What happens to a donated brain?
Inside the South West Dementia Brain Bank

Opinion:
The power of public medical research funding

Happy 70th!
Celebrating seven decades of the National Survey of Health and Development
£23.2m boost for cutting edge medical research ideas

The MRC has made awards worth £23.2m to accelerate innovative medical research and take ground-breaking ideas from UK universities into industry and out to patients.

The awards were made through three different funding initiatives, set up specifically to target different innovation needs. Universities and Science Minister Jo Johnson made the announcement on a recent visit to the University of Birmingham’s medical school and the Institute of Biomedical Research laboratories: “Our global scientific impact far exceeds our size as a nation, and our world class researchers like those at Birmingham University help drive the engines of innovation keeping the UK at the forefront of new discovery. This £23m fund provides invaluable support to help develop new ideas into the drugs and methods that will help save and improve lives.”

The Discovery Awards mechanism, providing £8.4m across 12 institutions, aims to accelerate ‘blue skies’ medical research by providing support much faster than usual funding routes. It will focus on building capacity and capability in areas of high national priority.

The Confidence in Concept awards, totalling £11.6m for 21 universities, provide flexible funding to universities to accelerate the transition from discovery science to viability testing. The awards aim to take promising basic research to the industry-academia interaction stage for the development of therapies, diagnostics and medical devices.

The Proximity to Discovery scheme, investing £3.3m in 17 universities, helps universities to build partnerships with industry by developing new collaborations and ways of exchanging knowledge and skills. Read more at: mrc.io/innovative-medical-research

Impact of research council investment

Each research council recently published a report, showcasing examples of the impact of investment through their awards, programmes and collaborations. The impact is wide-ranging, extending from furthering technological advances to combatting disease.

Collectively, the seven research councils invest £3bn in research each year, to meet tomorrow’s challenges today and provide the world-class research and skills that are the foundation of a strong and productive UK economy. This helps to achieve balanced growth as well as contributing to a healthy society and a sustainable world. By working in partnership, the research councils combine investments in a multitude of global societal and economic challenge areas to achieve even greater impact.

Read the MRC Economic Impact Report at: mrc.io/mrc-economic-impact-report1415

comment from
John Savill
Chief Executive

The Government continues to provide excellent support for UK research from the science and research budget, recognising the value of investment in research and the role it can play in international development. We are working individually, and collectively with the other research councils, to fully understand the implications and opportunities from the allocations, and will publish our delivery plans soon.

At the MRC we strive to identify and encourage exciting science, and bring different cultures together to form strong collaborations. We recently strengthened our commitment through £23.2m in new funding, announced by Science Minister Jo Johnson, to take pioneering ideas from UK universities into industry and out into healthcare.

I am pleased that this funding is made up of three different MRC initiatives, set up specifically to target different innovation needs (see page 3). The early outcomes of awards made under these schemes are promising, showing that through devolved decision-making, UK researchers have exploited the flexibility and collaborative potential of these innovative schemes.

Working together is also particularly important in the context of tackling the health risks posed by the Zika virus. We received an excellent response from the community to our Rapid Response Initiative, through which we have awarded £3.2m to 26 projects working in partnership with BIS colleagues, responsible for the Newton Fund, and the Wellcome Trust (see page 4).

I encourage researchers to continue to maximise all collaboration opportunities and bring expertise together to deliver patient benefit.

John Savill
MRC Chief Executive
Research funders join forces to tackle Zika virus

The MRC, the Newton Fund and the Wellcome Trust have joined forces to tackle the global threat posed by the Zika virus. The MRC-led Rapid Response received a total of 103 proposals. Funding was awarded to 26 high quality projects with a combined value of £3.2m. Specific awards include the development of an online data-sharing platform for images of fetal and newborn heads, and improved diagnosis for Zika virus infection through a shared laboratory partnership.

Alongside this initiative, the MRC has funded a research proposal with the Foundation for Science and Technology of the state of Pernambuco (FACEPE) in Brazil to investigate the viral features and host responses to Zika virus.

New ‘gene-editing’ techniques approved

A research group at the Francis Crick Institute, based at Mill Hill, has become the first to gain approval for using a new gene editing technique on human embryos.

