

TOWNLEY *Shake Up*  
**STEM**

MAY 2021 ISSUE 1

SCIENCE | TECHNOLOGY | ENGINEERING | MATHS



# Why STEM?

Why is STEM important?  
Why study STEM subjects?



## BRITISH SCIENCE WEEK

How we participated. This year's theme:  
Innovating for the future

## CORONAVIRUS

The structure and strains of Coronavirus  
The science behind the two vaccines  
Pandemics of the past

## INTERVIEW

We talk with  
a Biomedical  
Student working  
In Scientific  
Publishing.



TOWNLEY

**stem**

SCIENCE TECHNOLOGY ENGINEERING MATHS



MAY 2021 | ISSUE 1

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# Welcome to #shakeupstem

Welcome to the Townley #shakeupstem magazine that we are incredibly excited to share with you. We are a group of Year 12 students with an appreciation for STEM and an aim to share our interests with the Townley community. Whether as a hobby or career path, STEM is significant in every aspect of our lives (even when we might not notice it).

The theme #shakeupstem was chosen to enlighten students on how STEM can be intriguing, exciting and thought-provoking. The world of STEM is far too extravagant to include in our magazine but we chose areas that we found most important to us as students. The events around us shaped the articles we featured in Issue 1 so we did focus on COVID-19 in particular. The COVID-19 pandemic has made us all aware of the challenges STEM has helped us overcome. To name just a few: the use of maths in formulating the R number, virology for investigating new strains of the virus, computing to create the NHS Track and Trace App, and the engineering behind ventilators, PPE and medical testing. Without STEM, where would we be? Outside of the pandemic world that we now find ourselves in, STEM is still important and just as interesting. Outstanding discoveries have been made in recent years such as the discovery of plastic-eating bacteria called 'ideonella sakaiensis' that could help reduce plastic pollution! We also wanted to shine a light on the opportunities at Townley and beyond for both students and parents. Many of us did not have the confidence to pursue STEM subjects through to GCSE and A level. However, the enthusiasm at Townley has really encouraged us to take on leadership roles to become STEM leaders in the first place.

Our work as Year 12 STEM leaders was not limited to the magazine. Many of us contributed to British Science Week by creating videos and presentations about what science interests each of us the most. These can be found on the British Science Week Google Classroom or website: <https://sites.google.com/townleygrammar.org.uk/townleybritishscienceweek2021/home>.

We can't wait to continue our work and spread the word that STEM is actually pretty cool!

**Christabel O**  
**Ravisan P**  
**Rosanne C**

**Iremide S**  
**Jiya S**  
**Caroline R**

**Sharon U**  
**Caitlin T**  
**Kate D**

**Tisha S**  
**Jayanie P**

## A word from the Headteacher...

What's all the fuss, is STEM really that important? Let's try and imagine a world without it. Consider what you have done since you woke this morning; food, housing, transportation, light, gas, clean water, medicine, mobile phones, television, computers, the world wide web and measurement of time itself, the understanding we have (and take for granted) about our place in the universe...it's all down to STEM.

Science, technology, engineering and mathematics are essential to our futures and fundamental to the history of Britain and the wider world. They have permeated every aspect of our lives, providing both opportunities and challenges. As a community we are proud of the participation our students have in such subjects, both academically and beyond the classroom.

I am delighted to see the fruition of several months' work resulting in Issue 1 of the new Townley #ShakeUpStem magazine. This is an impressive example of student leadership where a number of our Year 12 STEM Leaders have shown commitment, intellect and empathy in creating a series of highly relevant and important articles on the importance of STEM in our daily lives. I hope this edition serves to inspire and motivate you to the same extent I am by the disciplines it covers – perhaps you will contribute next time?

**Nevita Pandya**

# Why is STEM important for the future?

**STEM is important because it pervades every part of our lives. Science is everywhere in the world around us. Technology is continuously expanding into every aspect of our lives. Engineering is the basic designs of roads and bridges, but also tackles the challenges of changing global weather and environmentally-friendly changes to our home. Mathematics is in every occupation; every activity we do in our lives. STEM will become very important in the future as it will drive our global economy; providing a huge amount of job opportunities.**

According to a research, 23% of companies all over the world are currently using of AI technology. AI technology is now being innovated into the process of most organisations and this figure is set to rise if younger students are willing to explore this academic field. AI is massively impacting our ways of living, some sectors are at the start of the journey, although some are still evolving, they are still nowhere near being fully advanced.

“[AI] is going to change the world more than anything in the history of mankind. More than electricity.”— AI oracle and venture capitalist Dr. Kai-Fu Lee, 2018

AI will help with the healthcare industry, diagnosing patients accurately and much earlier. As a result, enhancing the human ability to provide better healthcare. AI will extend the boundaries of human compatibilities, we will be able to reach for the stars - literally - and will help scientists



to reach Europa, Jupiter's moon where scientists believe a subsurface salty ocean lies beneath its icy crust. AI will also help protect the planet by helping trace endangered animals and the reduction of air pollution; by presenting other means of transportation e.g.: electric cars and planes. It may even help humans withstand natural disasters. AI can help in other ways that will bring fairness, justice and equality to us all.

