

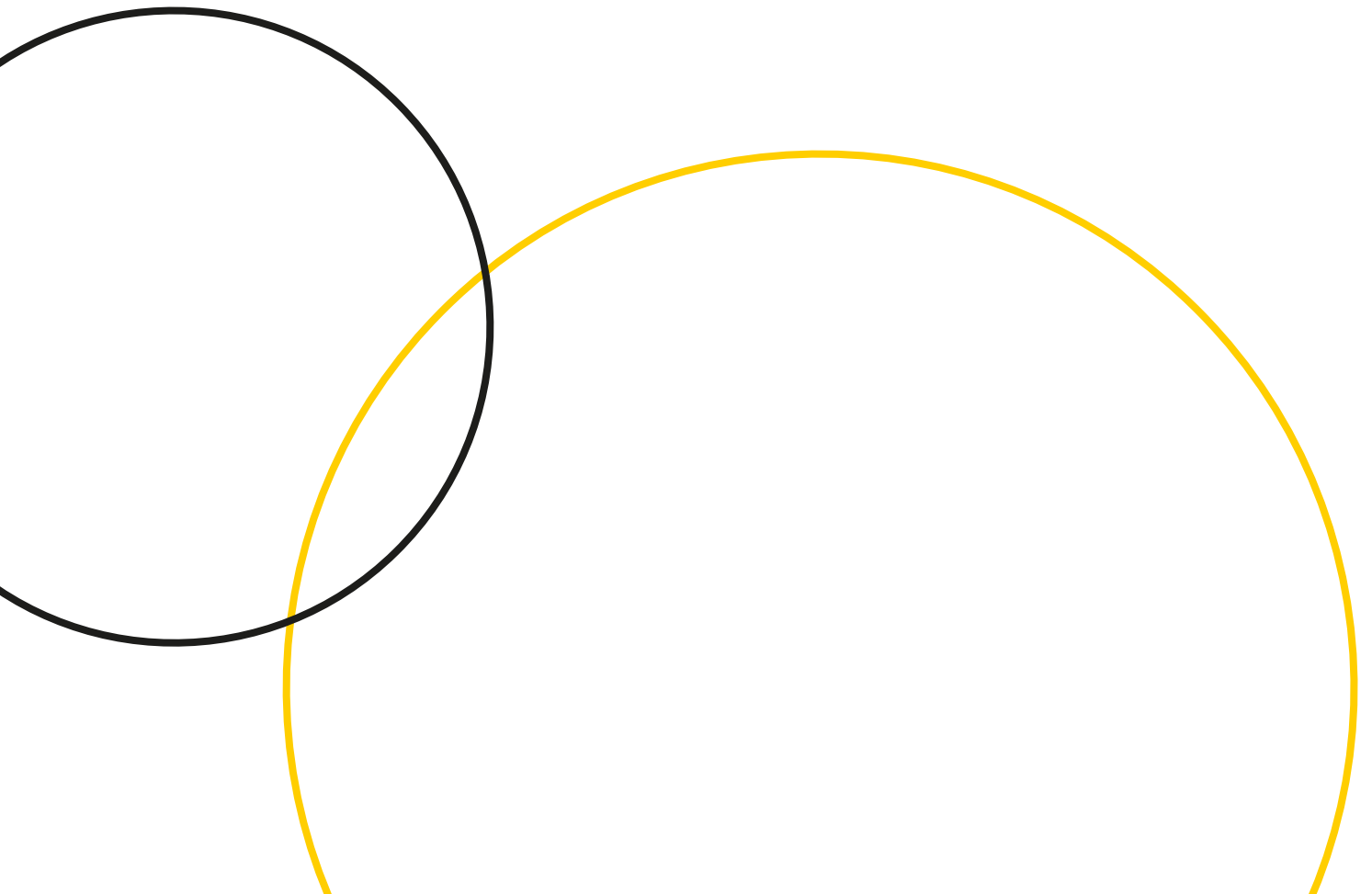


**wellcome
connecting
science**

annual review 2021

Director's introduction	03
Online learning for everyone	04
Translating training in the virtual world	07
Finding SPACE for research in a pandemic	10
On trust and trustworthiness around the world	12
The journey to virtual conferences	14
#flowcellular: recipes for creative collaboration	16
Understanding research, race, and equity	18
Supporting young people and diversity in STEMM	20
Looking at our past: Georgians, jet engines, and genes	22
Selected publications	24
Our people	25
Get in touch	25
Credits	25

contents



The COVID19 pandemic has caused a global tragedy and influenced all our lives in ways large and small, but it has also underlined the ubiquitous role that genomics and genetics are now playing in biological research and healthcare. The moment that the first SARS-CoV-2 genome sequence was uploaded to open access databases quite literally marked the beginning of the development of all the vaccines that are now being rolled out around the world. Genome sequencing has subsequently been fundamental to tracking the origin and spread of viral variants, and has directly informed major public health decisions. The need for cutting-edge training in the generation and interpretation of sequencing data for researchers and healthcare professionals all around the world has never been more obvious. At the same time, misinformation and public distrust has led directly to needless mortality, making clear the importance of dialogue and engagement with current science issues, as well as the need for rigorously generated and actionable research into the origins of that concern and distrust.

The pandemic has also reinforced the significant global inequities that beset science, with stark and unjustifiable differences in access to the tools needed to battle the pandemic between countries and regions. Tackling such inequities is a core part of our mission, and scaling access to training is a key and inspirational goal for the coming years of our work.