The Human Fertilisation and Embryology Authority (HFEA) has approved an application by Dr Kathy Niakan and her team to investigate how a healthy human embryo develops during the first seven days of its life. Dr Niakan and colleagues plan to use CRISPR-Cas9 technology to gain a greater understanding of the factors needed for a human embryo to develop in a healthy way. The embryos used in the study will be donated by IVF patients who have given informed consent.

This stage of the approval process looks only at scientific quality; the next step for Dr Niakan and her group is to gain ethical approval for the study.

Director of Science Programmes at the MRC Dr Rob Buckle, said: “The decision by the Human Fertilisation and Embryology Authority cements the UK’s position as a global leader for research.”

Read more at: mrc.io/gene-editing-techniques-approved

Read the MRC position statement on gene editing: mrc.io/genome-editing

Fighting fungal diseases

A new MRC Centre for Medical Mycology (MRC CMM) will spearhead innovative research and training to generate knowledge that will improve the diagnosis, prevention and treatment of fungal diseases. Led by director Professor Gordon Brown, the centre represents a joint £6.5m investment by the MRC and the University of Aberdeen.

Professor Sir John Savill said: “Fungal diseases can cause serious illness and death in patients with vulnerable immune systems and present a major challenge to healthcare providers. The centre will build upon work by the University’s well-established Fungal Group and increase capacity for medical mycology to turn basic scientific discoveries into clinical advances that will save lives.”

Read more at: mrc.io/mrc-cmm

MRC bacteria

MRC Clinical Research Training Fellow Dr Nicola Fawcett, at the University of Oxford, is using bacterial art to help explain how antibiotics affect the delicate balance of microbes in the gut.

Responsible prescribing of antibiotics is important to prevent the spread of antimicrobial resistance and protect the ‘good’ bacteria in our gut. “This work tells me to remember that the antibiotics I prescribe can sometimes cause unintended harm to the gut bacteria that are helping to keep my patients healthy. It tells me I should be careful not to use antibiotics where they’re not needed,” explains Nicola.

Supported by an MRC Public Engagement Seed Fund Award, the work is a collaboration with photographer Chris Wood. The images feature in an exhibition at the John Radcliffe Hospital until 14 May.

See more on our Insight blog at: mrc.io/1UyM8t7

MRC talks

Tune in to news and views from across the MRC community in our quarterly MRC podcast, MRC talks. Subscribe on iTunes or find all episodes at: soundcloud.com/the_mrc

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FUNDING

Strengthening global neurodegenerative disease research

A total of £3.6m has been awarded for 11 international ‘Pathfinder’ projects in neurodegenerative disease research, under the third funding call for the Centres of Excellence in Neurodegenerative disease (CoEN) initiative.

The awarded projects will take a ‘high risk, high pay-off’ approach to identify and validate new potential drugs for neurodegenerative disease, and develop innovative therapeutic approaches. They will bring together a wealth of resources and expertise across different countries and, if successful, will provide a step change in neurodegenerative research.

Seven of the 11 awards involve MRC-supported Centres of Excellence, and projects include investigations into Alzheimer’s disease, Parkinson’s disease and Huntington’s disease.

CoEN is an international initiative, launched in 2010, to fund collaborative research into neurodegenerative disease. It involves research funders in Belgium, Canada, France, Germany, Ireland, Slovakia, Spain and the UK.

Details of the awards are available at: mrc.io/coen-pathfinder-awards
For further information visit www.coen.org

Flexible funding

In recognition that different people take different routes in research, all MRC fellowships are open to individuals returning to research following a career break. Applicants should make clear any substantive periods of absence from research within their application. Details of career breaks or flexible working will only be used to make appropriate adjustments when assessing an individual’s track record, productivity and career progression.

Find more information at: mrc.io/flexible-working-policies

New funding approach to regenerative medicine research

To help stimulate the pipeline of translational research and deliver real treatments to benefit patients, the MRC has recently made some changes to the way regenerative medicine research is funded. The Regenerative Medicine Research Committee will now focus funding into Confidence in Concept projects, spreading its £2m allocation over ten or so projects, and the Developmental Pathway Funding Scheme has significantly expanded to embrace regenerative medicine research.

Further guidance is available at: mrc.io/regen-med-funding

Investing in genomic medicine

The Scottish Genomes Partnership, a collaboration between the Universities of Edinburgh and Glasgow aiming to support genome sequencing in the nation, has received £6m from the Scottish Government and the MRC.

