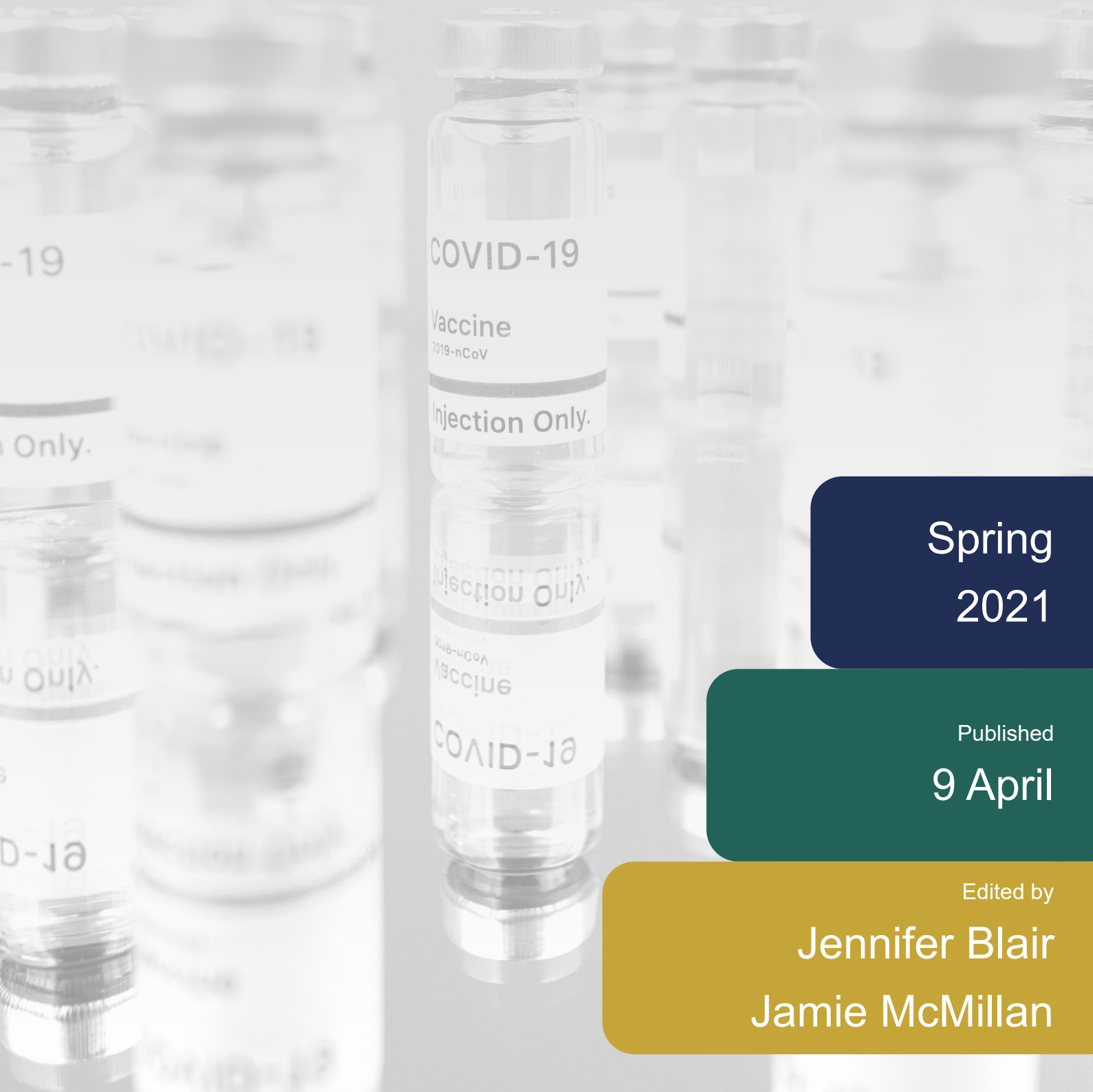
PostGraduate Institute
for measurement science

