

Innovate UK

How Catapults can help your business innovate

CATAPULT

What is a Catapult?

Catapults are not-for-profit, independent technology and innovation centres that connect businesses with the UK's research and academic communities.

They were established and are overseen by Innovate UK, the UK's innovation agency, to bring together the best people in their fields with world-class facilities and expertise to rapidly advance the UK's research and development (R&D) into global commercial success.

Whether your business is large or small, if you have the ambition to grow, Catapults can bring you new opportunities through innovation.

Each specialises in a different area of technology, but all offer a neutral space with the facilities and expertise to enable businesses and researchers to solve key problems together and develop new products and services on a commercial scale. ■

06	High Value Manufacturing @HVM_Catapult
08	Digital @DigiCatapult
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Foreword



I am proud of Innovate UK's role in building a world-class network of Catapults to transform the UK's capability for innovation and help drive economic growth.

Before joining Innovate UK, I worked with one of the first Catapults – Cell and Gene Therapy. I have since visited them all and am impressed at the scope and scale of the network, the expertise within it and the evidence they are turning commercial ideas into reality.

The latest is the Compound Semiconductor Applications Catapult, to be based in Wales, which will receive £50 million funding over the next 5 years.

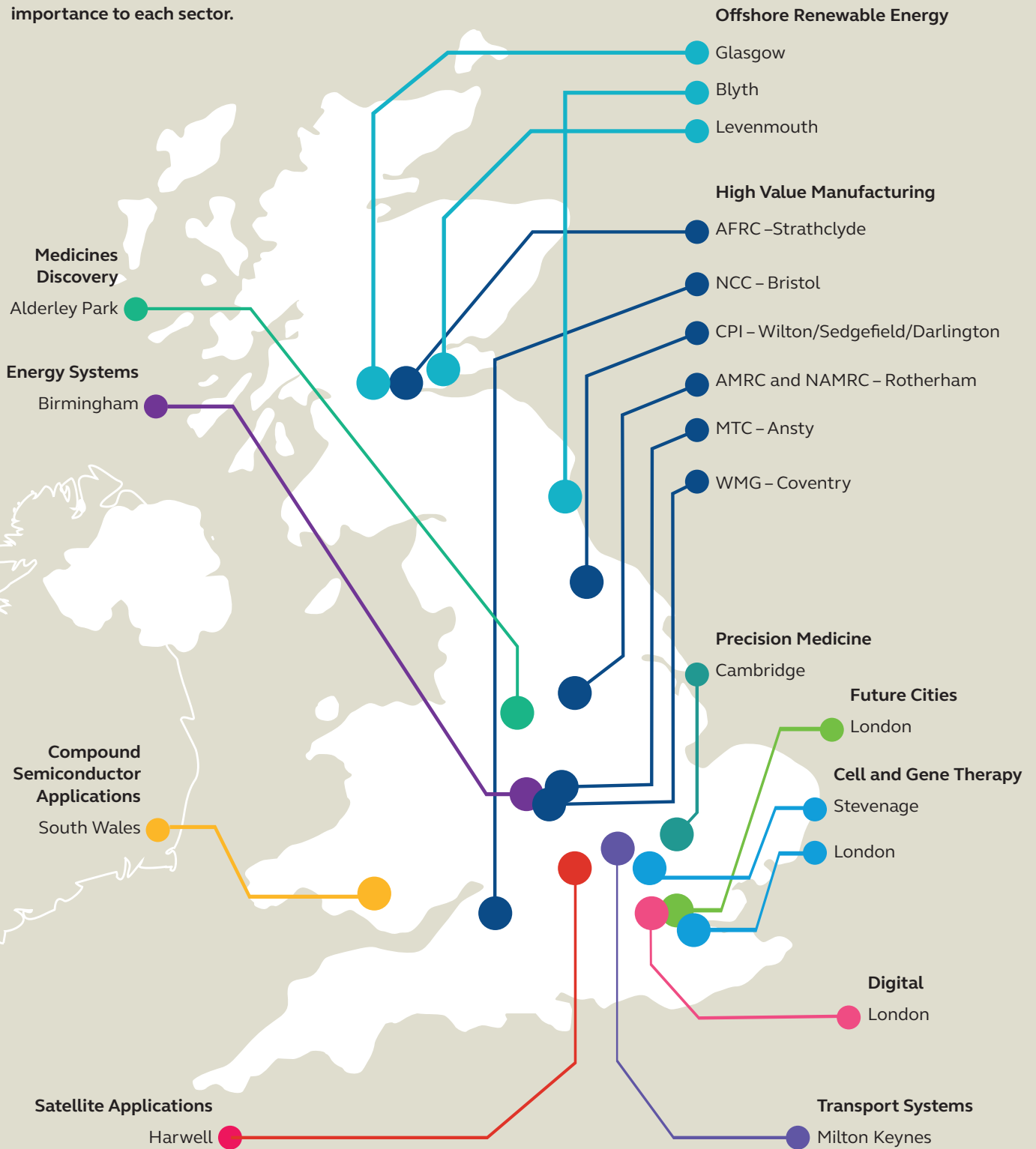
There are boundless opportunities for business and academics to engage with the Catapults. They help sectors translate innovative ideas from concept to commercialisation and develop connectivity between businesses, new technologies and funding.

