



UNIVERSITY OF
BIRMINGHAM

ENTERPRISE

ENTERPRISE & INNOVATION

2008–18



Ten years in numbers

198
INVENTORS
WE'VE WORKED WITH PER YEAR

147 NUMBER OF IP
AGREEMENTS
SIGNED

1316
RECORDS
OF INVENTION

122 STAFF AND
STUDENT
START-UPS

£1.2 MILLION
GIFT AID TO THE UNIVERSITY

£204 MILLION
RESEARCH CONTRACT INCOME

£100 MILLION
THIRD PARTY INVESTMENT IN SPINOUTS

£14 MILLION
INCOME FROM ACADEMIC CONSULTANCY SERVICES

£1.8 MILLION/YEAR
ROYALTIES AND FEES PAID TO ACADEMICS

222 NEW
PATENT FILINGS

£4.3 MILLION
IP LICENCE INCOME

£9.4 MILLION
RESEARCH PARK INCOME

755
PATENTS FILED

IN THE UK'S
TOP 10

4th
FOR INTELLECTUAL
PROPERTY

8th
FOR INVESTMENT
IN SPINOUTS

9th
MOST INNOVATIVE
UK UNIVERSITY

Reuters, Europe's Top Universities 2016

Welcome



Welcome to our annual review! This year we're celebrating ten years of accelerating innovation and also a change of name from Alta Innovations to University of Birmingham Enterprise.

Although the numbers on the page opposite and the many stories in this report are impressive, they also remind us that the journey from having an idea to seeing its impact can be a long one. It needs support from many different skills and people along the way.

In this report, we highlight the contributions that University of Birmingham Enterprise staff have made to Impact cases representing many different disciplines across the University. These projects span the last ten years and may be chosen for submission to the next Research Excellence Framework assessment in 2021.

As a leading global University, effective translation of UK research into benefits for people and the UK economy is part of our ongoing mission. We are creating innovations that help big and small businesses to grow and attract research-intensive activity to the UK from other countries.

The activity reported in this Enterprise annual review highlights our part of this wider University support for business. We're very proud of what we have achieved on behalf of academics, the University and the economy since being founded in 2008 and we look forward to even greater things in the decades to come!

PROFESSOR TIM SOFTLEY
PRO-VICE-CHANCELLOR, RESEARCH
AND KNOWLEDGE EXCHANGE

DR JAMES WILKIE
CEO, UNIVERSITY OF
BIRMINGHAM ENTERPRISE

Ten years of Enterprise

In the last ten years, we have grown from a team of seven to nearly 30 staff who look after University intellectual property and provide facilities, services and enterprise training for academics, entrepreneurs and business tenants. The case studies in this report highlight a few of our contributions.

Along the way we've delivered on our promise to bring money and reputational benefit to the University. We've brought in over £18 million for academics who innovate or do consultancy work, raised over £100 million for spinout companies, and returned more than £1 million in Gift Aid to the University.

We've also helped academics attract more than £200 million of competitive research funding, and supported the development of Impact Cases, which influence the research funding the University receives.

Our work has helped the University move up the UK rankings, and Birmingham is now 2nd and 4th of all the UK Higher Education institutions for records of invention and patents.

We've transformed the Birmingham Research Park into a vibrant hub that contains companies at all stages of development, includes two incubators for business start-ups, and attracts over 19,000 visitors a year. We've worked closely with our counterparts in other Midlands universities to improve the regional environment for research-based enterprises to grow and attract more investment.

INCUBATION FOR LIFE SCIENCE COMPANIES

We opened the BioHub Birmingham in 2015 to provide communal laboratory and office space for medical innovators. The BioHub was the first shared facility of its kind in the UK, and the existing space was filled by 2017. It is now developing a further floor, and the ecosystem that surrounds it is attracting international interest.