GRADPOST

Quarterly newsletter of the PGI



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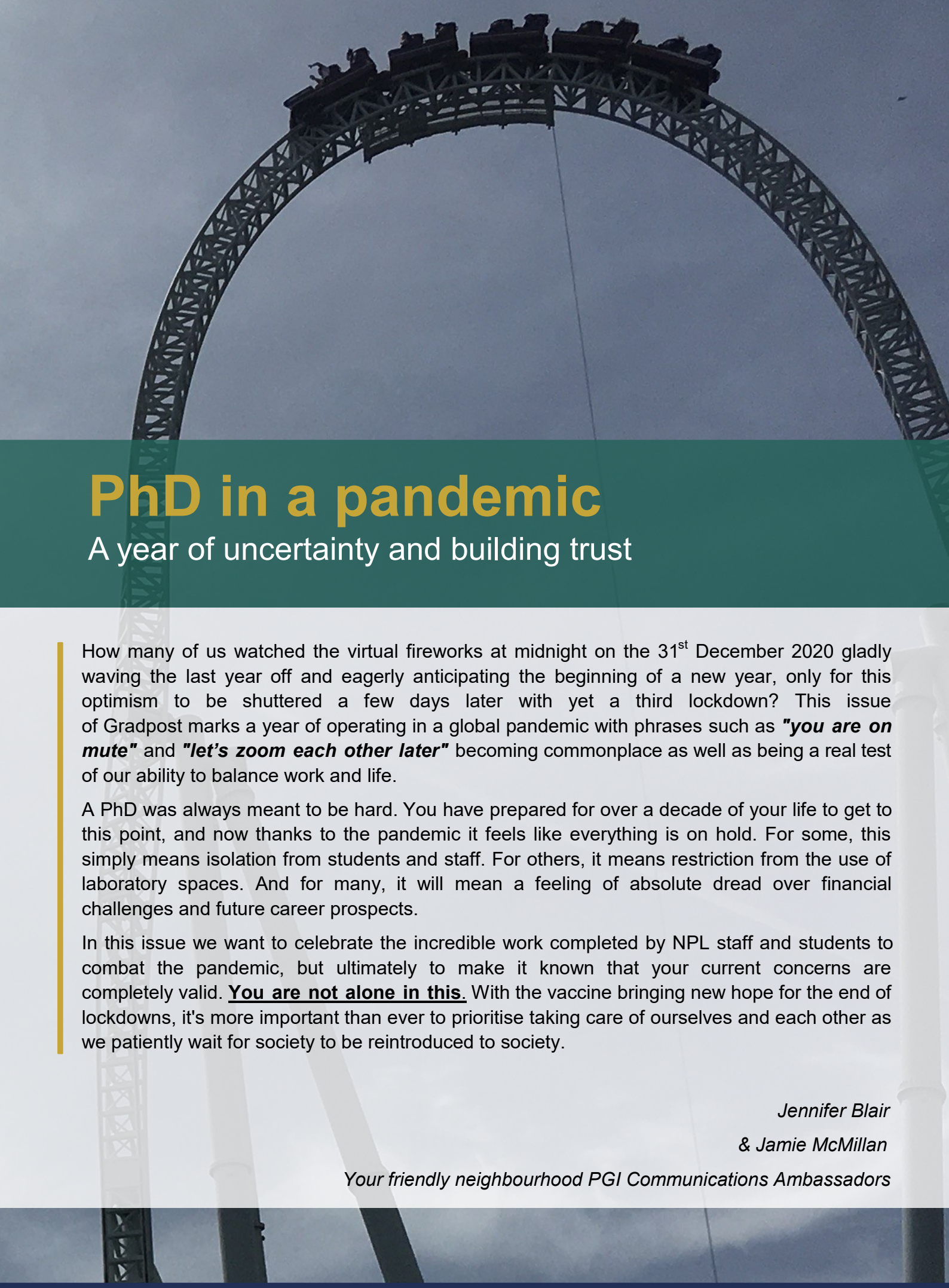


PhD in a pandemic

A year of uncertainty and building trust

How many of us watched the virtual fireworks at midnight on the 31st December 2020 gladly waving the last year off and eagerly anticipating the beginning of a new year, only for this optimism to be shuttered a few days later with yet a third lockdown? This issue of Gradpost marks a year of operating in a global pandemic with phrases such as ***"you are on mute"*** and ***"let's zoom each other later"*** becoming commonplace as well as being a real test of our ability to balance work and life.

A PhD was always meant to be hard. You have prepared for over a decade of your life to get to this point, and now thanks to the pandemic it feels like everything is on hold. For some, this simply means isolation from students and staff. For others, it means restriction from the use of laboratory spaces. And for many, it will mean a feeling of absolute dread over financial challenges and future career prospects.

