

# pelican

Dr Richard Henderson

Nobel Prize winner

Sacha Woodward Hill

General Counsel to Formula One

Professor Christopher Kelly

Master of Corpus Christi College



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**Professor Christopher Kelly**

PAGE 4



**Dr Richard Henderson FRS**

PAGE 6



**Sacha Woodward Hill**

By Dr Simon Heffer  
PAGE 12



**Dr Rune Damgaard**

PAGE 20



**Professor Judy Hirst FRS**

PAGE 26



**The Corpus manuscripts**

PAGE 34



**Revd Dr Andrew Davison**

PAGE 38



**Dr Melle Kromhout**

PAGE 46



**Dr Felicity Hill**

PAGE 52



**Michael Griffiths and  
John Lucas**

PAGE 58

# Professor Christopher Kelly

## 52nd Master of Corpus Christi College

When Christopher Kelly was elected Master of Corpus, he vowed to ‘tell the Corpus story’. This small and sixth oldest of the Cambridge colleges is the only one founded by the townspeople (the brethren and sisters of the Gilds of Corpus Christi and the Blessed Virgin Mary). Corpus, uniquely for an ancient college, had neither a royal nor an ecclesiastical founder. But the Corpus story is much larger than that. ‘It is the story’, Professor Kelly pointed out, ‘of a college that houses and cares for the Parker Library, one of the country’s greatest heritage treasures. It is the story of a small, tightly-knit community rightly prized for its friendliness amongst students, Fellows and staff, and for its broad range of achievement in matters cultural, social, sporting and, above all, for its commitment to excellence in teaching, learning and research.’ It is the story of a college where support is offered across the board to both undergraduates and postgraduates, and where that clichéd claim of being a family matches up to reality.

Christopher Kelly is no stranger to Corpus. He was elected as a Fellow under Michael McCrum in 1994, having been a graduate student at Trinity and Drapers’ Research Fellow at Pembroke. He served as Senior Tutor from 2000 to 2004, and later President from 2016 to 2017.

His own academic career stands him in good stead for the challenges of the Mastership. As Professor of Classics and Ancient History in the University (assigned to the Faculty of Classics), Christopher Kelly has a wide range of interests in the ancient world; these include government and power, its use and abuse, the society, religion and culture of the Roman Empire from Augustus to Justinian, the rise of Christianity, and Edward Gibbon and the Grand Tour. His books include *The End of Empire: Attila the Hun and the Fall of Rome*, made especially famous by Prince Philip who was photographed clutching it jealously as he boarded the royal train for Christmas at Sandringham.



With this track record, it is no surprise that the Master’s attention is sharply focused on academic matters. The complex and often troubled landscape currently occupied by higher education in the UK demands an intricate understanding of the issues, the funding, politics and people. Professor Kelly is keenly aware of the challenges the College faces in the next decade. ‘I firmly believe’, he remarked, ‘that it is important for Corpus to promote academic excellence at all levels and to underwrite that success by increased access and outreach initiatives, and by securing additional support against the rising costs of undergraduate and graduate education.’

‘He is passionately committed to Corpus,’ commented Dr Marina Frasca-Spada, Corpus’s Senior Tutor. ‘For more than twenty years Christopher has been a major intellectual presence in College as a Fellow, as Director of Studies in Classics, as a supervisor, as a member of key College committees, as Senior Tutor and as President. He is passionately committed to the welfare and academic success of both students and Fellows, and to the continued excellence of our collegiate University.’

The Master’s enthusiasm for the Parker Library and his desire to see its treasures appreciated and understood by alumni and an international audience is obvious. Loans of manuscripts to museums and collections around the world will be co-ordinated with curated viewings and with publicity well in advance so that alumni and friends can visit in their own countries and cities. ‘Simply put’, he stated, ‘the Parker Library, alongside the chapel of King’s College, is the most important international cultural heritage asset in Cambridge. This College glories in one of the best collections in the world of medieval manuscripts and early printed books.’ Corpus is committed to protecting and preserving the Parker Library, ‘but also to ensuring that its collection is shared and enjoyed by a wide audience through its dedicated website, the digitisation of its manuscripts, talks and lectures, and frequent loans to museums around the world.’

‘Alongside our small community and our firm commitment to excellence in teaching, learning and research, the Parker Library is one of the most distinctive and distinguishing features of Corpus. It sets us apart from every

other college in Oxford and Cambridge. It is a rare and remarkable piece of world heritage. In short’, he concluded, ‘it is something well worth boasting about.’

The Master’s wife, Ms Shawn Donnelley, also knows the College well and her support for his candidacy was fundamental to his decision to stand. ‘The most important conversation about agreeing to stand for the Mastership was the one I had with my wife,’ he told Fellows during his election. Shawn is a Guild Fellow of the College, a member of the University’s Guild of Benefactors and an experienced expert in philanthropy. She is President of Strategic Giving, a Chicago-based firm providing consultation on philanthropic giving. She serves on many boards in the US, including those of the Art Institute of Chicago, Northwestern Hospital Memorial Foundation, American Associates of the National Theatre (in London) and is a past chairman and current life trustee of the Goodman Theatre in Chicago.

Within weeks of Christopher being admitted as Master, Shawn had organised a fancy dress Hallowe’en party at the recently renovated dining hall at Leckhampton for the families of Fellows and staff. Its promise immediately enlivened lunchtime conversation; where does one get hold of goth make-up/human-sized pumpkins/white-haired wigs/horns/red cloaks/black silk leggings and garters? The discussion rivalled the most esoteric of discourses: one senior Fellow was heard asking another; ‘So are you going as Garibaldi? Because if you’re not then I am.’

Under Professor Christopher Kelly’s Mastership, the College can look forward to a flourishing new era of sharply focused academic achievement (amongst both students and Fellows), increased awareness and visibility of the treasures of the Parker Library, and ever stronger collegiate bonds within the community of the College and its alumni. ‘Let’s remember’, he said recently at Admission of Scholars, ‘that this little College last year claimed a Nobel Prize winner (Dr Richard Henderson), a Fellow of the Royal Society, three personal chairs, three readerships and more starred firsts than we have had in a generation. It’s not a bad place to be right now.’

Follow the Master and his wife on Instagram [@themastercorpus](#)



Professor Christopher Kelly and Dr Christopher Brookes (Senior Fellow) in the College Chapel before the admission ceremony.



Professor Christopher Kelly and Ms Shawn Donnelley.



The Master dressed as Obi-Wan Kenobi at the Hallowe’en party.



I have been very fortunate in my life and scientific career. I was born into a normal working-class family in the borders of Scotland, where my father was a baker and my mother had a variety of jobs. The educational system worked for me exactly as it was designed to do in the post-war expansion of secondary education. I went to four schools, each one a step up from the previous one. The teachers were mostly good, some excellent. The various exams, in Scotland the “quali”, that were designed to tailor educational level to academic ability placed me in the most academic stream at Hawick High School. I was academically able and gradually assimilated knowledge, somehow appreciating the intrinsic thrill of learning abstract concepts, particularly in mathematics and science. After an undergraduate degree in physics at Edinburgh University, I made a major effort to explore a variety of career options before deciding on a PhD in biophysics. Fortunately, our physics professor in Edinburgh, Bill Cochran, knew about the MRC Laboratory of Molecular Biology (MRC-LMB) because he had recently moved from Cambridge to Edinburgh, and recommended I should write to Max Perutz.

I came on the overnight train in February 1966 to the Saturday morning student open day at the MRC-LMB. I was interviewed by Max and John Kendrew, who had shared the 1962 Chemistry Nobel prize for their work on haemoglobin and myoglobin, though I was not aware of this at the time, and heard an explanation of the power of X-ray crystallography by David Blow, who became my PhD supervisor 6 months later and had himself been an undergraduate at Corpus in the 1950s. I was impressed that there were more people hard at work on Saturday morning at the MRC-LMB and having fun with their research than on a weekday afternoon in any of the other places I had visited in my explorations of potential PhD projects.

After my interview/visit to MRC-LMB, I immediately wrote to Max Perutz to say that I would very much like come to MRC-LMB for a PhD and was accepted

two days later. I had not realized that the Cambridge PhD required membership of a college. Since I knew nothing about the colleges, I wrote to another Edinburgh physics graduate, Keith Moffat, who had graduated a year ahead of me and had also been directed to Perutz by Cochran. Keith wrote back with a wonderful 4-page letter giving a thumbnail sketch of the positive and negative aspects of each of the then about 20 colleges.

Keith recommended Darwin and Corpus Christi, largely because Corpus had just opened new postgraduate accommodation in 1964 in the George Thomson Building. I spent a year living in the George Thomson building, and later became a fellow at Darwin and an Honorary Fellow at Corpus. Keith’s letter said; “Corpus Christi has a truly magnificent post-graduate hostel called Leckhampton, ultra-smooth, full of interesting people, and much sought after. No molecular biologists but plenty of chemists, an enlightened attitude towards research students – recommended. I see a lot of it as a number of my friends live there, including two Edinburgh chemistry graduates from my year, Gavin Currie and Ian Stenhouse. It’s a bit out of town but the setting more than makes up for the comparative isolation – a gigantic garden with swimming pool, rose garden, Henry Moore statue, squash courts and playing fields – the lot.” Consequently, I applied and was accepted by Corpus as a graduate student with a stipend from the Medical Research Council.

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AT MRC-LMB, I JOINED WHAT WE CALLED “THE CHYMOTRYPSIN GROUP”, LED BY DAVID BLOW, AND HELPED TO DETERMINE THE STRUCTURE AND UNDERSTAND THE CATALYTIC MECHANISM OF THE ENZYME CHYMOTRYPSIN.

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At MRC-LMB, I joined what we called “the chymotrypsin group”, led by David Blow, and helped to determine the structure and understand the catalytic mechanism of the enzyme chymotrypsin.

# Dr Richard Henderson (m1966)

Honorary Fellow and Nobel Prize winner





George Thomson building at Leckhampton.

This was a particularly productive period in the early years of structural molecular biology: in 1966 the atomic structures of only two proteins, myoglobin and lysozyme, were known but by 1969 when I submitted my PhD thesis there were nearly a dozen, of which chymotrypsin was one of the first. By now in late 2018, the atomic structures of over 140,000 macromolecules have now been deposited in the Protein Data Bank (PDB). This phenomenal explosion has been driven by many technical advances and could never have been predicted 50 years ago.

At Corpus as a PhD student I would occasionally meet the Master, Sir

Frank Lee, who was an impressive and very wise chairman of many Corpus committees, having had decades of experience in government. He was also Vice Chairman of the Board of Governors of the United Cambridge Hospitals, and masterminded many developments at Addenbrookes Hospital. These included the creation of a recreation centre for staff, later named the Frank Lee Centre, which provided superb leisure and fitness facilities including a swimming pool, squash courts, tennis courts and most important, a general-purpose room and bar. Now, 50 years later, I am still a member of the Frank Lee Centre, which continues to fulfil its purpose as part of the Cambridge Biomedical Campus. I also met

GP Thomson (1937 Nobel prize in Physics for the experimental discovery of the diffraction of electrons by crystals) and was invited to high table in the 1980s by then Master Michael McCrum but declined to renew my association with Corpus, instead becoming a fellow at Darwin College, where I spent 30 years, including three with the heavy responsibility of being wine steward.

During my graduate years in the 1960s, I lived for 18 months in the George Thomson building at Leckhampton, then six months sharing a house with other graduate students at 6 Clarendon Street, then a year living in a Corpus flat on

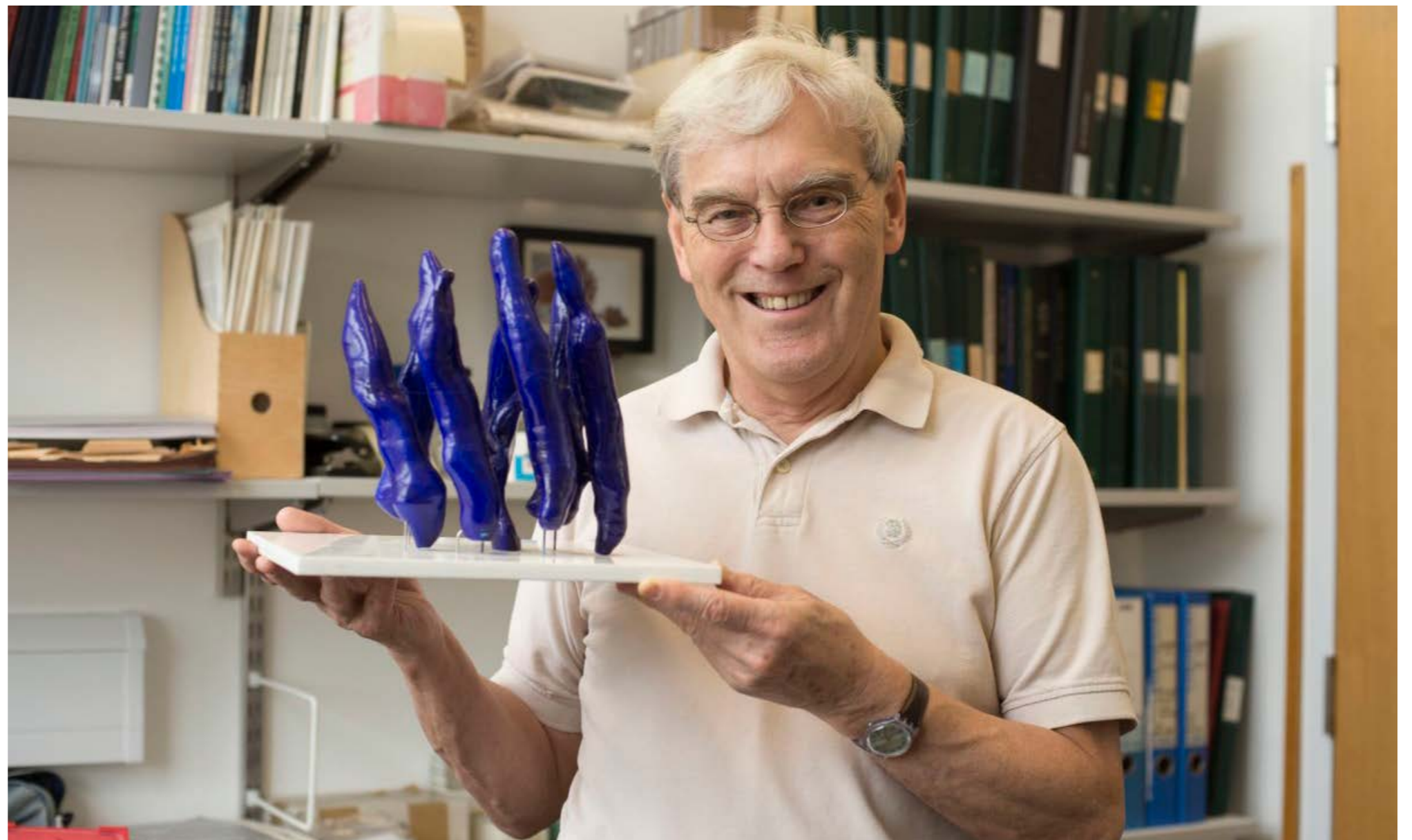


Photo courtesy: MRC Laboratory of Molecular Biology.

Cranmer Road after marrying Penny FitzGerald and starting a family with daughter Jennifer. Leckhampton was and still is a great place for a new arrival in Cambridge to join a pre-existing community, and the nearby housing for young families reduces one of the main economic hurdles.

After my PhD I went to Yale for three years and returned as a young independent scientist to the MRC-LMB in 1973, only to find that Craig Mackay, who had been in the same physics class as me at Edinburgh and had also come to Cambridge in 1966 for a PhD in radio astronomy with Martin Ryle, was now a fellow at Corpus. There were six of us

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FROM 1973 AND FOR THE NEXT 45 YEARS I PURSUED MY SCIENTIFIC INTERESTS AS A STRUCTURAL BIOLOGIST WORKING OUT THE STRUCTURES OF A NUMBER OF INTERESTING BIOLOGICAL MOLECULES AS WELL AS HELPING TO DEVELOP MORE POWERFUL METHODS.

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who made the journey south from Edinburgh to Cambridge to pursue graduate work of one kind or another in 1966, and Craig and I are still here.

From 1973 and for the next 45 years I pursued my scientific interests as a structural biologist working out the structures of a number of interesting biological molecules as well as helping to develop more powerful methods. It was a chance meeting with Nigel Unwin, who was another young independent scientist at MRC-LMB, after he gave a talk about his work using the electron microscope that changed my own focus from using X-ray diffraction to using electron



Dr Henderson receiving the Nobel Prize in Chemistry 2017.



diffraction and imaging. We worked together for two years in 1974-1975. The results we obtained in determining the first low-resolution structure of a membrane protein, bacteriorhodopsin, were an early indication of the potential and power of using the electron microscope to determine the atomic structures of biological macromolecules. Our collaboration changed the trajectory of both of our researches in different ways; I switched to using electron microscopy and Nigel

switched to working on membrane proteins. We shared the Gregori Aminoff award of the Royal Swedish Academy of Sciences in 1999.

Alongside my research activities, I also served as Director of the MRC-LMB in 1996-2006. It was Cesar Milstein (1984 Nobel prize in Physiology or Medicine) who told me it was “my duty” to accept the position as an MRC Director; after 30 years of freedom to pursue research without any heavy administration,

I realised he was absolutely right. Together with then Deputy Director Hugh Pelham (who subsequently became Director in 2006-2018), we persuaded the MRC to build a new laboratory building that was much bigger than the original 1960s building even after addition of many extensions and assimilation of surrounding buildings. During my term as MRC-LMB Director, I was appointed as an Honorary Fellow at Corpus and have been in regular contact since then.