We aim to deliver the maximum potential from innovation and have a 5-point plan for growth to achieve this. The Catapults are integral to it, so I look forward to celebrating their success over the coming years. ■

Dr Ruth McKernan CBE
Chief Executive

Catapults: where they are

Our network of Catapult centres is located throughout the UK in areas of strategic importance to each sector.



“To innovate, we need open centres where academia and business can get together and drive forward great ideas into manufactured products. And that’s what the Catapults are delivering for us.”

Juergen Maier, Chief Executive,
Siemens UK

Regional Centres

Precision Medicine

Manchester Leeds
Belfast Cardiff
Glasgow Oxford

Digital

North East and Tees Valley
Yorkshire
Brighton

Satellite Applications

North East East Midlands
Scotland South Coast
South West



“The High Value Manufacturing Catapult is one of the best industrialisation models in the world. These centres translate early ideas into proven ones, from the lab to a successful solution. You get 50, 60 companies together in one space creating ideas that spill down into the supply chain.”

Dr Hamid Mughal OBE, Director of Global Manufacturing, Rolls-Royce

Boasting 7 open access facilities across the UK, the High Value Manufacturing (HVM) Catapult is the catalyst for the growth and success of manufacturing in the UK.

It helps businesses accelerate new concepts to commercial viability and is committed to driving up technology innovation and growing the contribution of manufacturing to the UK economy.

The HVM Catapult works with companies of all sizes operating in high value manufacturing, investigating innovative technologies or scaling up new products and processes to prove they have achieved manufacturing readiness.

- It has capabilities that span from basic raw materials through to high-integrity product assembly processes.
- It provides companies with access to world-class facilities and the expertise and skills of more than 1,600 staff.
- It employs more than 1,600 engineers, scientists, technicians and other staff to support companies and push the boundaries of high-end manufacturing.
- It is developing a network of leading suppliers who contribute to key UK industry supply chains.
- It brings together industry, government and the research community to make the UK an

attractive place to invest in manufacturing.

The HVM Catapult is making a tangible difference. Uniting industry and research, and engaging with hundreds of UK manufacturing businesses in innovation programmes, helps anchor manufacturing jobs, skills and investment in the UK and encourages overseas investment in UK high-value manufacturing.

As a key enabler of a successful UK Industrial Strategy, the HVM Catapult has exceptionally strong support from industry and other actors in the field of innovation.

The facilities it offers businesses in the UK include:

Advanced Forming Research Centre – Strathclyde

Focused on developing metal-forming and forging technologies to support the design and advanced manufacture of products.

Advanced Manufacturing Research Centre – Rotherham

World-class centre for collaborative research focused on advanced machining and materials for aerospace and other high-value manufacturing sectors.

Centre for Process Innovation – Redcar, Sedgefield, Darlington

Using applied science and engineering combined with state-of-the-art facilities to enable companies to develop, prove, prototype and scale up the next generation of products and processes.

Manufacturing Technology Centre – Coventry

Inspiring Great British manufacturing on the global stage, offering capabilities relevant to companies across a wide range of industry sectors.

National Composites Centre – Bristol

Providing collaborative, open-access research, technology and people development and transferring knowledge for the design, manufacture and application of composites.

Nuclear Advanced Manufacturing Research Centre – Rotherham

Working with companies of all sizes to improve their manufacturing capabilities for nuclear and other innovative energy sectors.

Warwick Manufacturing Group Centre – Coventry

Delivering fundamental and applied research via sector-leading technology transfer to automotive, commercial and rail transport. ■



CASE STUDIES

Revolutionary tooling system

The Advanced Manufacturing Research Centre (AMRC) worked with tooling company Technicut and fittings specialist Nikken to develop a revolutionary tooling system for cutting tough alloys such as titanium.

The system helped reduce the time involved in machining fan discs for Rolls-Royce Trent aero engines by 50%. It is now used in the new Rolls-Royce Advanced Aerospace Disc Manufacturing facility in the north east of England.