In this issue we want to celebrate the incredible work completed by NPL staff and students to combat the pandemic, but ultimately to make it known that your current concerns are completely valid. **You are not alone in this**. With the vaccine bringing new hope for the end of lockdowns, it's more important than ever to prioritise taking care of ourselves and each other as we patiently wait for society to be reintroduced to society.

Jennifer Blair

& Jamie McMillan

Your friendly neighbourhood PGI Communications Ambassadors

Building trust through Measurement Science during a global pandemic

JT Janssen, *Chief Scientist*, NPL

The current pandemic highlights many issues concerning trust in science and the public understanding of risk. Often there are only a few minutes of an interview or a limited social media post available to deal with questions such as:

- *How did they develop a vaccine so quickly?*
- *How dangerous is COVID-19 to me?*
- *How can we trust scientists when they change their own views regularly?*

As scientists and engineers, you may be familiar with the difficulty in communicating science outcomes and uncertainties in a way that reaches a wider audience. We hear experts and politicians making numerous statements daily about the magnitude of the risks, using different formats and analogies but all highlighting the current uncertainties and the difficulties of being able to make accurate predictions.

We see different countries adopting different policies and public perception of science fluctuating from being the voice of authority and hope, to a cry of ineffectiveness.

In the light of this, metrology, the science of measurement plays a key role not only in advancing science outcomes, but also in restoring public confidence in evidence-based policy decisions. Currently it is also pivotal in ensuring the development of cost-effective diagnostics and the development of an effective vaccine that provides global protection.

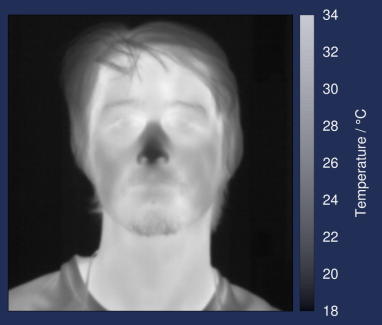
As the UK's National Metrology Institute, NPL and its student community have been providing alternative ways of thinking that enable us to define what should be measured and what level of uncertainty is acceptable. We have been delivering measurement solutions for science, technology and manufacturing throughout the pandemic and have applied our expertise to meet the unprecedented challenge of COVID-19 from contributing to the ventilator call challenge to 3D printing visors for health professionals.

Fever screening

At the beginning of the pandemic, all that could be done without a test for the virus was detection of common symptoms. Fever detection was implemented in travel hubs such as airports using forehead thermometers or thermal imaging techniques. This presented several problems due to physical and environmental factors influencing the measurement, making them unreliable for one-off fever detection. It was eventually discovered that fever alone was not a reliable proxy for COVID-19 detection due to the number of asymptomatic carriers.

Tips for PhD students

Reset your expectations and be kind to yourself! The notion that you will be able to simply continue with your PhD as if everything was normal is unrealistic. All of us are trying to adapt to a new way of living and it is hard work. Talk to other students, your supervisors and the PGI team to reassure yourself that this is a shared experience!



Thermal image of a PGI student

A year in the pandemic

OUR NPL COVID-19 STORY

Graham Machin, *NPL Fellow and PGI Supervisor*

Temperature and COVID-19

The COVID-19 pandemic led to the establishment of a global collaboration led from NPL on how to measure body temperature reliably with emphasis on fever detection. The Medical and Healthcare products Regulatory Agency (MHRA) were keen to collaborate on highlighting the issues and identify a path forward with implementing forehead thermometry and thermal imaging in public spaces in preparation for preventing future disease outbreaks. For this to be successful, further study into the relationship between outer body and core temperatures must be established and continuing efforts need to be made to improve instrument accuracy and traceability to national standards. Finally improving routine temperature measurement more generally in clinical environments would also serve to reduce preventable deaths and slow the growth in antibiotic resistance by allowing healthcare workers to provide more reliable disease diagnosis and hence better targeted care.

Josephine Bunch, *NPL Fellow and PGI Supervisor*

The Power of Mass Spectral Imaging

The MSI group have been active in the Measurement For Recovery (M4R) scheme including evaluating prototypes for companies producing Mass Spectrometry Imaging (MSI) tools and methods, working on the Cancer Research UK *Rosetta* project and interacting with companies such as AstraZeneca. The Rosetta project aims to build a *Google Earth* of cancer through imaging molecules within tumours. Understanding how these molecules interact and are relevant to the type of tumour can allow more useful therapies to be designed. Patients have experienced delays in critical treatments due to the pandemic and scientists have responded with an even greater push towards better cancer treatments and streamlined care pathways. In the future after this pandemic, the MSI group aims to be further involved in pushing the development of more reliable and faster MSI techniques, continuing the help companies monitor drug development and impact, and producing safer medical devices. Outwith Life Sciences, the department is prepared to support advanced manufacturing techniques, big data applications and machine learning applications.