One day in October a year ago, I received a phone call at 10.15 am from Gunnar von Heijne and the Chemistry Nobel Committee of the Royal Swedish Academy of Sciences with the news that I would share the 2017 Chemistry Nobel prize with Jacques Dubochet and Joachim Frank “for developing cryo-electron microscopy for the high-resolution structure determination of biomolecules in solution”. As a consequence, the last year has been a busy one for me but I’m looking

forward to getting back to the more normal pace of scientific research as the scientific spotlight moves onwards to illuminate the impact of other topics. Looking back on the last 100 years or so of scientific progress, what I find amazing is that the existence of X-rays or electrons was only recently known then. X-rays were discovered by Röntgen in 1895 (1901 Physics Nobel prize) and the electron by JJ Thomson in 1897 (1906 Physics Nobel prize). Together, they underpin vast areas

of modern science and are now used as the central principle of an enormous array of tools. Against this obviously increasing pace of discovery and invention, it is hard to imagine what further discoveries and inventions will be made in the next 100 years. Hopefully, Corpus will continue to play an important role in this continuing knowledge revolution.



# Sacha Woodward Hill (m1987)

## General Counsel to Formula One

Interviewed by Dr Simon Heffer (m1979)

It is about 40 minutes into an interview with Sacha Woodward Hill, General Counsel to Formula One and for over 20 years one of Bernie Ecclestone's key lieutenants, when I feel I must ask the obvious question: "What do you drive?" "You've got me there", she chuckles. "I don't drive. I've thought about it. But there are very few moments when I have said to myself: 'It would be very good to be able to drive at this moment.'"

Miss Woodward Hill may not have a driving licence, but she has acquired such a mastery of detail about the commercial empire that is F1 that, shortly before he stepped down as the chief executive of the business last year, Mr Ecclestone publicly tipped her to succeed him. As it is, she remains the chief lawyer of the business for its new owners, and we meet in their luxurious new offices in a development just off Piccadilly Circus.

Some people drift into high-powered jobs by accident, but as she explains to me her present position came about thanks to a piece of deliberate targeting. "Formula One came about because I knew I wanted to move in-house," she explains, having told me about her training with a leading firm of London solicitors. "And it was my sister who suggested to me 'think of what interests you. Choose something you enjoy.' I was a Formula One fan, so that seemed an obvious place to try.

"It was one of those sports that was always on in the background when I was at home on Sunday afternoons. My mother would only cook a Sunday lunch every second Sunday. The other one was a grand prix lunch, which you ate on your lap and which was self-service. And if we went on holiday, which was usually to France, the first priority was to tour the area and find a bar with a television, and

ask them if they'd be so kind as to put the race on. All the family were keen on motor racing. I do remember the 70s, the era of Lauda and Hunt, but it really pierced my consciousness in the 1980s, with Senna and Prost and Piquet and Mansell."

So when she decided she wanted to be an in-house lawyer, a job with F1 was the obvious place to go. "My sister urged me to contact them," she says. "At that stage Bernie Ecclestone was not the high-profile individual he subsequently became. I discovered his office address, and thought he would be the sort of person who would only be interested in the most abbreviated of CVs. So I shrunk my CV down to a couple of bullet points and wrote a punchy covering letter and posted it to him.

"He rang me the next day and asked me to go to his office at 2pm – so, having faked a dental appointment, I did. I arrived at 2pm and at four minutes past two he asked me: 'So when will you be joining us?' He never actually offered me the job. He just assumed: why would I have asked for a job if I didn't want it? We fixed a start date but he never wrote me a letter to confirm: so I was slightly nervous when I resigned my job that I might turn up and he wouldn't remember hiring me. And that's what he did on my first day – it was his idea of a little joke – he screwed up his eyes when he saw me in reception and asked: 'Who are you?'"

I ask Sacha about her childhood. "Home was in Kent for my early years, until I was 11 or 12, where I grew up with my parents and sister. Then my father took a job with the Ministry of Defence, so we were then attached to the Army, at which point we relocated to Germany. I returned to boarding school. Germany

I loved. The Army tended to cluster in communities, but we lived in a German village."

She was in West Germany at the height of the Cold War, but the atmosphere was "generally not" worrying. "The thing I was more worried about than the Cold War was terrorism. This was the time of the Hyde Park bombing, and I've never forgotten my Confirmation, in a church at a barracks in Bielefeld; as we arrived I was in the back of a car holding a Bible and dressed for my confirmation, and there were soldiers with guns, and they searched the underside of the car. It was rather incongruous, given the purpose of our visit."

She spent only a short time in Germany before going to boarding school. "What I remember most about Germany was a broadening of experiences; it was culturally different, and I enjoyed that. I didn't visit Berlin but I thought a lot about a partitioned city – it was such a crazy idea. It broadened my perception of politics."

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SACHA MAY NOT HAVE A DRIVING LICENCE, BUT SHE HAS ACQUIRED A MASTERY OF DETAIL ABOUT THE COMMERCIAL EMPIRE THAT IS F1.

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She flourished at school. “I was one of those at the top of the class. I was a general all-rounder academically, which made it difficult to work out what my path would be. My history teacher presumed I’d pursue history and my chemistry teacher presumed I’d pursue chemistry, and so on.” She also took part in speech and drama, and poetry recitals, and played the piano.

“The school suggested in the early 6th form that we should start having Oxbridge classes. It didn’t have a great tradition of sending girls to Oxbridge – mine was a bit of a bumper year when they got six in. And it was skewed towards Oxford – they didn’t think about Cambridge. They arranged an outing to Teddy Hall and I looked around and thought it was not for me. I said I was thinking about Durham, at which point they panicked because they thought I would get in to Oxbridge; so they said ‘What about Cambridge’?

“They rang around and eventually found out that a friend of a friend of a friend knew the admissions tutor of Catz. So they gave me a day off school to go on my own, with a chum, and just go to Cambridge for the day. We arrived at Catz slightly early and decided just to cross the road and have a look round. The thing I remember was stepping into New Court and seeing all the window boxes full of red pelargoniums and I thought: ‘I could be happy here’. So I went to meet a very kind tutor in Catz, and then wandered around Cambridge.”

She felt an attraction that Oxford had failed to have for her. “It wasn’t just about the atmosphere, it was about the syllabus. At that stage I’d chosen sciences and I wasn’t ready to pursue physics or chemistry on their own. The Natural Sciences tripos was very appealing, because it would give me more time to pursue different disciplines and work out what I wanted to study. Interestingly when I got there I worked out I wanted to study something other than science.”

She was in only the fourth year of women to go to Corpus. Was it equal proportions of men and women by then? “No way. It was about 7 to 1. And I had been to a very sheltered girls’ boarding school, so it was a bit of a culture shock.

“I never thought I should have gone to a women’s college. I didn’t regret it. It was just one of those things to manage. I did have a sense that women were still a bit of an oddity. It seemed sometimes to work to your advantage. There seemed to be this notion that women were strange creatures who needed hair dryers, and therefore they should be in the rooms that had the 13 amp plugs.”

Nonetheless, it was by no means a hostile environment. “I was made to feel very welcome. I remember particularly the porters. They were very paternal to the female undergraduates: several of them have made an indelible mark on my memory. I took a little while to find my feet. I think one thing I do regret is that I didn’t take a gap year. I didn’t know what I’d have done, but I think there was some growing up I needed to do in my first year that I would have preferred to do before I got there. I think I would have been slightly less of a child.”

Her intensive work regime of F1 had its foundations at Corpus. She says she took “very little” part in organised college activities: “I had a go at rowing and soon realised that getting up at 6am was never going to do it for me. Socialising, friendships and cultural experiences were how I spent my free time. I used to like the “come and sing” choirs, and I learned a few pieces of music that way. I was the least sporty person at that point; I think I got to 40 before I said to myself that there were a few things I hadn’t done, so water-skiing and snow skiing I took up later.”

She changed from Natural Sciences to Law in the second year. “I decided to change in my third term. I realised I had made a slightly immature decision to pursue sciences, largely because my school had assumed I wouldn’t. Careers advice at school had been a little thin on the ground: I don’t remember having any. I once sat down with a teacher who was supposed to give me some and she asked: ‘What does your father do? What does your mother do?’ And when I told her she said ‘Maybe you should be a diplomat.’ So I didn’t have a clear sense of purpose. I enjoyed science as an academic pursuit, but I had befriended several law students and felt rather envious of what they were studying, and the discussions that would come



from that, and decided that that was the subject I wanted to do.”

She has never regretted giving up science. But did she see herself being a barrister? “No. I didn’t even see myself being a lawyer. For me it was very much about having an interesting academic discipline.” So how did she end up first as a solicitor, and then at F1?

“It happened by accident. I graduated with no clear vision of what I was going to do for the rest of my life, and an overdraft. So I thought that if I did my Law Society finals I could then make a

decision.” She found a paid traineeship with a firm of city solicitors, and did her Law Society course at the former City Polytechnic in Moorgate and joined the firm that had sponsored her. Initially she thought about doing family law – “I wasn’t really thinking about corporate or commercial”. She was interested in criminology, “but particularly in sentencing policy – why do we send people to prison and does it work?” But criminal law held no appeal.

Once she had qualified, “I was surprised by how much I enjoyed what I was doing. I started off in my initial training

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THE THING I REMEMBER WAS STEPPING INTO NEW COURT AND SEEING ALL THE WINDOW BOXES FULL OF RED PELARGONIUMS AND I THOUGHT: ‘I COULD BE HAPPY HERE’.

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doing intellectual property – trademarks, brand infringement, which is very much what we do here at Formula 1.” One of her first jobs was to deal with the counterfeiters of a toy that had been replicated and was being “knocked out” as the real thing. “I spent a week in a shopping centre at Enfield surveying complete strangers, and sneaking into shops and taking surreptitious pictures of displays. It was huge fun.

“Then I ended up working in insolvency, and I eventually qualified as an insolvency lawyer. It sounds very narrow but it’s actually very broad, because a

failing business may well be perfectly viable if you can sort out its bank debt. It has staff, it has a building, it has unsold stock, it has unfulfilled contracts; it might have an issue with its pension scheme. You don't need to be an expert in any of those areas: you just need to know enough to navigate around. And if the business is viable you've got to trade it

while waiting for someone to come in and buy it. Today, a buyer is usually lined up: but I spent a year with a chap from KPMG running a chain of nursing homes. They were all eventually sold off."

What appealed to her was that "I was dealing with a living, breathing business and that was really interesting. It was an

ideal chance to see businesses up close, and I realised that working in a business was something I would rather do than work in a law firm." Hence her letter to Mr Ecclestone.

"I knew nothing of him before I met him: I think he only really came to public attention over the issues of the political donation he made to the Labour party. When I met him he was a big figure in the sport, but not in the country generally. He had great presence and was quite inscrutable.

"There was a formality about him: he was 'Mr E', not 'Bernie': it was many years before I called him 'Bernie'. There was a reverence about dealing with him. We realised that the sport we worked in was one that he had more or less built single-handed: it was a remarkable feat. He is a person who inspires great loyalty in people who work for him. They want to deliver their best for him."

She started off as one of F1's three company lawyers: within three or four years she was F1's senior lawyer. Was this a huge responsibility? "I never really thought that much about it. I was just very ambitious. The business was smaller than it is today. We have about 15 lawyers today and we're recruiting more at the moment."

Despite the reputation he has for being difficult, Mr Ecclestone posed no problems for his lawyer. "I established a good working relationship with him. He's not the sort of person who would choose to spend his time with lawyers. You need to be a particular sort of lawyer to work with him – someone who can enable his ideas. He's a very impatient person and his mind moves very fast – you have to be able to keep up."

I ask her whether she could make him laugh. "Probably the other way round. He made me laugh. He has a very deadpan sense of humour that doesn't always look good in print." There were difficult passages. "It could be exasperating. And it could be exciting: or both at the same time. I could tell when he wasn't in the building, because there was a buzz and an energy that he brought to the organisation that was absent if he was away travelling.



"He is the ultimate meritocrat. He doesn't care where you came from, or where you went to school, or who your parents are. All he cares about is whether you can get the job done and be competent. He allowed me to grow and develop in any way of which I was capable.

"I think because he was a very important person in the sport some people were afraid to contradict him. I never took that view. As a lawyer, it's my job to explain things and to let people know where the risks and pitfalls are. He appreciated working with someone who would speak to him on the level rather than just nod and agree with him. If you can't do something, you think of a way of achieving the objective that will work."

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SHE STARTED OFF AS ONE OF F1'S THREE COMPANY LAWYERS: WITHIN THREE OR FOUR YEARS SHE WAS F1'S SENIOR LAWYER.

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Has it, I wondered, been a seven day a week job? "It can be. There have been periods where I've had to re-set and carve out some time. I think it's in my nature to push a bit too hard on occasions. Sometimes for reasons of self-preservation you need to look after yourself. You need to make time for yourself. Making space to do other things is something I've made a very conscious effort to do."

Mr Ecclestone left in early 2017 when the new owners came in. "There has been a significant change here with a new leadership team," Miss Woodward Hill says. "It's been very difficult, I don't deny it. I'm still adjusting, 12 months on. The new owners had plans for the business, and they thought this was the

right moment to appoint someone new to take the business forward. When I joined it was owner-managed, but then very quickly, after a series of deals, it wasn't."

Had she considered moving on when Mr Ecclestone left? "I didn't think about it. If they'd wanted me to go because I was so closely associated with Bernie then I'd have been happy to step back. But they didn't, and I saw that there was a business that needed to be stabilised, as we were undergoing a really tremendous change. I felt a duty to the business and to the people who work here to be part of that stabilising process. Very soon, I realised the new owners have very exciting plans to develop the business and take it to its next phase."

I asked her to elaborate. "I think they want to connect to fans in a way we haven't before. We were a very conventional business. The whole digital thing was untouched, and that's part of what they're building. As well as developing use of social media, they have set up a championship for people who play the F1 computer game."

The sport has developed in more conventional ways too. "When I started it was about 15 races a year. Now it's 21 or 22. There are other places that are keen to have a grand prix, but there's a natural limit to how many races we can put on. We had a Fan Festival in Trafalgar Square last year, with F1 cars going up and down Whitehall. This year we are holding them in Marseille, Berlin, Shanghai and Miami. More needs to be done to engage the younger audience."

Does she like going to the races? "I don't go. There was a period when I would go, though not to every race. But it's very disruptive of life: you don't get to do much else. My job is best done from here."

Despite its petrolhead connotations, the sport brings her little trouble with environmentalists – "going the maximum distance while using the minimum fuel is the whole point of Formula 1" – but there have been difficulties with human rights. "We have to be mindful of the impact on human rights of our decision to go



to a country, but generally I'd say you don't do any good by staying away." She's never said no to a suggestion of a new venue. "There were one or two countries where it was vaguely mooted, but it never got to the point where I had to express my view."

Grands prix are held in China and Russia, both of which have recently been criticised for human rights violations. Did they give her pause for thought? "We don't see ourselves as a political organisation. We just want to bring a great entertainment spectacle to as big an audience as possible to as many countries as we can reach. The size of Russia is such that it would be odd to ignore it." So what if Kim Jong-un called and asked for a grand prix in Pyongyang?

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"I have joked about this internally in this very debate about where you draw the line," she says, tactfully.

Will she still be at F1 in a decade's time? "I suspect not," she says. "I think I am sort of reaching the point where I realise there's enough time to have a second career in a completely new area, perhaps with less focus on business. That's just stirring in my mind at the moment." I ask whether there are any good causes that she has time to support, and she replies "I'd like to be doing more of that."

She says she'd like to do more work "supporting girls", as a mentor. "I don't think we have an equal society. People talk about Formula 1 as being

male dominated: but I don't think it's any more male dominated than any other walk of life I have encountered. It remains my view that in life women have to work twice as hard and be four times as good to achieve half as much recognition.

"Women think differently from men. If an exciting new job is advertised a man with 35 per cent of the qualifications will feel he can apply for it and wing the rest. A woman may have 65 per cent but she will only be able to see the 35 per cent she doesn't have. It's about confidence."

I ask her whether her key role at F1 has meant a life of all work and no play. "Perhaps a little. I don't regret

not being married, and I don't regret not having children. I'm a determined person, and I make things happen for myself when I want them to. But it can be too intense sometimes, and my mission now is to carve out more time for other things. There are things we can give back, and I don't think that giving back is something I have done enough of. The change of ownership and the change of leadership here have caused me to reassess what is next for me." When her time comes to leave, the next institution Sacha Woodward Hill engages with will have acquired a formidable grand prix talent of its own.



# Dr Rune Busk Damgaard

## Research Fellow in Molecular Biology

GROWING UP IN RURAL DENMARK, I WAS FASCINATED BY NATURE. EVERY CHANCE I GOT, I WOULD GO EXPLORING IN THE WOODS, GO FISHING ON THE MEADOWS, OR DIG FOR FOSSILS AT THE LIME PIT. IN MY TEENAGE YEARS, THIS FASCINATION MATERIALISED AS A KEEN INTEREST IN SCIENCE, PARTICULARLY BIOLOGY. AS THIS INTEREST ONLY GREW STRONGER IN SIXTH FORM COLLEGE, I DECIDED, THE FIRST EVER IN MY FAMILY, TO APPLY TO UNIVERSITY. IT WAS NOT IN MY CARDS TO BECOME AN ACADEMIC IN CAMBRIDGE, BUT THANKS TO SOME INCREDIBLE AND INSPIRATIONAL TEACHERS IN MY SCHOOL YEARS, I AM EXCITED AND THANKFUL THAT IT TURNED OUT THIS WAY.

