

Imperial College
London



Three years of the Agilent Measurement Suite

How a strategic partnership
is shaping the future of
analytical science

Foreword Imperial

The Suite lets Imperial host the latest, regularly updated experimental equipment from a world leader, making it available to researchers across a wide spectrum of disciplines. It advances a wide range of our chemistry, biology, medical and environmental research, including increasingly cross-cutting research streams undertaken by our staff and students and companies in our ecosystem. And it supports our mission to produce highly skilled people who are ready to enter highly rewarding scientific jobs.

We believe that working with Imperial has delivered many benefits to our partner Agilent too. It ensures our staff and students – the future leaders of scientific research – are exposed to and trained on their instruments. It showcases their capabilities to our research community and our ecosystem of startups, scale-ups and pharmaceutical giants. Alongside this intense local exposure the AMS has benefitted from regular visits from government and industry who have been keen to learn about the role the AMS has played in supporting the local ecosystems. From delegations from BEIS through to the UKRI and the US military, visitors have been hugely impressed by what our partnership has achieved.

It is a collaboration, so we learn and advance together, ensuring everyone gets the most from the technology. And we share in the rewards through an ever-growing reputation for quality research at the cutting edge. Most importantly, the world benefits from work that solves thorny analytical challenges from medical innovation to safety testing.

This represents the ideal of a strategic partnership. It is one we hope to continue and grow to deliver ever more benefits to Imperial, Agilent, the academic and private research community, and all those who benefit from work in the Suite.

Professor Richard Craster
Dean of the Faculty of Natural Sciences
Imperial College London

As this report is published, in April 2022, it is three years since the Agilent Measurement Suite, the AMS, opened its doors in Imperial’s Molecular Sciences Research Hub in White City.

The AMS is a truly model partnership between an academic institution and a scientific instrument provider. The combination of Agilent’s equipment, software, and expertise with Imperial College London’s world-leading researchers delivers value to both partners that is greater than the sum of its parts. Indeed, since its inception the AMS has played a pivotal role in transforming the White City ecosystem into one of the most vibrant and fast-growing life science innovation districts in Europe with hundreds of SMEs choosing to locate themselves within a stone’s throw of the facility.

This remarkable growth has been driven by the reputation that the AMS has established as an endeavour that aims to support internal and external users alike, academic and industrial, at any stage of growth. Quite simply it is the beating heart of the White City Innovation District.

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“The AMS has played a pivotal role in transforming White City into one of the most vibrant and fast-growing life science innovation districts in Europe.”
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Foreword Agilent

During a pivotal meeting in 2016, the Imperial team shared their vision for the new campus at White City and the Molecular Sciences Research Hub with Agilent CEO Mike McMullen on his visit to the UK. With that, the wheels were set in motion to develop a unique, mutually beneficial partnership between these two leading institutions.

In February 2018, Agilent Technologies and Imperial College London signed the strategic scientific collaboration agreement that confirmed their plans to bring together Agilent's leading analytical technologies with Imperial's outstanding researchers.

Three years on, this report highlights some of the real successes generated by this strategic academia-industry collaboration. The Agilent Measurement Suite, which officially opened its doors in 2019, has been important in many ways for both parties. The laboratory's open-access policy means it is used by students, scientists from Imperial and external researchers alike, giving them access to state-of-the-art analytical instrumentation, whilst it also serves as a demonstration lab and showcase for Agilent.

The collaborative nature of the partnership has not stopped at the AMS, but has blossomed into other equally rewarding opportunities including a joint podcast series, reciprocal speaker opportunities, and the use of the campus and facilities to host Agilent-run symposiums.



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The AMS as seen from the lobby of the Molecular Sciences Research Hub in White City.

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“We have the absolute pleasure of knowing that we have assisted researchers in their achievements by giving them access to real industry tools, services and support.”
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The snowball effect that this partnership has had for both parties has been a joy to witness. We see the research work being done utilising this facility, and we have the absolute pleasure of knowing that in some small way we have assisted them in their achievements by giving them access to real industry tools, services and support. Very early on we saw this as a key opportunity

for us to involve ourselves with top researchers from a leading university, working on some really pioneering research. We are really proud of this continued collaboration.

Dr Darlene Solomon
Chief Technology Officer
Agilent Technologies

About the Suite

The Agilent Measurement Suite is a 120 m² facility in Imperial's Molecular Sciences Research Hub containing advanced chemical analysis instruments provided generously by Agilent and further Agilent equipment brought by [SynbiCITE](#), the national centre for the translation of synthetic biology.

Equipment housed in the AMS includes mass spectrometry, chromatography, spectroscopy and cell analysis systems.

At a fundamental level, the AMS offers highly accurate and reliable measurement technology that expands Imperial's technical capabilities. The kit is upgraded regularly to ensure the Suite remains state-of-the-art.

However, the model is a bit different to the usual lab-time-for-hire. From the start, the idea was to combine expertise from across Imperial with deep instrument know-how from Agilent to help researchers progress advanced research and expand their technical skills. Users are expected to do the measurements themselves, and are provided with training and support to do so. First-time users can book instrument training through Agilent's scheduling software and go on to book instrument time.

In this way, researchers learn how to get the most out of the instrumentation and get better results. "If users invest time and energy learning, they make best use of the instrument," says Professor Tony Cass, AMS Director, "and they will be able to take on more complex longer-term projects." This helps upskill scientists in a variety of disciplines.