Tips for PhD students, from Josephine Bunch

A career in science is a rewarding but challenging journey. When researching the unknown we face a lot of failure, however this is not the end and may even lead to the beginning of something new. Pursue things that are interesting to you since we do our best and most rewarding work in topics that fascinate us. Getting involved in public outreach can allow you to share your passion, inspire those following in your footsteps and even gain a new perspective on your research.

Mass spectrometry and COVID-19

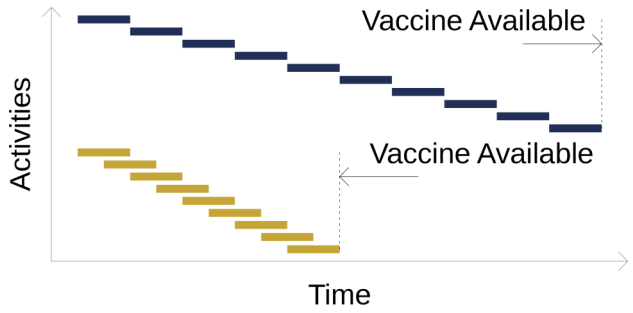
Mass spectrometry has been an important technique outside of NPL in the battle against COVID-19 as it allows scientists' insight into the structure of molecules in the virus. This allowed scientists to understand the spike protein which is responsible for how efficiently the virus can attach to human cells. Gaining an understanding of these structures through techniques such as mass spectrometry provides insight into the mechanisms at work on a molecular and cellular scale, aiding the development of diagnostic tests and vaccines.

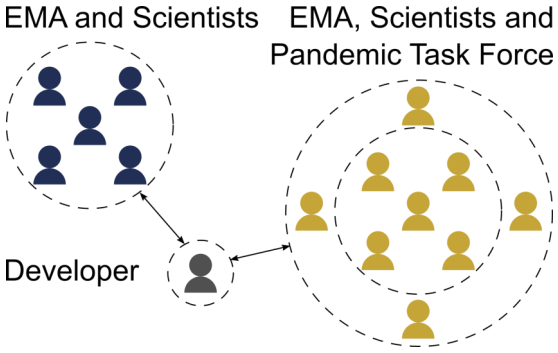
<h1>Mythbusting</h1>

Putting a stop to COVID-19 vaccine myths

1 Extensive vaccine research enabled compressed development time (with no cut corners!)

2 Continuous communication between regulators (EMA) and developers to streamline development

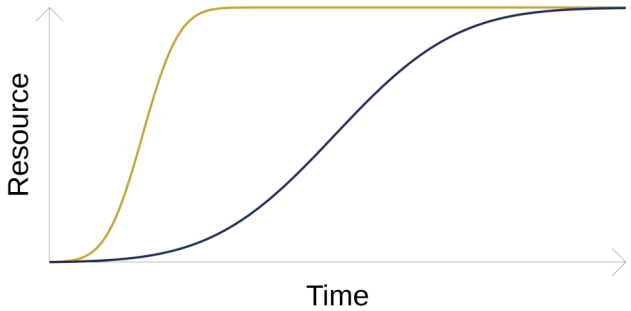


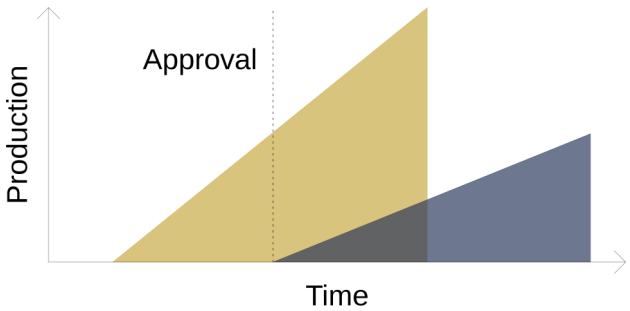


"How did they develop and approve the vaccine so fast?"