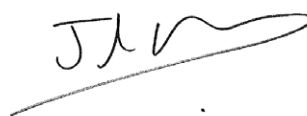
Through these extraordinary global changes, the Connecting Science team has undertaken our own extraordinary changes. Since early 2020 we have pivoted

all our delivery methods online, delivering over fifty virtual courses and conferences in the last eighteen months, as well as multiple discussion and interactive events for a broader public audience. I'm honoured to work with such a talented team of people, and it is hard to do justice to their passion, dedication and skill that has made this transformation not only possible, but also highly successful.

That success is also due to our incredible collaborators and partners, who have given their time and experience to advising us, supporting us, and contributing directly to these events - a heartfelt thank you to you all.

This year's review provides an inside view of the changes in our work over the past eighteen months, and our hopes and ambitions for the years ahead. I hope that you enjoy the insights, and that it conveys some of the sheer energy and innovation of our team.

Best wishes,



Professor Julian Rayner
Director, Wellcome Connecting Science
Director, Cambridge Institute for Medical
Research, University of Cambridge

director's introduction



“

Wellcome Connecting Science aims to enable everyone to explore genomic science and its impact on research, health and society. Never has that mission been more relevant than in the last eighteen months.

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Online learning for everyone

Although the majority of our training and learning programme has been based on in-person delivery, over recent years we have also invested in developing a bespoke online training offer. So in the midst of a pandemic, did we have a training solution prepared and ready to go? As with most things, it's a little more complicated than that!



Technology was both a huge challenge and a lifesaver.

**Dr Rachel Berkson,
Education Manager**



We've created courses on a range of topics, including a suite of standalone, short, online courses on Bacterial Genomes, developed in collaboration with our colleagues at the Wellcome Sanger Institute. These courses are aimed at research and healthcare professionals, as well as students, who are seeking an introduction to topics including antimicrobial resistance, comparative genomics, and genomic epidemiology for pathogen surveillance. As the UK, and much of the world, went into lockdown, we could see the number of learners joining up to these courses begin to surge. To date, over 100,000 people have joined one of our Bacterial Genomes courses.

Online courses are designed to be undertaken with no face-to-face contact, instead using an online platform to enable interaction between learners and educators. But to create an effective online course on a new topic requires hours of planning and development with educators and

subject experts, and the production of filmed and interactive content that supports relevant learning outcomes. However, the need for new skills and learning does not stop during the pandemic, so we had to find a way to meet these demands, but in a very different way.

Before the pandemic, we were planning a FutureLearn MOOC (massive open online course) in collaboration with Health Education England, targeted at primary care clinicians, supporting them to understand new genomic technologies. It almost goes without saying that the healthcare environment has experienced some of the most severe disruption during the pandemic. And this has merely compounded the existing challenges of finding time to advance clinical skills, while also delivering a frontline service. Training disruption can be partially overcome through the application of innovative technology, yet technology can create its own

complications for accessible and effective training.

We had chosen an online format, because we wanted to make it accessible to busy GPs and nurses by giving them the opportunity to learn when they had a free moment. The development process was also originally planned to be online, because we were collaborating with GP experts from all around the country. What was not part of the plan was that we would be prevented from ever meeting in person.

During development, we went through several different options for conference calls just as the whole world was migrating to Zoom. Document sharing was also a challenge. We've generally used Google Drive for collaborative editing, but faced technical barriers. Even scheduling meetings ran into issues with incompatible calendar systems! A big part of the problem was that IT systems in UK healthcare environments can be heavily locked down, or just old and slow. Our educator team couldn't simply pop in to their office to use software, and often had to resort to working on their mobile phones.

time to study on top of a heavy clinical workload, but doing so when busier than ever, and often with restricted computer access.

Making sure the course was relevant was essential in these circumstances. To address this, we structured it around a series of case studies representing patients typical for primary care, ensuring clear explanations and links between different sections. Learners might have weathered multiple emergencies since they last progressed on the course, so we couldn't assume they would remember prior sections. We prioritised making the information available in multiple formats, and made sure everything would still work if you had a tiny screen, or a computer that couldn't run the latest software.

An unexpected issue we faced was making films and videos for the course remotely. Instead of meeting with a videographer with professional equipment, we had to make videos in people's homes, using whatever they had available in the way of webcams and smartphones, and recording video calls for our interviews with experts. In many ways the planning was the

design and collaboration, far more than on access to the technologies we usually take for granted.

Of course, a pandemic is not the only situation when we want to work with busy people, who have limited access to travel, technology, and time. We've always tried to consider learners in less ideal circumstances, but now that we've lived through it ourselves, we have much better ideas of what works. And over the past year we've worked virtually to develop new courses on bioinformatics for biologists, and on delivering effective bioinformatics training.



Would you like to join one of our online courses? Visit our **[website](#)** to find out more.



Sign up to our quarterly **[newsletter](#)** for all the latest news.



The feeling that we can design, develop and deliver a course entirely online, was an amazing outcome. Being able to proceed more or less normally with our work, gave hope that despite terrible circumstances, we can still deliver relevant training to thousands of people around the world.

