Dear reader,

Knowledge is power, time is money, and money makes the world go round. The concepts of currency and control underpin many aspects of our society—whether within the world of science. That’s why for our second issue of the academic year, I, Science Magazine has decided to tackle all these. Money, Power & Influence.

As usual, our writers have impressed us with their creativity and insight into science. We begin with a recap of the biggest science news stories of the term, followed by an insightful exploration of gender stereotypes in children’s toys. Next up, we consider the role of power dynamics in universities, focusing on students’ roles as partners in higher education collaborations. Following this, we examine the influence of flagship endangered species on wider conservation efforts, followed by a fascinating take on power and corruption. Our penultimate sub-topic considers ideology in science, from the colonial underpinnings of modern research collaborations to the communist values that powered Soviet science. Lastly, we end with a perceptive examination of the workings of the academic publishing industry.

We’ve really enjoyed working on this thought-provoking theme and hope you find it both engaging and informative!

Until next time,

PRIYANKA AND CHARLOTTE
EDITORS-IN-CHIEF

We are always looking for new contributors for both the magazine and online. If you would like to get involved as a writer, illustrator, or photographer, please get in touch with us.

Email us at i.science@imperial.ac.uk
Follow us on Twitter and Instagram at @isciencemedia
Like us on Facebook at I, Science
Contact us via our website at www.isciencemag.co.uk

We are always looking for new contributors for both the magazine and online. If you would like to get involved as a writer, illustrator, or photographer, please get in touch with us.

Email us at i.science@imperial.ac.uk
Follow us on Twitter and Instagram at @isciencemedia
Like us on Facebook at I, Science
Contact us via our website at www.isciencemag.co.uk

FIND MORE GREAT CONTENT ON OUR WEBSITE:
WWW.ISCIENCEMAG.CO.UK

Harry Jenkins covers the latest news, from COVID-19, the coronavirus-caused disease, to the use of artificial intelligence to fight antibiotic resistance.

TOYING WITH SCIENCE | 6
Lydia Melville raises concerns about gender stereotypes in toys.

STUDENTS AS PARTNERS IN HIGHER EDUCATION | 8
Sharan Kapadia shares his takeaways from the Student-Shapers programme.

PHDS: INDEPENDENT RESEARCH PROJECT OR DIRECTED FROM ABOVE? | 9
Samuel Page talks about the degree of freedom in PhD work.

THE AGE OF INSTA-SCIENCE | 10
Priyanka Dasgupta discusses the complications of communicating science in the social media age.

THE COST OF CLIMATE CHANGE | 12
Daniel Mello-Jenkins examines the financial considerations of combating climate change.

ADA LOVELACE: A TANGLED LIFE | 14
Cristina Coman sheds light on the complicated legacy of Ada Lovelace.

TESLA’S DESPERATION | 15
Kenna Castlberry writes about how financial hardship affected one of the world’s most famous inventors.

PASSPORT PRIVILEGE | 16
Sze Chung Liew reveals the biases and concerns surrounding the power of one’s passport.

NOBEL WOMEN | 18
Looking at the award’s history, S Reid-Collins investigates the lack of diversity in the Nobel Prizes.

HAPPY TOGETHER? | 20
Nelli Morgulchik discusses the impact of merger & acquisition deals in the pharmaceutical industry.

BLUE SKY’S THE LIMIT | 22
Kate Quillin reflects on the unexpected virtues of blue-skies research.

SCIENCE’S BILLIONAIRE BENEFactors | 23
Daisy Veysey evaluates the role of private investment in funding science.

FLYING THE FLAG FOR ENDANGERED SPECIES | 24
Effective strategy or waste of money? Charlotte Hartley examines the use of flagship species in conservation biology.

ABSOLUTE POWER CORRUPTS ABSOLUTELY | 26
Josie Clarkson discusses why power affects different people in different ways.

SCIENCE COLLABORATIONS OR SCIENCE COLONIALISM? | 28
Matthew Dale digs into the colonial roots of modern collaborations.

CAN WE CUT TETHER OF IDEOLOGY FROM SCIENCE? | 29
Billy Irving questions whether scientific knowledge can ever be free from ideological values.

THE BACKWARDS WORLD OF ACADEMIC PUBLISHING | 30
Grace Browne dissects the complexities of academic publishing and the open access movement.
COVID-19: THE VIRUS DOMINATING THE HEADLINES

There couldn’t be a news roundup for this term without mentioning COVID-19, the disease caused by the new coronavirus, originating from Wuhan, China, which has grown into an official international health emergency.

As of February 22nd, 2020, there have been over 76,000 cases globally (1,400 outside China) and over 2,300 deaths according to the WHO. This has vastly outnumbered those from SARS, the disease caused by a previous coronavirus, which expanded into an epidemic and also originated in China.

At the time of writing, experts say that the world is at a tipping point as health systems across the globe struggle to keep up and contain the virus. This is exacerbated by the current lack of a vaccine and the recent discovery of an individual who passed on the virus despite having no symptoms and testing negative.

The virus is a true insight into a global health emergency in the information age, displaying both the talents of modern technology as hospitals are built in 10 days, and how misinformation and racism can spread in times of crisis.

SEPSIS: THE UNDERESTIMATED KILLER

In January, a report in The Lancet highlighted a global killer which hasn’t been making the headlines, stating that the current figures for the number of people in the world dying of sepsis have been grossly underestimated. They estimate that 11 million people die per year from sepsis – double the previous estimates.

The new figure also takes sepsis above cancer in terms of numbers killed annually, with most cases occurring in low and middle income countries.

Sepsis is considered a hidden killer due to how hard it is to detect. It is the result of the immune system attacking parts of the body, and is most commonly triggered by diarrhoeal infections or lung diseases.

BREXIT AND BORIS JOHNSON’S GLOBAL TALENT VISA

Amid global health crises, one can’t ignore that as of January 31st, 2020, Britain has started the process of becoming less global as we formally leave the EU.

In a bid to assuage fears that Brexit could be detrimental to the UK science landscape, the Government announced a fast-track visa system to attract world-leading scientists.

The system began on 20 February, and there is no cap to the number of people that can come to the UK under this visa. The UK Research and Innovation Agency (UKRI) is managing applications rather than the Home Office so that their scientific credentials can be quickly assessed by those qualified to do so.

Research organisations have been lobbying the Government to put together a new system amid fears that Brexit could lead to a brain drain from Britain, however concerns remain around the UK’s future role in EU research programmes.

THE POWER OF AI IN THE FIGHT AGAINST DRUG RESISTANCE

Headlines can be depressing but that doesn’t mean that they all have to be. AI has sparked new hope against the global fears of drug resistant diseases, as it is used to discover a new antibiotic.

The drug, called Halicin, has been shown to wipe out a range of antibiotic-resistant strains of bacteria, including 2 of the top 3 high-priority pathogens identified by the World Health Organisation.

Researchers at MIT used machine learning to work through a database of 107 million compounds, looking for those that look effective but are unlike current antibiotics. Eventually, this led them to Halicin, which was originally researched as a potential drug to treat diabetes.

The WHO calls antibiotic resistance one of the biggest threats to global health security and development today, so this is a major breakthrough in the fight against it.
still remember what my favourite childhood toy was—
a giant cuddly pig. Some of us may still own our favourite
toy proudly on display, worn and torn with love, or at least have it safely
stored in the attic. You would be amazed at how this toy may have influenced your
choices in life beyond merely providing entertainment. So, what am I playing at?