The £2m MRC contribution is part of a broader MRC ambition to enhance investment in genome research across the UK. The funding will allow scientists to decode and analyse the entire genetic make-up of more than 3000 people in Scotland. Linking this genetic data with clinical information will enable more precise molecular diagnoses for patients, leading to more personalised treatment and selection of drug therapies. It will also bring new understanding of the causes of both rare and common diseases.

Sir John Savill, who has a part-time appointment at the University of Edinburgh, played no part in the discussions leading to this award.

Supporting new researchers towards independence

To support early career researchers the MRC has increased the flexibility of its funding schemes available to post-doc researchers and provided clearer guidance.

Recognising that speed of progression can be affected by factors unrelated to an individual’s scientific potential, we have removed time-bound eligibility criteria from MRC New Investigator Research Grants.

New, simplified guidance is now available for MRC Clinician Scientist Fellowships, Career Development Awards and New Investigator Research Grants, explaining the difference between the schemes. We have clarified which may be most appropriate in terms of an individual’s long term career goals and chosen career route.

Sir John Savill said: “We recognise that we need to support our early career researchers through what can be a very challenging transition step in their careers. To ensure there are options available to meet their long term career aspirations and set them on the pathway to success, we are working in partnership with researchers and universities to remove roadblocks, increase flexibility, and provide clear guidance focused on developing our research leaders of tomorrow. I highly recommend that all researchers embarking on a path in biomedical research have a look at our Interactive Career Framework, to help guide their career choices.”

Guidance is available at: mrc.io/transition-to-independence

For further information visit www.coen.org
Pushing science forward

In recent data collections we have measured physical and cognitive capability, assessed the musculoskeletal and cardiovascular systems and asked participants about their mental health and wellbeing. These aspects of health were chosen because they have a significant impact on the quality and length of life, are potentially modifiable and evidence is accumulating that their origins lie earlier in life. We are increasingly aware that early life factors contribute to adult health and new NSHD research reveals that experiences during adolescence and midlife are also important.

Some of the findings that have come out of this study are now so widely known that to many they feel almost like common sense rather than knowledge we have gained through scientific study (see text box on page 10). The continued high rates of participation by study members allow this research to be undertaken.

In the last decade we have increasingly used NSHD data in combination with data from other cohorts to replicate findings and to provide large enough samples to discover small genetic effects. Coordinating and integrating research across cohort studies moves the science forward more quickly and helps to assess its policy relevance.

A recipe for success

Over its 70 years, a number of factors have been key to the study’s success. First, the parents who instilled in their children the importance of this study, whose own participation reflected the post-war spirit of optimism and commitment to improve society for the benefit of all.

Second, the commitment and participation of study members that allows the research to continue. Third, the core funding by the MRC since 1962 has been critical in facilitating innovative science. Fourth, the study directors who made sure that the study always addressed scientific and policy questions that were seen as relevant to people’s lives.

And fifth, the superb study teams who have been committed to the NSHD and its study members, their high quality scientific research and desire to translate their findings into improving the health of older people in Britain today.

Find out more about the study at: www.nshd.mrc.ac.uk/nshd

This ambitious study and its findings, along with the other British birth cohort studies that followed on, are the subject of Helen Pearson’s book ‘The Life Project’: mrc.io/21FszVS
Did you know?

Studies of the NSHD cohort have shown:

- Differences in mothers’ and babies’ health and survival in relation to socioeconomic circumstances and geographical area.
- A great risk of under-achievement among bright children in poorer socio-economic families, based on measures of cognition and intelligence and teachers’ assessments of behaviour and attitudes to school work.
- How significant aspects of risk associated with cardiovascular disease begin in early life and are amplified or reduced throughout life.
- That maintaining a healthy weight and lifestyle throughout adult life – including a nutritious diet, sufficient physical activity and not smoking – preserve physical and cognitive capability for longer, delay the onset of chronic disorders and reduce their associated impact on wellbeing and the activities of daily living.

A birthday bash to remember

To celebrate the 70th anniversary of the MRC NSHD the MRC Unit for Lifelong Health and Ageing (LHA) at UCL hosted two birthday parties for its study members.