Technicut CEO Mark Kirby said: “Being able to test our new systems at the AMRC allowed us to prove their value to the most demanding clients. We have won new business and grown our workforce as a result.”

Scale-up flexible electronic logic

PragmatIC develops imprinted ultra-thin flexible microcircuits to be incorporated into disposable items, from intelligent packaging to wirelessly traceable documents.

CEO Scott White said: “The public access facility provided by the Centre for Process Innovation was perfect for us. We needed to scale up and we were not in a position to do this on our own. The de-risking element, the access to world-class facilities without huge capital investment are crucial parts of the journey from concept to commercialisation.”

3D printing award

Hybrid Manufacturing Technologies (HMT) – in partnership with the Manufacturing Technology Centre – has developed ways of seamlessly combining different technologies for high-value metal parts manufacture.

Its system combines additive manufacturing, axis machining and in-process part inspection. The new approach took the machine world by storm and the company won the \$100,000 International Additive Manufacturing Award as a result. ■

Catapult: Digital

DIGITAL
LOCATION



“I am very supportive of the Digital Catapult and think their model is essential for driving UK success in the digital arena specifically and innovation more broadly. Digital Catapult is working and succeeding.”

Dennis Moynihan, UK Director, EIT Digital

The Digital Catapult develops breakthroughs for the UK around 4 areas of opportunity:

- sharing closed data between organisations
- sharing personal data in a secure and trusted way
- sharing content and licensed data more simply
- sharing data generated across the internet of things

These are hard kinds of data to share, but offer huge potential – an estimated £200bn of value could be unlocked for the UK. The Digital Catapult does this by sparking pioneering collaborations and marketplaces to accelerate economic growth and productivity.

Its first centre opened in London in November 2014 and there is now a growing network of Digital Catapult centres and communities across the UK. From running pilot projects through to large scale initiatives, the Digital Catapult takes actions to fix real problems and enables innovation to happen with impact. The centres provide the community with a space in which they can work, meet, showcase and collaborate to benefit their organisation and the wider UK economy.

All the Digital Catapult’s work is in collaboration with others – including startups, small and large businesses, academia, innovation clusters and the public sector. ■

CASE STUDY

Red Ninja Studios

Red Ninja has been collaborating with the Digital Catapult to help bring new products to market and form new partnerships, tapping into its expertise to add value, fill knowledge gaps, ensure compliance and boost its credibility.

“We believe in the power of design and collaboration to make

a difference. And our work with the Digital Catapult team has been invaluable,” said Lee Omar, Red Ninja Studios CEO. “The team’s combined knowledge of business and different sectors has helped us connect with a wider market and gain cutting-edge insights in the industry.” ■





“There’s one thing the Catapult did that I don’t think anyone else could have done for us. Because of its profile and visibility, it introduced us to a stream of well-connected people in government and business.”

Peter Lilley, Managing Director, iGeolise

The Satellite Applications Catapult is transforming the way the world uses satellite technology, enabling new businesses and improving lives.

The Catapult is accelerating UK space sector growth by:

- raising awareness of and increasing demand for satellite-enabled services
- making space technology more accessible and relevant
- helping innovators overcome the challenges of working in the space sector and bring new products to market

By running tailored workshops and focused networking activities,

the Catapult brings together representatives from business, research and government to discuss potential satellite-based solutions to sectoral or public administration challenges.

The Catapult develops tailored platforms to help make satellite technology more accessible. For example, it has developed an Urban Planning platform for local authorities, the Satellite Analysis and Fusion Engine (SAFE) platform for disaster monitoring and a Maritime Situational Awareness platform, which hosts a ‘Virtual Watch Room’ for illegal fishing. Developed with Pew Charitable Trusts, the platform provides vital insights into global fishing activities to

international regulatory authorities and supply chains.

It also works with businesses, entrepreneurs and innovators to bring new products and services to market by providing technical consulting, advice on business plans and market opportunities, introductions to investors and signposting to other funding mechanisms. It also provides affordable access to world-class facilities and external expertise on, for example, legal or regulatory matters.

Many companies are already seeing the benefits of working with the Satellite Applications Catapult, including increased investment, job creation and revenue growth. ■

CASE STUDY

Oxford Space Systems

Oxford Space Systems (OSS) is bringing to market a lighter, simpler, cheaper new generation of space-deployable structures.

Mike Lawton, CEO and Founder of OSS, said: “For the past 18 months, the Catapult has brought us original thinking, leading to quality output that we’ve used at high-profile events. It’s hard to think of a more perfect innovation environment in the UK, or indeed Europe, right now for our business to succeed.” ■



Catapults in development:

Compound Semiconductor Applications

COMPOUND
SEMICONDUCTOR
APPLICATIONS
LOCATION



Following detailed consultation by Innovate UK and the Knowledge Transfer Network involving industry and academia, a new Compound Semiconductor Applications Catapult – to be based in Wales – has been announced.