However, research has shown that there is a high demand for STEM skills as there are plenty of jobs that require the deep understanding of STEM and there are not enough people to meet this demand. STEM is an academic discipline that needs to be introduced to younger students in order to expand their interest in these areas.

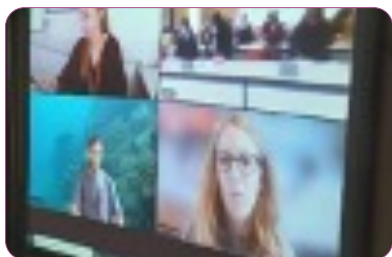
In conclusion, STEM is important in the future as it is mankind's last stage of evolution.

**Christabel O**

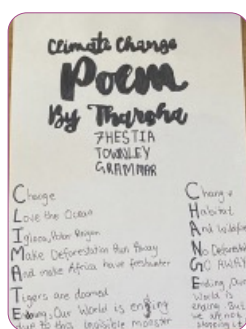
During British science week this year, a range of people from various year groups had the opportunity to engage in events and activities at home or at school. Many students took advantage of this opportunity as it was the perfect time to get creative and try out subjects and experiences that perhaps they would not have done before. Even virtually, this year was a great opportunity to get involved in something productive and feel part of the scientific community which many people managed to do. Not only did we smash stereotypes about women in STEM, but it also gave us a chance to raise awareness and spark enthusiasm surrounding these subjects. Furthermore, the participation in online activities and virtual events helped to build important values such as resilience, creativity and efficiency and to develop our mindsets towards the science and technology sector.

This year, our theme for STEM week was **'Innovating for the future'**. This is a really relevant topic, especially in the science industry, as technology is such a large part of our lives. It is constantly growing and changing so much that it is hard to tell where we will be with it in the future. Luckily, this year, many of us took part in that and had a chance to learn and discover about this ourselves. Even with science week over, there are still so many opportunities to explore further within this topic, so don't worry if you didn't manage to take part this year! With the excitement of British Science week this year at Townley we thought it would be fitting to look further into what people did to celebrate and how students took advantage of this amazing opportunity!

Some year 12 chemistry classes had the chance to listen to a PhD student attending a UCL talk about his experience in biology, and his journey at university. This was a highly motivating experience for many and it was an extremely inspiring talk.



There was the opportunity for students to take part in a climate change poem competition. There were many amazing entries and here is an example of one:

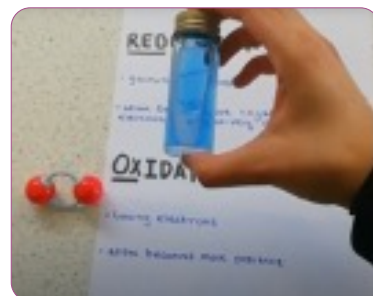


There were so many amazing posters handed in for the climate change poster competition. This was one of the outstanding examples of posters that had been handed in:



**Ravisan P**

Many of the STEM leaders filmed videos with explanations of different science experiments, you can access these on the school science week website. Here is an example of an oxidation and reduction experiment!





# Townley STEM Days 2021

For many, taking part in the Townley STEM days has always been an enjoyable experience- not only do you get the day out of lessons, but you also learn why STEM is so important within our world, beyond the curriculum.

I remember during a previous STEM day, we had the opportunity to fly homemade rockets, and discover how to project them across the fields! Tuesday 9th March will be the first-ever virtual STEM day, which definitely highlights how technology is ever so important and will allow you to engage with STEM in a more holistic way.

Embracing this day will allow you to connect with the foundations of science, technology, engineering and maths, as well as understand its role within modern-day society. I hope that you enjoy the opportunities that these days will offer, and most importantly, have fun!



**Rosanne C**

# Why I'm Studying STEM Subjects



For A levels I took chemistry and an elective in additional maths. For me, these two choices were perfect as I enjoy the maths elective a lot and it helps me with the more mathematical aspect of chemistry. In the future I am considering carrying on with chemistry because it develops critical thinking skills and requires a lot of focus and curiosity. I would definitely consider chemistry one of my favourite subjects, especially at A level because I have learnt to rely less on a textbook and more on my problem-solving skills. However, throughout the lower years, I was never very good at STEM subjects, and would never really take an interest in them, especially the three sciences. However, it wasn't until I started the GCSE syllabus and moved on to more complex scientific areas, that I really began to enjoy the sciences and understand their relevance in today's society, I even went on to choose engineering for GCSEs!

Although I started enjoying sciences more because of the new content we were studying, I also think a huge underlying factor for me was gaining confidence as I began to perform better in tests and assessments. For me, a lot of this confidence came from seeing and learning about other women in STEM. I found women such as Marie Curie and Ada Lovelace fascinating and it inspired creativity inside me to take part in daunting scientific activities that I wouldn't have dreamed of before. This extra motivation undoubtedly boosted

my confidence as I aspired to be like the women we learnt about in the classroom. I think one of the things that I enjoy most about the STEM subjects is the innovation involved. As I tend to be more of a visual learner, I was very provoked by the works of Temple Grandin. She really motivated me to continue further with sciences and maths and her inspirational trait of thinking outside the box helped to show me how important creativity really is for science.