The events, held in London and Manchester, were attended by 800 guests. Most attendees were the study members recruited from birth – some of the most closely medically observed people in the world.

Professor Diana Kuh, who leads the MRC NSHD at the MRC LHA, said: “NSHD study members have been helping us for seven decades of their lives and we are grateful for their time and commitment to the study. Their contribution to our knowledge about human development and ageing is enormously valuable for science and policy. Thank you all – and happy birthday!”

Sweet sixties

The latest findings from the MRC NSHD have also shown reason to celebrate, indicating a rise in wellbeing throughout the seventh decade of life.

Using the Warwick-Edinburgh Mental Wellbeing Scale, participants – when aged 60 to 64 – were asked to rank a 14-item scale with five response categories. The questions covered a range of aspects of mental wellbeing including feeling cheerful, confident, optimistic, useful and relaxed.

When the same individuals were asked the same questions at age 69, overall there was an improvement in all 14 items that make up the wellbeing scale, compared to their responses in their early sixties. This is in spite of most study members reporting at least one common chronic disease such as arthritis or cancer.

Dr Mai Stafford, Programme Leader at the MRC LHA, said: “The benefit of using a cohort study like NSHD is that we can look at how individuals change over time. We hope this will allow us to pinpoint which common experiences may be linked to an improvement in wellbeing in later life.”
Three British neuroscientists have been co-awarded the €1m Brain Prize by the Grete Lundbeck European Brain Research Foundation, for their outstanding work on the mechanisms of memory.

This year’s winners of The Brain Prize have all received funding from the MRC during their careers: Tim Bliss is a visiting worker at the Francis Crick Institute in London, Richard Morris is Professor of Neuroscience in Anatomy at the University of Edinburgh, and Graham Collingridge is Professor of Neuroscience in Anatomy at the University of Bristol, also holding appointments at the University of Toronto and Mount Sinai Hospital, Toronto, Canada.

Their research has focused on a brain mechanism known as ‘Long-Term Potentiation’ (LTP) which underpins the ability of the brain to continuously strengthen connections between neurons throughout our lifetime. Their discoveries have revolutionised our understanding of how memories are formed, retained and lost. The award testifies to the strong and sustained support that the UK funding bodies, particularly the MRC, have given to their research over the past three decades.

Read more at: www.thebrainprize.org
Organs have a sexual identity

Researchers at the MRC Clinical Sciences Centre have found that organs’ stem cells ‘know’ whether they are male or female.

It is thought that non-reproductive organs, such as intestines, function differently between the sexes because they are exposed to differences in hormones. But new results show there are genes acting within ‘male’ and ‘female’ organs that are responsible for making them distinct from each other.

The team took stem cells from the intestines of fruit flies and tailored them to be male or female, independent of the sex of the whole organism. This change altered how well the cells were able to multiply.

Their results also suggested that the female fly intestine was more likely to develop genetically induced tumours.

Lead author of the study, Dr Irene Miguel-Aliaga, said: “We have found a new mechanism which potentially means that every cell in the fly has a sexual identity.” This research could explain why men and women may respond differently to the same treatment.

Positive impact of pneumococcal vaccines

Researchers at the MRC Unit The Gambia have shown for the first time the real-life, positive impact of introducing infant pneumococcal vaccination in a low-income country.

A multi-partner collaboration, the study investigated the impact of the introduction of pneumococcal conjugate vaccines (PCV) on severe pneumococcal pneumonia, sepsis and meningitis, delivered within the Gambia Government’s Expanded Programme on Immunisation (EPI). Reducing the rate of pneumococcal disease is crucial, as children in The Gambia who develop invasive disease have a one-in-seven chance of dying, despite adequate treatment.

The eight-year study used robust population surveillance methods before and after introduction of PCV to measure the impact of routine infant vaccination with these vaccines. Results showed that the use of the vaccines reduced severe pneumococcal pneumonia, sepsis, and meningitis in children by 55 per cent.

Principal Investigator Dr Grant Mackenzie said: “I hope that our positive results encourage other low-income countries to introduce and maintain pneumococcal vaccine in their EPI. Our results show that spending money on PCV, and delivering the vaccine with reasonable coverage, will substantially reduce rates of pneumococcal disease and save lives.”