In the 1996 Friends episode ‘The One with the Metaphorical Tunnel’ Ross makes
gendered comments about toys he believes his son, Ben, should play with, favouring G.I.
Joe (the original Action Man) despite Ben’s preference for Barbie. Many of the
female characters confront him on this. Although it does not help the gender
sterotypes, the episode then discloses that Ross himself used to dress in his mum’s
clothes, which reveals a deeper issue in what is considered ‘normal’ both by the
characters and viewers. There is an overwhelming sense of ridicule associated
with playing with the ‘other’ gender role. In many ways, Ross’ views are
dated as children need to learn to interact with everything around them. So why is this
division between the sexes and genders still happening, especially with toys?

Child psychologists showed in 2015 that certain toys which
involve building and creating, such as Lego, are too often aimed at boys. Physicist and
STEM ambassador, Dame Athene Donald, emphasises how creating during
playtime develops children’s visuospatial
and mathematical skills. Playing with dolls is also important for strengthening language, communication and empathy skills, but these toys are often only directed towards young girls.

As human beings, we need both sets of
skills. So without influence from both toys,
and empathy skills, but these toys are
associated with playing with the ‘other’
gender role. In many ways, Ross’ views are
dated as children need to learn to interact with everything around them. This alters
to their future, influenced by culture, peer groups and adult expectations. When gendered,
way we play ultimately shapes our decisions either towards or away from a
career in science.

The toy industry also largely fails to truly represent different
differences and disabilities in toys. The Barbie brand,
launched by Mattel in 1959, expanded the skin tone and hair styles of the dolls to
to ‘play well’ in accordance with the
biological sexes. Toys exaggerate the
gender roles that prevent us from moving into
a more gender fluid reality, not just in a
world. Society then expects young
children to decide on their future,
influenced by culture, peer groups and
adult expectations. When gendered, we play ultimately shapes our
decisions either towards or away from a
career in science.

The toy industry also largely fails to truly represent different
differences and disabilities in toys. The Barbie brand,
launched by Mattel in 1959, expanded the skin tone and hair styles of the dolls to
show the first African American Barbie
for celebrating Barbie’s 60th birthday, a
new range of dolls with varying body
shapes was released—but this does
beg the question of why it took so long. A
campaign called #toylikeme began
to highlight this. Some of the toys
are available to see at the ‘Play Well’
temporary exhibition at the Wellcome
Trust Collection in London. Change is
slow in happening. But is this enough?

The lack of representation of
different individuals among toys
raises concern not only of gender
or ethnicity, but of the extent that
class rules us. Money and income
greatly influence what we can
and cannot afford as we grow up. Being unable to relate to other
children in social environments deeply affects children for a
long time. Memories of bullying
remain with us for many years
afterwards. Social exclusion
can have severe consequences
for children, including reduced
academic motivation, academic
success and can cause a
negative impact on general
well-being. However, divisions
based on socioeconomic
backgrounds can be dissolved,
albeit temporarily, through play.
By focusing on how to break
barriers in the toy industry
during early childhood, we can
help future generations feel
happier all-round.

The toy industry in the UK is
worth around £240m worldwide.
The market is enormous and now
expanding with online games. So,
are we still using the toy industry
to ‘play well’ in accordance with the
origins of Lego’s Dutch name? The
way we spend money guides future
generations to discover their interests
and the toy industry is just another
business with adverts which are made to
appeal to what we know and trust.

Ensuring a positive and inclusive message
is delivered to children is imperative for
their happiness in years to come. Breaking
the stereotypical gender roles is part of the
game to ensure playtime gives children
an understanding of themselves, which
they can then use to delve into any career,
scientific or otherwise, playing from early
life onwards with every possibility.

Researchers showed in 2015 that certain toys which
involve building and creating, such as Lego, are too often
aimed at boys.
Traditionally, Higher Education (HE) has dominated even today. However, a relatively recent and refreshing approach to HE teaching and learning is the ‘students as partners’ model. In 2014, Healey, Flint and Harrington summarised the benefits of these student-staff partnerships for both students (in the form of improved engagement, improved agency and increased motivation) and educators (honing teaching methods based on student perspectives). Collaboration can also create a greater sense of community. However, a significant challenge to the successful implementation of, and outcomes from, such partnerships is the seemingly omnipresent unbalanced power dynamic between staff and student.

WHAT ARE POWER DYNAMICS?

There are many definitions! From a general standpoint, ‘power’ is the capacity of one entity to influence the behaviour of others. In an educational context, ‘power’ can be conceptualised as the ‘differential capacities to act between teachers and learners. It is therefore unsurprising that an educator’s greater subject knowledge and experience introduces a significant imbalance of power.

Avenues for anonymous feedback is another way to prevent power dynamics from interfering with student honesty.

SOLVED?

The productivity benefits of “disrupting” power and encouraging greater legitimacy and agency, has been described in a recent blog. Though it is likely that some imbalance of power is an inevitable product of student-staff collaboration, we should attempt to lessen it, or mitigate its impacts. In our project, our educators sought to create an environment of friendliness and openness. They engaged with us as colleagues, not superiors. They encouraged contribution by emphasising that no suggestion is trivial. It was evident from day one that faculty were genuinely interested in our thoughts, and we found this highly motivating; it immediately allayed any apprehension.

IMPACTS OF POWER DYNAMICS ON COLLABORATIVE WORKING

I believe that the student perspective is one of the richest sources of feedback in the ‘students as partners’ model. Hence, a significant number of the benefits afforded by student-staff collaboration are grounded in students’ honesty and freedom of expression. Indeed, throughout my Student-Shapers project, I saw first-hand the cruciality of an ‘open’ collaboration. However, it is clear that it would require significant courage to share opinions with senior faculty. When there is an imbalance of power, students may fear being judged, being considered ignorant or arrogant, or their ideas being dismissed. This can thwart expression of a student’s own ideas, and their ability to “negotiate” with staff. Furthermore, it is important to remember that several senior faculty members have roles as assessors.

It can indeed be challenging for students to see faculty simultaneously as ‘partner’ (implying a one-to-one relationship) and as ‘assessor’ (implying a hierarchical dynamic). Interestingly, the phenomenon of disrupted student expression seems to occur despite the fact that faculty are often keen to hear student opinion. It is quite probable that

this is more of an intrinsic apprehension among students rather than an intentional suppression of students by faculty.

SOLUTIONS?

...
THE AGE OF INSTA-SCIENCE

Priyanka Dasgupta discusses the complications of communicating science in the social media age.

More and more, science is communicated through Facebook posts, Instagram stories and even memes. We have gone from 50 page proposals, to 20 slide presentations, to “Insta” science.

In this attention economy, content needs pretty fonts and spiffy design, while being captivating enough for a reader to consider it worth their while. But does this trimming of content pose a danger to the attention we owe these stories? Does it have the effect of making everything superficial and fleeting?

THE PROOF

A 2019 study from the Technical University of Denmark (DTU) looked at data from Twitter, Google books, movie ticket sales, Google Trends, Reddit and more. It provided extensive empirical data that showed our collective attention span is on the decline. Dr Sune Lehman from DTU explained how the allocated attention in our collective minds has a certain capacity, for which the many cultural items of the world must now compete. This means that the individual attention given to things must be narrowed down.