COACHING FOR ENTREPRENEURS AND START-UPS

We opened the BizzInn business incubator in 2013 to deliver greater opportunities for Midlands-based entrepreneurs and start-ups. Over 200 BizzInn members have benefitted from the guidance provided by mentors, entrepreneurs in residence, and business trainers. Some training and networking events are open to non-members, and all are free to attend.



JOINING THE FIGHT AGAINST ANTIBIOTIC RESISTANCE

When researchers realised they could build a medical device, they came to us. In 2010 we set up a company, which patented the technology and helped it gain venture capital funding. Linear Diagnostics Ltd is now testing a handheld device that detects antibiotic resistance, and provides a read-out within minutes, without the need for laboratory facilities.



USING ROBOTS TO CLEAN UP NUCLEAR WASTE

Robots can be used in situations that would be hazardous to humans – and a single patent we filed for a robotic hand was highly influential in the 2017 £42 million bid to develop the National Centre for Nuclear Robotics, which will tackle the major challenge of how to safely clean up nuclear waste.



MAKING GREEN ENERGY EVEN GREENER



PhD student Amrit Chandan came to our enterprise training in 2012. We mentored him and supported his business plan. His company Aceleron is now a social enterprise with an international footprint – repurposing used electric car batteries to provide affordable energy storage in the developing world.

IMPROVING THE OUTLOOK FOR AGE-RELATED BLINDNESS



Researchers looking at drug delivery realised they had found a novel method for delivering drugs for age-related macular degeneration (AMD), which causes blindness in elderly people. We patented the idea, and are currently working to accelerate clinical trials so the innovation can be brought to market.

BRINGING MORE POWER TO EACH BREATH



University researchers developed a technology to improve strength in the muscles used to inhale. We patented the concept and transferred the technology to an external company. Over the past ten years the company has developed devices for people with serious medical conditions and competitive sportspeople. These devices are now available worldwide.

JOINING THE WORLD TOGETHER BY ROAD



Since 2008, software developed by Birmingham researchers has determined over \$30 billion of World Bank funding to help developing nations build and maintain their road networks. The software is marketed world-wide by HDM Global, an operating division run by University of Birmingham Enterprise.

CREATING PRECISELY TARGETED DRUGS FOR CANCER



In 2009, when University researchers developed a specialised antibody that only attaches itself to cancer cells, they came to us for advice. We patented the antibody, and licensed it to a pharmaceutical company, who developed a treatment that is now in human trials.

INCREASING BATTERY LIFE IN MOBILE DEVICES



After graduating in 2011, PhD student Sampson Hu was one of the first members of the BizzInn. He is now CEO of a spinout company, Smart Antenna Technologies, which has offices in the Birmingham Research Park and Taiwan.

How the University of Birmingham helps businesses



'The BioHub Birmingham allows us access to a dynamic and collaborative science community to further enhance current projects, establish new partnerships and exploit novel technology.'

Dr Chris Hand, Chairman,
Abingdon Health Ltd

'This was my first experience of a Knowledge Transfer Partnership. Working with the University to see real improvement in the company performance due to the skills learnt by KUKA staff during the course of the KTP was a great experience.'

Alan Oakley, Applications Engineer,
KUKA Robotics UK Ltd

'The School of Chemistry at the University of Birmingham has consistently delivered practical solutions to technical and commercial challenges. This has helped maintain the company's position as industry leaders and further enhanced our reputation for innovation.'

Chief Scientific Officer for a global
nutrition company

What University of Birmingham Enterprise does

ENTERPRISE TRAINING



Our flagship Medici programme provides free Enterprise skills training to academics covering intellectual property, finance, business planning, people skills and the different models of commercialisation. Over ten years, more than 300 academics have attended the Medici programme – nearly half of these from neighbouring Midlands universities. University of Birmingham Enterprise also supports regional initiatives including Pitchfest West Midlands – a unique pitching competition that provides free coaching and workshops on how to pitch for investment.