Finally, I love the positive atmosphere that Townley offers to all the STEM students, we are always offered so many amazing opportunities to take part in and even during these times now, there is still such an energetic science community. I find the science teachers so motivating and uplifting and whenever I have any questions or queries, I can definitely rely on them to help me. There is no doubt that without the amazing STEM spirit within the school and the entertaining events surrounding it (such as STEM competitions, STEM day, STEM assemblies and science week) I may not have been as enthusiastic about my subjects as I am now. I am so happy I chose to take chemistry and additional maths as it really has given me so much self-confidence. To anyone considering taking STEM subjects for GCSE or A levels, I couldn't encourage you enough, join a group of people that are helping to change the world!

**Ravisan P**

# @ShakeUpStemWithMe



It's very important to surround yourself with people who have similar goals and passions as you. For example, some of my friends do/don't do STEM but they are ambitious and helpful just like from that movie Hidden Figures (women who despite their colour and who they were strived in STEM to be more than what society told them they could be). Surround yourself with like minded and positive people, invest your time in what you like and don't be scared to fail you never know how great you can be, so why not.

Iremide S

**#shakeupstemwithme**  
**#shakeupstem #stem**

# apollo





# Interview With a Biomedical Student Working In Scientific Publishing



Hi everyone, I'm Rosanne and I decided to interview my sister Kelly who studied a master's degree in Tissue Engineering after an undergraduate degree in Biomedical Science both at Durham University. She now works in scientific publishing. Hopefully, this will inspire you to also consider studying STEM further and work in the scientific industry!

## Why did you decide to study biomedical science at university?

During my GCSEs and A-Levels, I enjoyed Biology as I found the human body fascinating and wanted to understand more about the different processes that go on inside. I decided to study Biomedical Science as this helped to increase my understanding of the human body and also what happens when it goes wrong during disease. This is a particularly important subject because by studying what happens to the body during diseases, we can help to find more treatments and cures.

## What piece of advice would you give to someone considering a STEM degree?

I would suggest that you keep an open mind about the topics that you want to study because you might find something that you never thought you would enjoy. Learn as much as you can through reading papers and asking questions.

## What made you decide to work in scientific publishing?

I decided to work in scientific publishing because I realised that I loved health research but I did not enjoy working in a lab. During my Masters, my project was entirely lab-based and although it was a great experience, I wanted a job that still involved scientific research but was in an office setting. Scientific publishing is a great way of staying connected to the latest research in the field outside of a lab environment. For example, this past year we have published papers on

COVID and these have helped to increase the knowledge in the field.

## What does a day in your life look like in your occupation?

I am a Journal Launch Specialist, which means that it is my job to publish new journals to help increase knowledge in the field. This involves talking with academics and high profile scientists to try and get them involved with the journal and put the journal together so that we can publish it online. The journals can then be open for submissions and scientists can submit to the journals to try and get their papers published. My day to day activities involve lots of emails and video calls, as well as meetings with other teams in the company. A lot of my time is also spent searching for the right scientists to contact which means lots of reading abstracts and looking up academic profiles.

## What would you say the best thing about working in STEM is?

The best thing about working in STEM is that there is always new information being found every day. There are always more discoveries to be made which help to make our lives easier and healthier which is really exciting. However, there is a lack of diversity in some fields, particularly with female and ethnic minorities representation but people are becoming more and more aware of this and are trying to improve this. I would encourage anyone to work in STEM as science needs diversity in order to come up with new ideas and collaborations.



Example of a review article featured in a journal.

Rosanne C

Website: [www.townleygrammar.org.uk](http://www.townleygrammar.org.uk)

# What can parents do to encourage their children to pursue STEM?



With the second closure of schools due to COVID-19 it has become far more difficult to encourage young girls and the BAME (Black, Asian and Minority Ethnic) community to pursue STEM. Whether this is choosing STEM at GCSE, A level or as a career/degree. Therefore, it is becoming increasingly important for parents to play a role in promoting STEM. If you, as a parent, have a STEM career, I encourage you to talk about your career with your child. Here are some questions that you might find useful:

- 1. Why did you choose STEM? - talk about your passion for STEM and how you came to the conclusion of pursuing it. It is difficult for a young child to choose subjects at such a young age so this may help.**
- 2. What was your job like when you first started?**
- 3. What is your job like now?**
- 4. What is your favourite part of your job?**
- 5. How did you develop skills needed for STEM?**

If you are a student reading this, be intellectually curious and ask your parents or someone else in a STEM position to answer these questions. It may give you an idea or reassure you on an idea you already had. For example, I want to do a Biological Sciences degree but I didn't

know if it was right for me, so I set up a Zoom call with a family member in Canada who has a job based around that. Zoom calls, texts and emails may be important communicate systems to use during the pandemic. Take advantage of modern technology! I was fortunate to have that connection but if you know anyone in STEM reach out to them. Many people enjoy talking about their job because they want others to understand the importance of the work they do.