3 More resources were made available simultaneously to ensure developers had what they needed

4 Manufacturing capacity prepared pre-approval to reduce wait times for production and distribution





Previous Vaccines COVID-19 Vaccines

Resources

Figures are courtesy of the PGI and were compiled using the referenced sources

1 European Medical Agency (EMA) Vaccine Information
2 Norfolk and Waverly NHS COVID vaccine FAQs
3 British Islamic Medical Association: COVID-19 Vaccine Hub – Myths
4 WHO - COVID-19 Myths

Student engages with Parliament

Importance of scientific evidence for Government policy

Emma Braysher, *Joint PhD student,* NPL and University of Surrey

During the COVID-19 pandemic, more policy has been passed than any other time outside of wartime. It has been essential for decision makers to understand evidence rapidly, and be able to use this to inform and construct new policies in a challenging situation. Government and Parliament need to be well equipped to understand and utilise evidence, including scientific information.

Sense about Science kickstarted Evidence Week 2020, by inviting people from all walks of life to question their MPs about evidence. One of our PGI students, **Emma Braysher** (University of Surrey), got involved and asked the panel of MPs:

> *'How is the pandemic affecting our progress towards the net-zero carbon target and what is being done to make sure we are on track?'*

To see the answer to Emma's question, from the panel and her local MP Munira Wilson, plus watch the rest of the discussion from the opening event, click here.

After the event, Emma discussed her experience of engaging with parliament:

"I'd never met an MP or done anything like this before. Being able to communicate directly with MPs and those on the opening event panel was a powerful opportunity. It's crucial for the public to be listened to on the important issues that were discussed [during the opening event]. Having a scientific background, my way of thinking and reasoning is very much evidence-based, and I believe this is an important part of the decision-making process. The use of evidence is relevant to many areas of policy, allowing policymakers to make reliable and informed decisions that the public can have confidence in."

Tips for PhD students

Use your time to set new goals that can help with your PhD. There are many skills that would enhance the quality of your PhD and help build a stronger CV. The PGI has put together a diverse training calendar and there are plenty of other free courses available. So why not make some time for learning communication, management, project planning, time management, finance, grant writing, presenting, supervising or a myriad of other skills that can advance your success?

The effects of lockdown and questions raised…

The PGI fully empathises with the challenges currently faced by all – personally, professionally and whatever stage of your studies you are at. Throughout the various virtual drop-in sessions, individual queries, consultations and other PGI engagement, the team found that there were some common themes in the types of issues that students faced.

These included getting extensions, lab access, placements, balancing personal commitments, space to study, finances and maintaining mental health. As a result, the PGI has put together a Q&A document to help address some of the questions surrounding these subjects. For an up-to-date full version of the Q&A document, please contact pgi@npl.co.uk or keep checking the monthly bulletin and emails for new information.

Here are a few top questions and answers:

1. I think I will need an extension to my PhD end date. What are the steps to take?

In the first instance, you should speak to both your academic and NPL supervisors. Depending on your personal circumstances, plus following guidance at the time (ask pgi@npl.co.uk for current guidance), the supervisors should agree together whether an extension should be applied for now and the length of time needed. If the conclusion is that an extension is required, then it should be applied for via two routes simultaneously – the University and NPL. This is irrespective of whether the PhD is funded by NPL or the extension requires funding or not. The academic supervisor should apply for the university side of the extension, and they should follow the university's process and guidelines (the PGI do not have oversight of all of the different universities' processes, but the supervisor will know). At the same time, the NPL supervisor needs to seek approval from their Departmental Head or Group Leader for any extension.

Tips for PhD students

Rest and recover!

PhD students have huge demands on their time and are probably exhausted both physically and mentally. Most PhD students see significant drop in their mental health during a PhD which the pandemic could greatly exacerbate. Be mindful about your wellbeing and be sure to share your feelings about what you find challenging. You may find comfort in getting something off your chest and knowing that you're not alone in feeling this way!

Tips for PhD students

Stay connected!

Set some regular catch-ups and chats with people. Your loved ones will love to hear from you and will most likely share your worries. Your peers are also a great resource during this time. We are all in this together and looking for ways to build our networks. The PGI runs a great mentoring scheme and a student support scheme, we encourage you to take part.

Contact pgi@npl.co.uk

The effects of lockdown and questions raised…

2. I am not eligible for an extension at this time, but I am worried about the progress of my PhD. What should I do?

Your academic and NPL supervisors are always the first people you should contact, as they are there to support you and help with any concerns you may have. Together, you can review your project requirements and re-scope to better enable completion within your funded period. However, if you have extenuating circumstances you may still be able to ask for an extension.