ENTERPRISE FUNDING



We manage the £1 million Enterprising Birmingham Fund – a specialist fund that supports the gap that arises when research funding has ceased but before the concept or idea is sufficiently developed to attract funding from commercial investors. Many innovators find they are eligible for additional sources of funding when they start to innovate, and our teams also assist with applications for these and more traditional sources of research funding. We also manage the £5 million Spinout Investment fund which enables the University to co-invest with venture capitalists to support its best innovations.

INCUBATION AND OFFICE FACILITIES



We created the BizzInn and the BioHub to provide incubation for fledgling enterprises, in a community of like-minded people. Both are part of the vibrant ecosystem at the Birmingham Research Park, which provides commercial space for external technology companies and enterprises that have graduated from the BizzInn or the BioHub. The BizzInn also runs a rolling programme of training and networking events which are open to resident innovators, University of Birmingham staff and people who live in Birmingham.

SPINOUT COMPANIES



University of Birmingham Enterprise manages the formation of spinout companies by identifying the best management team for the company, supporting applications for external funding and employing our networks of business people and advisors to ensure the company takes the right strategic direction.

The University of Birmingham has 35 spinout companies, which have attracted £100 million external investment in the last ten years.

ACADEMIC CONSULTANCY



University of Birmingham academics undertake a wide range of consulting work with industry (from multinational companies to SMEs), non-profit organisations, public sector organisations and governments.

We operate the Academic Consultancy Service which handles contract and fee negotiation, invoicing and fee payments, use of the University's name and indemnity insurance for academic consultants. We also set up and manage Operating Divisions, to support academics who wish to offer a commercial service without the risk or pressure of running a fully-fledged company.

INTELLECTUAL PROPERTY



We work with academic innovators at the University of Birmingham to identify and protect intellectual property. We interrogate the concept for inventiveness, and assess the potential applications for the technology or the invention.

We advise on whether patenting is the best route, and if it is we support the process of applying for patent protection in global markets – and sale or licensing of the resulting intellectual property. The service is free to University researchers and the University pays all the patenting fees for inventions.

Case studies

Partnering to fight cancer

ROY BICKNELL

PROFESSOR OF FUNCTIONAL GENOMICS,
COLLEGE OF MEDICAL AND DENTAL SCIENCES

CRUK has a strategic target of increasing cancer survival rates from 50% to 75% within the next 20 years.

While screening tissue samples during a research programme funded by Cancer Research UK, his research team discovered a biomarker called *CLEC14a* that they believed was only present on blood vessels supplying solid tumours.

In 2014, the National UK Cell & Gene Therapy Catapult expressed interest in accelerating commercial development of a *CLEC14a* targeted therapy. The University of Birmingham Enterprise team had already developed a good relationship with their counterparts at Cancer Research UK and this allowed them to work closely together to create a new joint-venture company, Chimeric Therapeutics Ltd.

Chimeric Therapeutics received £1.5 million from the Cell & Gene Therapy Catapult, which has enabled screening of thousands of tissue samples to understand where *CLEC14a* is expressed. The company is developing a novel therapy for solid tumours and will start its first clinical trial by the end of 2018.

If the trials are successful, the new cell therapy could be licensed to a pharmaceutical company or Chimeric Therapeutics itself could be sold or 'floated' on the stock market.

CHARITY PARTNERSHIPS

The Cancer Research UK (CRUK) Birmingham Centre was established in 2017, and establishes Birmingham as one of the UK's premier sites for cancer research.

It benefits from the University's scientific strengths, and co-location with Birmingham's teaching hospitals, and the CRUK Clinical Trials Unit (CRCTU), which specialises in stratified medicine trials design, diagnostic and genetic testing.

In 2016, University of Birmingham Enterprise and CRUK agreed to jointly fund dedicated CRUK staff who are embedded into the University, to identify IP arising from cancer-related research.

'The beauty is that the spinout company works in the background as a vehicle for holding the intellectual property and the funding from the Catapult, leaving us to get on with the work.'