This commitment to training the next generation of research leaders was for instance instrumental in Imperial

securing over £10 million towards two prestigious UKRI Centres for Doctoral Training in Chemical Biology and Next Generation Reaction and Synthesis Technologies. These have funded the PhD training of over 200 scientists.

The Suite has developed a complementary programme of collaboration and knowledge sharing. It proactively runs training sessions for a wide range of relevant parties, operates open 'lunch and learns', and has even developed a podcast series to highlight the work going on to a wider audience.

These all contribute to the goal of making the Suite accessible and helping researchers understand the opportunities it presents to do ground-breaking science. The success of the AMS and its collaborative framework has attracted extensive interest across the globe with delegates from industry, academia and government visiting regularly to learn about its vision and operational frameworks.

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Users are provided with training and support to use the AMS.



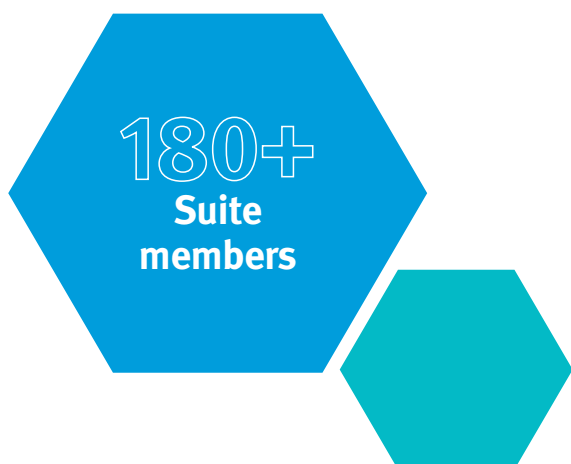
The future of analytical science

Analytical science is evolving in two directions. First, ever-greater accuracy is an ongoing trend making ever more demanding research questions tractable. Second, digital technologies will change how research is carried out. The AMS is a model for both trends.

BETTER INSTRUMENTS MEAN BETTER SCIENCE

Sensitivity is improving all the time. It allows lower concentrations and smaller sample sizes to be studied, while higher specificity lets researchers identify the full breadth of molecules in complex mixtures. “We can now get huge detail from very small samples,” says Professor Cass.

The AMS is a good showcase for this trend. Not only does it house the most sensitive technology, it also has a programme of continuous improvement that allows researchers to feed back their needs, so Agilent can make upgrades to support them – whether by modifying setups or shaping their R&D for their next generation instruments. This allows more rapid progress in improving capabilities than is possible in most measurement labs, where the manufacturer has little direct involvement.



CASE STUDY Organic transistors, solar cells and biosensors

Professor Martin Heeney and his group are carrying out pioneering work on organic semiconductors and their applications. They are using the AMS to advance their work designing organic polymers that conduct electricity and have other performance characteristics, such as the ability to be easily shaped into very thin films, which make them useful for more efficient transistors and solar cells.

Bowen Ding, a PhD student in Professor Heeney’s group, is working to develop organic materials that could be used to receive and transmit information in the same way the body does, making them potentially useful for a future generation of biosensors that register fine-grained information about neural activity, heart rate or the presence of certain molecules. Mr Ding has used a variety of equipment in the AMS, including the Cary 7000 universal measurement spectrophotometer, which has allowed him to characterise light absorption of materials.

One important advantage of the AMS, he says, is its model of pooled access to advanced equipment. “Quite often you need a machine your group doesn’t own as a one-off – research takes you in weird directions – and to get access to it requires a lot of creativity. Traditionally, scientists are possessive about their equipment, so if it belongs to a particular group, it doesn’t get used to its full potential,” he says. “The AMS has a collection of very advanced equipment which is accessible to all.” He also mentions the on-site support he received: “Learning first hand from a specialist is often more helpful than from a fellow researcher. The specialist taught me how to change the attenuation of the detector so you get nicer spectra. That sort of detail was very helpful and cannot be replicated in a standard lab setting.” The group has published papers derived from work in the Suite in journals including *Angewandte Chemie*, a leading chemistry journal, and *ACS Materials Letters*.





THE DIGITAL TRANSFORMATION OF RESEARCH

Improved accuracy is an ongoing trend. But a step change is now underway, driven by the tools of industry 4.0 – digitalisation, automation, AI, the Internet of Things, and robotics – that will make chemical analysis an increasingly digitally-connected field.

Digitally-connected chemistry will allow measurement of reactions in real time, with data fed into AIs that help researchers uncover insights. Machine learning can analyse very large quantities of data and spot patterns humans could not. The whole workflow will become more automated; in drug discovery, for example, researchers will be able to move from identifying target molecules to synthesis of small molecule lead compounds in a single workflow. “Automation is the big trend of 21st century science,” says Professor Cass.

Underpinning this is democratisation of research. Simple user interfaces and data analysis tools such as those being

made available to AMS users mean that the level of expertise required to use this advanced technology is shrinking. At the same time, cloud and mobile technologies, alongside open data, make it easier to interrogate data and build on other researchers’ datasets. That opens up sophisticated research capabilities to early-career scientists and more opportunities for researchers to cut across disciplines.

“Our technologies are designed to make data collection, sharing, and interpretation easier, and enable more to be done remotely, making analytical techniques more accessible for more researchers within more diverse fields,” says Jake Brown, UK Sales Manager at Agilent. “And I can only see us going further and further in that direction.”