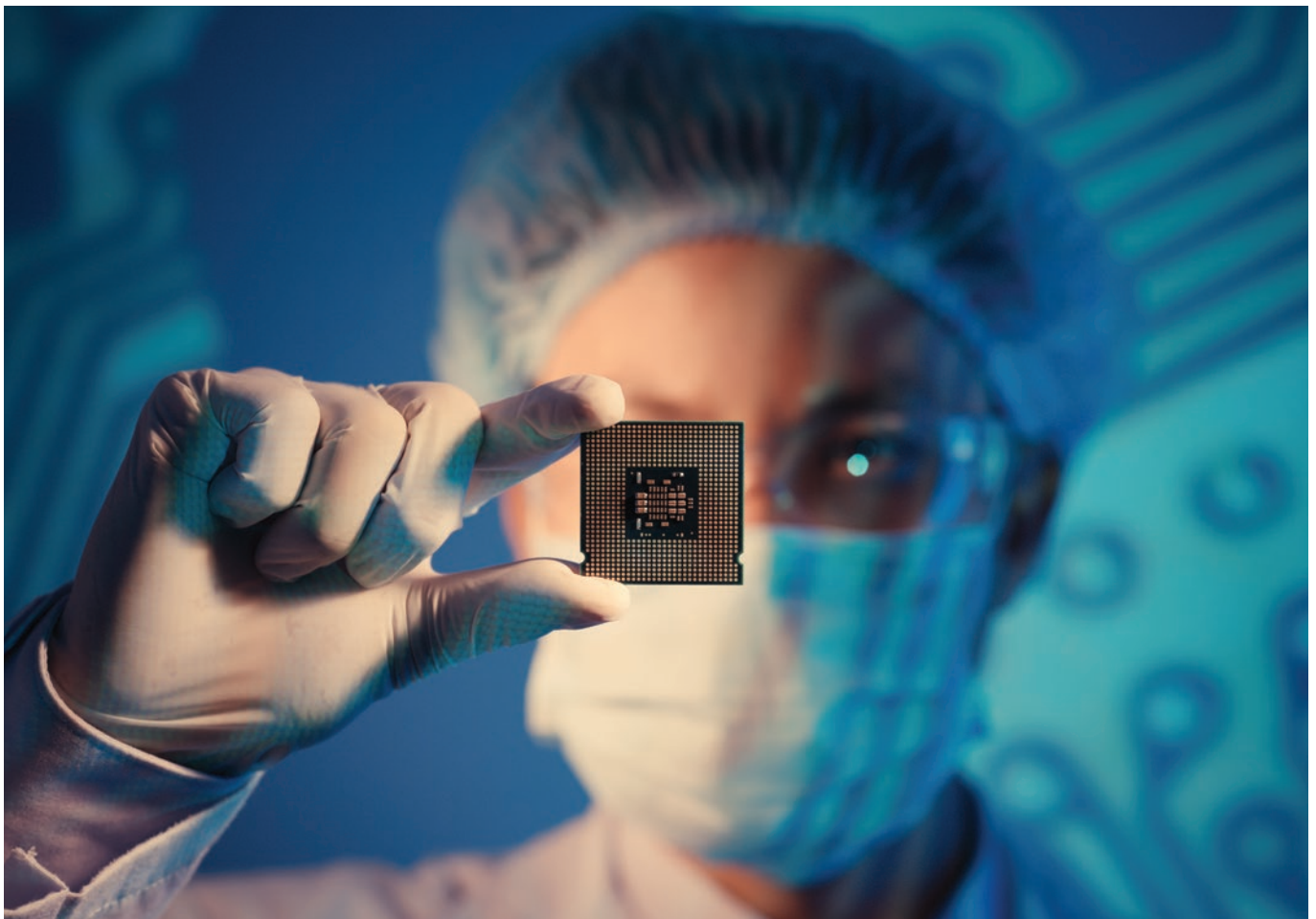
Compound semiconductors are at the heart of many devices we use today, from smartphones and tablets to satellite communication systems. They are central

to development of the 5G network, new high-efficiency lighting, the next generation of electric vehicles and new imaging techniques for a variety of uses, from security to health diagnostics.

The global market for compound semiconductors is forecast to be around £125bn by 2025 and the UK has the potential to access a significant portion of this thanks to its world-class research base in this field, which has

led to the creation of many companies along the value chain. This timing and the location of the Catapult in a region internationally recognised for its semiconductor expertise will attract global inward investment.