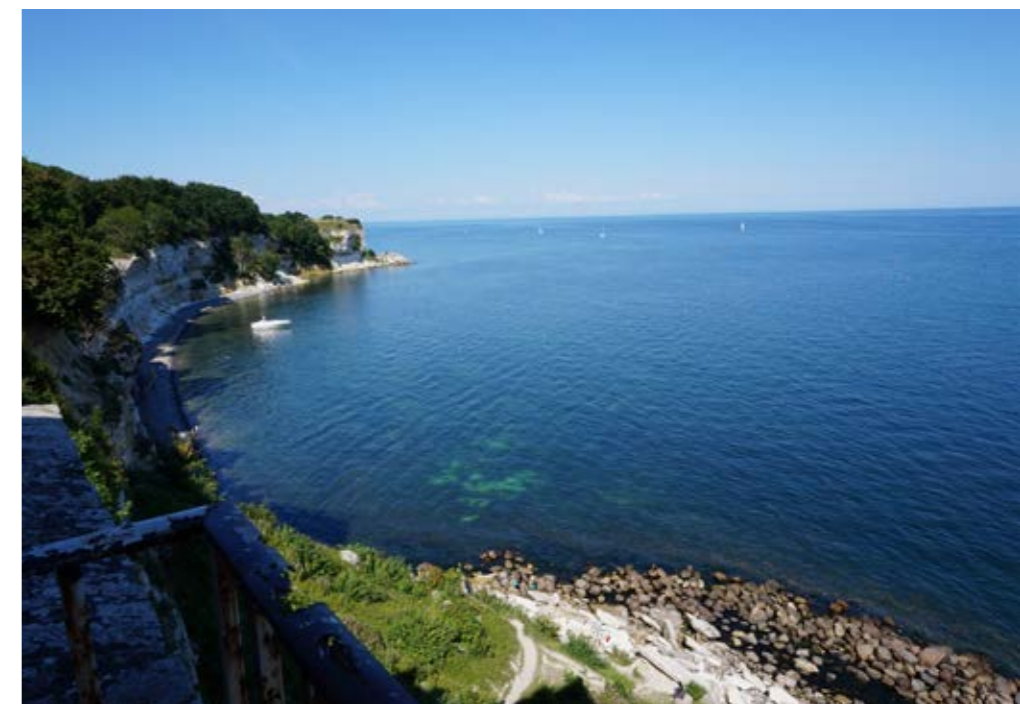
I grew up in a small farming town in Southeast Denmark, surrounded by giant, industrial pig farms and wheat fields as far as the eye can see. But in between the bacon factories and the cultivated, limy soil near Zealand's Baltic Sea coast, you can still find the most beautiful meadows with streams and rivers, wildflowers, bees, and butterflies. I spent so many of my weekends and summers there growing up, camping, canoeing, fishing, or finding strange insects. Not to mention the magnificent forests with the seemingly infinitely tall beech wood trees where I built hideouts and searched for owl pellets. I was so fascinated by the beauty and mysteries of nature. And there was of course the thrill of discovery! I would often bring home all sorts of artefacts I had found: feathers, animal bones, stones and fossils, etc. This was not always my most applauded habit, as you might imagine. But this was where my interest in biology and science was first ignited, I think.

In school, this interest was fuelled by a couple of fantastic teachers. The local state school I attended was mediocre at the very best, but I was so fortunate to have a couple of very talented and passionate teachers with a keen interest in biology and nature as well. They went out of their way to nurture our curiosity. They would take us on ornithological expeditions (it's an expedition if you have binoculars!) or take us to the nearest forest lake to find tadpoles or salamanders. It sounds banal, but their efforts really made a difference.

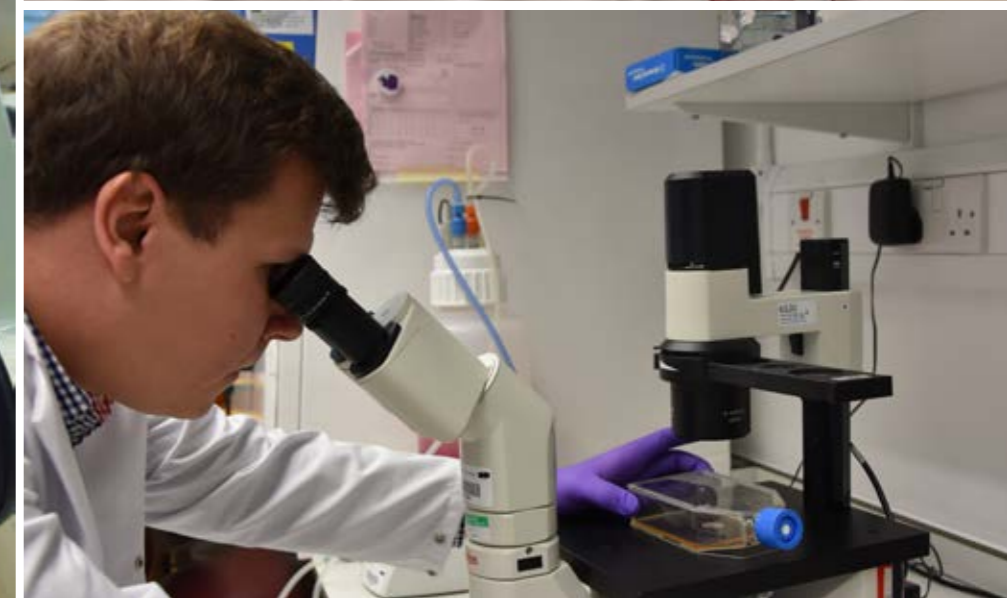
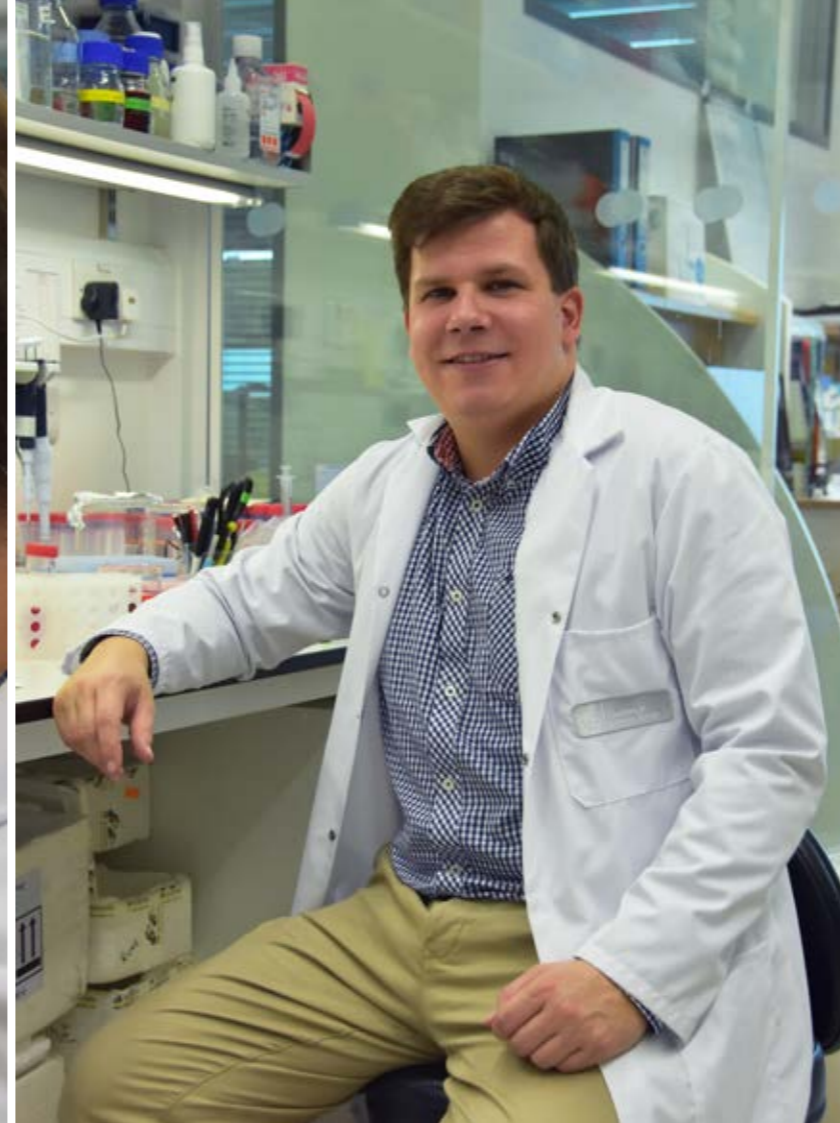
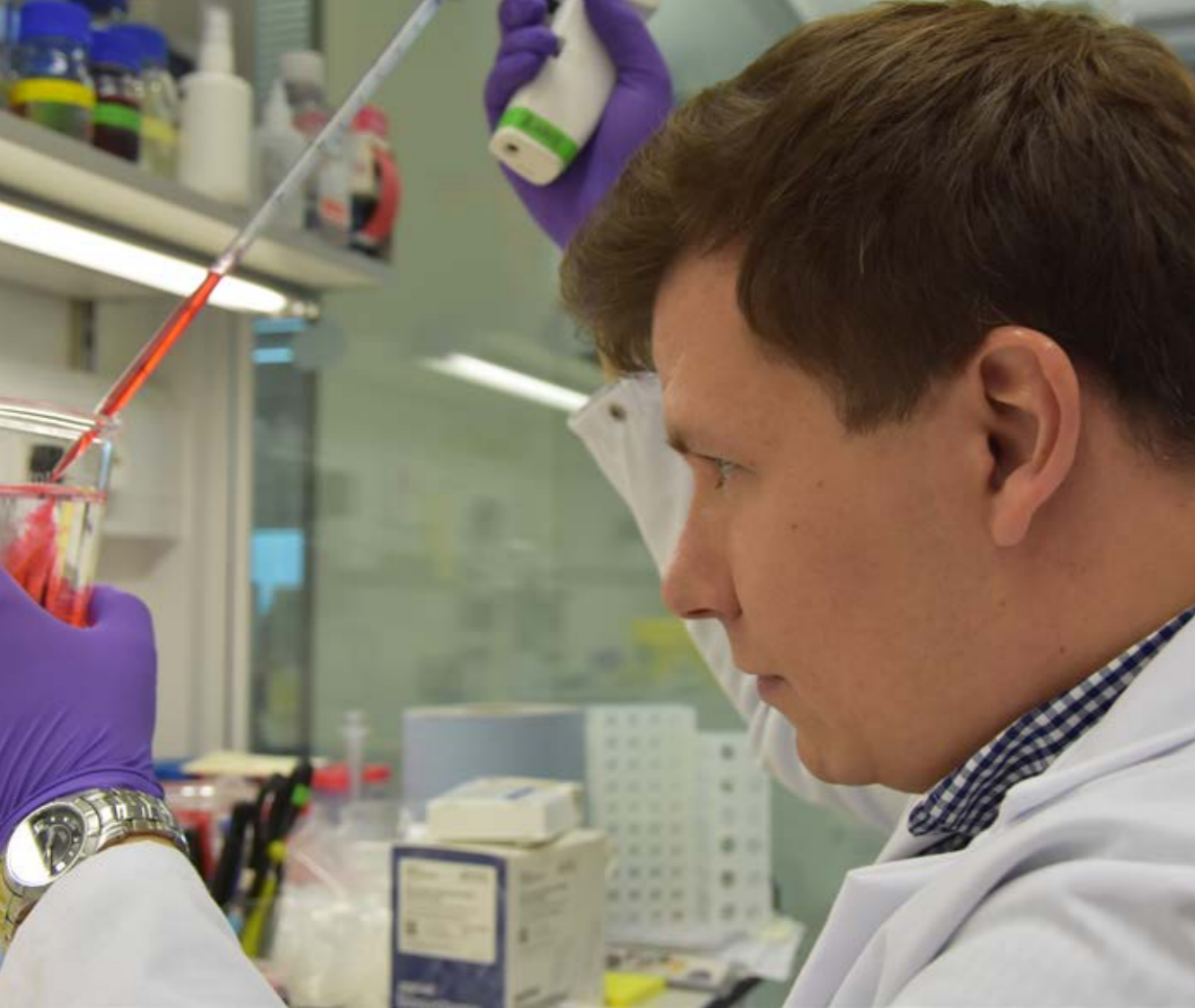
In Sixth Form College, my academic interest in the sciences was ignited. I loved it all – physics, chemistry, mathematics. But my favourite subject remained biology. Once again, an incredible teacher, Lars Kliim, became a great source of inspiration. Lars' (in Denmark, we address our teachers by their first name) exciting biology classes really piqued my interest in modern molecular biology. I became fascinated by DNA technology, genetics, and cell biology, and I wanted to understand how the cells in our body worked. I was truly amazed by these small and outrageously complex machineries, hundreds of different types of them: blood cells, nerve cells, liver cells, skin cells - all similar yet so different. How do they

work? What goes wrong in these cells when we develop diseases? How are normal cells transformed to cancer cells? How does the immune system recognise and eliminate infections? What happens to the nerve cells in Alzheimer's disease? Lars' classes and mentorship really inspired me, and I was considering applying to university to study these concepts further. However, I am not from an academic family at all, so this was uncharted territory.

My careers advisor suggested I could apply to either Biology or Medicine; my grades were good, and I would likely be accepted. I went to open days at University of Copenhagen, but neither Biology nor Medicine



East coast of Zealand, Denmark.



were exactly what I wanted to do. Biology seemed to have far too broad a scope, and I was not really sure how botany or freshwater ecology would help me address these questions and concepts I was so fascinated by. On the other hand, Medicine appeared concerned only with treating these diseases rather than understanding their root cause. Despairingly flicking through the university brochures, it suddenly caught my eye: Molecular Biomedicine, a new study programme at University of Copenhagen focused on understanding human disease at the level of cells and molecules. This was what I wanted to do.

Strongly encouraged and supported by my family and teachers, I became the first in my family to apply to university. But they could not convince me to disregard my perhaps quite naïve impulse to deselect Biology and Medicine. So, with exceptional determination – and a pinch of foolhardiness – I applied to only one particular course at University of Copenhagen: Molecular Biomedicine.

Fortunately, I was accepted. I was over the moon! Yet, I quickly realised: I was actually going to university. I had no idea what this would entail. Slowly, my complacency was transformed into a more tense and anxious feeling and my heart started pounding. What on earth had I gotten myself into?

Before starting university, though, I had to put out a few fires (literally!). I had planned to take a gap year to (quite originally) work and travel. However, I was drafted for national service (yes, this is still a thing in Denmark). So instead of travelling, much to my initial dismay, I spent six months training and working as a fire fighter and rescue worker in the Royal Danish Emergency Management Agency. Although this was not how I had envisaged spending my gap year, I had a good and educational time (retrospectively, at least). But most notably, I made an important realisation: if I could overcome the fear of running into buildings fully ablaze, I could overcome the anxiety of going to university.

I spent eight fascinating and very enjoyable years at University of Copenhagen; three years to complete my BSc, a further two years for my MSc, and lastly three years to complete my PhD. For my doctorate, I specialised in cell signalling, broadly speaking the study of how cells communicate with each other and respond to signals they sense or receive in their environment, for example the presence of a hormone.

Cells have a myriad of receptors on their surfaces. These are like small, molecular antennas through which the cells sense their environment and receive signals from other cells. These signals can be in the form of small molecules, lipids, or proteins that the cells produce and send out into their environment to communicate to their neighbouring cells. When a signal molecule binds to its cognate antenna on a cell, this signal must be transformed from something that is sensed externally into a signal that can be transmitted internally, through the cell membrane, to alter

the biochemical functions of the cell in response to the signal. For example, sensing of the hormone insulin via the insulin receptor sends a biochemical signal through the cell that results in an increased movement of sugar-transporting channels to the cell's surface. This results in increased sugar transport into cells for storage of energy after a meal. This ability to perceive and correctly respond to such signals forms the basis of most physiological processes. The signalling systems are our body's equivalent of modern communication technologies. Imagine what would happen if the internet and all telecommunication was shut off? Everything would be chaos. So, perhaps not surprisingly, errors in cell signalling processes are likely to, by analogy, cause communication shutdown or failure between cells, which leads to cellular malfunctions and a range of diseases, such as diabetes in the case of dysfunctional insulin signalling.

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into internal, molecular signals. How are the external signals conveyed through the cell to coordinate the cell's action in response to that signal? I study these processes mainly in the immune system where I focus on the communication between immune cells. The different cells of the immune system communicate with each other via signal molecules called cytokines that bind to specific antennas on the cells. When, for instance, an immune cell detects an infection, this cell produces and sends out cytokines to tell other immune cells about the

eminent danger. This starts an immune response and instructs other immune cells to combat the infection. But how is the information contained in the signal, the cytokines, transferred via the cytokine receptors, through the cell, into the nucleus and to the DNA where it changes the activity of many hundreds of genes to start the immune response?

When a cytokine binds its cognate receptor, this starts a molecular relay through the cell's cytoplasm. Small chemical modifications are passed from protein to protein, like batons on the running track at the Olympics, conveying the signal from the antenna at the cell's surface to the DNA in the centre of the cell's nucleus. These small modifications can have various chemical natures; they can be inorganic phosphates, aliphatic carbon compounds, or lipids. Hundreds of different types of chemical modifications of proteins can function in these relays. They serve as small tags – or molecular post-its – that come with an instruction; they

can function as “on” or “off” switches on the proteins in these signalling cascades, but we do not understand the function of most of these modifications or the instructions they carry.