Roy Bicknell



MARK DRAYSON

PROFESSOR OF CLINICAL IMMUNODIAGNOSTICS,
COLLEGE OF MEDICAL AND DENTAL SCIENCES

Mark specialises in the diagnosis and treatment of multiple myeloma, a blood cancer.

Although there is no cure for multiple myeloma, new treatments can provide long periods of symptom-free remission and a third of people diagnosed survive for ten years or more. During this time, monitoring of the patient is required so treatments can be adjusted as necessary. Previously, these tests required patient samples to be sent away for analysis. Mark and his team recognised that developing new 'point of care' testing technologies could greatly improve patient care. He engaged with University of Birmingham Enterprise, whose staff filed patent applications to protect the ideas and held discussions with a number of potential commercial partners.

COMMERCIAL PARTNERSHIPS

University of Birmingham Enterprise negotiates commercial partnerships such as the one with Abingdon Health so we can bring products to market as quickly and effectively as possible.

The University co-invests in these partnerships, so we assess our partners' past performance, assets, and future focus before we enter into an agreement.

These partnerships often result in contract research work, as well as providing income to the University and the academic inventors in the form of licence payments or share dividends.

University of Birmingham Enterprise then negotiated and structured a novel joint-venture with a third-party partner, Abingdon Health, who delivered the commercial management and additional funds required to finish developing the product and bring it to market.

As a result, Seralite, the world's first rapid test for multiple myeloma, is now available in 70 countries. It provides results within minutes, allowing real-time disease monitoring that supports faster clinical decisions.



Case studies

Delivering better training

CATHERINE NEEDHAM

PROFESSOR OF PUBLIC POLICY AND MANAGEMENT,
COLLEGE OF SOCIAL SCIENCES

Catherine Needham and Catherine Mangan are researching new approaches to public service workforce development. University of Birmingham Enterprise is arranging licences so they can merchandise a training tool that helps public service employees think differently about problem solving and strategy.

Catherine and Catherine did not set out to develop a novel approach to training. Initially, they presented their 21st Century Public Servant research in more conventional formats (a report, literature review and slide pack), and made these materials available on an Open Source basis.

'We've had interest from several national public sector bodies – including the Fire Service, the Police and the NHS.'

Catherine Needham

Interest in the research spread by word of mouth and they realised there was a demand for more practical training materials, so they developed a set of playing cards in collaboration with a trainer and a graphic artist.

University of Birmingham Enterprise were involved to capture the know-how and research knowledge used in the development of the playing cards, and to acknowledge the work of the external partners.

The research team will be monitoring sales in preparation for their Impact case study for the 2021 REF submission.



The card game facilitates group discussion during training sessions, and is based on 24 cards illustrating skills or attributes that are either effective or detrimental in the workplace. Each card has a number of points (some carry a negative score).

The group chooses a real-world problem to discuss before cards are given out, and uses the cards to decide where to start on the problem, which skills or attributes shown on the cards are necessary, and where change may be needed. The points on the cards generate discussion and agreement on what to prioritise in resource-limited settings.

JOAN DUDA

PROFESSOR OF SPORT AND EXERCISE PSYCHOLOGY,
COLLEGE OF LIFE AND ENVIRONMENTAL SCIENCES

Based on her research, Joan has developed a new approach to training sports, dance and fitness coaches that teaches techniques which promote the intrinsic motivation to get involved, and stay involved, with sport and or physical activity. This strongly differentiates it from other types of training available for coaches.

To date, programmes based on the 'Empowering Coaching' approach have been delivered in a number of countries including France, Greece, Norway, Spain, Qatar, Sweden, and Mexico. The development and evaluation work focused on Empowering Coaching has attracted backing from high-profile funders such as the Coca-Cola Foundation.

'I can't think of a better legacy than setting up a social enterprise.'

Joan Duda

University of Birmingham Enterprise is helping to set up Empowering Coaching as an Operating Division that will train sports coaches and promote sustained engagement by the public in sport, dance and active lifestyles. The overarching aim is to have Empowering Coaching spun out as a sustainable social enterprise.