The Catapult will accelerate the use of compound semiconductor devices within 5 key areas of application: healthcare, the digital economy, energy, transport and defence and security. ■



“Compound semiconductors is an area of UK strength and this new Catapult will reinforce our strong position in this important and growing technology.”

Dr Ruth McKernan CBE

Chief Executive, Innovate UK

Catapult:

Cell and Gene Therapy

CELL AND
GENE THERAPY
LOCATIONS



“With a wave of new clinical programmes in cell and immunotherapy emerging around the world, industrialisation and supply chain robustness become the biggest challenges. The Cell and Gene Therapy Catapult and its manufacturing centre will play an important role in helping the industry in Europe develop the technologies and systems to allow companies to scale up and prepare for market adoption.”

Kieran Murphy, CEO Life Sciences, GE Healthcare

Established in 2012, the Cell and Gene Therapy (CGT) Catapult is an independent centre of excellence that seeks to advance the growth of the UK cell and gene therapy industry by bridging the gap between scientific research and full-scale commercialisation.

With more than 100 employees focusing on cell and gene therapy technologies, it works with partners in academia and industry to ensure these life-changing therapies can be developed for use in health services throughout the world.

It offers leading-edge capability, technology and innovation that enables companies to take products into clinical trials and provides clinical, process development, manufacturing, regulatory, health economics and market access expertise.

The Catapult’s new large-scale £55m manufacturing centre, due to be opened in Stevenage in 2017, will be a licensed facility that conforms to Good Manufacturing Practice (GMP). It is a unique global business proposition that will be used to manufacture products for late-phase clinical trials and commercial supply of advanced therapeutic medicinal products, including cell and gene therapies.

The Catapult’s ultimate aim is to make the UK the most compelling and logical choice for UK and international partners to develop and commercialise these advanced therapies. Regenerative medicine, of which cell and gene therapy is a key part, is one of the industries seen as a major future driver of economic growth and new, high-value jobs in the UK. ■

CASE STUDY

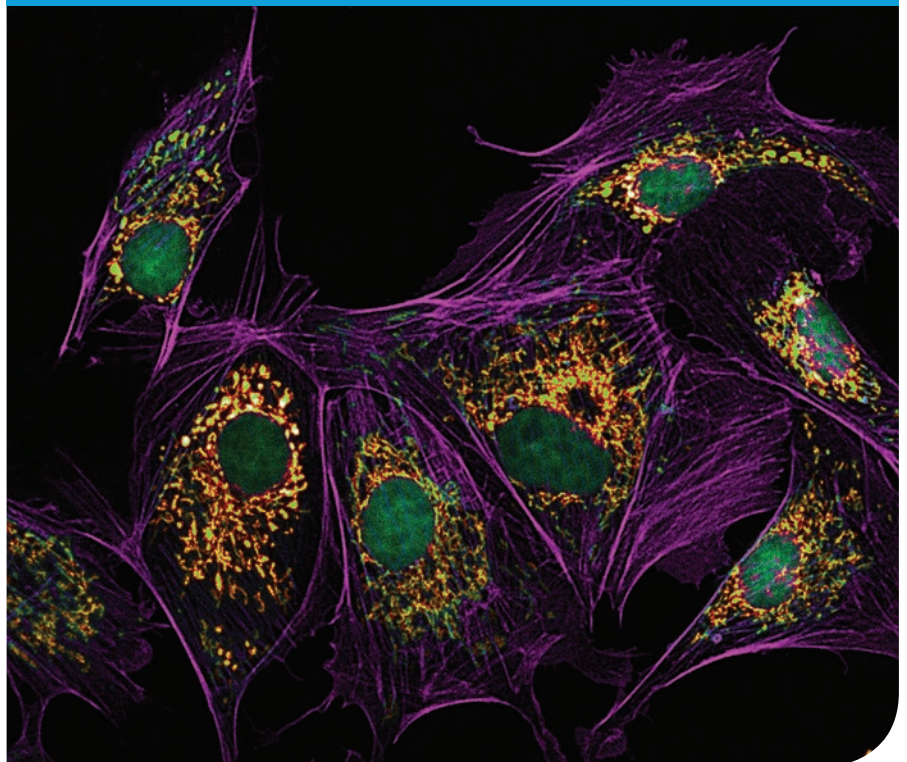
Catapult Therapy TCR Limited (WT1)

Our involvement in WT1 has driven forward a promising cancer therapy and allowed us to tackle industry issues head on.

Catapult Therapy TCR Limited is a university spin out that is progressing an autologous cancer immunotherapy into clinical trial. Recent milestones include treating four patients with the experimental gene modified WT1 T-cell receptor (TCR) therapy in a Phase I/II trial

for leukaemia AML/CML. CGT led the spin out and is leading the project towards commercialisation in the rapidly expanding field immunotherapy.