## **As a parent there are many things you can do to get your child thinking about a career in STEM in the first place.**

- 1. Talk to them about STEM**
- 2. Encourage curiosity and questioning**
- 3. Use resources** – The internet is a very useful place to find a myriad of resources
- 4. Visit museums** – This more relates to a post-COVID world when museums reopen in the UK when it is safe to. However there are many websites that provide information virtually (which I will link at the end)
- 5. Read about women and the BAME community in STEM** – The gap between men and women in STEM fields is beginning to be closed, however, there is still a long way to go. Physics is one of the subjects that is heavily distributed towards men. (Below are links to Women/ BAME in STEM organisations).
- 6. Lab experiments at home**  
– there are many simple experiments that can be quite fun to do at home. (Making slime, celery stalk & coloured water etc)
- 7. Connect STEM to the world around us** – especially during COVID-19, it is important to keep up to date with STEM news like what makes the COVID-19 vaccine different from others and how the government uses health statistics.
- 8. Subscribe to a magazine** – Chemistry/ Biological Sciences Review are examples.
- 9. For older students (Year 11+) Encourage your daughters/sons to do Massive Open Online Courses (MOOCs)** – edX and FutureLearn do great ones that are usually free (unless you exceed the time limit on the course or want to purchase a certificate).

**Jiya S**



# Museums

<https://www.sciencemuseum.org.uk>

offering virtual talks, downloadable apps, classroom resources (Science Museum)

<https://naturalhistory.si.edu/visit/virtual-tour>

virtual tours of the grounds (National Museum of Natural History)

<https://oh.larc.nasa.gov/oh/>

a tour of NASA's Langley Research Center. You can look at the labs and technologies they have built.

<https://hsm.ox.ac.uk/past-exhibitions-and-displays>

past exhibitions and displays of the museum – I found the Bioart exhibition very interesting. (History of Science Museum).

<https://www.tnmoc.org>

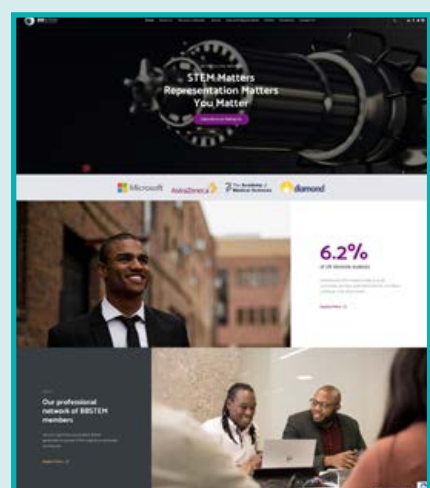
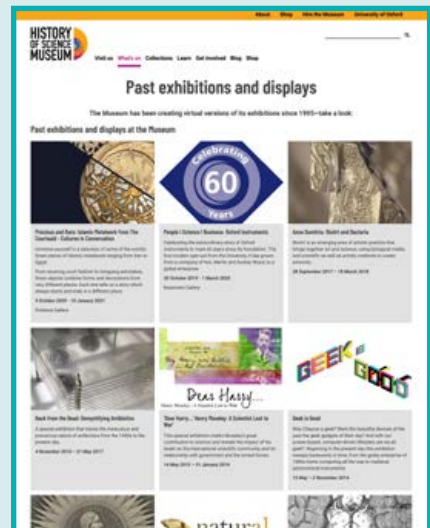
a calendar of virtual events (The National Museum of Computing)

<https://www.nhm.ac.uk/visit/virtual-museum.html>

14 ways to explore from home (Natural History Museum).

There are a lot more resources available for each STEM subject which you can use but I think a good one for home learning is:

<https://www.stem.org.uk/home-learning>



# Women's organisations

there are many more websites that provide information too

**The WISE Campaign – also focuses on BAME**

**STEMettes**

**Women's Engineering Society**

**Women in Technology**

**Girls Who Code – they offer free programs to learn coding too**

# BAME organisations

<https://bbstem.co.uk>

Each university does its own report on the BAME community in STEM so I won't list them all but there are many who are willing to share their experiences in these reports.

Thank you for reading and I hope you found these resources useful. Please get in touch if you would like recommendations on other resources like books, documentaries and MOOC's.