The results of the study leave room for interpretation. For instance, an oft-cited statistic claims that human attention span has decreased to about eight seconds—down from twelve seconds in 2000. For context, a goldfish has an attention span of about nine seconds. For many, it is evidence that the age of social media has had its dread effect, making for a more frivolous generation.

Others argue that this paints only half the picture. When it comes to what one can give their precious time to, there is a seemingly infinite number of options to choose from. And so, people have adapted to going through or filtering content at a quicker speed—call it an evolution of sorts of the collective attention span. It’s like when you’re able to go through the important information in five chapters on the night before an exam. The views contradict. Think of it like this: you might not stick, around to read a news report on your phone for 10 minutes, but can binge-watch a series on Netflix in four hours. This seems to suggest that while our collective attention span is definitely decreasing, we have started to develop ways to sieve out irrelevant information, and, if the context is engaging enough, we will give it our attention for longer and more often.

THE BIGGER PICTURE

Imagine what this means for communicating complex issues of science. This generational dive into selective condensed experiences, brings on challenges for the contenders from various sectors, who are all vying for our attention. With the inclusion of science as a big part of policy, ranging from health, energy, transport or security, there is a growing need to communicate certain multifaceted concepts quicker and well. There has, thus been an increase in investment in science communication and engagement strategies by a variety of non-scientific institutions. However, this throws us into a highly competitive playing field, where the importance of a subject hinges on the press it receives. We end up with a hack formula of sorts: Attention = promotion = numbers = mass support = funding.

What then of the scientific idea that didn’t gain enough traction for investment? Such a financial dependency means that institutions often find themselves toeing a line where the anticipated positive impact of an idea depends on a successful brand campaign. Granted, a campaign, if it manages to gain traction, can help meet the aimed impact far sooner than it would have taken ten years ago. Think conservation projects, cancer research or autism awareness campaigns. It can also go very wrong, very fast. Seeing things in passing on Instagram, leaves the scope to get across ideas subliminally, to define new normals or disguise statements as facts. For example, ten influencers who tweet about climate change being a hoax might convince their audience that it’s true. The algorithms then push media similar to previous clicks, thus providing similar posts, which then inevitably strengthens polarised communities with staunch ideologies. There is no doubt about the incredible power of social media when it comes to speaking of science. Stories shared by scientists can give insightful peeks into the diversity, measures and uncertainty of the world of science. However, the pruning of science to fit Insta stories and campaigns can give way to a fear of dilution of the actual work. While it does make science more accessible and can help break prejudices, as with everything that wields power, caution must prevail.

“Institutions often find themselves **toeing a line** where the anticipated positive impact of an idea depends on a successful brand campaign.”
I, Science

It has been estimated that across the world, over $9.3 trillion is spent annually on projects which will help tackle climate change. This may seem like an enormous amount of money, yet there are still worries that it is simply not enough. Stopping a threat as existential as climate change requires us all to implement the changes needed to keep temperature rise under the 2°C goal, set by the Paris Agreement in 2016. This will require multiple changes to the way we live, and money will play a major role in implementing them.

Climate change is a highly complex issue, but this complexity provides a range of ways to combat it. Reducing current global emissions is a well-known and highly important aspect of preventing future impacts. Currently, the most effective ways to reduce the amount of carbon dioxide released into the atmosphere include investing in green energy, creating and advancing sustainable transportation (such as electric vehicles), and developing agricultural techniques which produce lower emissions. The question is: can this problem be solved simply by throwing money at it?

Perhaps unsurprisingly, the vast majority of climate finance is driven into renewable energy resources, as these projects provide the best returns for their investors. Investment in renewable energy is necessary to reduce future emissions and is clearly an important part of the battle against climate change. However, global emissions have continued to rise, year after year, despite this heavy investment from both the private and public sector.

Not only is there an insufficient amount of money being spent on climate change at the moment, but it is also being distributed unequally. An estimated $800 billion was used to fund fossil fuel subsidies in 2018. With such a thriving market for fossil fuels existing, it is hard to imagine vital changes occurring over the next few years. The carbon tax, discussed by economists, is a popular option over the next few years. The carbon tax, introduced in 2016, costs money being spent on climate change at the moment, but it is also being distributed unequally. An estimated $800 billion was used to fund fossil fuel subsidies in 2018. With such a thriving market for fossil fuels existing, it is hard to imagine vital changes occurring over the next few years. The carbon tax, discussed by economists, is a popular option for addressing this issue. Now, at the start of 2020, despite a step in the right direction, we’ve failed to continue moving that way. It is unclear whether the target set in 2009 will be met, as the majority of climate finance in developed countries is still being spent domestically.

Wealthier countries have been including loans and money set in aid of natural disasters within the goal set in Copenhagen. This has led to controversy over how much money is really being invested in climate change. It has been contended that aid money should not be considered as part of the goal, as it is sent to help countries recover from disasters caused by climate change, not to defend themselves against future ones. Developing countries, such as India, have argued that because of this, the money which was promised should be formed of grants alone.

A clearer definition of the agreed terms and more financial donations to countries like India, where the risk of a natural disaster caused by climate change is higher, have been promised within the next five years. However, over the last three years both the United States of America and Australia (previously major contributors to the fund) have pulled out of the agreement, making these goals unrealistic and highly unlikely to be achieved in the set timeframe.

The cost of future damages from climate change is truly mind-blowing. It is well known that natural disasters are expected not only to become more frequent in the future, but they will also be more destructive. Even without considering the uncalculatable expense of human life, damage to infrastructure across the world is set to increase vastly. The true cost of this depends on how we act now. Harrowring estimates predict that if we were to see a rise of 3.7°C by 2100 (which is already above the global average), the world could endure damages to infrastructure of up to $551 trillion, almost a quarter of the world’s potential global income.

“Even without considering the uncalculatable expense of human life, damage to infrastructure across the world is set to increase vastly.”

These figures are clearly still not worrying enough to those in charge of driving political change. Unless significant change starts now to boost climate funding and to reduce subsidies for fossil fuels, we will drown in the ever-increasing cost of the impacts from climate change. Without coughing up now, we will not have the necessary damage control in place, leaving consequences of our current decisions and the financial burden of them, for future generations to face alone. Without drastic changes to the way the current economy functions, it is clear that no matter how much money is thrown at the problem, the cost of climate change will become an incurable debt.

Daniel Mello-jenkins examines the financial considerations of combatting climate change.
It is fair to say that Ada's life was plagued by drama, some as a consequence of her own decisions, and some circumstantial. There are, however, a lot of controversies regarding both her personal life and work as a scientist. In her biography, 'Ada, a Life and a Legacy,' psychologist and computer programmer Dorothy Stein attempted to untangle the mysteries behind the Countess of Lovelace's short life. Most quotations throughout this article were taken from this book.

"Her overbearing mother controlled all aspects of her life."
PASSPORT PRIVILEGE

Sze Chung Liew reveals the biases and concerns surrounding the power of one’s passport.

It is estimated that 80% of global inequality is the result of inequality between poor and rich countries. The passport that you hold, an inherent symbol of identity, determines if you can easily travel around the world, access valuable resources or be given preferential treatment from law enforcement officials.