To ensure the continued scientific integrity of the training, materials are translated in-country, and tutors are trained up to deliver the workshop, usually by partners from the University sector. Here, University of Birmingham Enterprise has helped with copyright licence agreements that are nuanced for translation, adaptation and teaching delivery. Advice was also given on how to protect the Enterprising Coaching brand.

WHY SET UP AN OPERATING DIVISION?

An Operating Division provides a shop front for dealing with external organisations.

University of Birmingham Enterprise sets up a trading name and handles the legal and financial sides of a business. This includes contracts, professional indemnity and other insurance, and a nominated and transparent account to make financial transactions.



Case studies

Accelerating technologies to market

KAI BONGS

PROFESSOR OF COLD ATOM PHYSICS,
COLLEGE OF ENGINEERING AND PHYSICAL SCIENCES

The £80 million research funding secured for the Quantum Technology Hub was made on the promise that the intellectual property outputs from the research programme would be effectively managed with a view to commercialisation as fast as possible.

University of Birmingham Enterprise was involved in the project from an early stage and has a member of staff embedded in the Hub to support the University and industry partners as they identify and protect areas with commercial potential.

As future research funding will also depend on being able to demonstrate progress towards real-world applications, the embedded member of staff works closely with researchers, delivers training on intellectual property, and ensures capture and management of IP. The research programme has so far generated 132 records of invention, nine patent applications and 77 industry collaborations, bringing £13 million to three University departments.

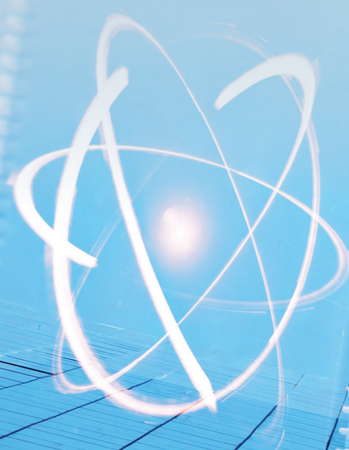
The approach of having an embedded member of staff is now being extended to other large projects at the University including the UK Rail Research and Innovation Network and the Birmingham Centre for Energy Storage.

QUANTUM APPLICATIONS

Quantum technologies provide sensitive measurements based on the movement of atoms. These technologies have been demonstrated in large-scale devices and the aim of the QT Hub is to shrink them so they can be used in portable and ultimately hand-held devices for very accurate position measurement, secure communications and computing.

'We are in the foothills of Quantum Technology sensor system development, working jointly with industry there is huge scope. Having embedded support from technology transfer professionals in University of Birmingham Enterprise is essential to taking this technology from ideas to reality.'

Kai Bongs



AN INTERNET FOR ENERGY

We can't control when the sun shines or the wind blows, and renewable energy is usually produced at sites which are distant from the point of consumption. The concept of the global power and energy internet is based on ultra-wide area energy grids. The HVDC transmission applications developed at the University will make these more flexible, reliable, efficient and cheaper over long distances.