Dusanka Nikolic, Senior Education Developer



Simultaneously, our collaborators were dealing with the same human challenges we all faced as the pandemic raged; from working from home with limited childcare, to adapting to the ever-changing lockdown rules. And more so because they were working on the frontline seeing patients, being redeployed for Covid-19 work, having to manage telephone appointments, and taking up the slack when hospitals were almost overwhelmed. We were very conscious that our learners would be facing similar challenges: trying to find

hardest part; with no fixed filming day, the process took far longer than expected. However, we were also able to interview some prominent leaders in the field, who might not have been in a position to set aside half a day for travel and filming, but were available for an online conversation.

After all our efforts, we produced a successful course, completed by 1,000 healthcare students and professionals from all over the world. It was an informative experience to realise that a good course depends on excellent

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One of the best courses I have taken lately! I enjoyed the interactive comment sections where we as students we were given a chance to guide, or be guided, on solving the challenges we could meet along the way.

Learner, Bioinformatics for Biologists: An Introduction to Linux, Bash Scripting and R, February 2021

Really helpful for primary care practitioners - the assessment was a mix of asking of really specific knowledge, and also more general concepts. Overall really pleased I did this, and would recommend to GP colleagues.

Learner, Genomic Scenarios in Primary Care, April 2021

The level was right for me. In fact, I like how the content is organized and presented. Some concepts are purposely simplified while some are purposely profoundly discussed. What I really like also are the interviews or examples or practical applications of the genome sequencing. Excellent course!

Learner, Bacterial Genomes: Disease Outbreaks and Antimicrobial Resistance, July 2021

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Translating training in the virtual world

Supporting research and healthcare communities to develop the skills needed to utilise genomic data and knowledge is one of our key goals. Relevant technical and analytical understanding is essential for accelerating research activities, translating these activities into health applications and interventions, and for professional career progression and development.

We deliver an extensive programme of learning and training activities. This ranges from research conferences to immersive, hands-on, laboratory and bioinformatics courses. Until recently the majority of this programme was reliant on face-to-face interactions, taking place in either the Hinxton Hall Conference Centre on the Wellcome Genome Campus, or in partner institutions in low- and middle-income countries.

Wellcome Sanger Institute colleague, Head of Scientific Computing, Dr Tim Cutts, was extremely helpful in putting us in touch with both Google and Amazon so we could look at their options for cloud-based computing to support virtual versions of our courses. After a few meetings and some experimentation, we decided that Amazon WorkSpaces were the best option. At the same time, provided that participants had computers of a reasonable specification and good bandwidth, we could use the VirtualBox virtual machines that we were already using for in-person courses to provide a local solution for virtual versions. However, the big unknown was would the technologies we'd chosen be usable by our course participants? To tackle this challenge head-on, we decided to have a one-to-one session with each participant to check their computing setup.

Data analysis is a critical part of research, but what about the skills to generate the data to begin with? Translating our laboratory-based courses into a virtual offer came with an additional set of challenges, from understanding how to develop



The admin and events team took time to research and practice new applications like Zoom and Slack, and build our confidence to enable us to support the instructors and participants.

**Yvonne Thornton,
Event Manager**



Inevitably, the arrival of a global pandemic resulted in some quite drastic changes. Global South courses were postponed in early 2020, followed by a pause in the UK element of our programme. However, once we began to come to terms with the new and different world we were living in, the next step was to explore how we could work virtually to continue to provide the training and skills development still needed by numerous professional groups. Our



We were adaptable and flexible to the participants' and instructors' demands. Whilst we had to postpone some courses, most still ran; and it meant people could stay at home and avoid travel, and do the course with minimal impact on their personal life and the environment.

Jacqui Brown, Assistant Laboratory Manager



content for this environment, to practical issues relating to scheduling and filming lab-based content that would be appropriate for learners. However, by working closely with our colleagues across the Sanger Institute and instructors from other organisations we have been delighted to find solutions that have enabled us to deliver virtual training courses. These ranged from Next Generation Sequencing and Fungal Pathogen Genomics to Single Cell Technologies and Analysis to Genomics and Clinical Microbiology.

These may not have been the circumstances we would have chosen to work in but we have also learnt about ourselves and how we can innovate to meet the needs of research professionals. We've gone from feeling somewhat cautious and nervous about developing virtual courses to increasing our confidence with each course and knowing we can deliver the next one.

A virtual offer is not the perfect training solution, and we have struggled to find effective ways to support the networking and relationship building

that happens organically with a face-to-face training course. However, the feedback we have from virtual course participants has remained very positive and similar to the feedback from the face-to-face offer. As we look to the future, we anticipate that our training offer will evolve, combining both virtual and in-person elements. We are planning to pilot a new model,

where the first part of the course will be face-to-face, and the second part will take place virtually a few weeks later. We have already piloted a remote classroom model based on an entirely virtual setup, with encouraging outcomes. Moreover, we are excited about what improved live streaming and other new technologies may enable us to deliver in the future.



I see an opportunity to strengthen representation from our global training regions, as we were able to have more instructors and assistants involved, and could support them to build their skills in training others, and facilitating learning. In the future, it will become harder to justify people flying everywhere, and others might not want to travel 'just' to deliver training. So having skilled regional training teams will create a truly sustainable programme.

Dr Alice Matimba, Acting Head of Courses and Global Training



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 **Alice Matimba**
@alicepn

Great course with the AMR team @ewan_harrison @bfgbeth @francesc_cic @belamalta10 @eventsWCS. Thanks to the participants for sticking out for long days and intensive sessions, and still all smiles in the end.