For some citizens from the Global North, like those from European, North American or rich East Asian countries, their passport is a symbol of freedom, as visas on arrival are generally given without complications. Hence, many Britons gave little thought to the privileges attached to their passports before the announcement of the UK’s divorce from the European Union. For others from poorer Asian and African countries (the Global South), it signifies oppression and a barrier to free movement, as nationals have to apply for a visitor visa to other countries months in advance.

This is a constant burden, requiring much planning and emotional investment before a flight overseas can be booked.

Even though idealistic science philosophers stress the universality of science, that science can be accessed by those who wish to, the harsh reality is that one’s nationality can either enhance or limit their progression in science. Researchers from the Global North may choose not to attend international conferences, as they are subjected to expensive and non-refundable visa application fees which may not be reimbursed by their institutions. Visa delays, rejections or long processing times may cause too much distress to justify attendance at a short-term conference.

Moreover, an approved visa may not guarantee access into a developed country, as they may be denied entry under the discretion of custom agents. This game of chance may be too risky to pursue. A possible rejection could also hinder subsequent visa applications, as inquiry into past rejections will determine the likelihood of future success.

A 2018 report commissioned by the Wellcome Trust found that African and Asian researchers are three to four times more likely to face difficulties regarding visa applications for short-term research visits than European and North American researchers. This is partly due to a lack of visa issuing offices in Africa, thus applicants often have to travel to neighbouring countries. Furthermore, African nationals are twice as likely to be refused a UK visitor visa compared with applicants of other nationalities.

In April 2019, six Sierra Leonean Ebola researchers were unable to attend an important pandemic preparedness training programme in the UK due to visa rejections and delays, despite filling out the correct paperwork. After providing a tedious list of documentation, including a 10-year travel history, one researcher was refused entry because the Home Office did not believe his status as a scientist. Highly discriminatory language used in visa refusal letters and increased suspicion directed towards African visa applicants can damage relationships between international scientists and undermine British efforts to solve global challenges in those countries.

It is hugely ironic and counterproductive that the British government is seeking to promote global health but is systematically creating a hostile environment for those who are actively working on the ground to ameliorate disease outbreaks. Diversifying perspectives through international collaboration is important to challenge the homogenous white, male-dominated narrative that permeates across all scientific disciplines. Local people’s understanding of health crises is often ignored, further justifying the need to listen to local perspectives in international conferences to derive holistic solutions.

During an international summit aimed to strengthen global trade with African countries in January, Boris Johnson acknowledged the hardships faced by Africans in obtaining a visitor visa and pledged a fairer migration system that values “people before passports”. To fast-track visa applications for scientists, an agreement between countries in the Global North could hold visas from countries with stringent vetting standards to cross their border without being subjected to further visa applications.

Unfortunately, immigration reforms may take years to enact. For now, international events should be held in countries with less hostile immigration policies, such as emerging research hubs in India and South Korea, so more scientists can easily attend.

Calls to improve African immigration policies to the UK exemplifies that inconvenient situations can improve as different countries’ international policies and alliances shift. However, the opposite can also happen. A third of a million international students in the USA hail from China. Even though this means enormous income pouring into universities, the American administration are fearful that Chinese students and researchers are partaking in intellectual-property theft or doubling as Chinese intelligence officers. Increased funding from Chinese companies in American universities to support the Chinese Communist Party’s activities, such as developing facial and voice-recognition technologies for mass surveillance, further exacerbates distrust towards Chinese scientists. Consequently, five-year visas for foreign graduate students in specific fields of science and technology, such as artificial intelligence, have been reduced to renewable one-year visas. Short-term visas for conferences that were previously issued to Chinese researchers without complications and access to research facilities are presently restricted.

This increased scrutiny towards Chinese scientists further alienates Chinese researchers, as they feel they have to constantly prove their worth to be in a country that views them as spies. In the shifting tide of geopolitics, where you come from will always hold certain prejudices in others’ minds. However, we should advocate for a science without borders, so bridges between countries can be built for scientific innovations.

As the recent coronavirus disease (COVID-19) outbreak exemplifies, success in tackling the world’s challenges requires global efforts. My hope is that priorities in international collaboration will outweigh any discriminatory immigration policies placed on any nationals, due to socioeconomic and political situations that are out of their hands, when applying for short-term visas.
The Nobel Prizes have widely become regarded as the most influential award a person can achieve for lifetime accomplishments within the sciences. Looking at the award’s history, S Reid-Collins investigates the lack of diversity and what the Nobel Institute can do moving forward...

- **54 women** and **865 men** have been awarded Nobel Prizes.
- **Only 32 women** have been awarded prizes in Chemistry, Medicine and Physics.
- **6 women** have jointly won awards with their husbands in the sciences, while **only 3 women** have won individually.

There is an alarming lack of diversity within the Nobel Laureates—not just a lack of women, but also a lack of people from ethnic minorities. At the same time, we’re seeing the number of women in scientific communities increasing significantly, with 28.8% of the world’s researchers now coming from women (UNESCO Institute of Statistics). This increased diversity within science is not being represented by the Nobel Laureates.

The Nobel Prizes are one of the most visible awards within the media. As the prizes shape the public perception of the scientific communities, representing women and ethnic minorities becomes essential.

The Nobel Prizes are not alone in their gender biases. The Royal Society’s Hughes Medal has been awarded since 1902 to an outstanding researcher in the field of energy. It has only been awarded to two women. The first, Hertha Ayrton in 1906, wasn’t able to collect her award as women weren’t allowed to enter the Royal Society. Thankfully, this policy has changed. Through various programmes, The Royal Society has made great steps to campaign for diversity, including breaking down barriers for and celebrating scientists with disabilities. Despite these positive changes, only one other woman, Imperial College London’s Michelle Doherty, has won the award, in 2008.

**WHAT CAN BE DONE TO INCREASE DIVERSITY?**

There are many ways that the Nobel committee can improve diversity, which other organisations already recognise. The American Geophysical Union is a scientific non-profit organisation of Earth and space sciences that understands the importance of diversity in science: “Having more diverse voices at the table leads to new perspectives and unique ways of thinking which in turn leads to better science and novel solutions.” One of the many ways they are working to increase diversity within science is through a global team that creates nomination packages for people from underrepresented groups.

Another way in which diversity of prize winners can be increased is through diversity within the granting panels. When panels lack this, a bias (unconscious or otherwise) is built, as people are more likely to give awards to those who look and think like them.

Jess Wade is a postdoctoral research associate in the Faculty of Natural Sciences at Imperial College, whose public engagement work has championed women and ethnic minorities in STEM. She spoke of the importance of visible diversity in awarding bodies: “If you’ve published a list of who’s on the shortlisting committee, it can really change who thinks to apply and also change the outcome.”

The way in which scientific happenings has also evolved. Large international teams collaborate, and this should be celebrated. In 2017 the Nobel Prize in Physics was awarded to three LIGO (Laser Interferometer Gravitational-Wave Observatory) researchers for capturing gravitational waves. This was made possible through the collaboration of over 1000 scientists working in 15 different countries. Many of those researchers have been awarded medals for their contribution, including 16 scientists in Scotland who received the President’s Medal from the Royal Academy of Edinburgh.

Science has changed, and perhaps it is time for the Nobel Prizes to change to reflect that.