XIAO-PING ZHANG

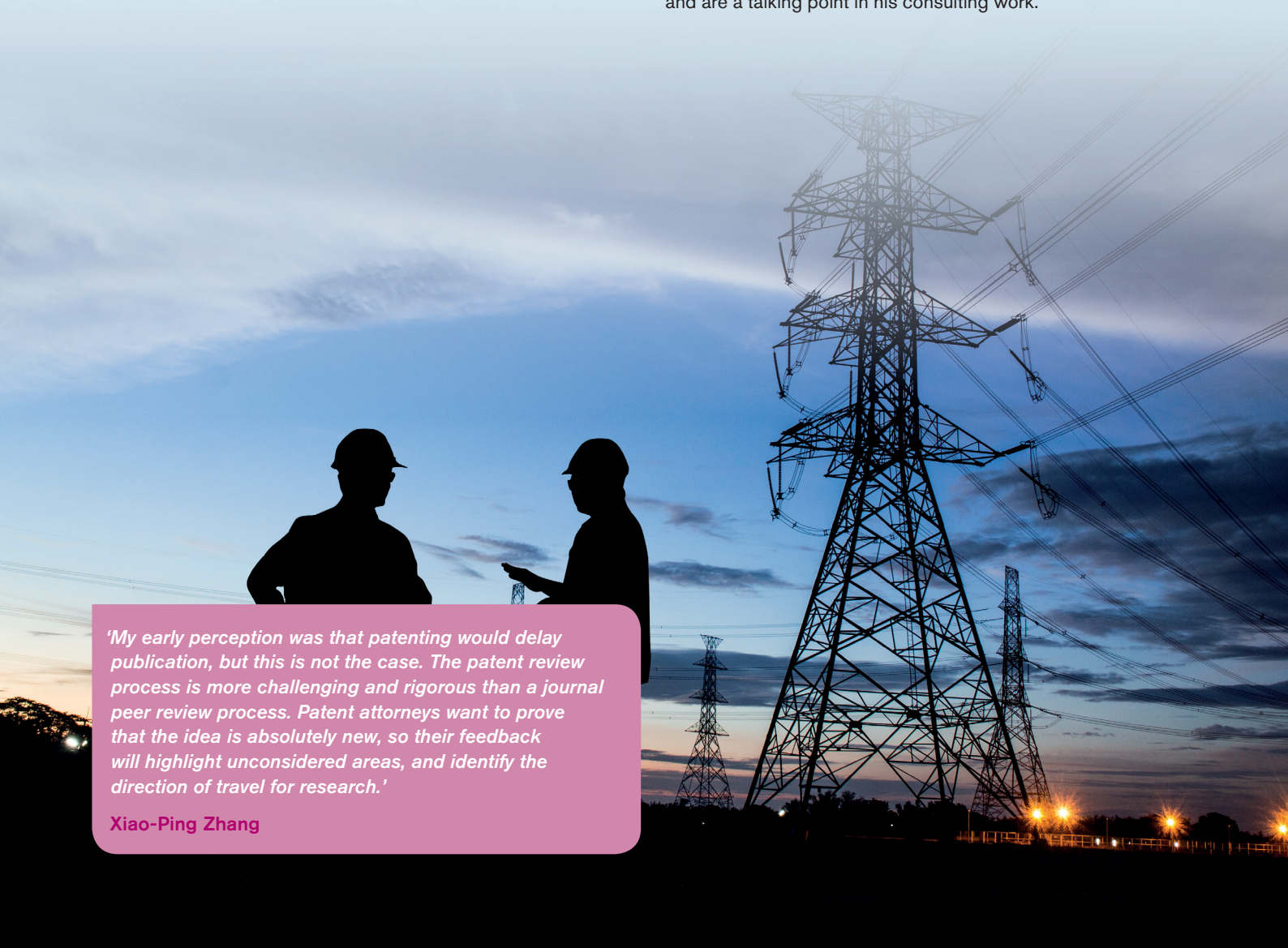
PROFESSOR OF ELECTRICAL POWER SYSTEMS,
COLLEGE OF ENGINEERING AND PHYSICAL SCIENCES

Xiao-Ping's interests in long-distance electricity transmission have recently focussed on a single issue: how to ensure that energy provided by grand renewable projects (solar, wave or wind farms) is efficiently transmitted from the point of creation to the point of use. He is proposing a global power and energy internet that will allow the wide-scale adoption of renewable energy.

University of Birmingham Enterprise has patented four technologies that will help make this possible. Although once convinced that filing patents would delay publication and harm his career, Xiao-Ping has found that working with the University of Birmingham Enterprise team to develop and file patent applications has clarified and shaped his research. He now prepares patents at the same time as preparing manuscripts for publication. Having patents granted gives independent validation, provides credibility to Masters students and industrial partners, and are a talking point in his consulting work.