This project has stimulated the creation of a second CGT backed university spin out (Chimeric Therapeutics Ltd) and the growth of at least two other SMEs in the supply chain. ■





Established in April 2015, the Precision Medicine Catapult is supporting the growth of the UK precision medicine industry, bringing health and economic benefits to the whole population.

Its overall aim is to make the UK the most attractive place in the world to develop precision medicine. Precision medicine is expected to bring significant improvements in health: diagnostic tests and data-based insights into patients' diseases will deliver treatments with more predictable, safe and cost-effective outcomes.

To tap into the wealth of sector expertise in the UK, the Catapult is establishing a network of centres of

excellence – in Belfast, Cardiff, Glasgow, Leeds, Manchester and Oxford – linked to its headquarters in Cambridge. Alongside these teams, the Precision Medicine Catapult is building a portfolio of exemplar projects to tackle industry challenges and advance products and solutions.

Over the next 10 years, the Catapult plans to establish sustainable growth, deliver £10bn in GDP to the UK economy and engage with health and care institutions and large companies in the UK and abroad.

The UK already has a leading position in this growing industry, based on its research and clinical expertise and the government's major investment in

research infrastructure. By tackling the hurdles to bringing precision medicine therapies, tests and solutions to the market, the Catapult is working to ensure the UK continues to lead in this sector, which is expected to grow to between £50bn and £60bn by 2020.

Key themes and challenges include:

- data – quality standards, biobank networking, patient engagement
- drugs and therapies – clinical trials, health economics, adoption
- diagnostics and eHealth – test beds, adoption, reimbursement
- business services – networks, funding solutions, exports, inward investment ■



“It is important we draw on the UK’s research and clinical expertise in precision medicine from across the country. Understanding which types of patients will benefit most from treatments requires effective use of diagnostic testing and data-based insights. The Precision Medicine Catapult’s reach to patients for clinical trials purposes will be enhanced through the national network of centres of excellence.”

Dr Ruth McKernan, OBE
CEO, Innovate UK

Catapults in development: Medicines Discovery

MEDICINES
DISCOVERY
LOCATION



The new Medicines Discovery Catapult at Alderley Park, Cheshire, will support industry to develop new technologies primarily for the discovery and evaluation of medicines.

It will operate at the earliest stages of medicines development, advancing and validating new technologies for testing potential medicines before human trials and supporting the UK's key strengths in pharmaceutical, biotechnology and contract research organisations.

The goal for the Catapult is to grow the UK's commercial medicines discovery capability, to improve productivity in drug development and approval and to make it the leading place worldwide to develop and launch

new products and services in this space. To achieve this, it will:

- develop and deliver on a vision of the future of medicines discovery
- support the development of next generation technologies that will transform the drug development landscape and de-risk them for further investment
- be a source of discovery expertise and knowledge
- provide technical expertise and infrastructure to ensure products are robust and useful
- support technologies that will reduce, refine and replace animal testing wherever possible
- inform regulatory science and work

with the regulators on how new technologies can be adopted and used as widely and quickly as possible

- create opportunities for training and collaboration, both nationally and globally
- be a source of knowledge about grants, investment finance and markets, so commercially viable products are progressed and become investable

The Medicines Discovery Catapult's ultimate aim is to increase UK wealth creation by supporting productivity improvements in medicines development and the effective commercialisation of medicines discovery technologies. ■



“With its outstanding global reputation for medicines discovery, Alderley Park has the facilities and people to make the Catapult a great success in the delivery of innovative technologies to enable the discovery of new, high-quality medicines for the benefit of patients.”

Professor Graham Boulnois,
Chairman, Medicines Discovery Catapult



Offshore renewable energy could provide 35% of the UK's electricity demand by 2030 and be cost competitive with conventional forms of generation.

The Offshore Renewable Energy Catapult offers a unique combination of world-class test, demonstration and research capabilities and facilities and expertise in key technologies such as blades, drive trains and electrical systems. It provides UK businesses with the tools and capability they need to innovate and drive down costs.

Its National Renewable Energy Centre in Blyth boasts the largest concentration of offshore technology testing facilities in the world, with the ability to test blades up to 100m in length and hosting 15MW wind and

3MW tidal turbine power train test facilities. It provides support for new technologies, getting them ready for deployment sooner by offering a controlled environment for accelerated life testing and proof-of-concept trials.

The Catapult also owns and operates the world's largest open access offshore wind demonstration turbine in Fife, Scotland, enabling collaborative research, development and demonstration of offshore wind technologies in a wholly realistic, safe and secure environment.