Jiya S

# Hashtag: [townleyshakeupstem](#)

Twitter: [@TownleyGrammar](#)



## STEM Events

### **Y8 & Y9 - Cyberfirst Girls Competition**

**Application closes 3rd February. Qualifiers start 25th Jan.  
It is a team competition requiring a teacher as a guardian.**  
<https://www.ncsc.gov.uk/cyberfirst/girls-competition>

### **Y7 to Y13 - Big Bang Young Scientists/Engineers competition**

**Application opens in Jan 2021. Application closes Late March 2021.**  
<https://competition.thebigbangfair.co.uk/about/>

### **Y9 Girls Engineering Summer School**

**Application closes 3rd of March. Provider: Imperial College London.**  
<https://www.imperial.ac.uk/be-inspired/student-recruitment-and-outreach/schools-and-colleges/students/on-campus-activities/summer-schools/ynine-engineering/>

### **Y10 Insights into Science and Engineering Summer School**

**Application closes 3rd of March. Provider: Imperial College London.**  
<https://www.imperial.ac.uk/be-inspired/student-recruitment-and-outreach/schools-and-colleges/students/on-campus-activities/summer-schools/insights-into-stem/>

### **Y11 Medical summer school**

**Application closes 3rd of March. Provider: Imperial College London.**  
<https://www.imperial.ac.uk/be-inspired/student-recruitment-and-outreach/schools-and-colleges/students/on-campus-activities/summer-schools/medical/>

### **Y11 STEM challenge**

**Application closes 3rd of March. Provider: Imperial College London.**  
<https://www.imperial.ac.uk/be-inspired/student-recruitment-and-outreach/schools-and-colleges/students/on-campus-activities/summer-schools/project-stem/>

### **Y10-Y13 Medic Mentor Virtual Medical Society**

**Every Tuesday at 7pm for Dentists, Vets and Medics. Provider: Medic Mentor.**  
<https://medicmentor.co.uk/how-to-become-a-doctor-join-medic-mentors-virtual-medical-society/>

### **Y12- Chiral Chemistry workshop**

**Booking required: Various dates can be found in the link below.**  
**Provider: University of Oxford.**  
<https://www.maths.ox.ac.uk/node/37970>

### **Y12/13 -Oxford online maths club**

**Every Thursday online. Provider: University of Oxford.**  
<https://www.maths.ox.ac.uk/node/37970>

**Caroline R**

 **Website:** [www.townleygrammar.org.uk](http://www.townleygrammar.org.uk)

# The structure of Coronavirus

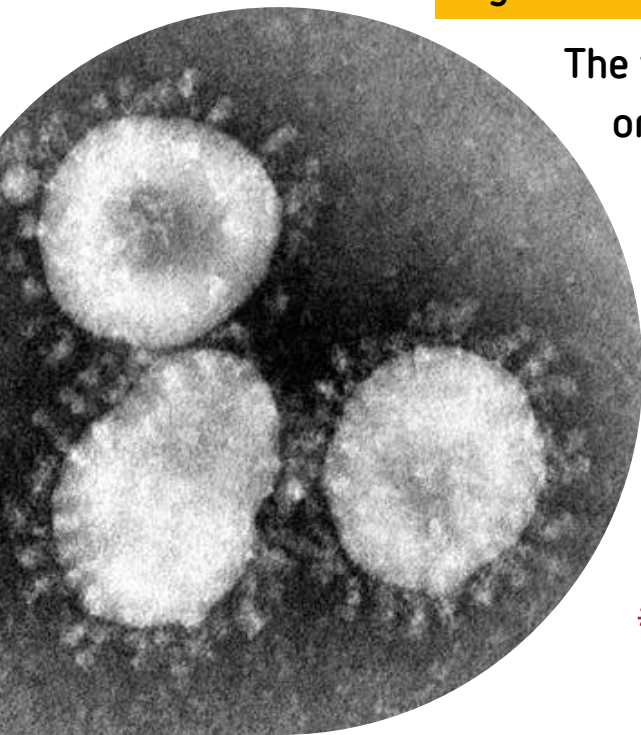
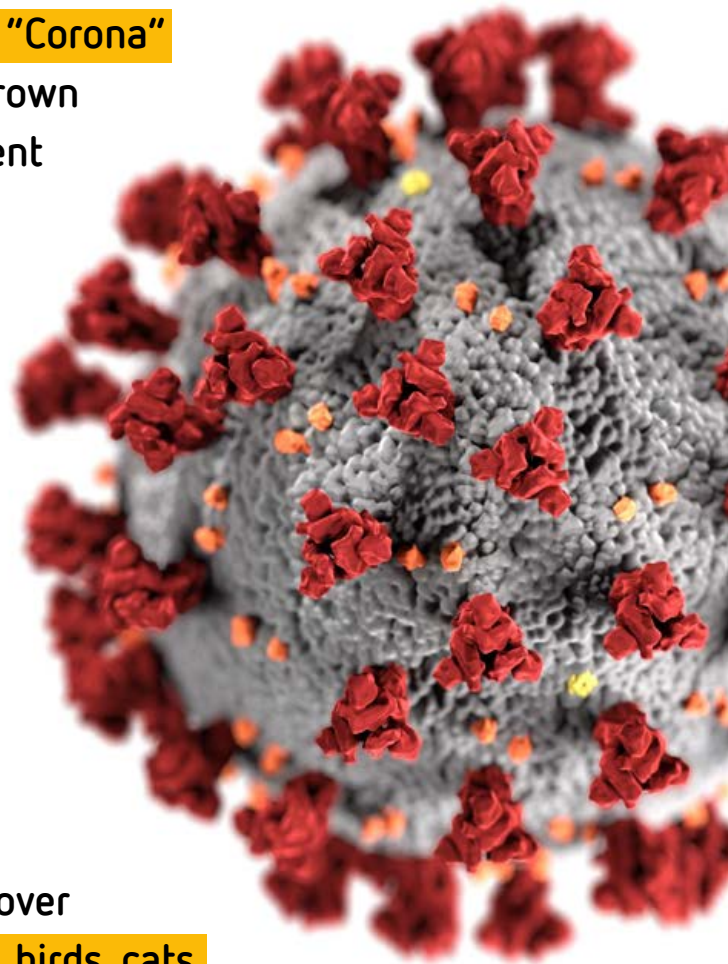
Coronavirus comes from the Spanish word "Corona" which means **crow** which describes the crown shape of the virus. There have been different coronaviruses during the 21<sup>st</sup> century. One example was the **SARS (Severe Acute Respiratory Syndrome)** coronavirus which was an **epidemic in 2002** which hit countries like China and Taiwan.