I am particularly interested in a type of modification called ubiquitin (so named because it was found ubiquitously in all cells and tissues of the body at its discovery in the mid-1970’s). Ubiquitin is special among the chemical modifications conveying the information in the cellular signalling

cascades because it can form polymers; eight distinct polymers to be exact. Ubiquitin can therefore encode eight different instructions when attached to proteins as a molecular post-it. In contrast, the vast majority of other modifications only encode one instruction.

Modification of proteins with ubiquitin (called ubiquitination) controls the very first steps in these signalling cascades from the cytokine receptors as well as other crucial signalling events during activation of the immune system. I am

therefore interested in understanding how ubiquitin modifications control these activation processes as it may provide fundamental insights into how diseases of the immune system, including autoimmune diseases and inflammatory disorders such as Crohn’s disease and rheumatoid arthritis, arise.

To pursue this line of research, I moved to Cambridge after my PhD to work with Dr David Komander at the Medical Research Council Laboratory of Molecular Biology. Dr Komander is a world-leading biochemist studying the basic chemical and physical properties of ubiquitin modifications. We have formed an interdisciplinary team that combines his biochemical and biophysical insights into ubiquitin modifications with my experience in cell biology and cell signalling to study the instructions that ubiquitin modifications carry and their importance in physiological models of the immune system. It remains very difficult to study the individual ubiquitin polymers as the experimental tools and methods available cannot readily distinguish between them. But based on Dr Komander’s previous work, we could design and perform experiments to specifically address what the function of one of the eight ubiquitin polymers, termed M1-ubiquitin, is in the immune system.

Previous work in Dr Komander’s laboratory led to the discovery of an uncharacterised protein in human cells that has a scissor-like activity, which can cut M1-ubiquitin polymers off other proteins and disassemble the polymers. Importantly, this protein is unable to do so for any of the other seven polymers. It is a molecular scissor extremely specific for M1-ubiquitin polymers. Our rationale was therefore to use this molecular scissor, called OTULIN, as a proxy to study the role of M1-ubiquitin signals. Since OTULIN cannot cut or disassemble any other polymers, the effects we would observe if we disabled OTULIN in our experimental immune system model could only be caused by M1-ubiquitin polymer signals.

It took a couple of years to generate the model system: a mouse strain in which we disabled the OTULIN scissor



protein specifically in immune cells by advanced techniques for genetic manipulation. But it was worth the effort. The effects we discovered were extraordinary. Mice that lacked OTULIN accumulated M1-ubiquitin polymers in their cells (because OTULIN was not there to disassemble them). This short-circuited the signal cascades from the surface receptors and the immune cells spontaneously activated and mounted immune responses even in the total absence of any infection. The mice could no longer control their immune system and hence developed autoimmune and autoinflammatory diseases. This provided us with the first evidence that M1-ubiquitin polymers are potent, molecular “on” signals in immune cells. Remarkably, we could dissect how the signalling cascades were short-circuited and identify a drug, Remicade, already on the market, which we could use to treat the mice to inhibit the immune activation and completely ameliorate their symptoms. Strikingly, together with clinical geneticists from Addenbrooke’s Hospital and the University of Birmingham, and colleagues from the United States

and Israel, we have also identified patients with genetic mutations in OTULIN, which develop a disease and symptoms almost indistinguishable from our genetically modified mice. Importantly, even though the onset of this severe immune disease is within the first weeks after birth, the identified treatment is very effective in the patients as well.

These results underscore the importance of correct regulation of M1-ubiquitin signals for human health and disease and show the importance and power of interdisciplinary research. But the question still remains if dysregulation M1-ubiquitin signals play a role in other diseases? My most recent results suggest that they are involved in development of non-alcoholic fatty liver disease and liver cancer as well; two major sources of morbidity and mortality killing 25,000-30,000 people in the UK every year (and with mortality rates still rising). A better understanding of the mechanisms of disease development can have a drastic impact on patients in the future. I will continue my research on the role of M1-ubiquitin

signalling in the development of these diseases to better understand both how they develop and how we may be able to treat or prevent them.

Research in Cambridge is thrilling (and exhausting). For the last three years, Corpus has been a solid support, fantastic community, and a welcome break from long hours in the laboratory. I strive to be involved in College life as much as possible when experiments allow. What I have found particularly enjoyable and attractive about the collegiate system is the close contact with academics from other disciplines, and of course the incredibly bright and talented students. Teaching Corpus students has been both challenging and rewarding. They are indeed some of the best minds of their generation and they are not shy about questioning ideas and concepts during supervisions. I hope to be able to support and encourage their learning, pique their curiosity, and offer them just a fraction of the invaluable inspiration and mentorship for which I am so indebted to my own teachers.



# Professor Judy Hirst

## Fellow in Chemistry and Dean of College

In July I was called to Carlton House Terrace to sign The Royal Society's Charter Book. Perhaps the world's greatest autograph book, the Charter Book collects together the signatures of the Fellows of the society, and therefore of many of the greatest scientists of the modern era: from Boyle, Newton and Hooke, who signed in the 1660s as the society was founded at the dawn of experimental science, to giants of the 20th century like Rutherford, Turing, Sanger, Florey and Djerassi, whose science has changed the modern world. As a newly elected Fellow, I therefore found adding my signature rather intimidating — both at the time, and as a concept — as well as (of course) an honour. And now here I am, FRS at this half way point of my research career, and asked to give you my take on how it came about.

I became a scientist because I can't resist meddling with things to find out how they work and what makes them tick. I like analysing stuff, spotting patterns and relationships, drawing connections, stripping something down to its basic parts to get to

the core of it and really understand it. I don't do superficial. It was the periodic table that led me into chemistry; the simplicity and logical order of it; the way it arises out of quantum mechanics and an elegant set of equations, and can then be used to 'explain everything'. So I read chemistry at Oxford — a much more focussed endeavour than being a Cambridge NatSci. Chemistry is traditionally split into the disciplines of physical, inorganic and organic chemistry, but for me a better division is into chemists who want to understand things and chemists who want to make things. It's not that simple of course — but I'm the first kind. Synthetic chemistry, mostly taught to me as 'pushing arrows' in a black art known as retrosynthesis, was the bane of my undergraduate life, especially the practical sessions (most memorably, the one that made everyone smell of vomit). On the other hand, I could put physical chemistry and the 'chemistry of the elements' together in a single, beautiful, coherent construction: start with the Schrödinger equation to define atomic energy levels, extend atomic orbitals into molecular ones by using group theory to describe bonding, then add statistical mechanics to move from the individual molecule to a population to capture thermodynamics and kinetics. Finally, couple this construction to a hefty dose of experience and background knowledge (to provide a robust idea of what the correct answer should look like) and it becomes possible to appreciate and predict the personalities of the elements and their compounds — and really see 'why chemical reactions happen'.

I specialised in electrochemistry for my final year project (a full year of research in Oxford, uncomplicated by exams). Electrochemists study reduction and oxidation (redox)

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sometimes does), be sure to behave in exemplary fashion.

After Oxford I moved to The Scripps Research Institute in La Jolla, California (just north of Mexico) with a Wellcome Trust Prize International (postdoctoral) Fellowship. Having the fellowship was great: there was no apparent limit to my travel budget, and I could decide the directions of my project for myself. So I learnt all about proteins: how to produce and purify them, manipulate them by mutagenesis, and study them by means other than fancy electrochemistry. Now for the second career-defining chance event (at which I wasn't even present). Fraser found himself at a conference with John Walker from Cambridge, who'd just won the Nobel Prize in chemistry and was then in the process of setting up a new Medical Research Council unit to work on mitochondria. I imagine the two of them drinking pints at the bar and John casually mentioning he was looking for someone to lead a fully-funded programme on complex

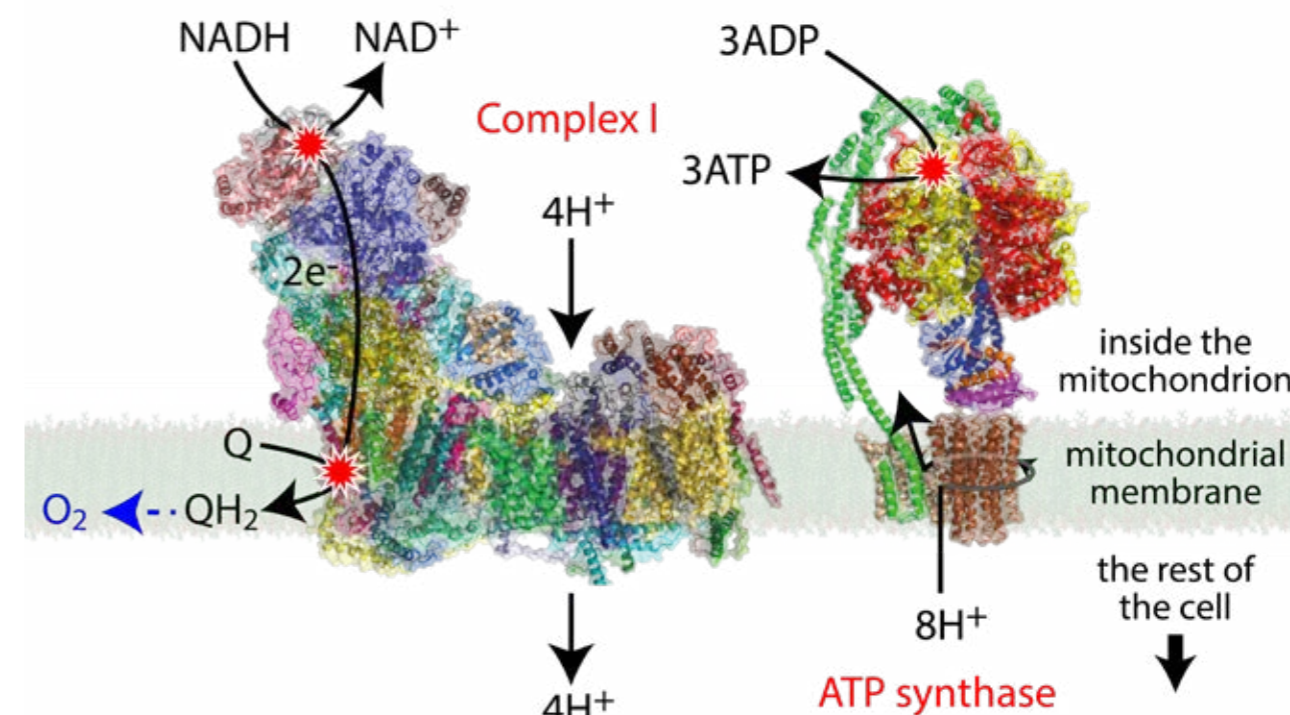
I (of which more below). Thus began a series of events that ended with me moving to Cambridge. I thereby became an independent scientist in the best possible way: I had the good luck to be the right person in the right place at the right time. Of course, fully-funded programmes don't come without strings: the MRC sets up specialist units to solve big challenges that require long-term investment and effort. Complex I is my big challenge, my career enzyme. It's huge, complicated, unstable and uncooperative in every possible way. I've fought with it, cajoled it, hated it, and almost walked out on it on numerous occasions. But it's also as central to mammalian metabolism as its dysfunctions are to human disease, and a beautiful, intricate, energy-transducing molecular machine.

Complex I is one of the largest enzymes we have. It's a megaDalton assembly of 45 separate protein chains (subunits), made up of almost 10,000 amino acids, in the general shape of an old boot (see figure).

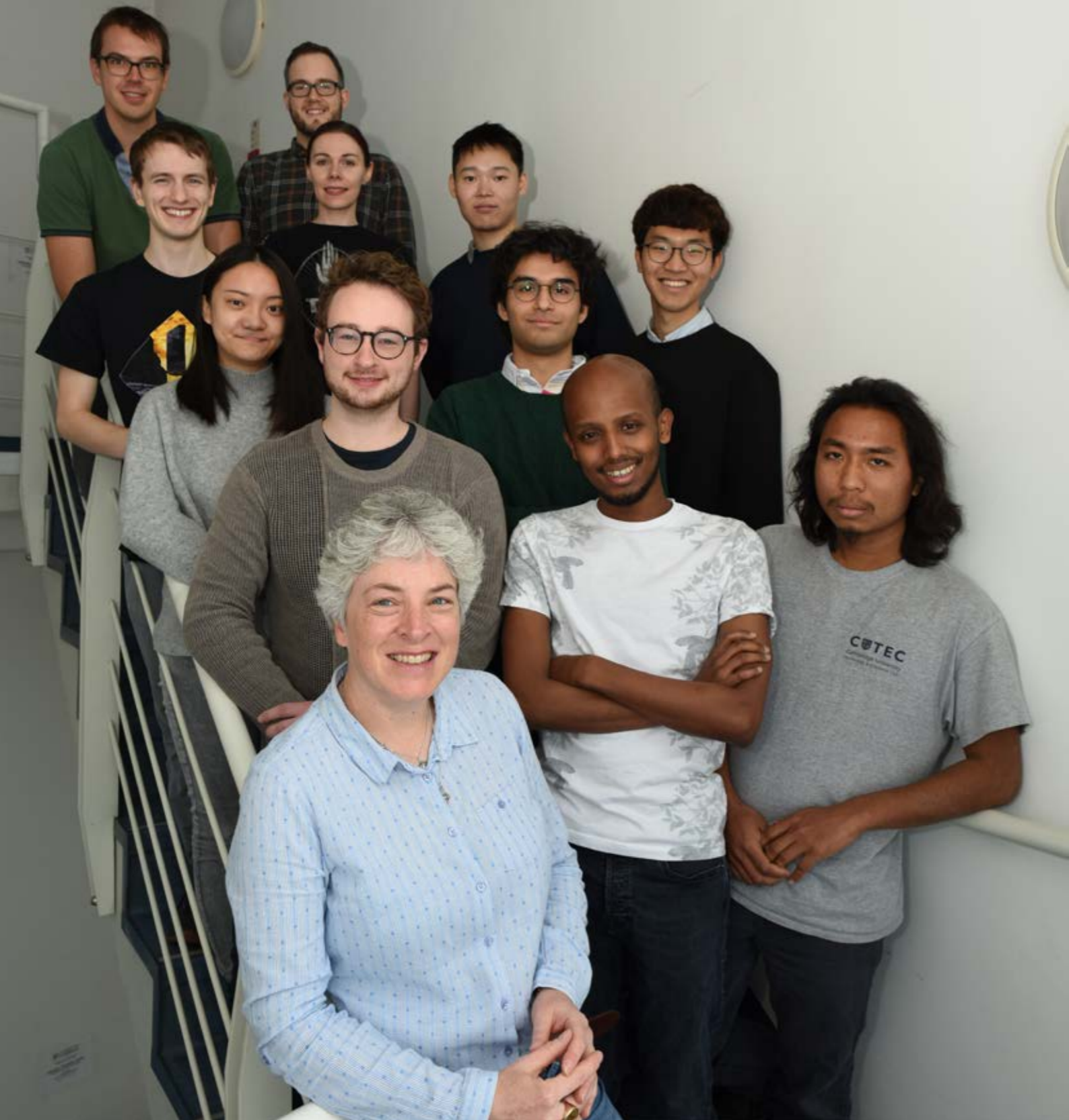
reactions: the addition and loss (exchange) of electrons. The project used electrodes and lasers to induce photoelectrochemical reactions in simple organic molecules, combined with numerical modelling to test and define the reaction kinetics. It was exciting the first time around, but then too much like a teaching lab experiment — negligible risk of either failure or surprise. Research isn't like that. At least, not the sort I do. The resulting need for a challenge set me off on a trajectory from pure chemistry towards biochemistry and medicine, leaving me today, somewhat incongruously, as Professor of Biological Chemistry in the Department of Clinical Neurosciences. But modern chemistry is like that: there's lots of exciting stuff happening at the boundaries of it. I have my FRS (in their words, not mine) for bringing "unrivalled physico-chemical incisiveness and rigour to achieving understanding of highly complex oxidation/reduction-driven energy coupling mechanisms in biology".

Back to the story, and the first of two career-defining chance events. Fraser Armstrong was appointed as chemistry tutor at St John's, my Oxford college, during my final year and I met him at an after-dinner party, as he exited the bathroom, pint in hand. An auspicious start. I discovered Fraser was an electrochemist too, but working on redox enzymes: huge, complicated biological things that, since they didn't feature on the Oxford chemistry course, weren't yet on my radar. In fact, redox enzymes define regions of exquisite chemistry, buried in their interiors, and constitute some of the most efficient energy-converting catalysts known. Their size is initially off-putting but that's simply a matter of focus — most of the protein structure (which we understand on a molecular level but usually don't need to think about) is simply a scaffold, to hold, construct and protect the active sites. Anyway, the principle of Armstrong-electrochemistry is to dock a redox-active protein onto an electrode and then interrogate it as an unknown

electronic component: apply a Voltage and measure current, sweep the Voltage at different rates to access kinetics, add a substrate to an enzyme and drive electrocatalysis. My DPhil thesis described the development of 'fast-scan protein voltammetry' (up to 1000 V/s) together with numerical methods to model and interpret the results. We applied the method to define the action of a 'swinging carboxylate arm' for proton-coupled electron transfer in a protein, a prototype module for a proton pump. This was the point I became addicted to the adrenaline rush of research: the challenge, the thrill of the chase, the excitement when it works, the strategizing, fighting with it and outwitting it when it doesn't — all in order to conquer it and describe it — and publish it to claim it. Fraser taught me (amongst many other things) how to be a scientist and gave me a scientific code of conduct: give due credit to others, never cut corners or compromise for the sake of publication and, when the race for the prize gets nasty (as inevitably it



Complex I oxidises NADH inside the mitochondrion and reduces ubiquinone-10 (Q) to ubiquinol (QH<sub>2</sub>) in the membrane (two electrons are transferred). QH<sub>2</sub> is recycled by complexes III and IV, and the two electrons ultimately used to reduce O<sub>2</sub> to H<sub>2</sub>O. The energy from the NADH/Q reaction is used to pump four protons across the membrane. The resulting charge separation (proton motive force) drives the ATP synthase rotor to turn ADP into ATP. Eight protons are transported to create three ATP molecules. ATP is the energy currency of the cell. Figure created from data by Hirst and coworkers (Zhu et al., *Nature* 2016) and Walker and coworkers (Zhou et al., *eLife* 2015).