AMS’s proximity to Imperial’s centres for data-centric chemistry and automation, [ROAR](#) and [ATLAS](#), its new molecular design institute [DigiFAB](#) and machine learning initiative [I-X](#), will support researchers in this transition by allowing them to combine their high quality measurement data with digital and automation technologies and expertise.

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NEW TECHNOLOGY CHANGES HOW WE DO SCIENCE

“This data-driven transformation is leading not just to new technology, but to a new breed of scientists,” says Professor Cass. “Today’s generation will be more comfortable with new measurement capabilities, complex analytics, and a much more collaborative approach to research.”

Many such scientists are being trained in the AMS. Its collaborative and supportive approach is teaching early-career researchers how to use the latest instruments, measurements science techniques, software, and data analysis tools. All of which, as Wolfgang Mayser, Agilent’s European Market Development Manager, notes, “will play an important role in preparing students for future jobs in science, industry and governmental labs.”

This greater measurement resolution, analytics, data sharing, and new skills will all combine to accelerate research. “In the past, when we talked about answering the big biological questions, we’d often talk in 20-year timescales,” says Professor Oscar Ces, head of Imperial’s Department of Chemistry. “But we now regularly solve far more complex problems in just a few years. This is very much due to sharing of expertise

and access to cutting-edge equipment in supportive environments such as the AMS. Partnerships between academia and business like this will be key to the march of progress.”

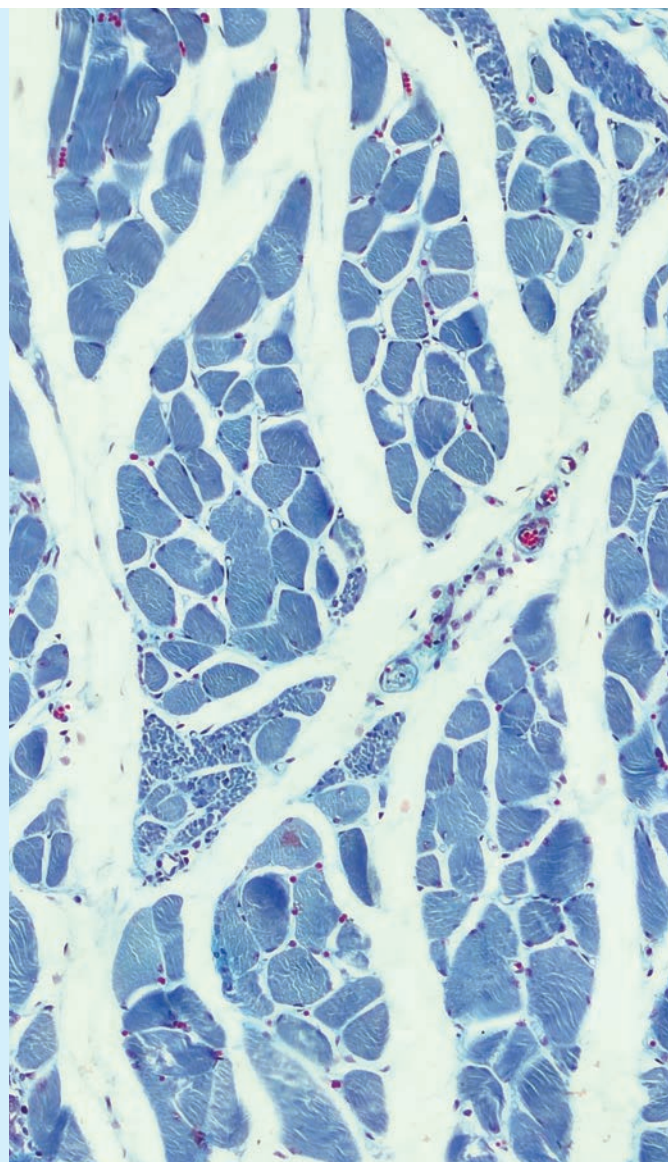
“In five to ten years’ time, analytical chemistry will be unrecognisable,” says Professor Ces. “And the work happening at the AMS is at the forefront of this change.”

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CASE STUDY Tissue engineering

Dr Yuan-Tsan Tseng, a biomaterials scientist in the National Heart and Lung Institute, works on tissue engineering – an advanced form of medical treatment in which living tissues are created artificially to repair or replace damaged organs such as the heart. As part of a wider research team including his Principal Investigator Professor Sir Magdi Yacoub and Dr Adrian Chester, Dr Tseng and colleagues focus on modification and manufacture of nanofibrous biomaterials that are used as intelligent temporary support to instruct and direct tissue growth in the body before biodegrading and replaced with native tissue – this has other innovative applications such as heart patches, skin grafts and temporary wound dressings.

In the AMS, Dr Tseng has had the opportunity not only to use the Gel Permeation Chromatography (GPC) instrument but to gain practical training on it. He has used GPC to determine the molecular weight of polymers both in vitro and in vivo, where it was implanted into animals to understand the rate of degradation and enable him to characterise the interaction of biopolymer degradation within a living system. “We found this was a very useful technique for determining whether our materials function as we hope they will, which gave us high reproducibility in terms of data,” he says. Dr Tseng and colleagues have a manuscript in preparation based on this work that will help drive forward the development of next-generation tissue engineering treatments.



Imperial and Agilent: A strategic partnership

The partnership brings together the company's equipment and expertise, and the College's research capabilities. It has helped researchers make remarkable breakthroughs including a new understanding of human microbiomes, biomarkers of disease, and techniques for delivering therapeutics into the brain. It has helped make the world safer by detecting contaminants in drinking water, pesticides on fruit, and over-the-counter painkillers in purported herbal medicines. Ever more exciting research will be possible in future.