“Science isn’t just done by one guy sitting in front of a blackboard with chalk. It’s done by huge extensive teams of people around the world. Giving your prize to three old men really doesn’t reflect that,” says Wade.

**If you’ve published a list of who’s on the shortlisting committee, it can really change who thinks to apply and also change the outcome.”**

Through various programmes, The Royal Society has made great steps to campaign for diversity, including breaking down barriers for and celebrating scientists with disabilities. Despite these positive changes, only one other woman, Imperial College London’s Michelle Doherty, has won the award, in 2008.

**NOBEL PRIZE WINNERS BY YEAR**

<table>
<thead>
<tr>
<th>Year</th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>1895</td>
<td>14</td>
<td>2</td>
</tr>
<tr>
<td>1900</td>
<td>12</td>
<td>2</td>
</tr>
<tr>
<td>1905</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>1910</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>1915</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>1920</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>1925</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>1930</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1935</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1940</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1945</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1950</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1955</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1960</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1965</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1970</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1975</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1980</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1985</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1990</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>1995</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>2000</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>2005</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>2010</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>2015</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>2020</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

**A NOBEL HISTORY?**

- **1896** Alfred Nobel dies and leaves the majority of his estate to a fund that would award “prizes to those who, during the preceding year, have conferred the greatest benefit to mankind”.
- **1901** First Nobel Prizes awarded in Stockholm on December 10.
- **1903** Marie Curie becomes the first woman to win an award. Together with her husband, Pierre, she wins the Nobel Prize for Physics for their study into spontaneous radiation discovered by Becquerel (who was awarded the other half of the Prize). She is awarded a quarter of the prize share.
- **1905** Barones Bertha von Suttner is awarded the Nobel Peace Prize.
- **1911** Marie Curie is awarded the Nobel Prize for Chemistry for her work on radioactivity. She remains the only Laureate to be awarded prizes in two separate science disciplines.
- **1919** Marie curie’s daughter, Irene Joliot-Curie, is awarded the Prize in Chemistry, shared with her husband.
- **1947** Gerty Cori is awarded Nobel Prize in Physics with her husband Carl Cori and Edward D. Cohn.
- **1962** Francis Crick, James Watson and Maurice Williams are awarded the Nobel Prize in Physiology or Medicine for their discovery of the structure of DNA. Rosalind Franklin had studied, learned different X-ray techniques, and used this to produce an image of DNA. Shared with Crick and Watson without her knowledge. This was essential to their work. She died four years prior, but her omission has caused great controversy. Despite the fact that Nobel Prizes are never awarded posthumously.
- **1964** Dorothy Crowfoot Hodgkin is awarded the Nobel Prize in Chemistry. She is the first woman to win a Nobel Prize in science without a husband as a Nobel Laureate.
- **1969** First prize in Economic Science is awarded. To date, only two women have won.
- **1974** Antony Hewish is awarded the Nobel Prize in Physics for discovering pulsars (rotating neutron stars that emit high levels of radiation and have potential applications across many fields of physics). These were co-discovered by Jocelyn Bell Burnell, who was working towards her PhD at the time. Controversially she was never awarded the Nobel Prize, despite her significant contribution. She has remained vocally gracious about this.
- **1983** Barbara McClintock is the last woman to date to win 10% share of an award in science.
- **2009** Across the six awards, five women are awarded Nobel Prizes, the highest number of women in a single year. These are shared with eight men.
- **2014** Aged 61, Malala Yousafzai becomes the youngest Nobel Laureate.
- **2018** Donna Strickland is awarded the Nobel Prize in Physics for her PhD work leading to the creation of chirped laser pulses, utilised in laser eye surgery.
- **2019** Thirteen men are awarded Nobel Prizes. One woman, Esther Duflo, is awarded the Prize for Economics, alongside her husband, Abhijit Banerjee.
HAPPY TOGETHER?

Nelli Morgulchik discusses the impact of merger & acquisition deals in the pharmaceutical industry.

My business wants to grow; whether it is by growing their profits internally or looking for external opportunities. These 'external opportunities' often refer to companies merging together to create a new company, or one company buying out the other. This phenomenon has a name: it's called a merger & acquisition (M&A). These deals, interestingly, appear to be more prevalent within the pharmaceutical industry than any other industry in the world.

In the last 20 years or so, 60 pharmaceutical companies in the U.S. merged into 10 giant enterprises. In comparison, it takes around 10-12 years for a newly discovered medicine to get to market due to extensive clinical trials. Just putting these figures together, you may already see that M&A deals in the pharmaceutical industry would have a huge impact on the market. As a result, the top five pharmaceutical companies in the world now take up more than half of the industry market share altogether. To put it simply, this means that they sell more than half of all existing drugs in the world.

The "merger spree" is yet to slow down, with the recent multi-billion acquisitions of Celgene by Bristol-Myers Squibb and Allergan by AbbVie hitting the headlines of almost all the financial newspapers.

When a pharmaceutical company discovers a new drug, they rush to patent it to make sure that only they are allowed to manufacture and sell this medicine for a set period of time—usually around 20 years. When the patent expires, anyone else can copy the drug design and make their own drug. This creates a lot of competition for the company that pioneered the therapeutic and can drag their profits down.

To this end, pharmaceutical companies are racing against the ticking clock of patent expirations, which explains why they tend to 'get together or buy out'. It takes years to push a drug through pre-clinical and clinical trials, and as many as 90% fail at one stage or another. Also, keep in mind that the cost of developing a single drug is comparable to the launch of up to ten space shuttles. After that, most companies only have around 10 years to pay off the spending on a new drug. This is because drug development time overlaps with the patent protection. This enormous pressure means pharmaceutical companies are constantly looking for new products to refresh their portfolio—and this is where M&A deals step in.

In many cases, the M&A move works perfectly. A few decades back, merger mania gave birth to the patriarchs of the pharmaceutical industry: Bristol-Myers Squibb and Glaxo Smith Kline. The mergers turned out to be extremely successful; these companies outperformed their past selves and their competitors in their drug pipeline productivity, improving the ratio of successful to failed drugs.

M&A activity also appears to boost innovation in the industry. Large pharmaceutical companies have doubled their revenue share from innovation in the last 15 years. Many pharmaceutical companies fight dirty to extend intellectual property rights for their "wonder drugs", such as AbbVie’s Humira, which generates more than 60% of the company’s revenue. However, patent battles stifle pharmaceutical innovation. The acquisition of Allergan might in the long term soften AbbVie’s aggressive strategy and lead to more drugs in the pipelines worldwide.

On the other hand, M&A deals have their downsides. The pharmaceutical company Bayer might be regretting their decision to take over the agrochemical company Monsanto. The company has had to deal with the many legal cases against Monsanto’s herbicides, which have been accused of being carcinogenic. On top of all the time and money spent on the original deal, Bayer’s share price fell by a whopping 40% after the acquisition was made public.

Yet, as a result of M&A transactions, pharmaceutical companies are free to charge exuberantly high drug prices with fewer competitors in play. “As a result of M&A transactions, pharmaceutical companies are free to charge exuberantly high drug prices with fewer competitors in play.”

Pharmaceutical companies are racing against the ticking clock of patent expirations.

M&A transactions, pharmaceutical companies are free to charge exuberantly high drug prices with fewer competitors in play.