“

It was incredibly well run over Zoom! Many benefits including no travel required (awesome for pandemics, the planet, limited resources and young families), being able to see and hear clearly at all times because you have a dedicated screen is 👍. Hope the virtual training continues 👍

Participant, Fungal Pathogen Genomics, May 2021



 **Sarion Bowers**
@SarionBowers

You know #SciencePolicy2021 @ConnectingSci is nearly here when you're recording your talk and the cat joins you. Looking forward to it.



Since I am new in genotyping methods in clinical methods and epidemiology, I wasn't really sure what to expect but it definitely met my expectations. I was impressed by the way it was possible to perform some exercises online. The instructions were sent ahead of time. The course was very well organized despite the challenges of online meetings.

Participant, Genomics and Clinical Microbiology, January 2021

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Finding SPACE for research in a pandemic

How a new research project exploring the ethical challenges of data-driven medicine had to adapt to a rapidly changing world.

We live in a world surrounded by data. Devices from smartphones to sequencing machines are constantly generating data about us, ranging from our activity levels to the DNA code of our genomes. This data is collected, used, and shared by individuals, companies, public services, and governments. Our data saturated world has the potential to have a positive impact on medicine, and the detection and treatment of a wide range of health conditions. But data-driven medicine also brings with it a number of social and ethical challenges.

The SPACE (Stakeholder Perspectives on ethical challenges in the use of Artificial intelligence for Cognitive Evaluation) study focuses on new and emerging approaches to using digital data and Artificial Intelligence (AI) to detect the early signs of cognitive decline associated with Alzheimer's disease and dementia. For instance data on changes in gait and movement from an exercise tracking device, may be an indicator that prompts further investigation. The SPACE study aims to understand how stakeholders, including researchers and technology users, negotiate, conceptualise and address ethical questions in practice.

Beginning in 2019, the study has involved a mapping exercise of

relevant digital tools, research initiatives and companies operating in this area; interviews with 26 experts and researchers in academia and the private sector; repeated interviews with 30 older people in the UK and Italy who are target users of the technology; and observations of workshops, conferences and seminars. Whereas the initial plan was to carry out in-person observations of researchers' work, to understand how they come to understand certain issues as being relevant to 'ethics', by 2020 this had switched to virtual observations.

the implications for justice, access, and bias. Interestingly, we found that researchers' perception of these issues is informed by the scope and nature of existing debates on ethical issues in Alzheimer's clinical research, particularly around the ethics of disclosure of disease risk in the absence of a disease-modifying treatment. This is such a dominating concern, that other issues specifically associated with 'Big Data' and AI, such as privacy and data ethics, can be difficult to articulate and grapple with, despite their recognised significance and importance.



We immediately realised that not being able to conduct these research activities would have significant methodological implications for the study approach on exploring how people 'do' ethics in practice, as opposed to how they talk about it in principle.

Dr Alessia Costa, Social Scientist

Our initial findings from the SPACE study have identified key ethical areas that stakeholders associate with this research. These include the communication of risk and/or a dementia diagnosis; privacy and transparency; the representativeness of the data that is generated; and



Our ethnographic work on older people's views and experiences of using digital technologies to monitor their health was also significantly affected by the pandemic. We had planned to conduct home visits to ask older people to show us how technology is part of their daily life,

for example, what devices they have at home, and how they use them. But as the pandemic progressed we redesigned our approach to embrace some of the opportunities we were presented with to explore people's relationship with digital technologies.

Firstly, as our daily routines changed significantly during lockdown, so did our relationship with technology. Most of us became more reliant on technologies to stay in touch with loved ones, socialise, or conduct daily activities that were precluded or limited by Covid-19 regulations. Secondly, technologies came to play an important role in healthcare delivery, with many medical appointments moved online. And finally, technological innovations were widely relied upon in the fight against the pandemic, from genomic surveillance to symptom tracking apps and digital contact tracing.

on Covid-19 contact tracing apps to explore people's attitudes towards using digital tools to monitor their health, including issues of privacy and transparency, and the value to individuals and society. We built on these experiences to investigate people's views of possible future uses of the technologies to track and assess non-communicable diseases associated with aging, such as Alzheimer's.

for our shared health resources, have raised questions around the fair distributions of benefits, burden, and risk. From this perspective, the pandemic has contributed to create public awareness on themes that are central to the debate on the ethics of genomics, and which have so far remained largely confined to scholarly debates.



The media and public debate on these questions has also revealed the very concrete risk of polarisation and further entrenchment of opposing views, highlighting the ever greater need for genuine and thoughtful public engagement on these matters.

Dr Richard Milne, Senior Social Scientist



Ethical and social challenges related to the use of technologies were therefore brought to the forefront of public debate, offering us the opportunity to explore questions which might have otherwise remained distant from people's daily experiences. We changed our protocol to conduct repeated phone interviews to discuss people's changing relationship with digital technologies during the pandemic. We focused in particular

Beyond the aims of the SPACE study, the pandemic has placed a spotlight on how issues of privacy, fairness and justice in relation to personal data and data sharing (for example in the context of vaccine passports), can unexpectedly impact all our lives. At the same time, the need to balance restrictions on individual freedoms with the need to protect the most vulnerable members of society, and the implications of these decisions

On trust and trustworthiness around the world

Trust is critical to virtually everything we do in life. Here, Senior Social Scientist, Dr Richard Milne explores the impact of trust on health research around the world, and in the context of a pandemic.