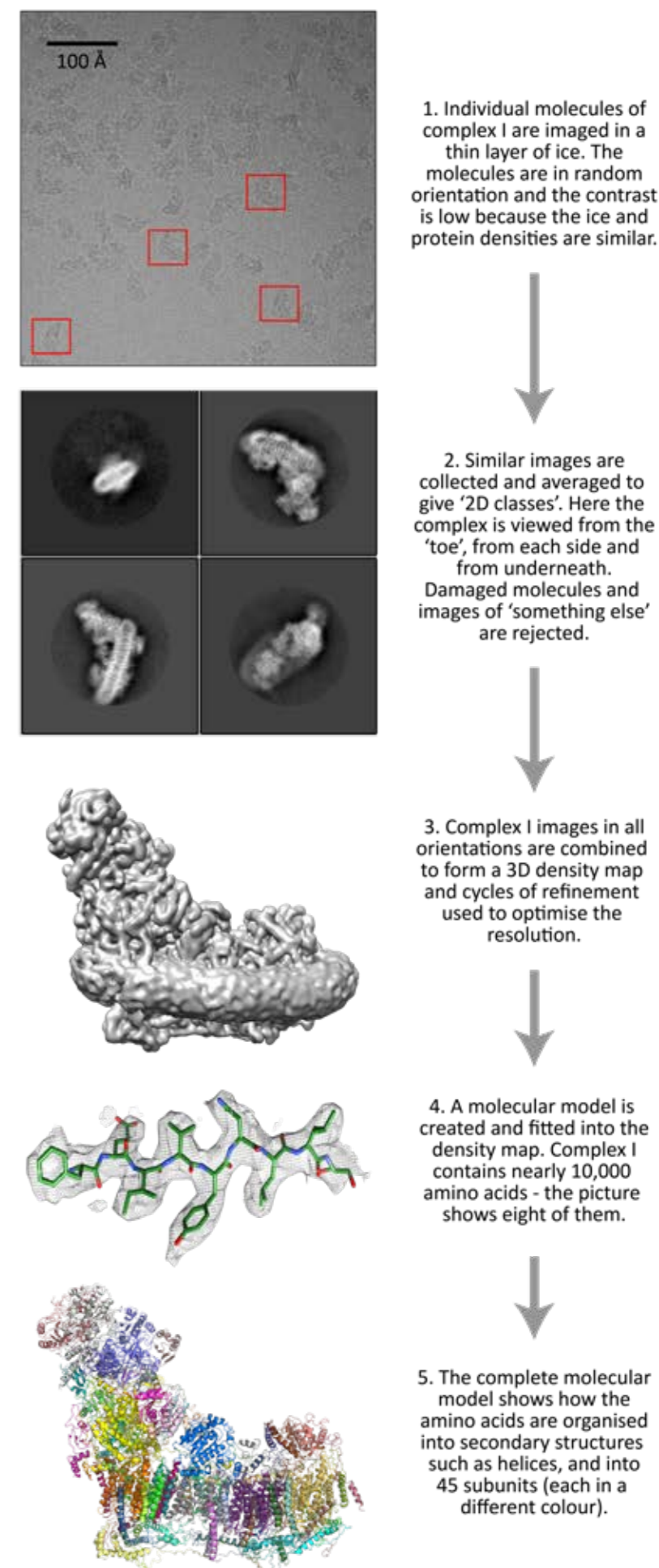
The foot of the boot is housed in the mitochondrial inner membrane (subunits in this domain cross the membrane, to transport protons from one side to the other) while the leg, which sticks up into the inside of the mitochondrion, contains all the redox machinery. The mitochondrion is the 'battery' of the cell where most of the ATP, the biological energy currency, is made. Metabolic processes channel the energy we obtain from food

into mitochondria, into a molecule called NADH. NADH is a biologically-amenable form of  $H_2$ , and, in analogy to the oxidation of  $H_2$  by  $O_2$  in a hydrogen fuel cell to generate electricity, NADH is oxidised by  $O_2$  to 'charge' the mitochondrial battery. Complex I is the first of the three respiratory complexes that catalyse this process: they use the energy from NADH oxidation to pump protons 'uphill' across the membrane, creating

charge separation. ATP is generated as protons flow 'downhill' back across the membrane through the ATP synthase rotor (John Walker's enzyme), driving it like a turbine. I'm not going to get into the (rather esoteric) details of complex I mechanism. Suffice it to say that we know a lot about the energy-generating redox chemistry, and a fair bit about the energy-consuming proton transfers, but we have no idea about how the two are tied together.

One can't happen without the other, and the energy is passed between them with almost complete efficiency — since the only thing it's possible to do with perfect efficiency is nothing, this is as good as it gets! Anyway, underpinning all this mechanistic knowledge, providing an architecture and a framework for it, and showing us where (if not how) the chemistry happens, is the enzyme structure. Here's the story of how we determined that. It's not the most intellectually satisfying or challenging piece of research I've ever done — just the most famous.

When I started working on complex I the only way to determine the atomic structure of an enzyme was to crystallise it. To do this you prepare it in a pure and homogenous state (with all the molecules in identical configuration), put it in an appropriate solution condition (there are thousands of possibilities to test) and, ever so slowly, dehydrate the solution. Then you hope that, instead of just crashing out as you cross the solubility boundary, the molecules get together in an orderly fashion to form a crystal lattice. You then use X-ray crystallography to determine the structure. We started by trying to crystallise complex I prepared from bovine heart mitochondria by a method developed originally by John Walker. No crystals. Thus began a twelve year struggle in which we worked on the preparation, set up crystallisation trials, went back to the preparation — and so on. Still no crystals. This was both incredibly frustrating and also a problem, because careers in science depend on publications, and failing to get crystals isn't publishable. Needless to say we were constantly diverted into more interesting things. However, at the point the first Titan Krios electron cryomicroscope (cryoEM) arrived in Cambridge, at the MRC Laboratory of Molecular Biology, we had a superbly optimised protein. So I asked Richard Henderson, LMB expert on cryoEM (and, coincidentally, Honorary Fellow at Corpus), if we could have a try at getting our structure that way (see figure).





Of course there were teething troubles to overcome (including, on one memorable occasion, Richard declaring our enzyme unfit for purpose) but then it worked like a dream. Our first paper, describing the architecture of the enzyme by single-particle cryoEM, was out in *Nature* in less than a year. Two years later we improved the resolution and located all 45 subunits and most of the amino acids. We now operate independently of the LMB and the resolution is sufficient to identify

individual amino acids by the shapes of their side chains. We're busy solving the structures of different catalytically-relevant states, and structures from bio-medically relevant models of mitochondrial disease. So, single-particle cryoEM was a fantastically lucky break for me and it's revolutionised complex I research. On the other hand, scientists make their own luck — I recognised the opportunity and nailed it. The structure of mammalian complex I was one

of the early successes for new-generation cryoEM — it even made an appearance in Stockholm when Richard won the Nobel Prize.

So, what next? In the short to medium term I've unfinished business with the chemistry of complex I, most particularly its elusive 'coupling mechanism'. But I'm also increasingly keen to apply the knowledge we get from basic research to medicine. People with genetic mutations in complex I

proteins suffer a diverse range of neuromuscular diseases on a spectrum of severity from infant death to late-onset blindness. There's no cure for any of them, but if the defect can be identified (by genome sequencing) it's possible to avoid their further inheritance, by 'three-parent baby' or embryo-screening technologies. The catch is that, in around half of cases, we can't identify the defect — either it's in an unrecognised protein, or can't be confidently distinguished

from innocent variation. Extending knowledge of complex I structure, function and biology is the only way to close this gap. Furthermore, the central role of complex I in metabolism defines it as a powerful drug target. There's increasing focus on complex I-targeted drugs for ischaemia-reperfusion injury (heart attack and stroke), ameliorating oxidative stress in ageing-related diseases, and in forms of cancer, such as prostate cancer, which depend heavily on

complex I catalysis. Structure-based drug design, supported by cryoEM, can now be brought to bear on these projects. In the longer term, the research landscape is liable to change without notice as new discoveries answer extant questions and open new avenues for exploration. The FRS brings new freedoms, status and responsibility — and, I hope, opportunities. There's no point in making too detailed a plan. Let's just wait and see.

# Corpus manuscripts at the British Library

The Parker Library is the College’s greatest national heritage treasure. It is internationally known for its astonishing collection of medieval and renaissance manuscripts. Until 19 February 2019, eleven of the most precious of these can be seen at the British Library, as part of the exhibition *Anglo-Saxon Kingdoms – Art, Word, War*. The Corpus loan is the largest contribution of any institution to the exhibition. It includes the sixth-century Gospels of Saint Augustine which was given by Pope Gregory the Great to Augustine in AD 597 as Augustine left Rome on a mission to convert the pagan kingdoms of Britain to Christianity.

Other Corpus treasures on show include the magnificent image of King Æthelstan offering a book to Saint Cuthbert, and the haunting polyphony of the Winchester Troper (the oldest large collection of two-part music in the West).

Alongside the Corpus manuscripts, the exhibition includes books from the British Library’s own collection, such as the beautifully illuminated Lindisfarne Gospels, Beowulf and Bede’s *Ecclesiastical History*. In addition, the world-famous Domesday Book proudly shows its unrivalled depiction of the landscape of late Anglo-Saxon England, while the Codex Amiatinus, a giant Northumbrian Bible taken to Italy in 716, returns to England for the first time in 1,300 years.

Below is a journey through the eleven Corpus manuscripts on loan from the Parker Library.

CCCC = Corpus Christi College, Cambridge  
MS = manuscript

## CCCC MS 286: The Gospels of St Augustine



The Gospels of St Augustine is one of the most famous manuscripts in the Parker Library. This small, and unutterably precious, book is said to have been given by Pope Gregory the Great to St Augustine in AD 597; a parting gift as Augustine left Rome on a mission to convert the pagan Anglo-Saxon kingdoms of Britain to Christianity. The text is written in a clear and readable Italian uncial hand (those with some Latin should not be afraid to try). The book was probably produced in a monastery in Rome or in the great scriptorium at Monte Cassino. The Gospels of St Augustine is the oldest surviving gospel book in Latin, and one of the oldest surviving books in Europe. It is also the earliest surviving gospel book with figure illumination: although most of it has been lost, with only a picture of Luke as a scribe under an arcade, and a page of gospel images in a grid. In the later Middle Ages, the Gospels was probably kept on the altar at St Augustine's Abbey, Canterbury. In 1982, it was put in the place of honour between Pope John Paul II and Archbishop Robert Runcie during the first papal visit to England since the Reformation. It normally leaves the College – securely chained to the Librarian – only for the enthronement of a new Archbishop of Canterbury.

## CCCC MS 197B: The Northumbrian Gospels



The Northumbrian Gospels is amongst the oldest decorated books made in England. This manuscript is the surviving part of a lavish gospel book with elaborate decoration. The larger part was acquired in the early seventeenth century by the great collector, Sir Robert Cotton. The Cotton library was bequeathed to the nation by his grandson in 1702 (and formed the core of what was later to become the British Library). The Cotton collection was badly damaged by fire in 1731 and only charred fragments remain of Cotton’s part of this gospel book. In the part of the book preserved in Corpus (unharmd and safe in the Parker Library) the eagle symbol of St John survives. Both Matthew Parker and Robert Cotton believed that this gospel book was once owned by St Augustine of Canterbury. The later date of the manuscript rules this out: it seems to be from late seventh- or early eighth-century Northumbria, almost certainly from the island of Lindisfarne. It is also likely that Matthew Parker had his part of the manuscript rebound, displacing the illustration of the eagle from its original position so that it became the first, and visually dramatic, page of his part of the gospels.

## CCCC MS 100: sixteenth-century transcripts of various medieval texts



The most important text transcribed in this manuscript is Asser’s *De rebus gestis Ælfredi regis* [*The Achievements of King Alfred*]. The text was copied for Matthew Parker from an earlier manuscript acquired by Robert Cotton for his library. It was completely destroyed in the fire of 1731. A Welshman from St David’s, Asser (died 909) became Bishop of Sherborne. His account of Alfred the Great (ruled 871–899) is the earliest known account of an Anglo-Saxon king. The text divides into two sections: the first discusses Alfred’s life up to 887, while the second is an approving discussion of his rule. In Asser’s *Life*, the picture that emerges of Alfred is of a ruler keen to promote religion and learning in the language of the people: English. Asser describes how Alfred’s mother once showed Alfred and his brothers a book of English poetry. She promised to give the book to whichever of them was able to memorise it the fastest. Asser claims that ‘spurred on by these words, rather than by divine inspiration, and attracted by the beauty of the initial letter in the book’, Alfred immediately took it away and learnt the poetry by heart. Somewhat less romantically, it is also Asser who tells the famous story of Alfred burning the cakes.

## CCCC MS 173: The Parker Chronicle



The Parker Chronicle is fundamental to any understanding of Anglo-Saxon history. The Anglo-Saxon Chronicle – the earliest history written in English – is part of Alfred the Great’s initiative to establish a local, English sense of identity through the recording of significant events in the language of the people (so in English, not Latin). A core set of annals was composed which were then augmented variously over the years in different places. Every version of the Anglo-Saxon Chronicle is therefore different and has its own complicated transmission history. The Parker Chronicle, also known as the A-version, is the oldest manuscript surviving. It was started in the late ninth century and continued into the eleventh. It originated somewhere in Wessex, probably in Winchester, but had moved to the cathedral priory of Christ Church, Canterbury by the end of the eleventh century. Although the Chronicle is the most famous part of the manuscript, it also contains other material: important early texts of the Old English laws of Alfred the Great and the late seventh-century laws of his distant predecessor on the throne of Wessex, King Ine (died in or just after 726), as well as a list of bishops and popes. The volume was greatly valued by Matthew Parker who brought the list of archbishops of Canterbury up to date to include his own name.

## CCCC MS 144: The Corpus Glossary



The Corpus Glossary, written in the early ninth century, contains some of the oldest words in the English language. A glossary is a list of terms in one language defined in a second language or “glossed” by synonyms (or at least near-synonyms) in another language. The first part of the Corpus Glossary offers explanations of various Greek and Hebrew/biblical names. The second part offers Old English glosses (in effect, a vocabulary list in alphabetical order) for over two thousand Latin words. It is an important record not only of Old English vocabulary, but also of the level of Latin education in Anglo-Saxon England. The text is thought to have evolved from a lost anthology of English words originally put together in Canterbury to help the Mediterranean missionaries understand the local language.

CCCC MS 41: Old English Bede



This manuscript contains an Old English translation of Bede's *Ecclesiastical History*. The Venerable Bede was a monk at Jarrow (near the mouth of the River Tyne) in the late sixth/early seventh century. He was one of the most important thinkers and writers in early medieval Europe, and is the only English-born saint to have been declared a ‘Doctor of the Church’ (by Pope Leo XIII in 1899). Bede’s *Ecclesiastical History* (originally written in Latin) is a history of Christianity in England. It is a fundamental text for English history and for understanding the formation of English national identity. The translation was commissioned as another element in Alfred the Great’s campaign to translate into English (in Alfred’s own phrase) ‘those books most necessary for all to know’ and, as with the Anglo-Saxon Chronicle, to establish a sense of Englishness through the use of language (English not Latin). MS 41 was written in the first half of the eleventh century probably somewhere in the south of England. The manuscript is large in format, written in grand round script, and was clearly intended to be a deluxe book. It was given to Exeter Cathedral by Bishop Leofric (1050–1072), and still contains the bilingual donation inscription warning anyone who attempted to remove it: ‘If anyone should make off with this book from here, may he be subject to a curse.’

CCCC MS 183: The Venerable Bede, Two Lives of St Cuthbert



This is one of several manuscripts associated with King Æthelstan (924/25–939), grandson of Alfred the Great. This is the only manuscript known to have been written in England in his reign (sometime between 934 and 939). Æthelstan is generally regarded as the first king of a unified England, his reign being marked by an increased centralisation of government and much greater and systematic legal intervention. He was also known as a learned collector of books and holy relics. Æthelstan seems to have commissioned this book for presentation to the community of St Cuthbert, which at this point was at Chester-le-Street, having fled Lindisfarne to escape Viking attacks, but not yet settled in at Durham. The presentation picture shows Æthelstan (with purple tunic, fashionable red hose, crown, yellow hair and beard) with bowed head, presenting the book to St Cuthbert himself. Cuthbert, a seventh-century monk, bishop and hermit, was the most important medieval saint in northern England with a pilgrimage cult centred on his tomb in Durham Cathedral. MS 183 contains The Venerable Bede’s two *Lives of St Cuthbert*, the first in prose and the second metrical, a mass and office for Cuthbert’s feast day, as well as lists of popes, bishops and kings, and a record of Æthelstan’s other gifts to the community.