All in all, while merged pharmaceutical companies indeed seem to be happier together and, so far, M&A deals have boosted the industry, only time will tell whether this model will be sustainable in the future.
Blue Sky’s the Limit

Kate Quillin reflects on the unexpected virtues of blue-skies research.

In 1953, James Watson and Francis Crick revealed the structure of DNA in a paper published in Nature. In 2012, CERN announced that the Large Hadron Collider had enabled researchers to observe the Higgs boson particle. Last year, scientists at NASA captured the first image of a black hole.

All of these are examples of ‘blue-skies’ research, which explores ideas that may or may not have any practical application. Scientists have always been drawn to the unchartered waters of blue-skies research, which is exploratory, pursued to satiate a curiosity about the unknown, it’s what we often associate with fields like particle physics, or space research. Blue-skies research is distinct from applied research, which uses pre-existing knowledge to develop specific technologies for practical applications.

“Researchers must justify why, and on what, they are spending public money.”

Many sources of funding contribute towards UK research and development – be it applied or blue-skies. For individual research projects, public funding is generally allocated based on a competitive application process. However, a detailed assessment of the impact proposed research would have, on the economy, and on society, would be too onerous for blue-skies research, this case may be harder to make.

Symptomatic of these more impact-based funding schemes is a need for accountability. Researchers must justify why, and on what, they are spending public money. Blue-skies research can be expensive—although funded by internationally pooled resources, the Large Hadron Collider cost a massive £3.74 billion to build—and good value for public money is, naturally, an important consideration.

This type of science is exploratory, pursued to satiate a curiosity about the unknown.

Since the 1970s, there has been a gradual shift away from the traditional view that scientists should be allowed total freedom, to a keener focus on specific objectives in line with the expectations of society, or the economy; it is important that neither extreme has total control. However, critics of the current system suggest that impact-driven research directs us towards ‘known unknowns’, solving only the problems we already know about.

But things may be changing. The government recently announced plans to invest £600 million in a new agency which would focus on identifying and investing in high-risk, blue-skies research. Even if that happens, decisions still need to be made on the allocation of that funding, which risks to take, and where to play it safe.

All of this asks the question: who should then have the final say? Who decides what research is useful, and what is not? Complex questions indeed, with answers just as uncertain. But if the stories of DNA or lasers teach us anything, we should perhaps remember the long-term benefits of taking risks, and make sure that blue-skies research doesn’t get lost in the noise.

Science’s Billionaire Benefactors

Daisy Veysey evaluates the role of private investment in funding science.

Among the several men justling for the position of the world’s richest person, Bill Gates is a well-known name. Love him or hate him, the technology giant is no longer at the top spot since giving away around $40bn of his wealth. This was achieved through the Bill and Melinda Gates Foundation, which was set up with the goal of improving global health and alleviating poverty, primarily through funding research into technological solutions. In fact, Forbes places the three trustees of this foundation, Bill and Melinda Gates and Warren Buffett, as the most charitable people in the world.

A person’s wealth can be a tricky thing to measure and when faced with the fact that a billionaire, such as Bill Gates, earns an estimated $10m a day, the question of wealth probably baulked. It isn’t unreasonable to wonder what a person could possibly do with that much money. Nevertheless, the system we live in enables such drastic accumulation of wealth into such few hands. Thus, many people believe it is the billionaire’s duty to give some of their excessive wealth charitably.

Bill Gates, like many of the ‘mega rich’, did decide to funnel money into scientific research. It is a field that can yield true innovations, exciting technologies, and life-changing medical advances with almost endless scope for discovery. Not to mention, science is ‘hot’ right now. The rich and powerful are clamouring to attach their name to the next disease cure, or add to the long list of donors to prestigious institutes such as Harvard.

The pull of investors towards science is so strong that scientists themselves are seeking training to learn how to attract and manage this new wealth.

“Investors are much less likely to donate to a lesser-known organisation.”

In many ways, they aren’t. One of the most important issues to science right now in the world of science is that, in much of the West, private investment into research has begun to outpace government funding. Only around 30% of research in the UK is government funded. This is bad for science in the same way privatisation can be a concern in any industry. When private entities control the funding, decisions may no longer reflect the interests of the people.

Even though the private funding comes from within corporations and not from billionaires directly, the flaws of private ownership still raise concern. Strong investment biases have arisen as more money is placed into ‘trendy’ research topics such as infectious diseases, helping global projects like the eradication of polo but leaving physics (despite all the recent interest for black holes and space) to languish. In addition, funding disproportionately favours diseases that affect wealthy Westerners, including cancer, obesity, and neglects those affecting populations in low or middle-income countries, or ethnic minorities, such as sickle cell anaemia.

Another dilemma with private benefactors is that funding biases do not only exist between different fields, but across research institutions. Science’s private investors are much less likely to donate money to a lesser-known organisation without the clout or reputation of a bigger name. For example, from private investors funding ventures, to university research, to keeping as much of the work revolves around improving existing technology rather than providing groundbreaking inventions.

There is no denying the importance of the generous contributions of private investors to the world of science. Private investors can push forward start-up companies and have the propensity to target a cause to fund until the goal is met. Moreover, since they are not beholden to the taxpayer, they are likely to fund more risky ventures which the government could not touch.

When it comes to science’s current funding imbalances between private and government sources, it seems unfair to only reflect the interests of the people.
FLYING THE FLAG FOR ENDANGERED SPECIES

Effective strategy or waste of money? Charlotte Hartley examines the use of flagship species in conservation biology.

ith 27% of all species assessed by the International Union for the Conservation of Nature (IUCN) threatened with extinction, the biodiversity crisis is in full swing. Protecting at-risk species relies on securing funding from governments, corporations and the public. One of the best ways to do this is with a popular, charismatic species to draw people in, known as a flagship species.

The idea is that flagship species are appealing to their target audience, so their plight can be used to rally support and awareness of wider conservation initiatives. "[This] is a very efficient approach to sensitise people to the struggles of a declining species," says Cristina Banks-Leite, a senior lecturer in Life Sciences at Imperial College London. "Pictures of slim polar bears are much more impacting than statistics on receding ice sheets."

Flagship species help conservation organisations create a brand image, often by incorporating a threatened species into their logo. A famous example is the symbol of the World Wildlife Fund (WWF), the giant panda. Willingness-to-pay studies, which investigate how much members of the public would pay to protect a particular species or landscape, have shown that people are willing to pay more money to conserve likeable species. Emphasising a beloved species can therefore encourage donations from members of the public, which is a valuable way of increasing precious funding for wildlife conservation. It also provides potential donors with a tangible recipient of their support. A lot of thought goes into selecting the face of a conservation campaign. They tend to be large, memorable animals, with a distinctive appearance. Flagship species are often described as having ‘charisma’, but what exactly does that mean in a non-human animal? A 2014 study defined it as a blend of the species’ detectability, usefulness and aesthetics. Together, these characteristics evoke an emotional reaction in humans. For example, the golden lion tamarin makes a good flagship for the conservation of Brazil’s Atlantic Forests because of its striking golden coat, social behaviour and, put simply, cuteness.

Charisma, however, is context dependent. Different groups might have different emotional responses to the same species, so it is important for conservation initiatives to have a clear target audience. For instance, hen harriers might appear charismatic to birdwatchers, but their tendency to feed on red grouse makes them a pest to grouse shooters. Likewise, African wild dogs are enormously popular with wildlife tourists, but come into conflict with local farmers wanting to protect their livestock.