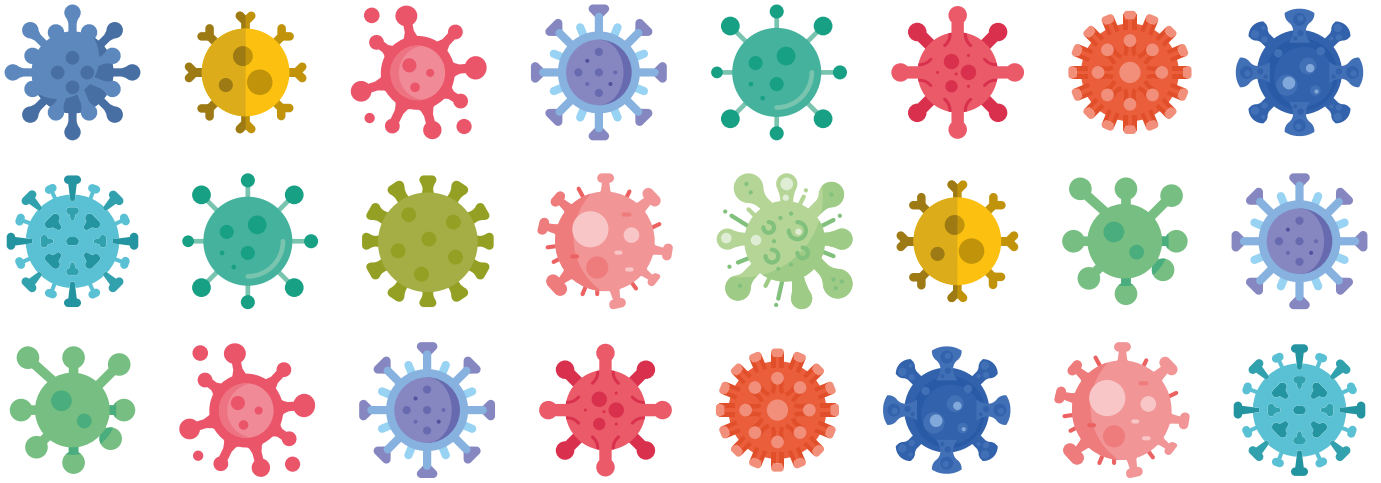
The red projections are called **spike proteins** and this is what our **white blood** cells attach onto to destroy it before it is able to reach our cells. This spike protein is very important in the **vaccine** production.

Coronavirus first originated from bats but over the centuries has now spread onto **camels, birds, cats, dogs and even cattle.**

The virus continues to change and **mutate** in order to survive as long as possible. Overtime, the virus will become **more resistant** and will be able to survive under **harsh conditions.** However, from the pandemic the government has now become more focused on funding the research companies in order to produce more **effective vaccines and drugs**

Sharon U

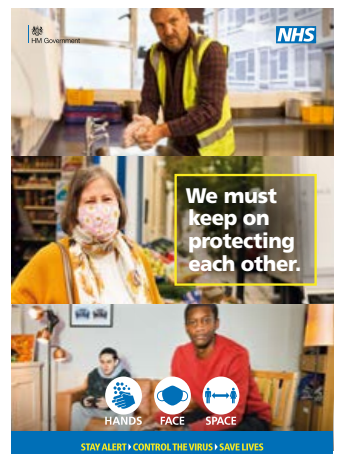
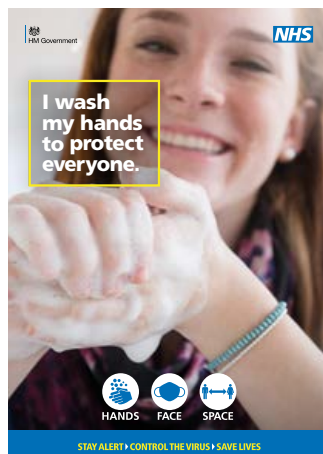
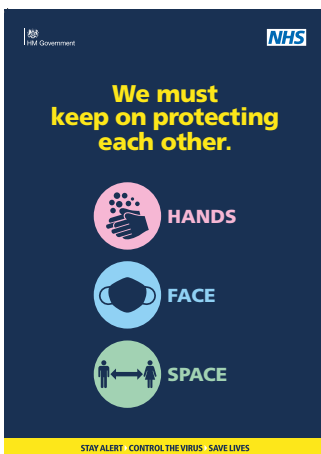