'My early perception was that patenting would delay publication, but this is not the case. The patent review process is more challenging and rigorous than a journal peer review process. Patent attorneys want to prove that the idea is absolutely new, so their feedback will highlight unconsidered areas, and identify the direction of travel for research.'

Xiao-Ping Zhang



Case studies

Revolutionising learning

DR HENRY CHAPMAN

READER IN ARCHAEOLOGY AND DIGITAL HUMANITIES,
COLLEGE OF ARTS AND LAW

Henry was responsible for introducing the novel digital displays for one of Birmingham's top tourist attractions, the Library of Birmingham, which has over 1.4 million visitors a year. These displays needed to represent the culture and history of the West Midlands in a way that would be compelling and accessible for a major visitor attraction.

Henry uses a highly collaborative approach for all his external work. This involves creating relationships with external stakeholder organisations such as the National Trust and English Heritage, or in this case, Birmingham City Council, in order to fully understand their wishes. As a result of this engagement, he chose to use digital touch tables in the new library.

The resulting displays are able to provide layers of information that can be expanded or collapsed by the viewer, to present historic artefacts in a geographic context.

University of Birmingham Enterprise arranged licences to the University covering the work of the artist and IT specialist who helped Henry develop the digital display. Once this was done, the Enterprise team arranged a licence covering the digital display from the University to the BBC, so they could install it into a touch table.

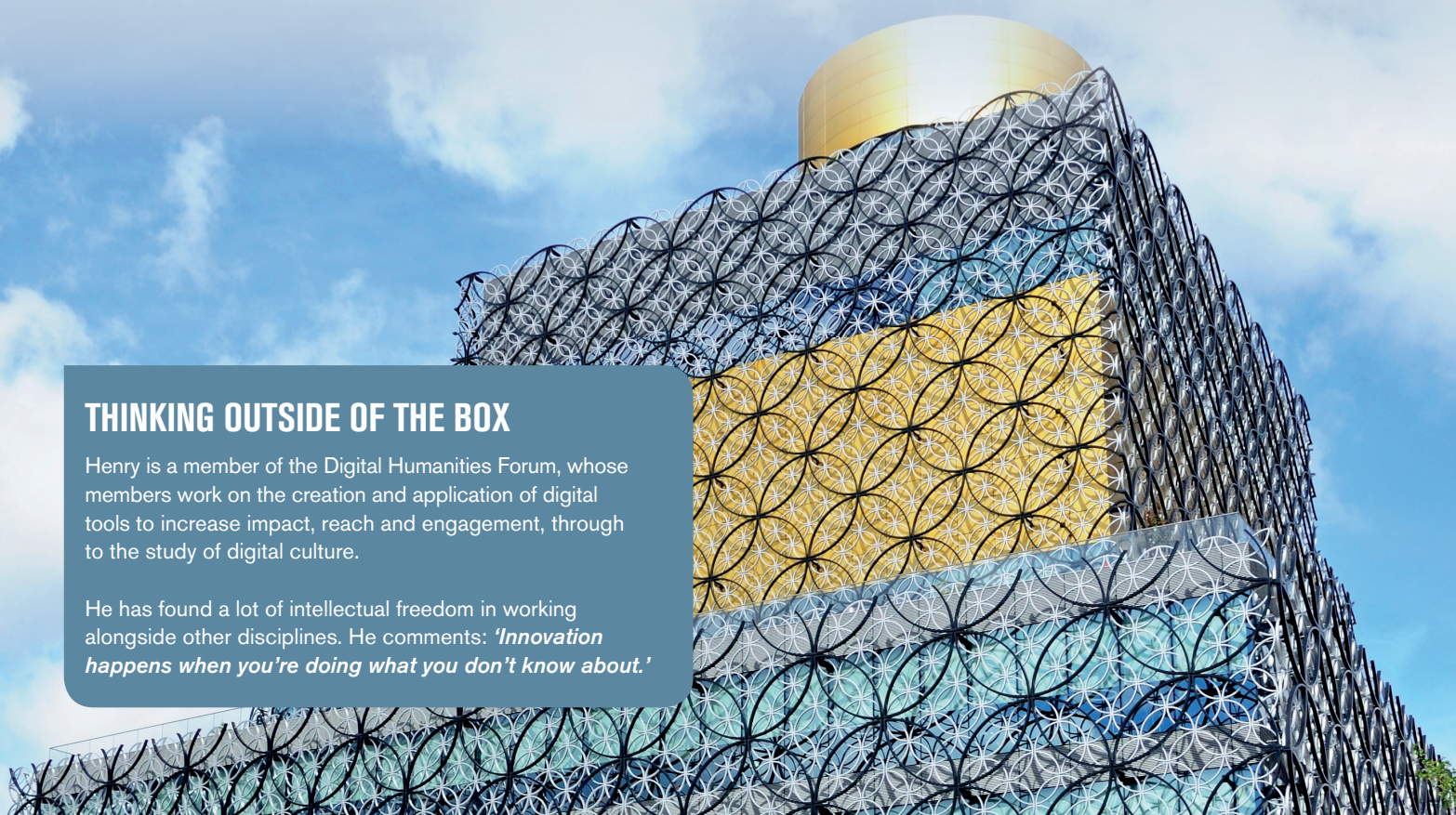
'This project delivered an imaginative way to encourage wider public engagement with the history of Birmingham in the largest public library in Europe.'