140+
collaborations
supported



CASE STUDY Finding adulterants in herbal remedies

The AMS is being used to offer analytical services both to the Imperial community and to academic researchers, businesses, healthcare providers and other organisations around the world.

In one case, a paediatrician working in West Africa contacted Imperial about analysing traditional African herbal remedies that he suspected had been adulterated with pharmaceuticals as young children in his clinic were showing symptoms consistent with this.

Dr Trevor Ferris, Facility Manager at the AMS, obtained several samples of the herbal materials and using the Suite set about determining which, if any, adulterants were present. Working closely with Dr Gordon Ross, a senior applications scientist with Agilent, he used a large database of known toxic compounds to screen the samples. This allowed them to quantify the identified adulterants.

Researchers used this to gather information that could be used to guide treatment.

Dr Ferris said: "This has been a very exciting project and I am delighted that we have been able to identify potential adulterants for further analysis. The facilities within the AMS allowed me to translate my forensic science skills into a detailed and prompt response to the initial enquiry, and I look forward to working with new clients in the future."

Dr Ross said: "I was extremely happy to work with Trevor Ferris in applying our existing screening workflows to such an important real world scenario. Our work together exemplified the role of the AMS in providing high end instrumentation and workflows in a research collaboration. I am equally happy to have co-authored a paper, describing the work, which will be submitted for publication."

CASE STUDY

A biotech company searching for useful bacteria

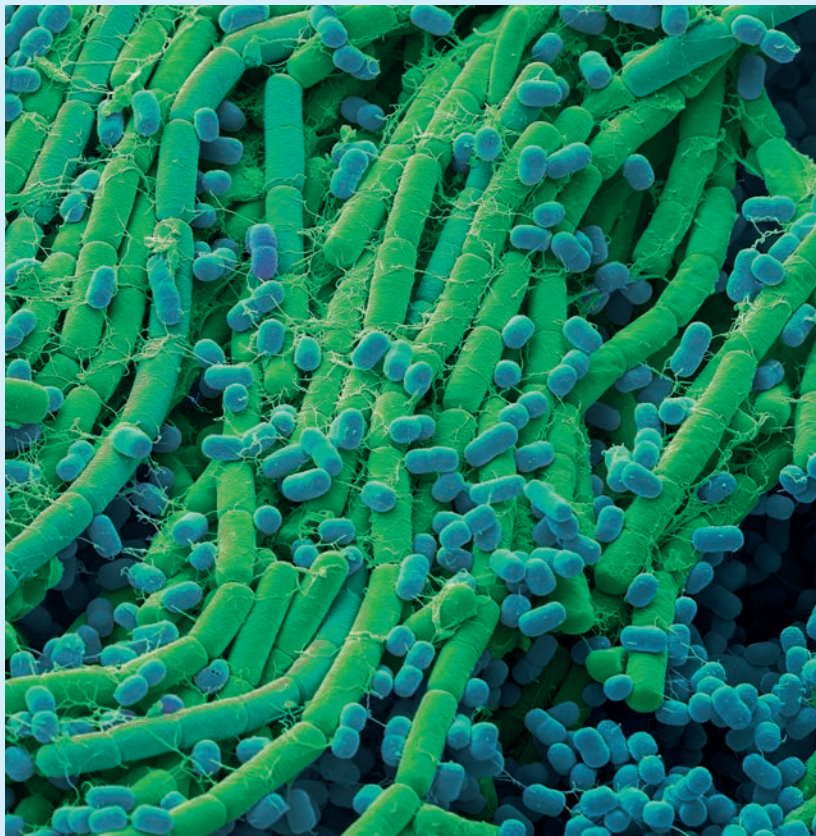
Biotechnology company Bactobio is working to address global challenges such as antimicrobial resistance by culturing unexplored bacteria that have previously been unculturable. Using a proprietary

platform supported by synthetic biology, directed evolution and machine learning, the company enriches for interesting species among the 99% of bacteria that have never before been cultivated, which the team calls biological dark matter.

They then culture these species and screen them for metabolites that could be used for practical purposes such as antibiotics, fungicides and detergents.

The company was launched in the UK in 2020 using founder Dr Daniel Hansen's biotechnology expertise and has already received significant investment (£2.8 million in the most recent round), growing to a team of over 20. Before bringing their workflows in-house with Agilent equipment, they used the services of SynbiCITE to analyse samples for them in the AMS.

"A major attraction was the range of HPLC instruments and column libraries; as a startup we didn't have the funds available to have such an extensive set up in-house. Since our own HPLC is Agilent it made potential method transfers easier and we trusted the quality of the data acquired from the Agilent Measurement Suite," says Dr Jayneil Patel, Bactobio's Head of Metabolite Characterisation.



A SHOWCASE FOR ADVANCED TECHNOLOGY

This research also has tangible benefits for the partners in terms of new connections, exposure and reputation. The Suite has been used not just by Imperial, but by other academic institutions, startups and corporate R&D departments, thanks to Imperial's networks and collaborations. These networks have expanded through positive word of mouth about the Suite's capabilities, and as AMS events and training sessions have attracted in a wide range of interested parties.