Wherever we are in the world, for most of us 21st century living requires a strong degree of trust. We trust that when we deposit money into a bank, it will still be there when we want to retrieve it later; and we trust that when we buy a loaf of bread from a shop it will not contain any ingredients that will be harmful to us. Research based around genomics and health data has huge potential, but is also a field where trust is critical. The people who collect, use, and regulate health and genomic data need to be trusted by those who donate both their biological samples and information. Without such trust, this research would quickly become unsustainable and grind to a halt.

Understanding global attitudes

Our Your DNA, Your Say project has been analysing public perceptions of genomic and health data and its use, using a survey-based approach. Working with global collaborators we have collected responses from over 35,000 participants around the world, in 15 different languages.

We've found that people's levels of trust in different groups who might collect, share or use genomic data varies substantially. We can draw

some consistent conclusions: across the board, people trust their 'own' doctor most (even in health systems where they might not have an identified family doctor or GP); other doctors and researchers from the non-profit sector less; and researchers working in for-profit companies and governments the least. They also trust all of these groups within their country more than they trust those outside it.

However, we've also found significant differences. For example, in China, trust in government is much higher than in the UK; and the percentage of people who trust for-profits is four times higher in the USA than it is in Germany. It's difficult to identify consistent reasons for why this may be, as they are likely to differ from country to country. For example, our collaborator, Professor Yali Cong, has suggested that trust in government in China reflects a long tradition of reliance on centralised power and authority. And in the USA, we might think that the greater involvement of for-profit companies in healthcare and research makes trusting them a bigger part of everyday life.

Our findings probably do reflect wider social and cultural trends. We know

for example, that levels of trust in general vary around the world – if you take data from the [World Values Survey](#), over 60% of people in China say that most people can generally be trusted, compared with only 6% in Brazil. The 2019 [Wellcome Global Monitor](#) study also showed how much trust in science and scientists varies around the world. While they found that nearly three quarters of people overall trust scientists to some extent, trust was substantially higher in Europe, North America and Australia than in Africa or South and Central America; and that trust was strongest in countries where incomes are more equal. They also found that those people who trusted their government were much more likely to also trust in science.

Trust in the time of a pandemic

Trust in scientists' use of data, as well as trust in science as a whole is relevant to the pandemic, not least in trust in treatments and vaccines for Covid-19. In both the cases of data collection and vaccination, people are put in a position where they are potentially vulnerable – and rightfully have questions about whether data might be misused, has the vaccine been properly tested, will it have side



effects, and so on. It is difficult to give definite, certain answers to these questions for any specific individual. Even when legal and governance protections are in place or when testing is strict and comprehensive, some people may be harmed. Because we can't truly give definitive answers, scientists, doctors and governments have to ask people to trust – and to receive this, they need to be seen to be worthy of that trust.

Building trust

Before and during the pandemic, there has been a lot of emphasis on the need to build trust, and discussion of how to do so. This suggests that trust is something the public lack, and that getting the right messages will address this deficit. I think there are two important nuances to this. The first is that not being trusted isn't always the same as being outright distrusted, but may just be a case of being unwilling to take that final 'leap of faith' that means putting trust in someone. The second is that putting the onus on researchers to build trust risks setting an almost unachievable goal. A better goal is to focus on helping researchers to be worthy of trust, and to demonstrate that this is the case. Our research suggests that

while some responsibility here does lie with policymakers – for example to ensure that legal protections and sanctions are in place – these are not necessarily the most important things to build trust, and might instead be more useful to stop people losing trust in the first place. Instead, our work in *Your DNA, Your Say* suggests some things that are particularly important in helping researchers to be, and be seen to be, trustworthy – being transparent about what research is being done, who it's going to benefit and how, who is using data, and how they stand to benefit. These are all things that are within the scope of researchers to think about and act on. Ultimately, if we build research that is worthy of trust, we can only hope that trust will be well-placed, while communicating with the wider public about what 'trustworthy' research looks like may also reduce the likelihood that people are affected by the consequences of misplacing trust in researchers or organisations that don't meet these standards.

The journey to virtual conferences

Our learning and training programme is global; connecting scientists and healthcare professionals across the world. We could see the pandemic approach from the questions our conference delegates and speakers were asking us about our upcoming events.



From January 2020 onwards, some delegates were unable to travel due to the newly introduced travel restrictions. However, the prospect of cancelling a large-scale conference, Single Cell Biology, a few days before the event was due to start, was somewhat daunting. But we quickly discovered that our participants were glad not to have to travel, and for us to have made this decision for them. By mid-March we had decided to pause our in-person programme and move to a virtual one, and a week later the UK entered its first lockdown.

As a team, we quickly realised that the only opportunity most researchers would have to share their ideas and discuss the latest research was through a virtual conference. We had previously live-streamed some of our conferences, but going fully virtual was a new undertaking for us. We worked closely together to devise new virtual processes for our conferences – while also working remotely and not physically seeing each other. We certainly hit the ground running!

One of the biggest challenges for us was ensuring that a virtual offer

It was useful to have a new focus to help distract us from all that was going on in the outside world over which we had no control.