# Strains of the Coronavirus

Different types of coronaviruses have been around for a while. The new coronavirus, which has impacted our world drastically, is often called the 'novel' coronavirus, and is one of several known coronaviruses to infect humans (however it has most likely been around for some time in animals). When viruses infect you, they invade our cells and make copies of our DNA. These copies sometimes contain mistakes, called mutations. These mutations are random and on accident, and often don't affect us very much, if at all. However, sometimes the mutations can have a negative impact on our health. For example, the mutation can make it easier for the virus to infect people, spreading that strain of

the virus more. When a mutated form of the virus spreads, it is known as a new strand of the virus. For example, in late 2020, a new strain of the coronavirus was found in the UK and many other countries. This new strain of coronavirus has a 70% higher transmission rate between people, compared to the original, 'novel' coronavirus. The mutation on this virus is on the spike protein, which the COVID-19 vaccines targets. Many different strains of the coronavirus (and viruses in general) will continue to develop as the virus spreads and mutates, however scientists are working incredibly hard every day to develop vaccines which target and kill all strains of the virus.



Caitlin T



# COVID-19 Vaccination Programmes

The national rollout of the COVID-19 vaccine is restoring hope. We are all holding our breaths for the vaccine to work effectively so that we can return to a more 'normal' life.

The vaccine development can be confusing considering the number of companies involved in the rollout of the vaccine. Here is a simple breakdown of the approved vaccines (there are many more that are awaiting approval for use in the UK):

Company	Type of Vaccine	How many doses?	Efficacy★
<b>Pfizer/BioNTech</b>	mRNA	<b>2 doses</b> (the second dose 21-28 days after the first)	<b>94%</b> (7 days after second dose)
<b>AstraZeneca/Oxford University</b>	Genetically modified version of virus – using adenovirus as a vector	<b>2 doses</b> (the second 8-12 weeks after first)	<b>82%</b> (after second dose)
<b>Moderna</b>	mRNA	<b>2 doses</b> (the second dose 28 - 42 days after the first)	<b>92%</b> (14 days after first dose)

★For comparison the best flu jab is 50% effective. These figures can also fluctuate depending on the study done for each. At the beginning (the first clinical trials) AstraZeneca had an efficacy of 62% but was more successful in recent studies.

**Jiya S**

# Hashtag: [townleyshakeupstem](#)

Twitter: [@TownleyGrammar](#)



# The science behind the two types of vaccine

The **AstraZeneca** vaccine is a genetically modified version of a virus. This is a common approach to creating a vaccine; lots of vaccines are made using a weakened or modified versions of viruses. This vaccine is a version of a common cold virus found in chimpanzees (our close primates). This virus (called an **adenovirus**) has been modified to be more like the coronavirus. Modification takes place by taking **genes** from **COVID-19** and putting them into the adenovirus. The **genes** taken are specifically for the **spike protein** on **COVID-19**. This **protein** is important for recognising **COVID-19**.

Once it has been modified, it is injected into a person. The **adenovirus** enters our cells and then uses the **DNA** to code and create the **spike protein**. Then a primary immune response takes place which recognises the **spike protein** as foreign and attacks it. The immune system will produce T and B lymphocytes★★ that go on to combat the **spike protein** by: producing **antibodies**, producing killer T cells and producing B and T memory cells. Memory cells are very important. They mean that when the real **COVID-19** enters the body, the immune system can respond faster because they already have T and B cells ready to fight the disease. As a result, a person won't get so sick and their immune system is ready to fight the disease (this is known as the secondary immune response).

★★Lots of other cells are involved in an immune response - phagocytes, plasma cells, T helper cells etc. You can do some further reading on these if you are interested.

The **mRNA** vaccine is something you may not have heard of before but it has been researched for decades. The way it works is slightly different. It teaches our body how to make the spike protein using mRNA (messenger RNA ) rather than DNA. mRNA is essentially a copy of the DNA. But it is not an entire copy because it is only single stranded, whereas DNA is double stranded. The mRNA will be synthesised in a lab and then injected into a person. The spike proteins will be made by our cells and the same immune response (primary and secondary) will occur. The reason mRNA is used is because it is smaller than DNA so it does not need to use the adenovirus as a vector for getting into the host cells. Instead the mRNA is small enough to go into the cells itself. But don't worry, the adenovirus won't harm you at all. The way it has been modified means it can't replicate inside our cells so won't make us ill. All the vaccine types are safe for us.