Conservationists also need to consider how different flagship species might interact. Indian wild dogs, or dhole, suffered a huge decline during the British occupation of India due to British hunters. Today, they remain under threat from local farmers. Banteng, a species of wild cattle from Southeast Asia, are also threatened by hunting, as well as habitat loss and hybridisation with domestic cattle. Both are endangered and were selected as flagship species on the island of Java. Only one problem: dhole predate heavily on banteng, making it very difficult to prioritise the survival of both species.

A common argument against using flags is that they skew limited funding away from species that may be in greater peril, but lack that je ne sais quoi. The lack of proportional representation becomes clear when we consider that the vast majority of flagships are birds and large mammals. Yet, the IUCN estimates that a higher proportion of confusers, a decidedly less charismatic group, are threatened with extinction than mammals or birds.

By focusing efforts on flagship species, we should in theory be able to help save other, less exciting species that live in the same habitat, or are threatened by the same causes of extinction. However, according to Banks-Leite, it is uncommon for the requirements of one species to encompass those of all other species in a community. "Saving the polar bear, panda, or tiger may or may not save other species and may or may not have an impact on all facets of ecosystem functioning," she says. Ecosystem functioning constitutes processes such as pollination, decomposition or predation, which rely on many different species by definition. "If the main goal is to preserve ecosystem functions, then we really need to take an ecosystem approach," she says, explaining that by focusing conservation at a landscape level (as opposed to the level of individual species), we can improve habitat quality for multiple species with the same intervention. Unfortunately, landscape approaches might fail to protect the most sensitive and endangered species, which are usually threatened by persecution or hunting, rather than reduced habitat quality. A recent study led by Banks-Leite showed that the number of these highly sensitive species varies widely between areas. Researchers can use this knowledge to plan the most appropriate conservation strategy. Areas with many sensitive species would benefit from a landscape-based approach, to support the needs of many species. Meanwhile, in areas with just a few sensitive species, tailoring conservation strategies to individual endangered species is more likely to save them.

One group of endangered species that might benefit from a species-based approach are Evolutionarily Distinct and Globally Endangered (EDGE) species. These are species with very few close relatives, meaning they represent a distinct evolutionary history. If an EDGE species goes extinct, a disproportionate amount of biodiversity will be lost, and their unique history is gone forever. The Zoological Society of London’s ‘EDGE of Existence’ programme borrows tactics from flagship initiatives to raise awareness of lesser-known EDGE species. In doing so, the programme aims to provoke conservation action in order to prevent their extinction.

One way in which ‘EDGE of Existence’ draws attention to evolutionarily distinct species is through art. Back in 2018, street artist Louis Masai painted six murals at London Zoo. Each one depicted a different EDGE species in his iconic patchwork style. By focusing on underrepresented species like the gharial (a species of crocodile found in India and Nepal) or Olen salamander (Europe’s only cave-dwelling vertebrate), Masai put them on the map. More crucially, he creates something beautiful out of them, which evokes that all-important emotional reaction. By learning the lessons of the flagship approach, researchers can apply them to less traditionally charismatic or familiar species. In sparking a positive association, be it through building relationships with local people or through street art, conservationists can garner the attention, support and funding needed to conserve the irreplaceable biodiversity of our planet.
Josie Clarkson discusses why power affects different people in different ways.

Absolute power corrupts absolutely

Josie Clarkson discusses why power affects different people in different ways.

Absolute power corrupts absolutely—most people are familiar with this 19th century saying from the English historian, John Dalberg-Acton. But they may be unaware that there is more to the quotation. The full quotation is “Power tends to corrupt, and absolute power corrupts absolutely.”

The word “tends” gives the statement subjectivity, hinting that power may affect people differently. Just as in The Lord of the Rings, Frodo can carry the ring for most of the story without it corrupting him much, but Gollum is completely overcome by it. Additionally, the distinction between power and absolute power implies that the more power someone has, the more power it has to corrupt.

Do more corrupt people actively seek out power? Or does power make corruption irresistible to even the most altruistic of people?

Power corrupts

A famous example of the ability of power to corrupt is the Stanford Prison experiment, a landmark psychology study conducted by Philip Zimbardo in 1971. In the experiment, Zimbardo randomly assigned psychologically healthy students to be either prisoners or guards in a mock prison setup, then observed how the power dynamics affected their behaviour. The experiment had to be stopped after just six days, as some guards became increasingly aggressive and sadistic towards the prisoners, who experienced severe emotional responses as a result.

The crucial element to note is that thorough psychological testing conducted prior to the experiment had concluded that the guards were psychologically fine. When interviewed after the experiment, most of them were shocked and appalled by how badly they had treated the prisoners. However, one guard said “Acting authoritatively can be fun. Power can be a great pleasure”—perhaps the allocation of power had revealed the subjects’ latent underlying qualities.

Not all guards behaved cruelly towards their inmates, and those who did, did so to different extents. So, what caused this difference in behaviour?

Individual characteristics

An experiment led by Samuel Bendahan showed people are predisposed to varying degrees of corruption. He found people with higher baseline testosterone levels were corrupted more by power. Interestingly, the hormone testosterone inhibits the stress response, so people with more testosterone tend to remain calmer under pressure. Perhaps testosterone-fuelled individuals are more likely to rise to power because they can withstand the stress that comes with positions of authority?

Other experiments have shown that people with more testosterone are rated as less empathetic by their work colleagues. They were also power able to identify other people’s emotions, demonstrating the “us versus them” mentality created by authority. One study found individuals who exercised their power more avoided social interaction with their workers in order to create emotional distance from them. This lack of empathy and emotional connection explains how powerful people can take actions which benefit themselves to the detriment of others.

While the link between testosterone and power is convincing, it isn’t the only variable at play. People who are more prone to dishonesty were shown at first to be more corrupt than honest people. However, honest people were not immune to the corruptive effects of power and became more corrupt when given more power. Fascinatingly, these traits mirror some of those attributed to psychopathy: dishonesty, lack of empathy and immunity to stress.

Cumulative effect of power

Bendahan also found that the most corruption occurred when people were given the most power, supporting Acton’s statement about absolute power. It suggests that, while higher testosterone and dishonesty may mean a person is more corrupt to begin with, giving those people more power will corrupt them further.

Several experiments giving people varying degrees of power have shown that power gives people greater self-esteem. This means they attribute overall success to themselves and devalue their workers’ contribution, as they feel they influenced their productivity. This leads to more controlling behaviour by the leaders, creating a vicious cycle. Further investigations have demonstrated that people will use whatever power is available to them. Therefore, giving people “absolute power” will enable them to exercise more control, exacerbating the feedback loop of self-esteem.

So, individual predisposition and the corruptive effect of power interact in conjunction to produce corruption. That is, power does have a corrosive influence, and some people are more susceptible to it than others.
**SCIENCE COLLABORATIONS OR SCIENCE COLONIALISM?**

Matthew Dale digs into the colonial roots of modern collaborations.

Have you ever wondered why our university is called Imperial? Well, there’s probably a reason.

The name originally indicates that the science of this institution was supposed to serve the Empire. In 1920, Imperial’s Rector (President) Alfred Kolnig wrote that “Imperial College has been developed with a special view to meeting Empire requirements.” In a letter to the Colonial Secretary.