CCCC MS 23: Prudentius and Orosius



MS 23 is one of the most richly illustrated books surviving from Anglo-Saxon England. It consists of two volumes bound together. The first is an elegantly illustrated manuscript of works by the late fourth-century Christian poet Prudentius – one of the most popular poets (alongside Horace) in the Middle Ages. This manuscript presents Prudentius’ *Psychomachia*, a poem about the struggle between personifications of the vices and virtues for possession of the human soul. In the battle between virtue and vice, full weight is given to the power of Luxuria with her attendants Beauty and Pleasure, and her weapons of rose petals and violets. Luxuria almost overcomes the army of Virtue, before yielding to ultimate defeat. This copy was produced in England probably in the late tenth century, perhaps at Canterbury, but a presentation inscription claims Malmesbury. The 89 delicate illustrations in coloured inks of red, brown, green and blue are likely to have their origin in a much older, fifth-century manuscript. The second volume is a copy of the early fifth-century historian Orosius’ *Historia adversus paganos* [A History against the pagans]. The two manuscripts were probably bound together by Matthew Parker.

CCCC MS 383: Anglo-Saxon Laws



This late eleventh- or early twelfth-century manuscript, possibly from St Paul’s Cathedral in London, contains a very early version of the Anglo-Saxon law codes and related texts. This manuscript is a legal encyclopaedia copied throughout by a single hand in an easily legible script in dark brown-black ink. This manuscript contains the only surviving Old English version of the *Rectitudines Singularum Personarum* (a manual to guide the administration of a late Anglo-Saxon estate and the only systematic record of the obligations and perquisites of its various tenants and workers written prior to the Norman Conquest) and the *Gerefa* (a discussion of the duties of an estate overseer in the style of a colloquy based on classical models). Both texts are key to understanding Anglo-Saxon economic history. The *Rectitudines* begins with a discussion of the duties and obligations of four different social ranks present on the estate; then turns to tenant beekeepers and both tenant and bound swineherds. It then runs through a series of agricultural occupations from plough ‘follower’ through to cheese-wright, barley-keeper, beadle, forester and hedge-warden. At some point, the manuscript was in the hands of Robert Talbot, prebendary of Norwich (died 1558) and contains notes in his hand as well as that of Matthew Parker’s secretary, John Joscelyn (1529–1603).

CCCC 201: Old English religious and legal texts



This is a composite volume which can be divided chronologically into three parts, probably first bound together by Matthew Parker. The oldest sections, written in the early eleventh century, contain a fragment of the Old English *Regularis concordia*, the code of monastic observance, and some Old English religious poems, most notably *Judgement Day II*, a translation of The Venerable Bede’s *De die iudicii*. The second part of the volume contains a large number of sermons by Wulfstan, Archbishop of York (died 1023), as well as a collection of ecclesiastical material, mostly in the vernacular. The third part was written at Exeter in the time of Bishop Leofric (1050–1072) and was probably once part of CCCC MS 196. This manuscript did not come to the College with the rest of the Parker collection in 1575. Instead it was one of the large number of books which Matthew Parker gave to his son John. It had arrived at Corpus by 1600, before John’s financial troubles that likely led to the majority of the books bequeathed to him by his father ending up in Trinity College through the gift of Thomas Nevile (Dean of Canterbury 1597–1615 and Master of Trinity 1593–1615).

CCCC MS 473: The Winchester Troper



This small-sized book attests to the musical repertory of the Old Minster at Winchester in the eleventh century. It contains some of the oldest polyphonic music in the West and is of incalculable importance for understanding the history of western melody. As well as ‘tropes’, musical settings of words like ‘Alleluia’ which were added as embellishments to the standard chant for the liturgical texts, it also contains sequences and other music. It would have been used by a cantor, whose office it was to lead the music at mass and the divine office. There are many signs that this manuscript was made for use in the Old Minster at Winchester, including texts for the feasts of the Winchester saints Swithun, Æthelwold, Justus of Beauvais, Hædde (Hedda) and Birinus. It was perhaps for the personal use of the cantor, Wulfstan, a disciple of St Æthelwold, Bishop of Winchester (963–984). In September 2007, the College choir took this manuscript back to Winchester Cathedral to sing a Michaelmas mass. It is likely that the Winchester Troper had not been in Winchester since the sixteenth century, and that its music had not been sung in its original setting for over a thousand years.



# The Revd Dr Andrew Davison (m2000)

## Fellow in Theology

Readers may be familiar with a set of novels written by Susan Howatch, published in the late 1980s and early 1990s. They are set in the cathedral city of Starbridge, and while they focus on the spiritual struggles—and progress—of their characters, they are notable for the way in which the story of the Church of England in the twentieth century pans out in the background, across the span of six books.

In a roundabout way, it was those novels that brought me back to Corpus Christi for a third time in 2014. I had been an undergraduate at the College, and later a graduate. I took up a fellowship in 2014, just after I had been appointed to a lectureship in the University. That lectureship had been founded and endowed by Susan Howatch twenty years before. Her books had provided the funds which, out of her generosity, produced the appointment that took me to the Faculty of Divinity and, because of that, brought me back to Corpus.

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IN THE FACULTY, I HAVE A MARVELLOUSLY EXPANSIVE BRIEF: TO RESEARCH, WRITE, AND TEACH ABOUT ANYTHING THAT TOUCHES ON THE RELATION BETWEEN THEOLOGY OR RELIGION, ON THE ONE HAND, AND THE NATURAL SCIENCES, ON THE OTHER.

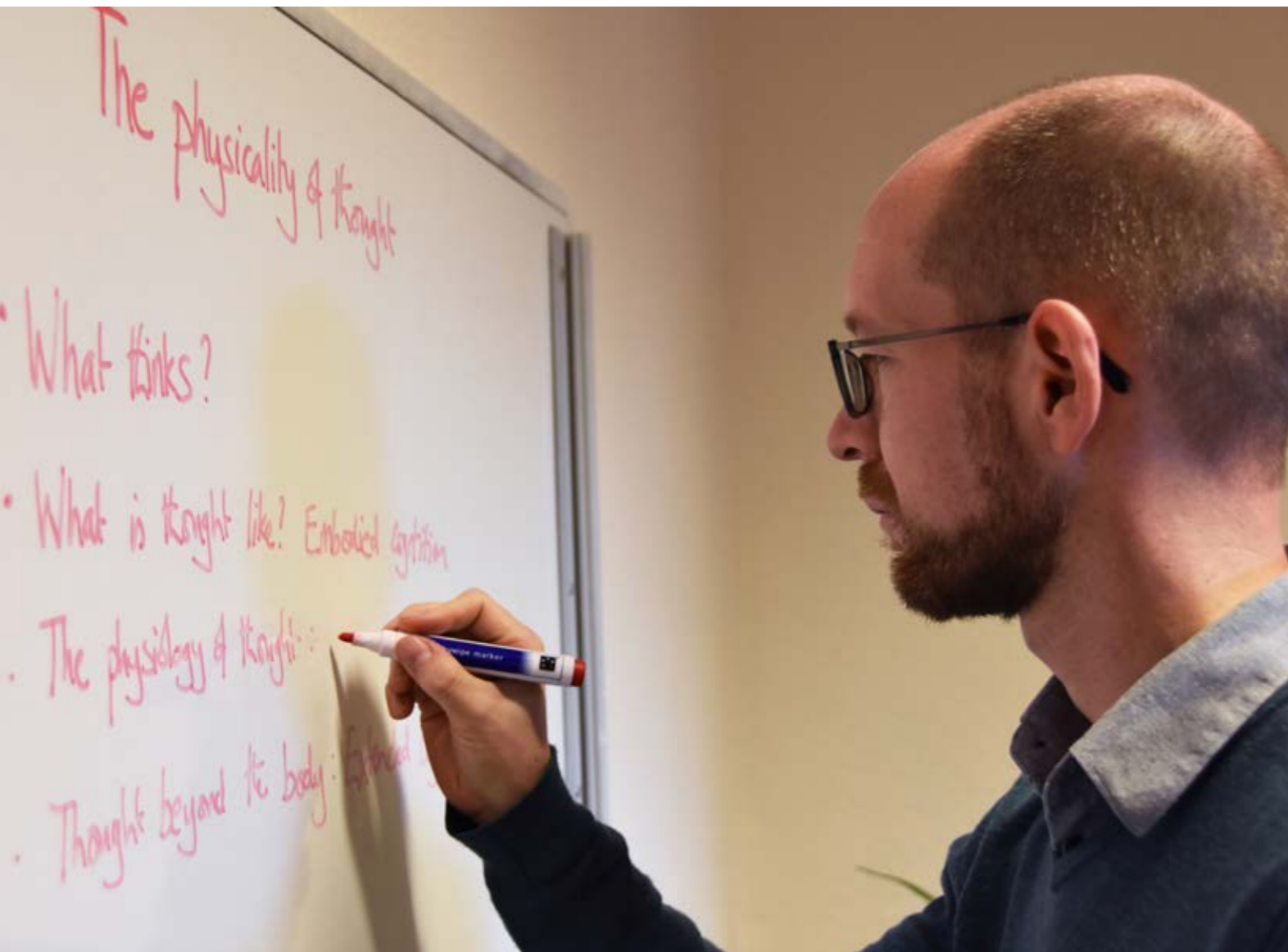
Susan declined to name the post after herself, so it is the ‘Starbridge Lectureship in Theology and Natural Sciences’. I may well be the only person in the world with a position named after a fictional place.

In the Faculty, I have a marvellously expansive brief: to research, write, and teach about anything that touches on the relation between theology or religion, on the one hand, and the natural sciences, on the other. I also make contributions to other courses from time to time meaning, last year, that I could honestly say that I was responsible for love and desire in the Faculty of Divinity: not in toto, happily, but in the form of a paper, devised by Professor Janet Soskice of Jesus College entitled ‘*Love and Desire in the Christian Tradition*’.

At the moment, a mainstay of my undergraduate teaching is a final year paper that looks at what it means to be a creature from a theological perspective, and more particularly what it means to be a human being, bearing in mind all we can learn from contemporary sciences. I have sections on evolution, on neuroscience, and on technology and transhumanism (human self-adaptation). I look at creaturely inter-relation (symbiosis in biology is a particular interest of mine) and end with a couple of lectures on the theological implications of life elsewhere in the universe, which some students find quite a challenge, although others seem to take it in their stride.

That question about extra-terrestrial life took me away from

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Corpus for nine months in 2016-17, to the Center of Theological Inquiry in Princeton, New Jersey. I was a member of a team thinking about the implications of life elsewhere in the cosmos, on a project partly funded by NASA. They thought they better have a few people thinking ahead about the ‘societal implications of astrobiology’, as the project was called, in case evidence for any such life turns up. Since we now know that there might be sixteen billion billion Earth-like planets around Sun-like stars in the observable universe, the likelihood has certainly shifted from the days when we wondered if we occupied the only habitable spot. I have a book coming out on the topic in 2019. It will probably have the rather dull title of *Astrobiology and*

*Christian Doctrine*. I have noticed that publishers are more and more gravitating towards safe, descriptive titles that show up well in Amazon searches. I have to suppress my urge to give books titles taken from lines of poetry.

I have mentioned my interest in symbiosis in biology, and especially in mutualism, which is the name we give to relationships between creatures, of different species, that are beneficial to both. I take it to be one of biology’s most startling recent discoveries to appreciate just how constitutive these sorts of relationship are, and how common: they are the norm, not the exception. All sorts of creatures cannot survive without the aid of another, and two of the

most spectacular developments in all of evolutionary history—the emergence of mitochondria and of chloroplasts—turn out to involve a symbiosis of one organism within another that became so definitive that we now talk, in each case, of there being only one organism, not two. To my surprise, almost no work has been done in theology or philosophy to think through the implications of this sort of shift in our picture of biology. I organised a discussion on the theme in Boston last year, and I am currently editing an edition of the journal *Theology and Science*, to encourage colleagues from around the world to kick start a discussion. ‘Hey, what about x?’, bringing together themes from science, theology and philosophy, is probably the basic

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ALONGSIDE WORK ON SCIENTIFIC TOPICS, I HAVE A SENSE THAT THERE IS A STRING OF LARGE-SCALE THEMES THAT I WANT TO WORK ON, EACH SITTING AT THE BOUNDARY BETWEEN THEOLOGY AND PHILOSOPHY.

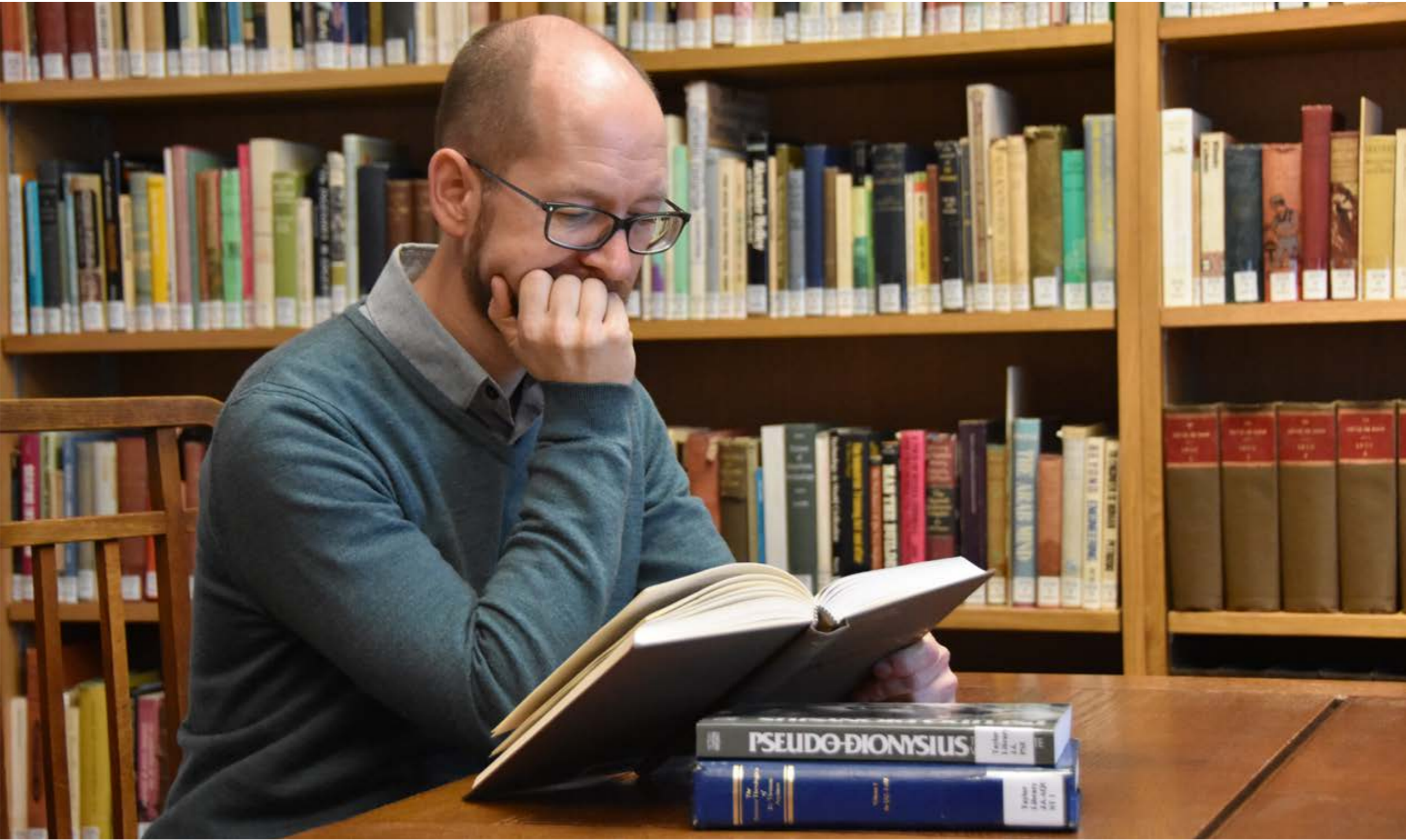
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pattern of much that I spend time thinking about.

Alongside work on scientific topics, I have a sense that there is a string of large-scale themes that I want to write on, each sitting at the boundary between theology and philosophy. My Cambridge PhD gave me an opportunity to think about the first, namely finitude, or what it means to be finite. Most writing on finitude turns out really to be about death: about having a finite span of existence, or at least of earthly existence. I wanted to do something different, and think instead mainly about the finitude of being a particular sort of thing: the finitude of being this, not that. For as long as I can remember, I’ve had a delight in the particularity of things:

a joy in the apple-ness of apples, that the architecture of the 1920s and 30s is so much just like it is, that Bach’s music has Bach written all over it. I think that was what pushed me towards thinking about finitude in that way: the finitude of characterfulness, a finitude we can be grateful for.

That PhD brought me to Corpus a second time, starting in 2010. I say it brought me to Corpus but, in fact, it rarely did. I was teaching in Oxford by then, at St Stephen’s House, one of the permanent private halls, and I did the PhD part-time. There was an expectation that I would take a regular part in the life of the Cambridge Faculty (and I write that, as it happens, now being the ‘part-time degrees officer’ in



that Faculty). I was part of a lively academic life in Oxford already, however, so I really only came to Cambridge to see my supervisor. All the same, I am devoted to my old college, and still am, so I was glad to be back at Corpus, however notional that might actually have been.

I came to Corpus the first time as an undergraduate in 2000. I was training for the priesthood at Westcott House, and because I had an undergraduate degree and a DPhil

under my belt already (in chemistry and biochemistry respectively, at Merton College, Oxford), I came as an affiliated student: fully a member of Corpus, but housed at my theological college, and dispensed from the first year of the degree.

I am often asked how I came to switch from studying sciences to studying theology. ‘Training for ordination’ is the obvious answer, but the answer lies partly in the other direction; that it was theology

“ EXPOSED TO SOME SCIENTIFIC RIGOUR, THAT CONVICTION LASTED JUST OVER FOUR WEEKS. IT PLUNGED ME INTO A CRISIS OF FAITH THAT LASTED FOR MUCH OF THE REST OF MY DEGREE. ”

that led me to ordination, as much as vice versa.