This has enabled the AMS to play a central role in establishing White City as one of the most vibrant and fast growing life science ecosystems in Europe. In addition to SMEs themselves, large scale incubators such as Scale Space and BioHotel have chosen to locate in the local area knowing that the companies they host will be able to benefit from the unique capabilities of the AMS. This directly addresses one of the major valleys of death for deep tech SMEs.

As research using the Suite progresses, publications using measurements from Agilent instruments are appearing in journals such as *Nature Communications*,

Angewandte Chemie and *ACS Materials Letters*. Stories are getting around of interesting research applications (see case studies in this report). As evidence emerges of its impressive capabilities, more and more people are being drawn to it.

All of this has allowed Agilent to connect with local SMEs, corporates, and rising stars of academia, and in turn for them to experience the equipment in its most advanced applications. "It provides a place to showcase our top of the range instruments in action to customers from the UK and Europe," says Agilent's Jake Brown.

CASE STUDY Bioplastics

Chloe Baker, a doctoral student in Professor Nicholas Long's research group, is developing novel plastics. "The big message we're hearing is don't use plastic," she says, "but it's used in hundreds of millions of tons a year – most non-biodegradable and petroleum-derived. It inevitably ends up in the sea and on beaches. We can't just eradicate plastic because it's so useful."

Ms Baker's research focuses on biopolymers – 'bio' in this case meaning both bio-derived and biodegradable – derived from lactic acid. She has used the AMS to support her work to develop biopolymers that have the qualities needed to replace conventional plastics in applications as varied as takeaway coffee cups and temporary medical implants. "What we're looking for in my case is high molecular weights and quite low dispersity," she says.

Ms Baker has benefitted in particular from the advanced gel permeation chromatography (GPC) device found in the AMS, for which she received extensive training. "Other GPCs I could access only measure the refractive index of the sample, whereas the one in the AMS will give you more information about polymer size and configuration, due to the extra features of light scattering and viscometry analyses. This was valuable for gaining as much information on the polymers, and without the AMS I would have had to liaise with another group or send my samples somewhere. Having access to the AMS saved a lot of time and money." The results of Ms Baker's research have been published in *Chemical Communications*.



A PLACE TO LEARN AND ADVANCE

Having a constant turnover of world-leading scientists putting instruments through their paces has also helped Agilent to understand the needs of researchers.

This helps them modify and configure instruments to ensure researchers have what they need. Longer term, it feeds into Agilent Research Laboratories, which will use these insights to develop new instruments aligned to the next generation of research needs.

This ongoing real-time feedback helps Agilent develop ever-better technology and ensure Imperial researchers have the capabilities for their evolving needs.

LONG-TERM STRATEGIC VALUE

Whilst there are many short-term tangible benefits, both parties are keen to emphasise that it's all about working together to do great science. Jake Brown says: "the real benefit to Agilent is relationships, knowledge-sharing, academic credibility, and being part of the future of research." Sandra Fiscelli, Associate VP EMEA Sales at Agilent, adds: "These partnerships put our best technologies at the heart of the world's most advanced research, where they can deliver real impact in fields like medicine and environmental science. That is the most inspiring part of our job."

Their comments on the partnership's strategic value are echoed by senior leaders at Imperial such as Professor Ian Walmsley, the Provost, who says: "Our strategic partnership with Agilent illustrates the impact that our research can have in driving innovation. The Agilent Measurement Suite is a key element of the innovation ecosystem centred at White City." Dr Simon Hepworth, Imperial's Director of Enterprise, adds: "It has been inspiring to see the successes of the AMS. The model adopted in our partnership with Agilent now lies at the heart of how we support, collaborate with and learn from early-stage businesses and helps us collaborate with industry in meaningful ways".

"These partnerships put our best technologies at the heart of the world's most advanced research, where they can deliver real impact in fields like medicine and environmental science. That is the most inspiring part of our job."

Agilent and the White City innovation ecosystem

The Imperial-Agilent partnership is both a beneficiary and a driver of the growing innovation ecosystem in the White City area of West London. Imperial's White City Campus, a new hub for translational research, has been designed to support collaboration between researchers, students, and innovative businesses ranging from global corporates to an ecosystem of life sciences and other deep technology startups. This location ensures maximum exposure for the AMS and maximum opportunity for researchers to benefit from its capabilities.

17
in-person
seminars (expanding
as pandemic
measures relax)

↓
Imperial's new campus at the centre of the growing White City innovation district.





The site in White City, acquired in 2013 after the BBC moved out, has been growing as a centre of scientific research with an investment of £2 billion, and the AMS is one of the latest high value additions. The AMS is housed in Imperial’s £167 million [Molecular Sciences Research Hub](#), one of the first buildings in place, and the largest investment in a university building in 21st century London. It has just been joined by the Sir Michael Uren Biomedical Engineering Research Hub, and will soon be joined by the [School of Public Health](#). To the north is Hammersmith Hospital, an NHS research hospital and an important hub for Imperial’s medicine research. Major research companies Novartis and L’Oreal have recently opened new headquarters in the area.

Imperial’s innovation spaces such as the Translation & Innovation Hub and the White City Incubator – which hosts offices, wet labs, and support programmes for deep science companies – have attracted hundreds of life sciences and technology companies at varying stages of growth. In 2020, 51 local biotechnology startups raised a record £1.1 billion investment. For growing businesses, scale up community Scale Space, a joint venture between Imperial and venture builder [Blenheim Chalcot](#), is offering an 18,000 m² workplace.

The presence of the AMS and other flagship facilities has been key to attracting investment in these spaces and new members to join the entrepreneurial community.