Working with turbine manufacturers and the supply chain, it designs and delivers testing programmes and provides advice for new technology developers. It also convenes cross-industry programmes to solve

challenges and works with academia and early stage SMEs to accelerate the commercialisation of the most promising technologies. ■

“Developing and proving our products prior to field installation is a key component in maintaining our leadership. Having the ability to access ORE Catapult's high-quality facilities gives us a unique industrial advantage.”

Tekmar Energy Ltd

CASE STUDY

Atlantis Resources

The Catapult's open access test facilities provide a valuable testing ground for Atlantis Resources to prove the reliability and validate the performance of the power train systems for their tidal turbines.

Following the successful testing of its AR1000 at Blyth in 2012, Atlantis will also test their next generation AR1500 using the Catapult's 3MW drive train test facility. The AR1500 is due for deployment at MeyGen, the UK's first tidal array. The tests are the critical final stage of development that will give Atlantis, MeyGen and their investors confidence the turbine is ready to be deployed and to start generating electricity. ■



Catapult:

Future Cities

FUTURE CITIES
LOCATION



“We are working hard to build the UK’s capability as a centre of excellence on smart cities. Small businesses and start-ups have received support through advice, capacity building and the ability to test and prove new solutions.”

Peter Madden, OBE, CEO, Future Cities Catapult

Based in London, Future Cities Catapult exists to advance innovation, to grow UK companies and make cities better.

It brings together businesses, universities and city leaders to co-operate on solving the problems cities face, both now and in the future.

The world-class expertise and facilities

of its Urban Innovation Centre support innovators to develop new products and services, collaborate with others, test ideas and develop business models.

Helping innovators turn ingenious ideas into working prototypes that can be tested in real settings is its ultimate aim. Once they’re proven effective, the Catapult then helps businesses spread

these solutions to cities across the world to improve quality of life, strengthen economies and protect the environment.

The Future Cities Catapult is committed to bringing together unlikely partners to foster innovation and solutions, provide new opportunities for businesses and make cities across the world better places to live and work. ■



CASE STUDY

Cities Unlocked

The Cities Unlocked project – a partnership between Future Cities Catapult, Guide Dogs for the Blind and Microsoft Corporation – aimed to find solutions for the mobility challenges faced by people with sight loss in our cities.

Collaborators undertook extensive research, which was used to develop

a new soundscape technology and identify opportunities that could unlock cities for everyone.

After testing the technology to assess its effectiveness, the results were impressive.

The soundscape technology improved the experience of people with sight loss, with 10 out of 17

measures of wellbeing significantly increasing when using the technology. What’s more, 62% of participants reported increased safety, confidence and resilience, allowing them to relax into the journey. ■



Complex regulation and uncertainty of future policy can cause difficulties in the energy market, in particular for new ventures and SMEs.

The Energy Systems Catapult supports new ventures and SMEs developing products and services to address new commercial opportunities created by the transformation of UK and global energy systems (electricity, heat and combustible gases).

It works with its partners in industry, government and academia taking a whole systems approach to research, test, demonstrate and accelerate new energy products and services with

the ultimate aim of creating a secure, affordable and sustainable energy system for the UK.

Themes of interest include:

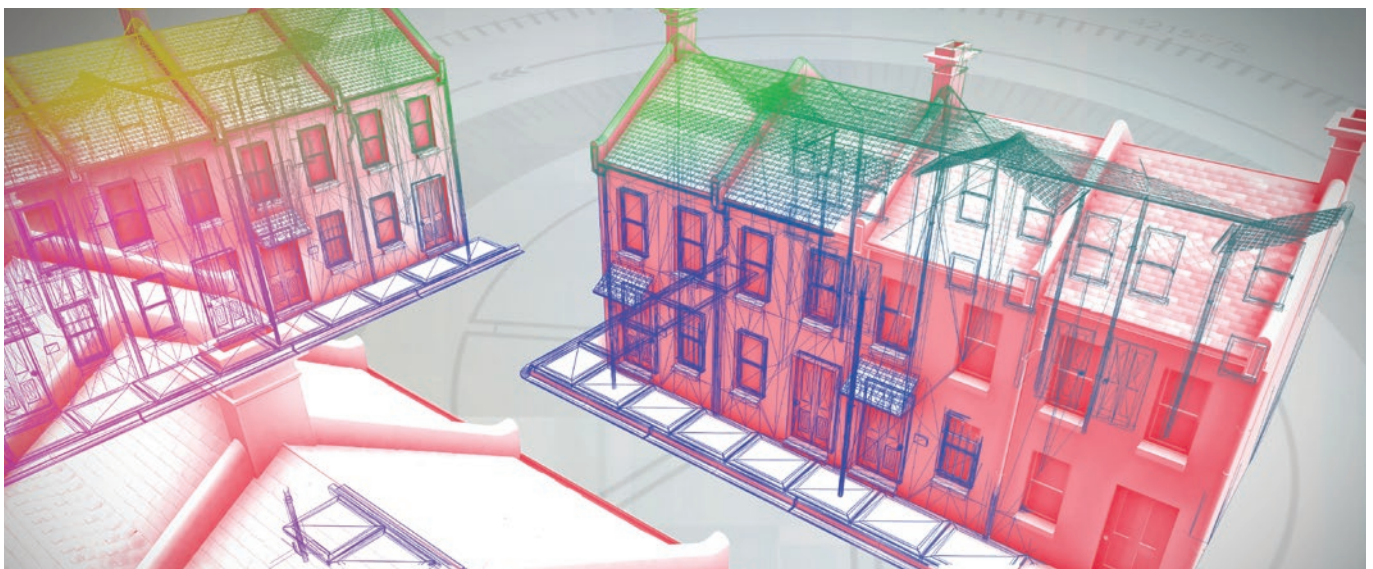
- localised energy systems including heat and power
- consumer adoption
- advanced control solutions
- new business models
- new market mechanisms