David Potts, Head of Library Resources,
Library of Birmingham

THINKING OUTSIDE OF THE BOX

Henry is a member of the Digital Humanities Forum, whose members work on the creation and application of digital tools to increase impact, reach and engagement, through to the study of digital culture.

He has found a lot of intellectual freedom in working alongside other disciplines. He comments: *'Innovation happens when you're doing what you don't know about.'*



Economic impact

University of Birmingham Enterprise has supported many of the 122 new companies started by staff and students that are still trading after more than three years. Among these are 36 spinout companies and social enterprises that have attracted £100 million from third-party investors since 2010 and which are valued at over £200 million. Most of these new ventures are high-tech or life science businesses and many of their innovations address global concerns.

Our incubation services also create new economic growth. In just over two years, entrepreneurs supported by the BioHub Birmingham and the BizzInn have created 250 new jobs in the West Midlands. We also make a direct contribution to the local economy through operating the Birmingham Research Park, which houses 55 companies and where nearly 500 people come to work every day.

More widely, the University contributes significantly to the economies of Birmingham and the UK through alliances with entrepreneurs and businesses that translate knowledge, know-how and research into enterprise. Nearly 1 in 50 jobs in Birmingham already depend on the University and recent support for Knowledge Transfer Partnerships with industry has created 175 jobs and more than £50 million of new goods and services across the UK.

This collective contribution is wholly underpinned by the quality of research done at the University. Much of this research has a practical focus, and as a result, Birmingham academics co-author more publications with industry, and generate more income from innovation than any other university in the Midlands.



Our mission

University of Birmingham Enterprise supports academics who want to innovate, take their ideas to market, work with businesses and social enterprises, or enrich their professional lives by doing academic consultancy projects. We do this by providing enterprise training, funding, office and laboratory space, and a full technology transfer service. University of Birmingham Enterprise also manages the incubation services and facilities at the Birmingham Research Park.

THE BOARD

Chairman: John Powell

CEO: Dr James Wilkie

Directors: Andrew Sleigh, Professor Andy Schofield, Brenda Reynolds, Professor David Adams and Dr David Brown

Company Secretary: Melanie Kaiser

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‘University of Birmingham Enterprise provides invaluable assistance in helping people who are new to the world of business understand how to formalise their ideas and move forward with their business goals and dreams.’

Anonymous academic responding to satisfaction survey



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Edgbaston, Birmingham,
B15 2TT, United Kingdom
www.birmingham.ac.uk

Designed and printed by

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creativemedia