Scientific and colonial institutes have always unconsciously enjoyed a symbiotic relationship. A country’s colonies granted valuable access to scientific resources. Scientists were able to bring in many specimens of plants, animals, and exotic ‘humans’ to study. In return, inventions such as wireless radio were fuelled by their utility for the colonial effort.

Sometimes, the scientific project played direct roles in colonial projects. Napoleon’s invasion of Egypt included a battalion of 160 academic members, many of whom were scientists collecting new flora, fauna, and minerals. All of this was motivated by a wider project in Enlightenment France to extract cultural and scientific riches from such a history. The inequalities created by imperialism have made some scholars concerned about the modern standards adopted within collaborations.

In this article, we’ll look at a historical case study that illustrates how ideology impacts science.

**CAN WE CUT THE TETHER OF IDEOLOGY FROM SCIENCE?**

Billy Irving questions whether scientific knowledge can ever be free from ideological values.

**Through collectivisation, Soviets sought to change the human spirit and biology.**

For Lysenko, vernalisation proved that an individual organism is connected to its external conditions. This thinking led to a preoccupation with an “interconnectedness” of all life. In Lysenko’s 1948 speech to the All-Union Lenin Academy of Agricultural Science, he presented a view that organisms are generally affected by their environment. This thinking was passed down to descendant wheat, if grown in the spring, will not typically be harvestable.

**Our desire to perfect humankind might derive from our capitalist ideology.**

Obviously, this is an extreme example. A critical reader will argue that Lysenko’s story is not consistent with their view of science, that Lysenko was hardly a scientist at all. To such a reader, I would point out how ideology also impacted European and American science during the same period. From the turn of the century, several U.S. states passed compulsory sterilization laws for people in prisons and mental institutions, lasting until 1963. Likewise, the 1933 German Law for the Prevention of Genetically Diseased Progeny mandated compulsory sterilisation for those deemed genetically inferior.

With CRISPR-Cas9 editing, the issue of eugenic persists today. Our desire to “perfect” humankind might derive from our capitalist ideology, which deems some people to be a drain on resources and others to be a drain on the human spirit as a malleable thing capable of change.

It’s possible for ideology to impact science at all, and we choose to accept that possibility, we are left with a choice. We can either choose to believe in the success of our collectivisation, or we can constantly question our science, discern the motivation behind it, and edge forever aspirationally towards the Truth.

\[28 \text{ I. SCIENCE}\]
"An open access world would mean making journal articles free to read for everyone, the world over."

Grace Browne dissects the complexities of academic publishing and the open access movement.

The first blush, the academic publishing system may seem a little confusing to understand. Academics write papers for free. These papers then go through a process called peer review, where the paper is scrutinised, and the authors are given suggestions for its improvement, and a decision is made for or against its publication. Peer review, a lengthy and labour-intensive process, is done by fellow academics, also for free, on a volunteer-basis. If published, the research is then sold back to academic institutions and university libraries by journals, to be read by academics, who—in a large sense—created the product in the first place and paid for it to be published.

An estimated two-thirds of the world's research is hidden behind a paywall. People wanting to read about it must typically cough up a fee of about $30 in order to gain access. The majority of research is publicly funded, meaning it is supported by the taxpayer's money. Therefore, should a person who is not a member of an institution that subscribes to these journals want to read a research article, they are, effectively, charged twice—once to fund the research in the first place, and then again to read about it.

Academic publishing is an incredibly lucrative business. The largest companies, including Taylor & Francis, Wiley, and Springer, have eye-wateringly high turnovers. The academic publisher Elsevier is the largest of them all, and has also been the one to garner the most criticism. The publishing behemoth made $2.5 billion last year, and regularly has profit margins of 35–40%—that's more than Google, Apple or Amazon.

The perceived inequity of the system has driven academics to fight back against it. It was through this pushback that a new movement was born, called the open access movement. He viewed open access as a form of political liberation, a means of making the Internet a fairer and better place. However, Swartz's rebellion against what he saw as an unfair system did not escape the attention of the authorities; in 2011, he was indicted on multiple felony counts for downloading several million academic articles from a subscription database called JSTOR. The prospect of imprisonment for up to 50 years pushed Swartz to take his own life in 2013. He was 26 years old.

To carry on Swartz's legacy, Alexandra Elbakyan steps in. Elbakyan is a young Kazakhstani computer programmer and founder of Sci-Hub, an illicit website that hosts a free collection of over 78 million scientific journal articles that would normally be locked behind a paywall. Dubbed by the internet as 'Science's Pirate', and the 'Robin Hood of Science', she is forced to stay in hiding, owing to charges of hacking and copyright infringement by the US Department of Justice. Elsevier also successfully took Sci-Hub to court in 2017, winning $15 million.

But Sci-Hub remains adored by academics and the general public alike, receiving hundreds of thousands of visitors every single day.

The ramifications of a closed-off publishing ecosystem are graver than mere irritation. Only the wealthiest of universities can afford to foot the bill of pricey academic journal subscription fees, which rise dramatically with every passing year. But even the likes of Harvard University have admitted that the subscription fees are becoming untenable for them. In 2019, in a stunning move, the University of California system announced it would be ending its subscription to Elsevier, following the trend set by universities in countries including Germany, Sweden, Norway and Hungary. In poorer countries, the cost of these subscriptions falls beyond the budget of many institutions, meaning much of the research they need access to is unobtainable. It has been argued that the worst of the Ebola pandemic, that resulted in the deaths of more than 11,000 people, could have been largely avoided if the necessary research hadn't been locked behind paywalls. It transpired that a host of studies, buried behind paywalls, had warned of the risk of the virus as far back as the year 1982. When the crisis came, medical professionals caught in the middle of it were not aware of the research, and it took months for Ebola to be uncovered as the culprit at play, with many lives potentially lost as a result.

But who should foot the cost of publishing instead? This is the issue that proponents of open access haven't managed to solve: if readers or the institutes they work for are no longer paying to access papers, a profit must be made somehow. Most typically, this is achieved by charging the authors themselves a fee for the cost of publication. To publish in an open access journal, one must cover the cost of article processing charges, and these can soar as high as $5,000 for some journals, a prohibitive fee for many researchers who are often badly paid. So, the model is not perfect. An alternative and increasingly popular choice amongst academics is to publish research on preprint repositories, such as Arxiv and BioRxiv. In doing so, they have the chance to share off their findings before they are published in a journal—free for anyone to view. However, the research has yet to go through the rigor of peer review, so must be heeded with a healthy dash of caution.

In 2018, a group of eleven research funders in Europe put forward Plan S, a radical proposal that declared that researchers undertaking work financed by taxpayer money would be obliged to make it available to read online for free at the point of publication. The initiative has now been backed by over 20 public funding bodies across 13 different countries, including the Wellcome Trust in the UK and the Bill & Melinda Gates Foundation in the US. And so, the tides seem to be turning, and all for the better. The traditional for-profit publishing model's stranglehold on science hampers the impact and transparency in research, it hinders the opportunity for collaboration between academics across the globe, and scientific advances may be needlessly stalled as a result. A more open and democratic academic organism would undoubtedly lead to better science.

Until the system changes, the majority of the world's most cutting-edge and innovative research will stay locked away, with only a select few in possession of the key. It is time for the bubble of scholarly publishing to pop.