Future focus areas could include:

- integration of energy storage
- demand-side management

The Catapult supports business through a centralised national energy systems knowledge hub and whole systems approaches to energy innovation and systems integration expertise. It makes these available through collaborative projects.

As well as developing its own unique technical capabilities, the Energy Systems Catapult is committed to opening up new markets and promoting the UK's skills and strengths. It is establishing strong networks that provide businesses with practical support to develop novel ideas – and the international links required to commercialise them. ■



CASE STUDY

Smart Systems and Heat

The Energy Systems Catapult has assumed responsibility for the delivery of the Energy Technologies Institute's (ETI) Smart Systems and Heat programme, which aims to create future-proof and economical local heating solutions for the UK.

The programme, commissioned and funded by the ETI's membership – BP, Caterpillar, EDF, Hitachi, Rolls-Royce, Shell and the UK government – will develop a suite of software models and heating

technologies that will enable the design of location-specific energy systems together with improved heat efficiency in buildings.

The Catapult, upon the completion of this work for the ETI by the end of 2017, will then seek to undertake a large-scale demonstration of the designs and technologies developed within the ETI programme, further building upon the key capabilities developed by the ETI for the UK energy sector. ■



The Transport Systems Catapult's aim is to use emerging technologies and innovative solutions to enable UK industry to create a world where journeys are seamless, transport is smart and connected and delays and congestion are a thing of the past.

Its IMovation Centre in Milton Keynes features a collaborative space for transport innovators and the Intelligent Mobility Platform, a combination of facilities, software and skills that helps businesses, universities and other research institutes develop new transport solutions.

The Catapult has 5 specialist teams that offer advice to innovators who focus on data exploitation, modelling and visualisation, customer experience, autonomous transport systems and Smart Asset Management. All seek to integrate services to create smarter transport solutions.

The overall vision is to create an environment that makes the UK a world leader in transport systems innovation through Intelligent Mobility – the smarter, greener and more efficient movement of people and goods around the world. ■

“Having big friends who can act as enablers, open doors and make introductions has proved extremely useful. Without the help the Catapult has given to this nascent industry in the UK via the Lutz project and attendant publicity, we would not be in the position we are in today.”

Dr Graeme Smith
Chief Executive, Oxbotica



CASE STUDY

LUTZ Pathfinder

LUTZ Pathfinder is a pioneering research and development project carrying out the UK's first trials in public pedestrianised areas of self-driving vehicles.

Overseen by the Transport Systems Catapult, the project involves electric-powered 2-seater 'pods' that operate in designated pedestrianised areas of Milton Keynes.

Oxford University's Mobile Robotics Group supplies the navigation and obstacle detection systems and Coventry-based firm RDM builds the pods.

Findings from the research will inform the larger-scale UK Autodrive project, which will trial a fleet of 40 pods (as well as regular road-based vehicles) in Milton Keynes and Coventry. ■

Useful contacts

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Innovate UK is the UK's innovation agency. Innovate UK works with people, companies and partner organisations to find and drive the science and technology innovations that will grow the UK economy - delivering productivity, new jobs and exports. Our aim at Innovate UK is to keep the UK globally competitive in the race for future prosperity. Innovate UK is the trading name of the Technology Strategy Board, which is an executive non-departmental public body sponsored by the Department for Business, Innovation and Skills, and incorporated by Royal Charter in England and Wales with company number RC000818.

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