“At Scale Space, our mission is to plug businesses into the services, people and space they need to grow, says Richard Broyd, Advisory Director at Blenheim Chalcot. “Access to the specialist technical know-how, bespoke training and state-of-the-art equipment in the AMS and the collaborative open culture of the Molecular Sciences Research Hub has been pivotal in convincing companies across the UK to decide to join our White City community. In turn Scale Space is increasing its capacity for onboarding life science startups over the years.”



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Innovation spaces in White City include
Scale Space, a new community for
innovative businesses looking to grow.



CASE STUDY

Treating neurodegenerative diseases

Protective antioxidant molecules are considered a promising approach to slowing the progression of neurodegenerative diseases such as Alzheimer's and Parkinson's, but their efficacy is limited due to their low bioavailability when introduced to the body. Dr Maria Elena Piersimoni, a senior scientist at Pfizer R&D UK, carried out PhD research using AMS's Seahorse Analyzer in which she explored the use of gold nanoparticles as a delivery system for antioxidants, finding that they have the potential to increase the efficacy of the treatment.

Commenting on the AMS, she said: "It was a really good experience. The software tool provided is quite user friendly, it's not difficult to use. The experts can help you set up your experiment. It's worth asking as many questions as possible." The results of this research were recently published in *Nanoscale Advances*.

MAKING RESEARCH ACCESSIBLE FOR ALL

The AMS is highly visible on the White City Campus. Researchers can simply walk in the door of the MSRH building, into the welcoming atrium, and talk about their measurement and analysis needs. The AMS is the first thing they see, behind large glass doors. The whole setting is designed to be accessible to this community.

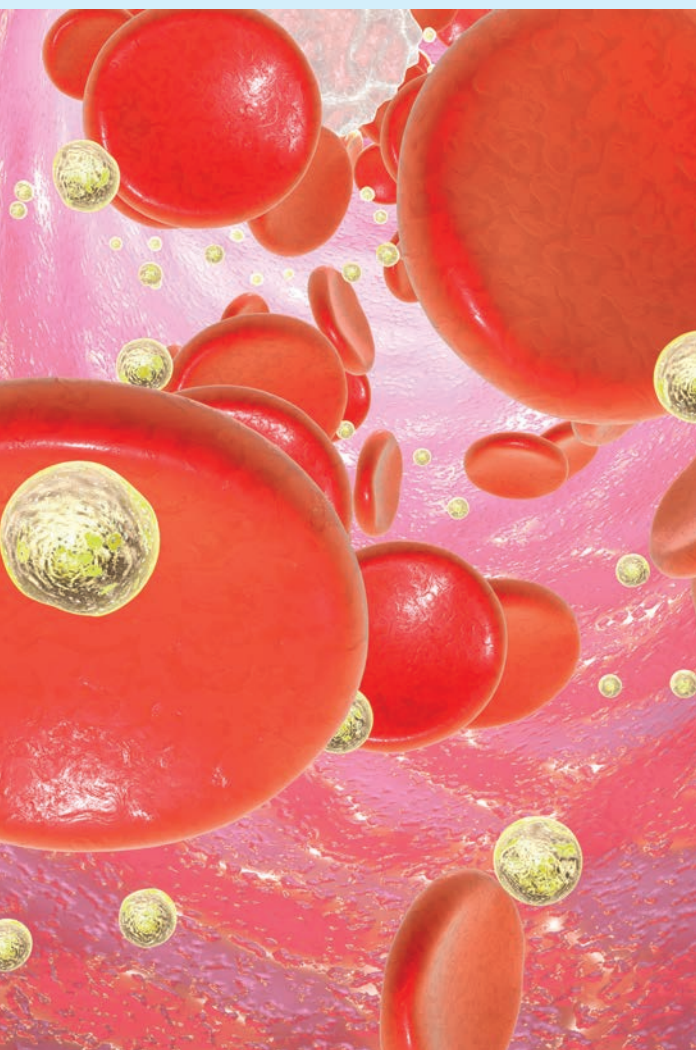
"The White City Campus is creating a vibrant environment of science and multidisciplinary research, with many entrepreneurial activities," says Wolfgang Mayser. "Working with Imperial exposes Agilent to an environment of translational research, and exciting startups and companies."

"The AMS is directly addressing a valley of death that has previously held back the growth of the life sciences SME sector and is transforming the landscape for startups in our community," says Councillor Andrew Jones.

Measurement is often a major roadblock for chemical and life sciences startups, who need it to conduct research and validate claims, but the level of accuracy required is often out of reach as a small business. A vibrant and growing entrepreneurial community is making use of these Suite, for example biotechnology company Bactobio, which is developing technology to cultivate useful bacteria in the lab and was able to carry out studies using Agilent equipment that allowed them to bring workflows in-house.

"Without this easy access to the AMS and the accompanying expertise from Imperial and Agilent – which White City startups now have – much early-stage research would have been considerably slower, if not impossible," says Professor Ces. "By having both Agilent experts and Imperial researchers involved to guide the research and showcase the equipment, we make everything easy for them. The reputation the AMS has established for supporting SMEs from both the College and local ecosystem is world leading – the AMS has become a flag to gather around for the life sciences SME community in London."