Blocking brain inflammation may delay Alzheimer’s

Researchers at the University of Southampton have found that blocking a receptor in the brain responsible for regulating resident immune cells, called microglia, could protect against memory and behavioural changes seen in Alzheimer’s disease.

Inflammation in the brain can drive disease progression and research suggests reducing inflammation may slow disease development.

In the study, funded by the MRC and Alzheimer’s Research UK, the team analysed post-mortem tissue samples from healthy brains and those with Alzheimer’s. They found higher levels of microglia in the disease tissue, and that activity of molecules regulating numbers of microglia correlated with disease severity.

By giving mice oral doses of an inhibitor, the researchers investigated whether blocking a receptor responsible for regulating microglia, CSF1R, could improve cognitive skills. Treatment prevented a rise in microglia numbers and these mice demonstrated fewer memory and behavioural problems.

Dr Diego Gomez-Nicola, lead author and an MRC New Investigator Research Grant holder, said: “The next step is to work closely with our partners in industry to find a safe and suitable drug that can be tested to see if it works in humans.”

Hope against ovarian cancer

An annual blood test may help reduce the number of women dying from ovarian cancer by around 20 per cent, according to the world’s biggest screening trial.

The screening blood test, called ROCA, interprets changing levels over time of a blood protein called CA125, linked to ovarian cancer, indicating a woman’s individual risk.

The UCL-led 14-year UK Collaborative Trial of Ovarian Cancer Screening (UKCTOCS), funded by the MRC, Cancer Research UK, Department of Health and The Eve Appeal, screened 202,638 post-menopausal women aged 50 to 74.

Results showed a delayed effect on mortality between the screening and control arms, which became statistically significant after the first seven years. Initial findings suggest that one life can be saved for approximately every 600 women screened for 14 years.

Study author Professor Ian Jacobs, President and Vice-Chancellor of UNSW Australia, Honorary Professor at UCL, co-inventor of ROCA in 1996 and also a non-executive director of Abcodia Ltd. (the UCL spin-out company licensing ROCA), said: “Longer follow-up is needed but this brings hope in the fight against a disease for which the outlook for women is poor and has not improved much during the last three decades.”
Majidah Hamid-Adiamoh joined the MRC Unit The Gambia as a scientific officer in 2004 and has been working with the malaria research programme ever since. She talks about winning the L’Oréal-UNESCO ‘For Women in Science’ fellowship, her career so far, and her plans for the future.

I started at the Unit working on a clinical trial for a new malaria drug. Samples were collected from patients six times per day and I was responsible for performing two-assays on each sample from four different patients – that’s 48 assays every day! It was challenging but I enjoyed every bit of it.

I am very proud of the quality of malaria research output from my department, thanks to the quality of its leaders and staff. The Unit has the right people, the right environment and the appropriate facilities to conceive an idea and be able to implement it.

Following that first project, I have continued with malaria research both in the field and in the lab. I have taken a lead role in a number of projects defining the genetic profiles, or ‘genotypes’, of different malaria ‘vectors’ – agents that carry and transmit malaria, such as mosquitoes – and I am currently working on a project characterising malaria transmission in The Gambia.

As part of the entomology team, my role is to genotype the malaria vector population. The study is in its final phase and, so far, we have found an emerging mosquito population (Anopheles funestus) that were not originally present in The Gambia. It will be interesting to determine whether this mosquito population is capable of carrying and transmitting malaria in The Gambia and assess how it will impact on efforts to control the spread of infection.

I am now planning a project that looks at people with malaria who are asymptomatic to explore how genetic diversity and other factors influence the density of the gametocyte germ cells in their blood.

Malaria gametocytes are a type of germ cell generated inside a host infected with malaria. When these germ cells are taken up by a mosquito feeding on the host, they are stored inside the parasite, ready to be transmitted to another body. I am also investigating whether a host immune response to the gametocytes affects their transmission to mosquitoes.

The project will require blood samples from healthy, asymptomatic Nigerian children and adults in malaria-transmission hotspots in Lagos. I will need to store the samples for some time so I intend to process the blood samples for DNA and RNA extraction as soon as collected and transfer them to the Unit in The Gambia for analysis.

I became interested in this topic because of the present era of malaria control and the focus on the elimination of the human reservoir of infection. Most studies so far have focused on clinical and symptomatic malaria as opposed to asymptomatic infections.