I grew up an Anglican, but in my later teenage years I shook the dust of the Church of England off my feet, and joined a charismatic evangelical house church. In a way that I now find horrendously dismissive, I had decided at the age of sixteen that my rural Yorkshire parish church was moribund. I was completely wrong: it wasn’t moribund; it was just reserved—

Yorkshire farming families generally being quite reserved—but faith there was, no less deep for being undemonstrative.

The house church was wonderfully friendly, and I am glad that I spent a good deal of time getting to know the Bible, but theologically it did me few favours. I went up to university in 1992, to read chemistry, thinking that the world was made in six days, six thousand years ago. Exposed to some scientific rigour, that

conviction lasted just over four weeks. It plunged me into a crisis of faith that lasted for much of the rest of my degree. If that wasn’t true, what else was also on shaky ground? This isn’t the place to record spiritual autobiography, but suffice to say that I came out of the other side of those rather dark years with my faith intact, if changed in the process, thanks both to the humane dignity of the college chapel at Merton, and to newly acquired Roman Catholic friends. They, introduced me to Thomas Aquinas, a thinker of such expansive interests and deep foundations that he seems to be able take anything in his stride. Few days go by, even now, when I do not read something by Aquinas, and marvel.

As the dust settled, I found that the sort of questions that had kept me awake in rather an anguished way were still keeping me awake, but now in fascination. I was lying awake thinking about theology, not about biochemistry. It looked like a sign. I asked the Diocese of York if they would talk to me about the priesthood. A year later, I was off to Westcott House and to Corpus.

Those intellectual questions, I should add, were not the only provocation for a change of tack. During my DPhil, I volunteered on the wards of Sobell House, the hospice in Oxford. It always turned out to be the most rewarding part of my week, however difficult it often also was. I took that to be another pointer towards a change of direction. I am not in full-time pastoral work anymore, but being a supervisor and a director of studies is sometimes not a million miles away.

After Westcott, and that first stint at Corpus, I served a curacy in South East London, in the parish of St Dunstan, Bellingham, just south of Catford, in the Borough of Lewisham. It was quite a change from my eleven years at university. For one thing, the only people I knew with a degree living in the geographical parish were me, the vicar, the vicar’s wife, and the Roman Catholic parish



priest. Much to my surprise, a good deal of my work there turned out to be with children. I had never thought that I would be ‘cool’ enough for children’s work, but it turns out that isn’t an important criterion for success. You just have to be willing to sit on the floor with them, and take their questions seriously—and if there’s one thing that eleven years at university might be hoped to do, it is to instil an instinct for taking questions seriously. I was grateful that the children put me through my intellectual paces: the adults hardly ever did, although the vicar was always keen on a lively theological conversation.

Today, my clerical life takes various forms. I think that the bedrock has to be work as part of a particular community. It isn’t healthy to spend much time relating to central bodies, however necessary they may be. I am delighted that, for me, that particular community is St Bene’t’s in Cambridge, a parish church so closely connected to Corpus. Beyond that, I speak and preach around the country fairly often, in churches and at festivals, and I contribute regularly to the main Anglican newspaper in the UK, *Church Times*. In the past, writing books for a popular readership has been an important part of my sense of vocation as a priest—I would single out *Why Sacraments?*—although I don’t have as much time for that as I used to. For the past few years I have been a canon of St Albans Cathedral: their ‘canon philosopher’. The idea is that I contribute some teaching, and advise the bishop and his staff.

For the past couple of years, I have been serving on the science and medicine panel among the groups that are advising the bishops of the Church of England in the run up to a new teaching document on marriage and human sexuality. I wrote a short book (*Amazing Love*) with some friends in 2016, to make a theological case for the value and dignity of same-

sex relationships. I think it played some part in derailing an attempt to kick the issue into the long grass. I hope so. If my writing and teaching can illustrate that it is possible to be convinced of that perspective and, indeed, to be equally enthusiastic about the ordination of women, and at the same time be a Christian of catholic outlook and hold entirely traditional ideas about Christian doctrine, I would be glad.

Over the course of my life so far, I have often had the chance to reach back, and pick up an earlier thread, to weave it back in later on. I’ve mentioned the constructive influence of Roman Catholic friends in the 1990s; today, I am half way through ten years on the Anglican–Roman Catholic dialogue for England. That may allow me to pay back a small part of my debt to those friends, and their tradition. Work at Sobell House was another prod towards what turned out to be a wonderful change of direction; a decade and a half later, I was able to write a book on care for the dying with a physician, Sioned Evans. Merton Chapel had a huge influence on me; while I was teaching at St Stephen’s House, I spent four years as a part-time assistant chaplain at Merton. I trained at Westcott House; I was later the tutor there in Christian doctrine. Probably the largest-scale weaving back in of all has been the opportunity, with my University of Cambridge position, to make the natural sciences once more an integral part of my life and studies. And most fortunate of all is coming back to Corpus: I was an undergraduate here, and later a PhD student; a vacancy for a fellow in theology when I received my university appointment allowed me to be a candidate for a fellowship: a candidate, but there can be no expectations. I am delighted that my old College took me on. It has been a remarkably happy return.



# Dr Melle Kromhout

## Research Fellow in Music

AS THE SON OF A CELLIST AND A VIOLINIST, I WAS BORN AND RAISED WITH MUSIC; FROM THE CLASSICAL REPERTOIRE TO AVANT-GARDE CONTEMPORARY MUSIC, FROM JAZZ TO VAUDEVILLE, FROM TANGO TO FILM MUSIC, AND EVERYTHING IN BETWEEN AND BEYOND. I THEREFORE BELIEVE IN THE VIRTUE OF OPEN EARS THAT LISTEN WITHOUT PREJUDICE OR ELITISM, BEYOND ARBITRARY DIFFERENCES BETWEEN HIGH AND LOW, SERIOUS OR POPULAR, ART OR ENTERTAINMENT MUSIC.

Music might not be the ‘universal language’ that some claim it to be (because musical differences can be as pronounced and violent as linguistic ones), but as a cultural practice, it is shared by all of humanity. Hence, the study of music touches upon the question what it means to be human and how being human becomes meaningful. This is exactly what I’m interested in: the point at which sound becomes meaningful as music.

To begin this comprehensive overview of my research in the world of sound and music, I want to take us back to 27 August 1883: an exceptional date in the global history of sound. Early on that day, the massive eruption of the Krakatoa-volcano in present-day Indonesia caused what records show to have been one of the loudest sounds in human history. In an article on the event published in science magazine *Nautilus* in 2014, physics writer Aatish Bhatia describes how historical reports confirm that the shockwave caused by the eruption “was heard 1,300 miles away in the Andaman and Nicobar islands [...]; 2,000 miles away in New Guinea and Western Australia [...]; and even 3,000 miles away in the Indian Ocean island of Rodrigues, near Mauritius.” Furthermore, Bhatia writes, the sound instantly ruptured the ear drums of sailors over 40 miles from the explosion, and even after it had become inaudible to human ears, its pressure wave went on to circle the earth four times.

Almost exactly a hundred years later, Welsh singer, composer and musician John Cale—who, alongside Lou Reed, became famous as one of the

founding members of experimental rock group The Velvet Underground in New York in the late 1960s—sang the following lines in the song ‘Praetorian Underground,’ of his long out-of-print solo album *Caribbean Sunset* (1984):

*The world heard Krakatoa*

*An arrogant attitude*

*What’s left of Krakatoa*

*Was blown halfway across the world*

*Into the heart of music*

*Into the heart of men*

In the irreverent medium of a rock song, Cale uses the unimaginably loud bang of Krakatoa’s eruption as a metaphor for the drastic developments that affected “the heart of music” from the late nineteenth century onward. By profoundly changing how we make music, how we listen to it, how we use it, and where we encounter it, these changes indeed almost exploded the entire concept of what we consider music to be. Although the historical and conceptual causes for these changes are many and complex—and definitely not as instantaneous as a volcanic eruption—I think that Cale’s metaphor of a bang that reverberated around the world is perfectly applicable to describe their most important root cause, which can be summarized by just two words: sound recording.

Six years before the Krakatoa exploded, Thomas Alva Edison entrusted his rendition of *Mary Had a Little Lamb* to tin foil wrapped around the metal cylinder of his newly invented phonograph, and

thus became the first living being in the history of the world to hear his own voice in any other way than as the faint reverberations of an echo. In his extensive oeuvre, German media philosopher Friedrich Kittler, who provided key inspiration for my research, theorized the tremendous impact of the media technological revolution of the nineteenth century—which not only included sound recording, but also telegraphy, telephony, photography, film and the typewriter—on the way that human beings make sense of the world. Following in this media theoretical tradition, my work tries to further our understanding of the many ways in which the volcanic eruption of technical media profoundly changed the domain of music.

“ THE STUDY OF MUSIC TOUCHES UPON THE QUESTION WHAT IT MEANS TO BE HUMAN AND HOW BEING HUMAN BECOMES MEANINGFUL. ”

My interest in this specific intersection of music and media goes back about thirteen years, to the time when I first started working on my bachelor thesis at the University of Amsterdam in 2005. This study dealt with the harsh and confrontational early work of German ‘Industrial Music’ pioneers



or harmful as it is enriching or desirable. By studying the basic principles of sound recording, conducting close reading analyses of noise reduction-technologies and looking into the history of some of the more fundamental aspects of the physics of sound, the project ultimately turned from a study of the role of noise into an analysis of the way in which technical media changed the sound of music. In other words: I ended up tracing the impact of the metaphorical explosion of sound recording from the end of the nineteenth century onward.

Because my analysis of noise evolved into a conceptual analysis of sound reproduction itself, I realized that the ultimate goal of this project would be coming to grips with the effects of this explosion; to better understand the many ways in which sound technology not only changed the production, reception, distribution and consumption of music, but the very sound of music itself. Because all the transmission channels of recording, transmission and reproduction systems inevitably affect the signals they record, transmit and reproduce, sound technologies fundamentally shape the sounds they produce. Over the course of the twentieth century, this sound—in all its physical complexity—therefore increasingly became the focus of musical invention and development, thereby changing the way that music appeals to listeners, what they are drawn to, what they like.

Einstürzende Neubauten, which I first encountered through their eighth album *Silence Is Sexy*, released in 2000. Enticed by the experimental sound and lyricism of that record, I slowly worked my way back toward their debut album *Kollaps* from 1981. Whereas the work from 2000 might be classified as avant-garde pop or rock music—certainly unconventional and experimental, but not nearly as radical as what came before—their earlier material is much less listener-friendly: heavily dissonant layers of manic screeching, drilling, banging and drumming on scrap metal, gut wrenching shouts and screams, tape effects, untuned and distorted guitars; topped off with cryptic, expressionist

German lyrics. It first opened my ears to all the noise that is music and all the music that some people call noise. Why, I wondered, do people listen to this noise? What makes it appealing or musically attractive? Why are we drawn to it? Why do we like it? These questions might sound, one could say naively, simple, but their potential answers are not. I would spend over ten years to bring the project to a conclusion, ultimately as full-time PhD Fellow at the University of Amsterdam from 2012 to 2016. Over the years, the project evolved into a much broader attempt to understand the formative, even fundamental

role of noise in recorded sound and music. As I wrote in the introduction to my dissertation, the most obvious problem with the study of noise is the inherent plurality of the term. Not only does it invoke a great many academic disciplines—from musicology to physics and from media studies to mathematics, to name a few—but among those disciplines, its very definition is notoriously unstable: noise is a sonic object, a social nuisance, a physical phenomenon, a therapeutic background sound, a concept in communication theory, a musical genre, a legislative issue, an obstacle in sound engineering. Throughout all of these uses and definitions,

the issue of noise emerges, as philosopher Michel Serres writes, as “a black thing, an obscure process, or a confused cloud of signals—what we shall soon call a problem.”

From my initial interest in essentially aesthetic questions regarding the sonic and musical attraction of noise, I began to assess the much more fundamental question as to how and why, from its invention onward, technological sound reproduction had been confronted with the introduction of noise, and how, in response to this, inventors, sound engineers and musicians developed a refined sense for the many ways in which noise can be as disturbing

“ AS I WROTE IN THE INTRODUCTION TO MY DISSERTATION, THE MOST OBVIOUS PROBLEM WITH THE STUDY OF NOISE IS THE INHERENT PLURALITY OF THE TERM. ”

At several instances throughout his oeuvre, Kittler refers to this media technological development as the emergence of an ‘other music’ [eine andere Musik]. This ‘other music’ came into its own in the West with the transition from our age-old culture of musical trans- or prescription - in the form of those silent black lines and dots on white sheets of paper that are turned into actual sounding music by humans with analogue musical instruments—to a culture of direct technological inscription, in which all sounds can be captured and reproduced again and again and again, exactly as they are, in full spectral complexity, regardless

of their potential place or meaning in the pre-established forms or structures of traditional music theory or history. I call this ‘other music,’ the ‘music of the media age.’

By combining media theory with musicology and contemporary philosophy, I try to further this concept of an ‘other music’ and develop a better understanding of “the song” that, as Einstürzende Neubauten frontman Blixa Bargeld puts it, “sleeps in the machine.” In my dissertation, the analysis of the role of noise in sound reproduction became a way to better understand what it means for contemporary music that most of its sounds are shaped by all those technical components that affect the signal on its journey from a moment of origin to when it reaches the ears of its listeners. Along the way, this also involved issues that pre-date the invention of sound recording and deal with the development of our physical concept of sound in nineteenth century acoustics. After the completion of my PhD, these more historical questions became the focal point for my project in Cambridge—adding the history of science to my increasingly convoluted roster of academic disciplines.

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Even before defending my dissertation in March 2017, I joined the Cambridge Faculty of Music as a Postdoctoral Research Fellow in the project Sound and Materialism in the 19th century, run by Dr David

Trippett. Here, I am tracing the themes explored in my dissertation further back into the nineteenth (and, in part, eighteenth) century. I look at the development over the course of the nineteenth century of our contemporary concept of sound and hearing, especially focussing on new physical representations such as the figure of the ‘sine wave’ as an elementary building block of all sounds, the corresponding idea of sound as a ‘spectrum’ of frequencies, and the image of the ‘waveform’ as the privileged visual representation for sound. In many ways, this project is therefore a ‘prequel’ to my previous book: it traces some of the ground-breaking developments in nineteenth-century acoustics that would eventually be solidified in the hardware of technical sound media—from the stylus of Edison’s phonograph, shakenly etching sound waves into tin foil, to the digital machines in our pockets that can analyse, process and change entire sound spectra almost in real-time.

From a distance, it might seem as if, from the earliest roots of my noise-project in 2005 to my current work on the history of scientific representations of sound, my research gradually drifted further and further away from music proper; and in some ways, this is true. Because of this, I sometimes hesitate to call myself a musicologist, as my work is often far removed from traditional musicological practices. Overall, I identify more strongly with the young and burgeoning field of Sound Studies, which has become an increasingly prominent voice in debates on sound and music over the past decades. Sound Studies are inherently interdisciplinary, multifaceted and fluid, offering refuge to academic nomads like me, who do not feel at home within the confines of traditional academic disciplines.

In the early days of this field, there sometimes was a tendency to stay as far away from music as possible. Although such rivalry is understandable—given the need to establish the objects, methods and theories that define a new academic



field—I am pleased it has mellowed in recent years. Nowadays, much to the benefit of both parties, the exchange between musicology (or music studies) and sound studies is increasingly common. In my own case as well, music might not always be at the forefront of my day to day work, but it consistently forms its backdrop.

All the phonographs and gramophones, magnetic tape recorders and analogue-to-digital converters, sine waves and waveforms notwithstanding, in the end my work spirals back to the fall-out of the sonic eruption that changed the heart of music and the heart of men: the emergence of the ‘other music’ of the media age; of an entirely new sound world that is recorded, repeated, electrified, reversed, mixed, split apart and put back together. Even more so, I do not just explore this particular sound world in my academic studies, but in my own musical practice as well.

As a failed violinist, a very limited pianist and an ‘okay’ singer, I currently experience music as a living, breathing activity in the form of improvised electronics. With my duo ‘Glice,’ we build noisy, densely layered soundscapes that sometimes push against the outer limits of what some consider music to be. We always aim, however, to work with (and not against) the ghost in the machine; connecting instruments and effect pedals, turning knobs and pushing keys, manipulating voices and layering noises to connect with our listeners and encourage them to find sonic coherence and musical meaning where one least expects it. Beyond the academic restraints of language, interpretation, analysis and understanding, in our live performances and recordings, the eruption of the Krakatoa still reverberates, to reach the ears and brains of listeners as something that might as well just be called: music.

# Dr Felicity Hill

## Research Fellow in Medieval Studies

BEFORE BEING OFFERED A RESEARCH FELLOWSHIP IN MEDIEVAL STUDIES AT CORPUS IN 2016, I KNEW LITTLE ABOUT THE COLLEGE. BUT CORPUS HAS A GREAT TRADITION IN MEDIEVAL HISTORY. THE COLLEGE WAS FOUNDED IN 1352, A LITTLE AFTER THE FOCUS OF MY RESEARCH (THE THIRTEENTH CENTURY), YET THE PARKER LIBRARY LOOMS LARGE IN MEDIEVAL STUDIES AND ECCLESIASTICAL HISTORY. IN FACT, I REALISED AFTER ARRIVING THAT THE SOURCE I CITED MOST OFTEN IN MY DOCTORAL THESIS WAS A CHRONICLE (MATTHEW PARIS'S *CHRONICA MAJORA*) PRINTED FROM MANUSCRIPTS WHICH SURVIVE IN THE PARKER LIBRARY (MSS 16I & II).