Councillor Andrew Jones, Cabinet Member for the Economy in Hammersmith & Fulham, champions the development of local businesses. He says: "By providing companies with easy to access, specialist equipment and unprecedented opportunities for collaboration, the Agilent Measurement Suite is an outstanding example of how we can accelerate the growth of companies by enabling them to undertake research faster. It is directly addressing a valley of death that has previously held back the growth of the life sciences SME sector and is transforming the landscape for startups in our community."



CASE STUDY

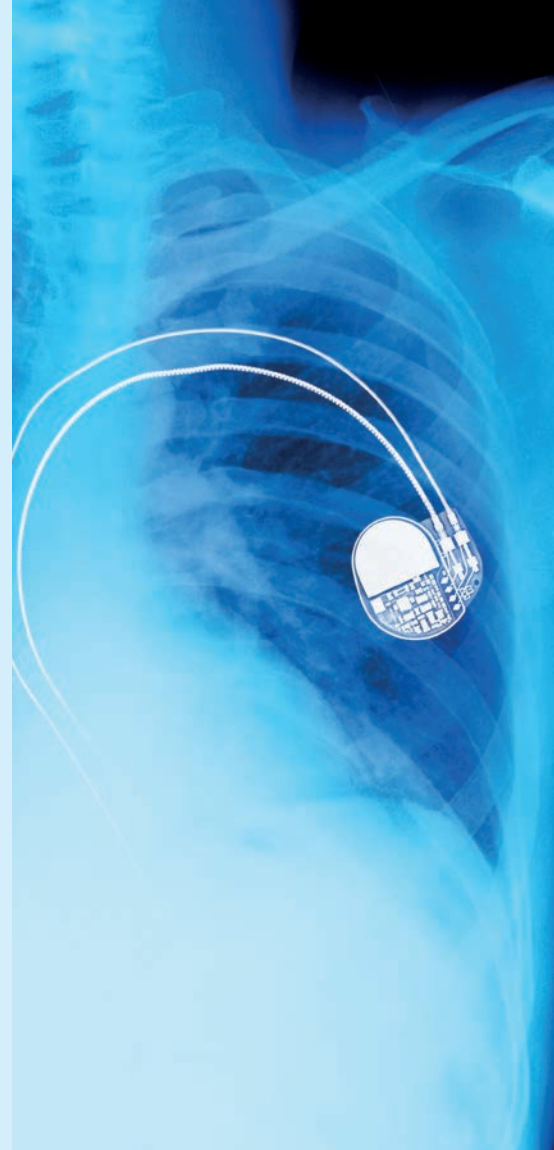
Polymeric pacemaker leads

Alexey Novikov, a doctoral student in Professor Rylie Green's group in the Department of Bioengineering, is developing polymeric leads for pacemakers. Pacing leads run from the pacemaker into the heart to help control its beat. Conventionally made of metal, constructing them from polymers could make them safer and more reliable in the long term, for example because they are more flexible. But any plastic alternative needs to be biocompatible (many are cytotoxic) and sufficiently conductive.

Mr Novikov is investigating polymer-surfactant mixtures that could be used to create leads that have these properties. He measures how surfactants bind to polymers using high performance liquid chromatography (HPLC) equipment in the AMS, using a partly novel methodology. "There already literature on the process for doing this using an HPLC device," he explains, "but I am also trying to improve

it to take advantage of the newest equipment. We now have more efficient columns and new approaches."

Mr Novikov is new to liquid chromatography, but says he benefitted from the practical support in the AMS. "The support staff really helped me. Liquid chromatography requires a lot of decisions on the parameters – which solvents, which wavelengths. They gave me a really good head start." He also praises the flexibility of the Suite. "It's quite difficult to find HPLC equipment. A research group has to be really rich to have their own devices like the AMS has. They would be departmental. But the problem with departmental devices is they are often restricted use – you can only use them for certain kinds of study. The AMS is much more flexible." Mr Novikov has a manuscript in preparation reporting the results of this research.



JOINED-UP RESEARCH CAPABILITIES

While the AMS operates as a standalone facility serving many local research needs, it also forms part of a suite of complementary services. There are eight national facilities within 100 metres. These include the [Centre for Rapid Online Analysis of Reactions, or ROAR](#) (data-centric research in synthesis), [ATLAS](#) (automated high-throughput chemistry), and [NMR](#) (spectrometry). ROAR also hosts advanced Agilent equipment.

These offer natural synergies for users. Digital chemistry can offer more rapid research and fresh insights from ever larger measurement datasets. In turn, reliable data analysis and modelling relies on rapid and accurate measurements, captured in usable formats, and this is exactly what the AMS does. Working together, these facilities improve the speed, reliability and quality of research for Imperial and the SMEs

and corporates that contribute to the College's innovation ecosystem.

"The Agilent Measurement Suite has proven to be a tremendous asset complementing Imperial's excellent research infrastructure at the Molecular Sciences Research Hub," says Dr Christian Holtze, Academic Partnership Developer at chemicals company BASF. "BASF is currently supporting 12 PhD students at the REACT Centre for Doctoral Training with a wide range of analytical needs. Having access to the AMS makes many tools available within the building that might otherwise not be readily accessible and has therefore proven to be extremely useful for conducting efficient research. On a strategic level, the Suite perfectly blends into Imperial's value proposition for research collaborations with industrial partners."

The Suite is now an integral part of the growing White City ecosystem, which represents one of the UK's most

advanced research hubs. Both in its own right, and as part of wider range of facilities, it has become hugely valued by a growing number of local users. And as word gets out, it is helping attract ever more top researchers to the area.