I am self-funding my PhD tuition at the University of Lagos in Nigeria and the L’Oreal UNESCO fellowship will fund just a part of my project.

It has been a challenging journey towards being able to do a PhD since I completed my Masters programme in 2010. The award ceremony was a day I will never forget; I felt encouraged in the pursuit of my research dreams and reassured of success.

When they told me that I had won I kept asking over and over again what the lady was telling me. I did not believe it!

The awards showcase the great work that women are doing around the world to contribute to human development. This is the right time to intensify efforts to boost women’s confidence that they too can come up with scientific solutions to many of the problems the world faces.

Women have been solving issues around human survival throughout history and I think what is happening now is just a formalisation and a better acknowledgment of women’s problem-solving abilities.

My advice to women aspiring to a career in science is that they should never allow challenges along the way to discourage them from pursuing their dream. Most importantly, they must support other young women in their scientific careers. The more women we encourage into scientific careers, the more quickly their skills can be translated into a better world for us all to live in.

Applicants to MRC-funded fellowships no longer have to apply within a certain number of years of finishing their PhD. This is important to me because age restricting career opportunities discourages people who have gone through the rough and odd ways in their career and yet have a strong determination to advance. This frequently applies to women from Africa who, due to family and financial constraints, have to thread their way slowly to their dreamland.

As told to Sylvie Kruiniger

Read more at: www.mrc.gm
What happens to a donated brain?

For the 12 million people in the UK living with a neurological condition, research is urgently needed to better understand disorders, and to find new and better interventions and treatments. Examining brain tissue, stored in brain banks, is vital to increasing this knowledge, and researchers are making great advances. So what happens to a brain once it reaches a brain bank? Here Dr Laura Palmer and Dr Candida Tasman from the South West Dementia Brain Bank at the University of Bristol explain.

The South West Dementia Brain Bank, set up in the mid-1980s, is part of the MRC-led UK Brain Banks Network, made up of 10 brain banks. Dr Laura Palmer, who started out as the bank technician and is now the brain bank manager, has dealt with over 300 potential donors and their families.

“Last year we received our 1000th brain donation – a massive milestone. I have huge respect and admiration for people who decide to donate their brains. Every donation here is a person to us – it’s our job to make sure his or her brain can be used for research and that the tissue is treated with respect.”

When they receive a donation, research technician Dr Candida Tasman prepares the tissue for post-mortem diagnosis and research. “When a brain arrives at the bank the first thing I’ll do is weigh it. People can lose up to a third of the weight of their brain through tissue loss in Alzheimer’s disease,” she explains.

“Next the brain is cut down the middle into two equal halves. One half gets dissected immediately and cut into slices. The tissue is separated out into areas which will be used for research and frozen in bags and tubes at -80 degrees Celsius.”

Frozen tissue is particularly useful for research. “It can be used to look at protein levels in the brain, to conduct different assays and look at the activity of proteins,” explains Laura. “The different colour tubes represent different areas of the brain that we know are most involved in dementia.”

Meanwhile the other half gets preserved in formaldehyde for three weeks, which gently fixes the tissue, so it doesn’t decay and can be stored. It is dissected into slices 1cm thick and assessed for any visible signs of tissue deterioration, which may indicate whether dementia-related abnormalities are present. Samples are taken from key areas that are most likely to show these different abnormalities and placed in a processor. This replaces the water in the tissue with paraffin wax, giving it a more solid structure.

“The tissue is then embedded in blocks of paraffin wax which are cut into extremely thin slices, less than a cell thick, enabling us to see individual cells under the microscope and make a diagnosis,” explains Candida.

Tissue samples are sent to approved researchers anywhere in the world including Canada, Sweden and Australia, though the majority of requests come from the UK. Tissue is couriered either frozen on dry ice or on microscope slides at room temperature. The bank processed about 32 requests last year – some as small as four samples and some as large as 1,000.

Laura’s favourite part of her job is writing to families to let them know the diagnosis of their loved one. “Each brain must receive a diagnosis before it can be used for research, and we try to write to families within 3-6 months. I feel that a definitive diagnosis can help families to move forward after the death of a loved one.”