Laura Wyatt, Conference and Events Manager



delivered a good experience for all our event participants, enabling them to share their ideas and to network online. And we worked with our established audio-visual partners Venue AV to design a virtual conference platform. We decided that, as our speakers and delegates are based all over the world, in different time zones and with variable internet connections, our conference format would include pre-recorded speaker presentations. This approach was complemented with a live Q&A at the end of each session – which helped bring a sense of immediacy. We used a proximity-based networking application, SpatialChat, to enable delegates to meet each other and have online discussions. We also introduced extra elements to our platform to improve poster presentations – but as most other organisers would agree, this has been one of the main challenges in delivering virtual research conferences.

Since going virtual, we have reached a larger audience than possible in-person, and have increased the participation of delegates from the Global South. In the past year, over 10% of the 5,686 delegates who attended our events have been based in low and middle-income countries. This has been a major positive for us, as we are acutely aware of the many barriers that exist in travelling to international conferences.

We'll be introducing hybrid conferences in 2022, so that we can offer the scientific community the best of both worlds – an in-person experience, or a virtual one. We think that hybrid events can enable a more diverse global audience to participate in a conference, while also considering broader issues around sustainability.



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We're looking forward to the international scientific community reconnecting at our events on the Wellcome Genome Campus, where we can facilitate the sharing of knowledge and the meeting of minds.

Dr Treasa Creavin, Head of Conferences and Online Training

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#flowcellular: recipes for creative collaboration

In early 2020, we commissioned artists from the Saturday Museum to develop a creative collaboration with researchers and public participants, and create an exhibition aimed at exploring research within the Cancer, Ageing and Somatic Mutations programme at the Wellcome Sanger Institute. The programme seeks to understand more about how our DNA changes over our lifetime, due to a variety of biological, lifestyle and environmental factors and how these affect our health as we get older.

collaboratively in clusters, meeting regularly in the larger group. They used Zoom to connect and swapped their labs and studio spaces for their kitchens and homes.

The project has been unique for us in many ways. It has made space for a deeper level of engagement with a single group of the public over time. It has brought people with lived experience of cancer together with researchers studying cancer. The group of participants has been

We launched our first online exhibition in the Genome Gallery, and an accompanying online events programme, attracting over 600 attendees to the live events and more than 3,000 visits to the exhibition. #flowcellular was also selected as part **Engage Unconference 2021 'Part 1 – A recipe for Collaboration'**.



I've been thinking of new experiments to do because of this project. When we were doing the fruit [break and repair metaphor] we were talking about how some repair mechanisms are better than others, and then that made me think well, how much better are they than others? We know some are better, but not really quantifiably... so I've been starting to think about how to design an experiment to test how much better one [mechanism of DNA repair] is than the other... Playing around with things helps you think outside of the box, and it helps you to ask questions you might not have asked otherwise.

Dr Alex Cagan, Researcher, Wellcome Sanger Institute



The collaboration aimed to provide a platform for people to explore the themes of the research in dialogue with people's health-related experiences, and to share that learning with each other and the public. Lockdown forced us to work together online and we were impressed with the response and commitment from participants despite the backdrop of a pandemic and all the challenges that brought for individuals. Over the course of a year, two artists, five researchers and ten public participants worked

inter-generational, ranging from people in their early 20s to their 80s. We connected with Science Gallery London, Wysing Arts Centre, Addenbrookes Cancer Patient Participation Group, Zoological Society London and Cancer Research UK Patient Advisory Panel for Policy, Information and Communications. Despite the significant challenges facing each organisation they generously supported the project by connecting us to public participants and hosting or collaborating on public events.

Some interesting insights on the impact of this project are already emerging, such as the researcher's approach to their scientific practice, including bringing new questions and ideas for research back to the lab and finding new ways of communicating and writing about their work. For some of the public participants, they have reported increased confidence in engaging in science and an increased sense of trust in science.



Enjoy content from our **#flowcellular event** and explore the online exhibition



“

I've really enjoyed it. It's been life changing for me, I didn't expect it to be such an amazing project... I started to look at things in a completely different way. When I heard about the [Covid-19] vaccines the first thing I wanted to know is how do they work?... [now] I want to know the science behind it, I wouldn't have thought of that before, it would have just gone over my head.

Melody, public participant with lived experience of cancer

”

Highlights from **#flowcellular** feature on our Instagram Stories collection.

Understanding research, race, and equity

At Wellcome Connecting Science our mission is to enable everyone to explore genomic science and its impact on research, health and society. Along with the Wellcome Sanger Institute, we are part of a wider organisation that aims to foster an inclusive culture, where everyone can thrive and diversity is celebrated.

In 2020, following the murder of George Floyd and the rise of the Black Lives Matter movement, we joined many others in the academic research and Higher Education sector to state our commitment to equality, diversity and inclusion. And although we like to think of ourselves as a diverse and inclusive organisation, has that always been the experience of our audiences, users, staff, and colleagues? Is 'everyone' really able to experience and benefit from genomics in the same way? What does this look like in our sector, and what does it mean for our programme? The answers to these questions are not clear cut, and we have taken time to consider our responses.

The racial inequalities that persist in society are mirrored in academia, with a lack of diversity amongst senior leaders, and an under-representation of historically excluded people progressing within the field. When we examine data from the UK, we see that people of colour, and those specifically from a Black background are particularly disadvantaged, and this flows along the whole of the educational pipeline - from exclusion rates at school and undergraduate degree awarding gaps, to lower success rates with grant funding

agencies and proportionally fewer numbers of Black people at postgraduate and professorial levels. We took the recognition of structural inequalities and racism reflected in these stark contrasts as the starting point for our thinking.