A huge amount of what I do is only possible as a result of the work of Christopher Cheney, a professorial fellow at Corpus for over thirty years. So Corpus turned out to be a very fitting place to turn my thesis into a book. Having the Parker as my 'home' library is an incredible privilege.

After a false start at the University of Manchester, where I applied for a course I didn't enjoy, I decided to stay there and start a BA in medieval studies. This meant that I could study history as well as literature and languages (and avoid the horrors of going through the UCAS system again). In the end, history quickly became my focus. I don't think I knew what a PhD was when I went to university, but I loved studying history. I moved to London to chase funding and supervisors I wanted to work with, studying first at UCL (MA) then at the University of East Anglia (PhD). A one-year fellowship at the Institute of Historical Research allowed me to write up my thesis.

Undergraduates claiming that there are 'no' sources for the middle ages will inevitably receive an exasperated rant from a medieval historian, but it is true that studying the period presents challenges. Though there is a huge amount of material surviving from thirteenth-century England, it can be patchy, and does not always provide the answers you'd like. It is also almost entirely in Latin, and much of it remains only in manuscripts written in difficult-to-read scripts. But, while this can certainly be frustrating, the challenges involved are part of the

reason I love working on the middle ages. It is necessary to be imaginative when analysing the lives of people who lived seven or eight hundred years ago. Not having all the answers is one of the most exciting things about medieval history.

My work looks at excommunication, the medieval church's most powerful weapon. My book is a social history, exploring how people experienced life in medieval England by looking at excommunication's effects on individuals and communities. On the one hand, excommunication was a very serious matter – it cut people off from God, from the sacraments, and from the rest of the Christian community. In a highly religious society, it is hard to overstate the implications of being separated from the Church in this way. On the other hand, excommunication was not a rare occurrence. It affected men and

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women at all levels of society, from kings and emperors to peasants. Bishops used excommunication to govern their dioceses, while the pope of course was able to excommunicate anyone in Christendom. Understanding the power and efficacy of excommunication brings us closer to understanding the authority of the medieval church. Fundamentally, however, I enjoy my research because it is about people – how they acted, how they communicated, their motives, their beliefs, their petty squabbles.

One of the most difficult parts of my research is dealing with beliefs and fears. But excommunication was meant to be scary, so ascertaining whether or not the faithful were afraid of it is fundamental to assessing how well it worked. Miracle stories used in preaching taught, for instance, that excommunication 'kills with sudden, bad and unexpected death', and that 'excommunicates are eternally burned in the infernal fire, and are devoured and dissipated by demons'. Excommunicates were condemned in a solemn ceremony during which bells were rung and candles – the flames representing the excommunicates – were thrown to the ground and stamped upon: 'thus let the condemned souls smoke and stink in hell'. The cheap tallow tapers would generate foul-smelling smoke, creating a vivid impression of an afterlife in hell. At the same time, however, theologians and canon lawyers stressed that excommunication was to be used only after due process of law, and





that it was medicinal not punitive. The purpose of excommunication was to get people to repent and seek absolution, not to curse them. There is an obvious tension here, and my research emphasises the difference between how the average person would have understood excommunication and how medieval scholars thought about (and justified) it.

Excommunication certainly did terrify many, but it was used so much that it seems to have been less frightening

than we might imagine. The church used the sanction for a huge number of offences, and not all of them were all that serious. In 1308, the Archbishop of Canterbury condemned ‘the sons of iniquity, haters of ecclesiastical privilege’, who deserved to have their ‘detestable audacity and nefarious presumption’ remedied because they had, ‘forgetful of their salvation, in their savage cupidity and too great malice’, had the nerve to ... uproot some trees belonging to the church of Canterbury. Excommunication was often used in the material interests of

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clergymen, and it is understandable that laypeople sometimes rejected it. Perhaps my favourite response is from some burgesses in Dunstable in a dispute with the local priory. They defiantly exclaimed ‘we are excommunicates, and we would rather go to hell than pay your taxes’. Others argued that they wouldn’t be going to hell at all – essentially ‘God and I are cool, it’s you who are wrong’. This was in fact a sound theological argument, though it could be used disingenuously. Still, when it came to the prospect of

dying excommunicated, people suddenly deemed it safer to seek absolution, even if their consciences and convictions had previously made them defiant. The trouble was that that usually took longer than was useful to the church, which of course desired a swift capitulation.

As the word indicates, excommunication also involved social exclusion. Faithful Christians were not supposed to converse with those who had been expelled from the church (there were a few exceptions, such as close

family members). A Cambridge college is a good place to imagine the effects of this. If an excommunicate attempted to dine in hall, everyone would have to get up and leave. If an excommunicate tried to say hello to someone walking through court, they would be blanked. The repercussions for a ruler were particularly severe: excommunication could be used as an excuse to rebel. King John, excommunicated by the pope, was forced to submit to his demands as his barons became increasingly mutinous. They even treated his rift with the church as permission to offer the French prince the English throne. The social and political consequences of excommunication could therefore be serious, but again churchmen undermined their own sanction. Orders to ostracise excommunicates were not always obeyed, even though excommunication was ‘spiritual leprosy’, i.e. contagious (though a communicator only incurred a lesser form). It was particularly damaging when churchmen used excommunication against one another. Who were people to believe when each side was denouncing the other as excommunicated? As Matthew Paris observed in 1251, no wonder the whole thing became ridiculous to the laity. Excommunication could still be hugely damaging, but was more dangerous for those who were already unpopular or vulnerable. The church had no trouble convincing excommunicates’ enemies to shun them, but their friends might ignore the church’s dictates. This shows the limited nature of ecclesiastical authority. The efficacy of excommunication was to a large degree at the mercy of communal judgements. We can therefore see medieval people exercising discretion, deciding that churchmen were being unreasonable, trusting their own judgement. However much clergy claimed to be speaking for God, it was clear to contemporaries that they were not infallible.

This did not mean that excommunication wasn’t a horrible experience. Much of my work focuses on the publicity given to sentences. If you want everyone to

ostracise an excommunicate, you have to broadcast who they are and what they've done. So sentences of excommunication were publicised extensively. An average person might have their crimes broadcast in their own parish church and two or three nearby, on Sundays and feast days, but excommunications could be announced throughout an entire city, diocese, kingdom or even through the whole of Christendom. The content was designed to persuade communities to enforce the sentence, so could be extremely vitriolic. Pope Gregory IX's excommunication of the Holy Roman Emperor in 1239, disseminated throughout Europe, was a complete character assassination. People complained about the bad press that accompanied excommunication more than any other aspect of the punishment. They frequently felt persecuted by uncompromising condemnations containing, they claimed, lies. The majority of people in this period could not read – excommunications were pronounced in English (or other vernaculars) not Latin, so that people understood, and were accompanied by a dramatic ceremony to catch their attention. This was a medieval method of mass communication.

This publicity was exploited to slander individuals and to condemn political enterprises. Designed to be broadcast widely and to influence public opinion, sentences of excommunication were a form of propaganda. King Edward I, for instance, fought against both the Scots and the Welsh during his reign and asked that both groups be excommunicated throughout his realm. The sentences against them were intended to garner support for his wars amongst his English subjects more than to terrify the Welsh or Scots. The alleged atrocities (mercilessly killing English women and children, for example) transmitted in this way might be compared to WWI Hun posters.

Excommunication was not necessarily an unfailingly powerful way of forcing people to submit to the church's judgements (though nor was it a damp squib; a lot depended on the



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excommunicates' personalities and circumstances). What it certainly did was spread information about political events and causes to all levels of society, even if all citizens did not believe what they were told. Medieval government was accessible only to a few. Aristocratic men, and more locally still well-to-do men, were the only ones who really needed to know what was going on, most of the time. But through excommunication, pronounced in local parish churches frequented by men, women and children of all classes, news was

spread much more widely. It turns out, it was discussed and assessed by the wider populace. It is often assumed that mass communication and the public sphere are modern phenomena, but a detailed study of excommunication challenges this idea.

It is something of a cliché to say that a benefit of college life is talking to scholars from many other disciplines, but I have absolutely found this to be true. Corpus lunches and dinners are always fun and stimulating, and

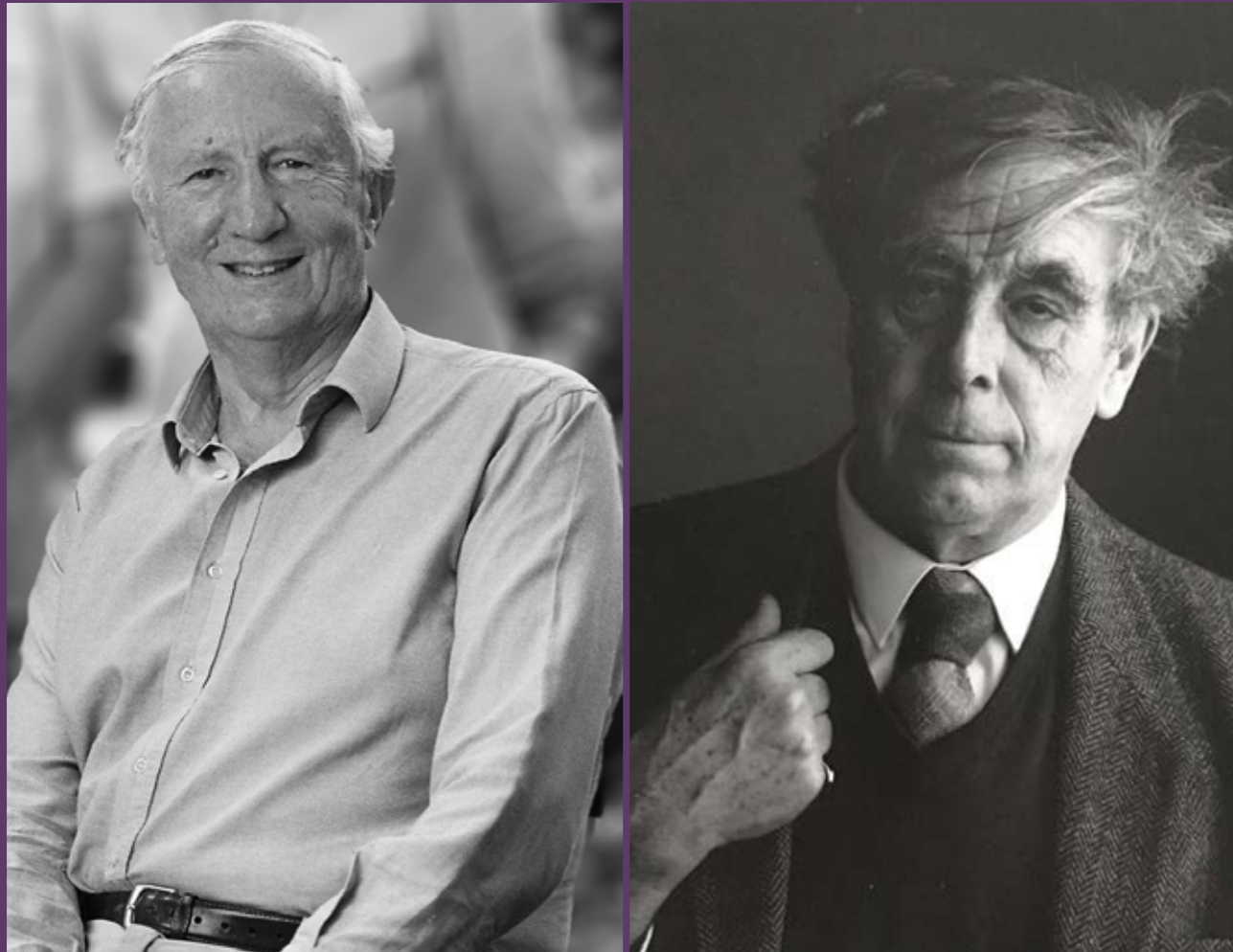
provide welcome breaks from the day to day work of an historian – solitary hours spent in the library reading and translating books. After almost a decade living in the big cities of Manchester and London, Cambridge has been an adjustment. It has been a beautiful place to continue my research. Leckhampton, right on the edge of the countryside, has in particular been a really lovely change and I will miss living here a lot. Cambridge will though, I suspect, feel like a vast metropolis when I move up to St Andrews to start a lectureship

in the new year. A research fellowship at Corpus has allowed me to focus on writing my book. It is with nerves and excitement that I am preparing to take on a full teaching load alongside my new research project exploring medieval common knowledge. I have moved institution at every stage of my career, and have been lucky to have had the support of brilliant mentors, colleagues and friends at each of them along the way. I am extremely grateful to Corpus and Cambridge for providing more, and I look forward to visiting from Scotland.

# Value Economics

Michael Griffiths (m1957) and John Lucas (m1956)

LIZ WINTER SPOKE TO ALUMINUS MICHAEL GRIFFITHS RECENTLY ABOUT HIS BOOK VALUE ECONOMICS WHICH HE CO-AUTHORED WITH JOHN LUCAS AND ASKED HIM WHAT INSPIRED THEM TO WRITE THE BOOK AND MORE IMPORTANTLY, TO EXPLAIN VALUE ECONOMICS.



**LW:** Your book *Value Economics* by M Griffiths and J R Lucas has recently been published by Palgrave Macmillan to considerable interest from the academic community. Can you explain value economics to me?

**MG:** Yes. We are proposing a “creation of value” approach to how we should measure “value” in economics. We recommend that “economic value” ECVAL, which we define as NOPAT (net operating profit after tax), less the

cost of capital, becomes the key metric for measuring the creation of value by economic enterprises, which will supplement the market capitalisation value metric of total shareholder return (TSR), which may be different from total shareholder value (TSV), ie the long term intrinsic value of an economic enterprise. See Chapter 8 “Economic Value and Intrinsic Value”, which recognises the three dimensional nature of value in business, ie economic, environmental and social, reflected

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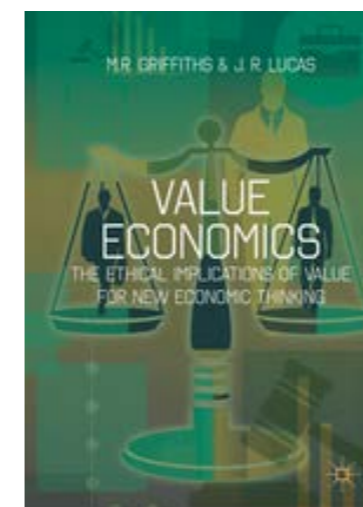
in triple bottom line accounting (TBL)

**LW:** “Value”, or even “Economic Value”, is notoriously difficult to measure, as the economic value of any action in the present can very much depend on the future. What are your thoughts on how to gauge economic value in these situations?

**MG:** Our book “Ethical Economics” published by Macmillans in 1996 proposed five rational principles for economic activity, the last of which relates to the indeterminacy of economic outcomes to which you refer, and which require managerial competency and skills in forecasting results, risk management, and measuring the profitability and sustainability of a business enterprise.

- The need to define the needs, wants, beliefs, and interests of all the stakeholders in a business enterprise, which we call the “alteritas” principle. ie recognition of the objectives and values of the “Other”.

- Business as a non- zero sum game which requires that the privative interests of the stakeholders, shareholders included, have to be modified in light of the desired “economic returns” of all parties involved in that business.



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- In this way, it is rational to see economics as a non-privative activity where consultation; participation and sharing become the means for economic management, and introduces the concept of how all stakeholders share in the distribution of the “cooperators’ surplus”, which raises questions of how employees might participate in decision making and ownership of the enterprise for which they work.

- Money as “encapsulated choice” which enables consumer preferences to be realised within the confines of the demand and supply for actualising those preferences. Chapters 5 and 6 of “Value Economics” on Money and the Moneyed Society seek to address the issues involved in supplying the money for exercising consumer choice.

- Economics as an indeterminate process whose outcomes are not always predictable, however important monetary and fiscal policies are in determining supply and demand and investment in business enterprises. The management of this indeterminate process requires skills in a) measuring economic value at any one point in time and b) forecasting its future value. We are proposing ECVAL as the key metric for doing this, also for providing an antidote to “market exuberance”

where share price may not be the correct measure of intrinsic value.

**LW:** Recently, Nobel Laureate Jean Tirole published a book titled *Economics for the Common Good*, in which he touches upon similar subjects, such as the morality of markets, and how to allocate resources in a way that serves society. Do your ideas correspond at all to those of Professor Tirole?

**MG:** Yes, there is a clear correspondence between Jean Tirole’s new agenda for the role of economics in society and “Value Economics” suggestions for new economic thinking. Jean Tirole’s agenda covers global warming, unemployment, the post 2008 global financial order, the euro crisis, the digital revolution, innovation, and the balance between free markets and regulation. In this list the measurement of economic value does not occur. A key theme of *Value Economics* as we have said above is how we can measure value in economics proposing that ECVAL (NOPAT less cost of capital) becomes the key metric for measuring the creation of value by economic enterprises to get the balance right between total shareholder return (TSR) and value (TSV), which focuses on the intrinsic value of a business enterprise, and not only on the market share price and EPS.

**LW:** Do you still believe in capitalism as a viable and worthy operating system for a 21st century developed country?

**MG:** Yes, but with a greater emphasis of the creation of triple bottom line value, ie economic, environmental and social, and the way executives are rewarded for the creation of that value using the ECVAL metric, and not only the market share price metric.

*Value Economics: The Ethical Implications of Value for New Economic Thinking* by M Griffiths and J R Lucas. Publisher: Palgrave Macmillan.



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