As told to Katherine Nightingale

Find out more about brain banking in our video: mrc.io/1Or43eM

More information is available at: www.mrc.ac.uk/research/facilities/brain-banks

BBC medical correspondent, Fergus Walsh recently visited the Bristol Brain Bank to examine some of the latest advances in neuroscience: www.bbc.co.uk/news/health-35552030

When Susan Jonas helped to donate her aunt’s brain to medical research in 2013, it inspired her to sign up to donate her own brain after her death: mrc.io/1Ht0SAM

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Dr Owen Brimijoin is a Senior Investigator Scientist at the Scottish Section of the MRC Institute of Hearing Research (IHR) in Glasgow, where his research investigates the relationship between hearing and the dynamic three-dimensional world around us. He showed Jane Bunce around his shared office at the Royal Infirmary in Glasgow, where his desk is no stranger to LEGO®.

**Development rack**

People’s ability to tell where sounds are coming from declines with hearing impairment, and understanding speech in noisy rooms becomes harder. One in six people in the UK have a level of hearing loss that warrants a hearing aid, but the aids often don’t perform as well as desired. We examine this in four soundproof rooms of varying sizes, with loudspeaker systems to control the source of the sound precisely or play multiple sounds from different directions. This is a mock-up of the system that runs a big ring of loudspeakers.

**Nintendo controllers**

We bought these off the shelf and we use them in our hearing test experiments — for example, we ask people to press a button when they’re pointing in the direction of a woman’s voice. The cameras in them can also be used to do head tracking to move sounds around someone as they move.

**LEGO bricks**

We build prototypes out of LEGO bricks. Once you’ve built something in metal it’s hard to adjust, but you can use LEGO to figure out the optimal distances and arrangements. I’ve built a motion tracking ‘crown’ and a frame for measuring the position and angle of our loudspeakers in our soundproof rooms. This is actually my childhood LEGO set brought over from the States.

**Photograph and fossils**

These are from the Isle of Skye, off Scotland’s northwest coast. The fossil is a Jurassic-era ammonite. The photograph is of the ruins of a cottage overlooking the fossil grounds — my wife and I found it one day when we scrambled up this waterfall and there it was. It’s not on any map. Most of the traveling we do is in Scotland. I was a Career Development Fellow on a three-year post when I moved to Glasgow from the US, so thought of it as a brief adventure. Now we just love it and we don’t want to go anywhere else.

**Bat etched in glass globe**

This is from the Museum of Jurassic Technology in Los Angeles. A friend gave it to me, because my dissertation was on how bats process complex sound. I was a neurophysiologist by training. Donald Griffith, who discovered that bats use echolocation to navigate, was academically my great-grandfather — my advisor’s advisor’s advisor. When he made the presentation at a scientific meeting that bats use sonar, he was taken aside by naval intelligence — sonar was a highly-classified technology at the time and they were offended that bats could do it!

**Directional hearing aid prototype**

This is an early prototype of an experimental directional hearing aid we built in collaboration with the University of Glasgow. The theory is that it would amplify sound based on what you’re looking at by measuring which way the eyes are pointed using electrodes in the ear. It’s an exciting project because there’s a lot you could do to improve hearing aids if you know what someone is looking at.

Dr Owen Brimijoin is a Senior Investigator Scientist at the Scottish Section of the MRC Institute of Hearing Research (IHR) in Glasgow, where his research investigates the relationship between hearing and the dynamic three-dimensional world around us. He showed Jane Bunce around his shared office at the Royal Infirmary in Glasgow, where his desk is no stranger to LEGO®.

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We build prototypes out of LEGO bricks. Once you’ve built something in metal it’s hard to adjust, but you can use LEGO to figure out the optimal distances and arrangements. I’ve built a motion tracking ‘crown’ and a frame for measuring the position and angle of our loudspeakers in our soundproof rooms. This is actually my childhood LEGO set brought over from the States.

**Photograph and fossils**

These are from the Isle of Skye, off Scotland’s northwest coast. The fossil is a Jurassic-era ammonite. The photograph is of the ruins of a cottage overlooking the fossil grounds — my wife and I found it one day when we scrambled up this waterfall and there it was. It’s not on any map. Most of the traveling we do is in Scotland. I was a Career Development Fellow on a three-year post when I moved to Glasgow from the US, so thought of it as a brief adventure. Now we just love it and we don’t want to go anywhere else.