“

Moving towards actively addressing structural racism may not be a comfortable journey. It will require self-reflection and scrutinising our own projects and processes. But there are a range of positive actions we can take as a programme, and as individuals, to develop in this context.

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Wellcome Connecting Science is committed to:

- Actively seeking to ensure that our activities reach Black, and other historically excluded and marginalised groups in the UK.
- Ensuring that our public-facing activities include and reflect Black, and other minority voices, and audiences, while recognising the trauma and challenge that this may bring for some.
- Ensure that our professional-facing activities acknowledge structural inequality in the UK, and actively include and promote the participation of both current, and the next generation, of Black and BAME healthcare and research professionals in training and learning activities.
- Working collaboratively, to strive to make our activities with global communities inclusive, increase awareness and understanding of research inequality between the Global North and South, and address specific barriers to both participating in, and benefiting from, research.

As a programme, we are focused on learning, training, research, and engagement around genomic knowledge that will ultimately deliver benefits for all of society. But our work also needs to acknowledge that not everyone in society is currently able to benefit on an equal footing. We are exploring how we can address structural barriers to participation, and promote and amplify Black and other historically excluded voices as a response to the specific inequalities present in the UK, and globally.

Our Research and Race Equity Action Plan sets out a number of areas where we seek to bring these commitments to life. Some of these actions are around processes, for example, we recognise that we need to improve our knowledge of who is currently accessing our professional and public-facing activities, in order to understand who is missing and why. Some actions relate to sector-wide activities, and we are currently planning a new project which will explore the language used as descriptors of race and ethnicity in genetic and genomic research, involving community perspectives from a range of stakeholder groups. On a wider organisational basis, we are active participants in mandatory staff training on diversity and inclusion, and supporters of our staff Race Equity Network.

As an impact-driven programme, that is part of an evidence-based organisation, we want to ensure that our actions are effective in delivering the progress that we want to see. We collect data for this purpose so that we can analyse if the decisions and actions we take are fair and effective. But we need to humanise this data and remember that behind each data point there is a person. We also need to look at the intersections with gender, disability, socio-economic background, and other characteristics, and be aware of varying experiences and the overlapping and interdependent systems of discrimination. We are not monolithic beings, but diverse, complex and unique. We expect to learn and

develop, as we embed our research and race equity commitments into our processes and work plans. In addition, we certainly don't expect to get things right all of the time. However, along with our colleagues in the Sanger Institute and our funders at Wellcome, we do expect to make positive changes to how we do things and to influence how the wider world of learning, training, research and engagement with genomics works.

Based on an article written by Dr Ireena Dutta, Associate Director, Wellcome Connecting Science, and Dr Saher Ahmed, Head of Equality, Diversity and Inclusion, Wellcome Sanger Institute, for the Sanger Institute blog.



Read full article: 'Reflections on race and equity in research: One year on...'



Supporting young people and diversity in STEMM

For some young people, a STEMM career can seem out of reach or inaccessible due to a lack of representation in the sector and other structural inequalities. The Black Lives Matter movement of 2020 brought into sharp focus that we should, and could, be doing more to support Black students with our education offering.

In January 2021, we piloted Black STEMM Futures, a new initiative in partnership with the Youth STEMM Award. The pilot aimed to offer students of Black heritage and other minoritised ethnic groups the opportunity to complete a Youth STEMM Award – a national skills-based award for students aged 13-19, designed to support and inspire the next generation into Science, Technology, Engineering, Maths and Medicine (STEMM).

A highlight of the programme has been the speaker series, featuring Black and other minority group scientists from different backgrounds and disciplines. Speakers included Dr Mandisa Green (first Black President of the Royal College of Veterinary Surgeons), Dr Eric Numkam-Fokua (Optoelectronic researcher, University of Southampton), Tapoka Mkandawire (Wellcome Sanger Institute PhD student), Dr Christine Boinett (Bioinformatician, Wellcome Sanger Institute) and Dr Nishadi De Silva (Data Scientist, EMBL-EBI).

Between January and August 2021, the pilot programme supported students from 12 schools in London, Luton and Kent to complete a bronze or silver Youth STEMM Award. With staff from across the Sanger Institute and EMBL-EBI, we provided a bespoke programme of talks, STEM activities, advice and support, which enabled each student to gain the knowledge and confidence to complete their award. Students also created a portfolio of activities that became part of their applications for sixth form college and university admission.

Starting a new online pilot project during a third national lockdown was not without its challenges! Some teachers and students were shielding at home, some schools were unable to join the pilot or participate in the way that they had originally planned. Issues included schools' IT security; a federation wide email-hack; limited access to devices at home for less advantaged students; and pressure on students to catch up on other school work. These

difficult conditions impacted online communications between our team, students, and teachers, and meant that some students were not able to participate in the programme as fully as anticipated.

Despite this, our pilot programme achieved a real impact, engaging 159 young people overall. These students recorded 854 individual activities – 242 of which were provided directly by our team. In total, students completed 1,600 hours of activities, with 20 completing their bronze or silver Award, and the remaining students well underway and due for completion in the next academic year.

