where possible.
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.

Pietro Bardini, composer - view video here
“This residency helped me develop my practice by inviting me to participate directly in the research processes and allowing me to freely expand my initial ideas. Collaborating with SMQB’s researchers and teams pushed me to investigate new approaches to sound composition and how collaboration between different practices can generate novel and unexpected outcomes. This residency has helped me find a balance between my composition background and my interest in computation, which I have been further researching into since.”

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.”
Research Incubator 2022: Project Summaries

When applying please make clear which project your proposal relates to.

**Project 1: Metabolic fingerprint of pituitary tumours: novel prognostic biomarkers and therapeutic targets**

Pituitary tumours are lumps that develop in the pituitary gland (which sits at the base of the brain). They can cause many problems, e.g., loss of eyesight, headaches, problems with becoming pregnant or fathering a child, reduced ability of the body to cope with stress, high blood sugar and blood pressure, thin bones. They can also lead to early death if not successfully managed.

Available treatments (surgery, X-rays, drugs) often are not successful and frequently the tumour comes back. Therefore, we clearly need to understand what makes these tumours occur or regrow. We will try to answer this by studying metabolism in tumours removed by surgery. Metabolism is the chemical reactions important for release or use of energy, and its products are called metabolites. We plan to measure metabolites with scientific methods. This will give us information on what went wrong that may have led to the development or progress of the tumour and which metabolites can be used to inform us that the tumour will be difficult to manage. This research is novel, opening new avenues. It can allow the development of new treatments and improve the way we manage pituitary tumours with a positive impact on patients’ outcomes.

**Project 2: Improving ocular drug delivery using mathematical modelling of the eye**

Degenerative diseases of the retina, the light sensing tissue at the back of the eye, are leading causes of blindness. Major priorities for patients with retinal disease is to develop treatments that can be given as eyedrops instead of injections directly into the eye. Our recent progress in developing eyedrops for retinal diseases have led to exciting new research avenues but we are mainly relying on the use of animals to help us understand how drugs are delivered into the eye.

We would like to develop a mathematical model to describe how drugs distribute within the human eye after being given as an eyedrop. The anatomical features inside the eye will be modelled using equations to describe drug movement inside the eye. Our mathematical model will then be compared to existing biological data to assess its accuracy.

Being able to predict if an experimental drug can be delivered as an eyedrop and reach the retina would help us more rapidly identify suitable therapies. Our mathematical model would also help us reduce the numbers of rodents used in ophthalmic research.

**Project 3: Switching off Efflux: a multi-disciplinary approach to understanding and overcoming antimicrobial resistance**

Bacteria cause millions of infections every year. While some are minor and treatable with antibiotics, others can be long-lasting and caused by bacteria that can evade antibiotics; these are called resistant infections. For antibiotics to work, the drug must accumulate inside the bacterial cells. One key mechanism that bacteria use to become resistant to antibiotics is to simply throw the antibiotic out of the cell using what’s called an efflux pump. The bacterial cells respond to internalised antibiotic by making more copies of their efflux pumps.
In this project we will develop a computer simulation of a bacterial cell that enables us to monitor how efflux activity is regulated and ultimately work out the optimal way to disrupt efflux activity. By inactivating efflux pumps at the correct time in an infection, we should be able to ensure that resistance is lost and the antibiotics can successfully kill the cells and cure an infection.

**Project 4: An innovative computational approach to accelerate the development of synthetic extracellular vesicles for therapeutic applications**

Extracellular vesicles (EVs) are very small natural particles produced by human cells. They act as messengers between cells and help transfer important biological cargo to maintain health. As such, EVs represent an exciting tool to heal many diseases, however it is very difficult to source sufficient quantities needed for treatments. Moreover, as billions of nanoparticles are continuously being produced by our cells, there are concerns about the purity and quality of EVs isolated from a natural source. To overcome this problem, pharmaceutical science is being used to engineer artificial versions of the natural EVs that may be used to target specific diseases. These synthetic EVs benefit from the possibility of large-scale production and allow the industry to have control over their composition.

To accelerate the development of synthetic EVs, this research project aims to use a computer-based approach to create simulations of their design before laboratory development. We aim to help scientists optimise the initial parameters of their work and to make better material choices for their product to be developed faster and at a lower cost. The development of this tool thus supports the innovation of numerous nanotherapies inspired by EVs.

**Project 5: Using Artificial Intelligence Based Application to Support Leprosy Ulcer Care and Treatment by Community Health Workers**

Leprosy has been identified by the World Health Organisation as one of the key neglected tropical diseases. These are a group of diseases which often receive less research funding and global attention, despite their significant effects on the lives of those affected. Leprosy is caused by a bacterium and can be treated with existing medication. However, for several reasons, including stigma and limited economic means, people living with leprosy might delay seeking diagnosis and consequently treatment. Leprosy can result in ulcers which significantly affect quality of life. While there is good evidence to support current practise in the care of ulcers, affected individuals often live at considerable distances from healthcare centres and receive care mostly from community health workers who lack specialised leprosy knowledge.

In our current project investigating methods to improve healing of leprosy, we have gathered a database of leprosy images. All individuals in our trial have anywhere from four to 20 images taken of a single ulcer over time. Our goal is to use these images to develop an application, which can offer tailored predictive advice based on the analysis and learning from these images.
**Application Form**

When applying please provide the information requested on this form, alongside your CV and up to 10 images or a link to a <10 min video of your recent work. Submit these altogether in a single PDF if possible so we can review your application and all relevant material in one place. Email the PDF to c.d.t.gillett@bham.ac.uk with the subject ‘AIR 2022’. **The deadline for application is Thursday 9th June 2022** (11:59pm).

**Name & Surname:**

**Email:**

**Telephone:**

**Website link** (if you have one):

**Research project of primary interest** (please mark X in the box underneath your project of interest)

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Last time we found that we had many applications for the same projects, whilst other projects received few/no applications. We therefore now ask whether you would like to be considered for other projects, should you not be shortlisted for your first-choice project. We do not require a second proposal, instead we will judge applications based on the existing material you have provided. If you are not interested in any other project leave the secondary interest question below blank.

**Research project of secondary interest** (please mark X in the box underneath any other project(s) of interest)

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Please also include the following:

- **Your artist statement / biography** (max 200 words)
- **Proposal Outline** (max 500 words)
  Please describe the kind of creative work you would like to organise, how this will respond to the research project of primary interest and your plans for ensuring it will engage others.