"The Agilent Measurement Suite has proven to be a tremendous asset to Imperial's excellent research infrastructure," says Dr Christian Holtze from chemicals company BASF.

Celebrating our partnership

The AMS was launched in March 2019. The official launch saw the ribbon cut by Professor Alice Gast, Imperial's President, and Maria Angeles Diaz, Agilent's EMEA and India Sales Vice President.

The £167 million Molecular Sciences Research Hub, which houses the AMS, was formally launched in April 2019 by Mayor of London Sadiq Khan alongside Imperial's President Alice Gast, Science Museum Group Chair Dame Mary Archer, and Bernard Taylor, Chair of the Royal Commission for the Exhibition for 1851. It featured a panel discussion chaired by Agilent's Chief Technology Officer, Dr Darlene Solomon.

110+
external visits
involving
over 1,000
visitors

100+
user training
sessions

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Maria Angeles Diaz and
Professor Alice Gast open the AMS.





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Dr Darlene Solomon speaks at the launch of the
Molecular Sciences Research Hub.

Exploring Analytical Science podcast

In 2021, Agilent and Imperial released a seven-episode podcast series, *Exploring Analytical Science*, on the capabilities and achievement of the AMS.

The podcast was created to raise awareness of the AMS to potential users at Imperial and beyond. It features interviews with stakeholders and users, discussing the work and capabilities in the Suite.

HIGHLIGHTS INCLUDE:

- Dr Lisa D Haigh from imperial's Department of Chemistry on using mass spectrometry to understand how regional differences in cheesemaking affect flavour
- Loukia Petrou from the Department of Bioengineering on developing a point-of-care screening test for predicting pre-term birth using microRNA biomarkers
- Dr Trevor Ferris, AMS Facility Manager, on how chemicals in fingerprints can identify criminal activity

Exploring Analytical Science is available on [Apple Podcasts](#).

Imperial will also soon be launching an online TV series that will showcase research at White City and how it is enabled by facilities such as the AMS.



↑
Professor Tony Cass with Professor Alice Gast and Maria Angeles Díaz at the opening of the AMS.

TRAINING AND COMMUNICATION

Often sophisticated technology is underutilised because users don't appreciate its upper limits. The AMS is designed to empower researchers to push themselves, and leave a legacy of upskilling and new thinking.

For researchers actively using the AMS, instrument training is available to anyone who wants to use the lab from in-house staff and Agilent's applications specialists. In addition, personalised training has been delivered to researchers from across Imperial's departments.

To engage researchers with the Suite's potential, a series of lunchtime online seminars for Imperial researchers ran weekly throughout Autumn 2019. These showcased the full instrument portfolio, raising understanding of what

was possible amongst a wide range of potential users, and inspiring people to consider new avenues for their research.

This has been accompanied by a promotional programme to draw in new expert users from the local area and beyond. Imperial has held AMS open days, and AMS spokespeople have presented on the Suite's offer at various institutions and events, including at a Food Mass Spectrometry Meeting, the London Centre for Nanotechnology, and the Pharmaceutical Forum 2019.

Over a thousand guests visited the AMS in 2019 alone, either just to see the facility or as part of a tour. The visitors came from a range of stakeholders including companies, local governments, international trade departments, funding agencies, school and universities.

Working through a pandemic

When the UK went into lockdown in March 2020, entering labs to conduct research suddenly became a challenge. In the first weeks, all but essential work tackling the pandemic ground to a halt. But as things opened up again, the AMS found ways to keep advancing science.

Fortunately, Agilent had a pandemic solution ready to go, its iLab laboratory management software. This was designed to manage booking and scheduling, and was upgraded to limit occupancy and ensure distancing. Facility manager Dr Trevor Ferris could oversee scheduling and monitor usage remotely, ensuring user needs could be delivered without them needing to go too near each other, whilst also keeping himself safe. All users were registered so they could be traced and contacted promptly if necessary.

As a result, after the initial lockdown, most projects could continue without further setbacks. Demand for the facility remained high through the pandemic and although capacity was reduced, it continued to support students and enable academics to continue vital research. The scheduling tools have also proved effective, and will be carried forward even after the pandemic has receded.

Afterword

In just three years of the AMS we have seen incredible value to Imperial and to the White City ecosystem.

With the introduction of the Suite, we have expanded our capabilities in high-end analytical chemistry, allowing our researchers to conduct projects that would not have been possible without the Suite. The West African project looking at adulterated medicines is a good example, without the Suite we would not have had the accuracy to solve this challenge and potentially save lives.

The technology and the direct support from Agilent have also allowed Imperial researchers to deliver real value to the local White City ecosystem and expand the reach of the lab.

Looking ahead, we intend to expand the facility to new users and new applications. As L'Oreal and Novartis become established in White City, we hope to start working with them and other large corporate R&D departments. The same can be said about the many startups and scale-ups that the new innovation spaces on the campus will attract.

We expect more projects and collaborations, and to expand work in areas such as biopharma and metabolomic research. We expect to see the Suite delivering across more Imperial departments and creating new opportunities for partnerships beyond our immediate ecosystem. We will publish more papers collaboratively with Agilent. We aim



to encourage businesses to fund PhDs that solve their most complex analytical chemistry problems through Imperial and the AMS.

The AMS provides a natural hub for all of this ground-breaking work. We are excited for its future.

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Information about the AMS is available from the [Agilent Measurement Suite](https://www.agilent.com/MeasurementSuite) website – queries can be directed to agilent-msrh@imperial.ac.uk

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