Two of our Black STEMM Futures schools, the Harris Academy Chafford Hundred and Icknield High School in Luton, were recognised by the Youth STEMM Award as the most active school of the month in March and May respectively. They logged the most activities of any school in those months – a fantastic achievement for two schools who were only a few months into starting our programme.

In October 2021, an online celebration event recognised and celebrated the achievements of the students and schools who took part in the first year of the pilot. During the event, six students were recognised as winners of special prize categories for their outstanding individual work and effort, as well as the most engaged class.

Following this successful pilot, we have re-launched for the new academic term using the name **My STEM Future**, which better reflects the diversity of the students and scientists involved. We will be continuing to support students who joined in the previous year, as well as welcoming a new cohort to take part in the Award.

My STEM Future Online Celebration Event, highlighting two student winners: Malick, winner of the Outstanding Year 10/11 Student prize; and Huzaifa, winner of the Outstanding Year 12/13 Student prize; along with members of our team and the Youth STEM Awards team.



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Explore the **My STEM Future Speaker Series**



Sign up to our education **newsletter** for highlights of upcoming opportunities for primary and secondary school learning and engagement.

‘The YSA award has been a great experience for students at Icknield High School. The resources and guest speakers are very informative and quite interactive. They provide an opportunity for us to extend our scientific knowledge and provide high-quality career guidance to help us make informed decisions about our future.

Student, Icknield High School, Luton

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Looking at our past: Georgians, jet engines, and genes

From a family home to a local community hub, and a wartime billet to a powerhouse of discovery and innovation, we have been exploring the long and tangled history of Hinxton Hall.

We develop and deliver a diverse programme of learning, training, research and engagement, which is global in its reach. We are located on the Wellcome Genome Campus, by the village of Hinxton, near the city of Cambridge, in the UK. The Campus totals around 100 acres of buildings and green spaces, and we are tucked in alongside neighbours such as the Wellcome Sanger Institute, EMBL European Bioinformatics Institute, and Genomics England.

If you have ever visited the Wellcome Genome Campus when attending one of our research conferences or training courses, or as part of a school visit or public event, did you notice Hinxton Hall at the north end of the Campus? For those of us who work on the Campus, it's easy to take the Georgian country house where we

often hold our meetings and events for granted.

The Hall is a Grade II* listed building, meaning that it is on a register of properties compiled by English Heritage that are of architectural or historical interest. Grade II* listed buildings are "*particularly important buildings of more than special interest*" and only around 5% of buildings on the register are in this category. The Hall is now part of Hinxton Hall Conference Centre, and both our own team and our colleagues in Estates and Facilities Management, invest significant time and effort into ensuring that it is well maintained and preserved for future generations.

Over the past few years, we've started to think beyond the Hall's physical structure, to consider who actually

lived here. What were their lives like? And how did the Hall become part of a site that is a global leader in genomics research? We decided to try and find some of the answers!

A core group of our Conference Centre and Programme staff have been researching the earliest days of the Hall, its links to the village of Hinxton, and its use before it was part of the Campus. As well as accessing the work of specialist historians, we've been lucky enough to speak with some of the people who worked in the Hall in the 1950s and 60s, and even meet some of the descendants of the family who owned and lived in the Hall through the early 1900s.

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I have had a keen interest in the history of Hinxton Hall since I started working at the Conference Centre in 2014. I felt the story of the Hall and the estate had yet to be told so I jumped at the chance of being involved in this project. One of the best aspects for me was gathering research from the local community during an open day, and visiting Alastair and Lavinia Robinson in their family home. It was so lovely to be able to hear stories and view photographs and letters from people who were connected to the Hall, and I felt it added a real personal touch to the whole project.

Sophia Tirelli-Hurst, Event Coordinator

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We've found an intriguing literary connection or two, a family identity swap, and a number of unexpected uses for a butler's pantry! The diverse skill set of our programme, has meant that we've been able to draw on the expertise of our Digital Programme Curator, Beth Elliott, to produce an online exhibition which enables interested audiences to delve into some of our findings.

The Genome Gallery exhibition includes a variety of personal stories, memories and imagery of life in and around Hinxton Hall. It's also the home to a short season of live digital events which discussed the Hall's connection to nature and its kitchen gardens; its first iteration as centre for research and development; and its more recent role in providing space for the Human Genome Project and Covid-19 sequencing and surveillance.

As with all journeys through history, it is only when we start to look that we realise how much more there is to find. We have really enjoyed getting to know some of the people who lived and worked in this fascinating place, their day-to-day lives, as well as the extraordinary events and achievements that shaped them.

Beth Elliott, Digital Programme Curator

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There are definitely many gaps to fill in the story of Hinxton Hall, and we're very interested in discovering more about where the wealth of the families who lived on this estate came from. But in the meantime, whether you'd like to take a step back in time, and find out about our connection to the development of the Raleigh Chopper bicycle, or explore the impact of 21st century genome sequencing, do pay a (virtual) visit to our exhibition.



➤ We're delighted to be reopening our Conference Centre in 2022. We have a wide range of both modern and heritage spaces, suited to large-scale events, and small private meetings. Our experienced team has expertise in supporting cutting-edge research conferences, retreats and away days, and professional networking and training events. The grounds of the Hinxton Hall estate offer a perfect opportunity to take a break, and even have a game of croquet on the lawn! We have a range of flexible indoor and outdoor meeting options, so please do get in touch, **we'd love to hear from you.**

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