**Bat etched in glass globe**

This is from the Museum of Jurassic Technology in Los Angeles. A friend gave it to me, because my dissertation was on how bats process complex sound. I was a neurophysiologist by training. Donald Griffith, who discovered that bats use echolocation to navigate, was academically my great-grandfather — my advisor’s advisor’s advisor. When he made the presentation at a scientific meeting that bats use sonar, he was taken aside by naval intelligence — sonar was a highly-classified technology at the time and they were offended that bats could do it!

**Directional hearing aid prototype**

This is an early prototype of an experimental directional hearing aid we built in collaboration with the University of Glasgow. The theory is that it would amplify sound based on what you’re looking at by measuring which way the eyes are pointed using electrodes in the ear. It’s an exciting project because there’s a lot you could do to improve hearing aids if you know what someone is looking at.
The power of public medical research funding

‘Spillover’ measures the wider economic gains from public investment, both government and charity. Here MRC Chair Donald Brydon discusses the MRC-funded Spillover Report, and how UK public funding of research has the power to stimulate investment in the economy.

Public funding for research, although not generous, has led to scientific advances that impact on millions of lives and have delivered extraordinary health gain. It also has a very healthy effect on the economy.

For every £1 we invest in medical research, we see a 17 per cent annual return to the UK economy, indefinitely. Thats before you take into account the monetised benefits of a healthier population. Include that and the rate of return rises to somewhere between 24 and 28 per cent.

The Spillover Report, published in February, demonstrates the effectiveness of government and charity funding for research and its power to stimulate investment from industry. Drawing on 30 years of data, the researchers calculated that for every ‘public’ pound invested in medical research, the private sector invested a further 99p into the UK economy. The effect is nearly immediate with 44 per cent of that investment occurring within a year.

The MRC has supported discovery science to improve human health for over 100 years and is internationally acknowledged to have been instrumental in some of the most important medical advances of the last century. Examples include the randomised controlled trial, the structure of DNA, MRI and monoclonal antibodies.

These four landmark advances now underpin multi-billion pound global industries.

The power of UK public funding of research to stimulate investment in the economy is partly down to its synergy with industry. The UK’s world-leading research excellence is regularly cited as a major reason for a thriving life sciences sector, gaining the country returns from an industry employing over 180,000 people and turning over £56bn in the UK.

Although previous estimates had put the rate of return at 30 per cent, these were based on data that were US-centric and increasingly out of date. The new estimates in this report are lower, but much more reliable. The rate is still incredibly significant, particularly when we consider that it improves not only the UK economy, but the health of millions.

I am persuaded by the growing weight of evidence that shows public, charity and private sector funding strategies are highly complementary, and that we each need to work closely together and be adequately resourced if UK success in science is to continue.

The fact of the matter is that scientific and technological advances need both public and private sector support.

Discovery science often has no immediately obvious commercial opportunities but is needed at every step in translation. The process of turning discoveries into new products is not a linear, but an iterative process between pure research and applied development. Public funding means that this research is still pursued for the benefit of human health. As a result, industry finds a rich seam of ideas and experts in the UK, all the reasons it needs to invest here again and again.

At a time when Government is considering how best to deploy finite resources, I suggest that funding research is an exceptionally good way of leveraging inward investment, creating new employment and, importantly, improving the health and quality of life for people whether in the UK or elsewhere.

Read the report, funded by the MRC and led by Professor Jonathan Grant, Director of the Policy Institute at King’s College London, published in February in BMC medicine:
mrc.io/1XsRWne
**YOUR FEEDBACK**

*Network* is for anyone who has an interest in the work of the MRC, including scientists, doctors and health professionals involved in medical research, government departments and parliamentarians, and university staff and students. The aim is to provide a quick, easy-to-read summary of activities across the MRC, from research news through to funding, grant schemes and policy issues, with pointers to more in-depth information on websites and in other publications.

We are keen to receive feedback on *Network* and suggestions for new features from our readers. So if you have any comments, please email: network@headoffice.mrc.ac.uk

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A bride at her wedding in the late 1960s, taken by Professor Diana Kuh, Director of the MRC National Survey of Health and Development. In the 70 years since it began a lot has changed, but the study continues to collect data on the entire life course of thousands of people born in one week in 1946.