3. What support is available to me during lockdown?

You can access support through a variety of different channels. Remember that your supervisors are your main point of contact and support. However, we would also highlight the following:

Tips for PhD students

Keep progressing your PhD. Make sure you keep in close contact with your supervisors. But try to remember that most of them will currently be challenged and dealing with their own issues so be patient but persistent.

Don't just wait for your supervisor to provide you with solutions. Come up with your own ideas and suggest interesting new ways to do work and talk about the new skills you are developing.

Welcome to the new PGI Ambassadors

Jennifer Blair, *University of Strathclyde [Communications]*

Jennifer is a new PhD student at the University of Strathclyde working on supporting analytics for the Nuclear data lifecycle in partnership with NPL. The project will focus on developing tools to analyse the quality of data being used for monitoring and managing important equipment. Jennifer joined the PGI Communications team this year and is involved in creating this edition of Gradpost and organising the upcoming PGI Conference. Hobbies and Interests: Jennifer enjoys landscape photography, sea kayaking, playing the viola and painting.

Karim Daramy, *University of Strathclyde [Events and Training]*

Karim is a first year PhD researcher investigating and developing methodology for characterising the interaction between nanoparticles and proteins using in silico molecular dynamics modelling and in vitro metrology techniques. He is based full-time at the Strathclyde Institute of Pharmacy and Biomedical Sciences, with links to the Surface Technology Group at the NPL. Karim has been an PGI Ambassador since late 2020 as part of the Training and Events team and is also involved in the organisation of the PGI Conference. Karim enjoys reading, rugby, gaming and nanoparticles.

Jamie McMillan, *University of Surrey [Communications]*

Jamie McMillan joined the Temperature & Humidity group in 2015, following three years of measurement services and commercial collaboration Jamie began his PhD in the field of quantitative thermal imaging. As part of his studies, he has supported decommissioning activities with a view to explore active in-situ measurements. Jamie has recently joined the communications team as a PGI Ambassador. When he is not diving into the Linux command line, Jamie enjoys cycling, playing video games and trying to level up his chess game.

Anoma Yamsiri, *University of Surrey [Event and Training]*

Anoma is a second-year research student working towards a PhD in Physics at the Advanced Technology Institute, University of Surrey. Her research aims to exploit temperature dependence of the III-V compound semiconductors such as InGaAsP-InP to develop compact and inexpensive forms of photonic thermometry. She has recently become an ambassador in December 2020 joining the PGI Training and Events team. Anoma enjoys stargazing, swimming and practicing yoga.

Ambassador highlight

The PGI is saying goodbye and thank you to a long-standing ambassador, **Lewis Hill** who will be stepping down as an ambassador. Lewis was a great supporter of the PGI and a real advocate for students' welfare and mental well-being. Read below about Lewis' experience:

Undertaking a PhD in not easy. The challenges of running a project, making discoveries, and continually convincing others of the value of your research is difficult enough – not to mention the additional pressures of planning what's next and determining who is going to help you get there. You cannot afford to let these pressures hold you back however, and hence it is essential to build a network of support and connections to help you survive this tough period.

Being a member of the PGI community has given me plenty of opportunities over the years. These have ranged from networking events, to bespoke training for skills development, to giving me access to training funds which allowed me to attend external events – such as Standing up for Science.

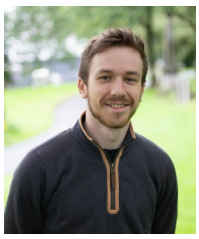
I took the same approach to developing my skills and networks at my host university, where I was an active member on the Department of Physics' Equality and Diversity committee and was the Chair of the University's Doctoral Researchers Group – which attends many of the University's senior committees and further received international recognition under my leadership.

Dr Lewis Hill,
***Joint PhD student,* NPL and University of Strathclyde**

> '*The opportunities given to me by the PGI and the University of Strathclyde have allowed me to not only develop my skills and build a stronger CV but have also given me the chance to help others and make a lasting impact on the future delivery of the PhD program.'*

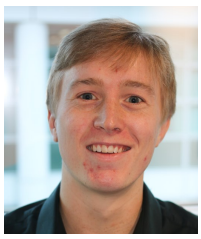
Welfare and Cohort Experience

Danielle Cox-Pridmore



David Connolly

Communications



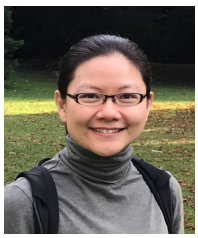
Jamie McMillan

Keir Murphy

Jennifer Blair

Training and Events

Dan Flintoft



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