Jiya S

# Why you shouldn't be scared to get the vaccine

Teenagers will be one of the last groups to get vaccinated unless you are apart of a higher risk group. However, eventually we will have to get the vaccine and many of our parents/grandparents will be getting the vaccine soon. Anti-vaxxer groups could disrupt the vaccine programme because in order to combat this disease we need to have herd immunity. We must limit the number of people susceptible to the disease to reduce transmission rates. We need this to protect vulnerable groups. Many people can't receive the vaccine due to allergies, pregnancy or other health complications. As a society we need to protect them by also protecting ourselves.

From a scientific perspective there is nothing to fear. The mRNA vaccines have been well researched in other diseases such as the flu, rabies and even cancer (cancer vaccines are a whole other story that you can research independently). We also have new technology and knowledge of SARS (another coronavirus that caused a pandemic of its own in 2002). Scientists are well equipped and have followed EU regulations for pre-clinical and clinical trails to ensure the vaccine is safe for us.

So far the vaccine rollout had been successful for the UK. According to data, hospital admissions have been reduced by 81% in over 80 year olds due to the vaccines. The government seem to be on track to vaccinating all adults by the end of August which is promising for the UK because

the UK has the most COVID-19 cases in Europe. The main priority is to vaccinate the elderly and most vulnerable in society with the aim of limiting the number of deaths. However, some may disagree and argue that teachers and certain essential professions should be a priority as well (healthcare professionals were one of the first groups to get the vaccine). It brings into question whether teachers are being protected and prioritised enough as essential members of society. That is why we must all do our best to social distance and wear masks at school to

protect our classmates and our teachers. There are additional concerns arising around new variants ("Kent" and "Brazil" variants) which means that virus has mutated. This may mean our current vaccines will not protect against them. However, some scientists have said minor changes will need to be made to the vaccine if the variant is different. The "Kent" variant

does not require a new vaccine but others may need them.

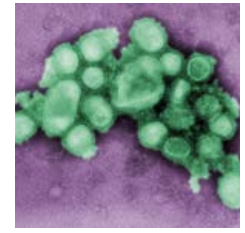
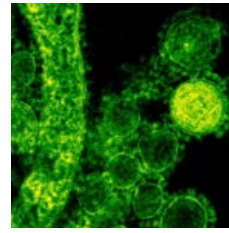
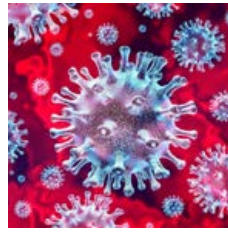
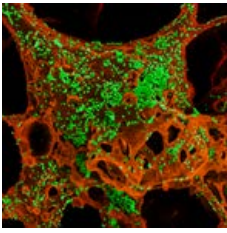
To end this very scientific article, I recommend you watch the video "Hold Still", spearheaded by the Duchess of Cambridge on the National Portrait Gallery's website. A link:

<https://www.npg.org.uk/hold-still/>

It is quite emotional to watch and interesting to think we were (and still are) living through a historical moment that will be looked back on for years to come.



Jiya S



# Pandemics of the past- Why is Covid worse?

Disease has been around for as long as humans have. But how does Covid compare to pandemics of the recent past?

PANDEMIC	YEAR	TRANSMISSION	MORTALITY RATE	NUMBER INFECTED	NUMBER KILLED
SARS	2002-2003	Transmitted through direct contact with infected people, no presymptomatic transmission	9.6%	8,098	774
Swine flu	2009	Transmitted through droplets in the air, can survive on surfaces	0.02%	700,000,000+	151,700-575,400
MERS	2012	Close contact with an infected person	34%	2,519	858
Ebola	2014-2016	Direct contact with the bodily fluids of an infected person	50%	28,652	11,325
Covid 19	2019- ?	Transmitted through droplets in the air, can survive on surfaces	1.4%	95,560,000	2,000,000+

★Swine flu was a variation of the flu which is seen every year- 290,000-650,000 people die of the flu every year worldwide. SOURCES: World Health Organisation (WHO), and Centers for Disease Control and prevention (CDC).

Looking at past pandemics, we might feel glad that Covid isn't as deadly as Ebola, or doesn't spread as easily as swine flu. However, Angela Rasmussen, a virologist at Columbia University who specializes in infectious diseases, describes it as a 'kind of perfect storm'. Although it's not as deadly as SARS, MERS, or Ebola, Covid 19's more mild nature means you might not know you have it; like swine flu, this presymptomatic and asymptomatic transmission means it's much harder to contain. However, it's still dangerous enough to kill a large slice of the population.

Moderate mortality rate, high transmission rate and the global nature of 21st century society have all contributed to Covid-19 becoming a dangerous pandemic.

**Kate D**

# The Importance of Healthcare workers in the UK today

Undoubtedly, the National Health Service is an invaluable institution to the UK and has been since it was founded and launched in 1948. It has offered free health services to everyone and is based on clinical need, not the ability to pay. Every worker that's part of the NHS has selflessly and tirelessly given their all to treat patients admitted to hospital, do general check-ups and work in emergency care. This is just the day-to-day role of the NHS and its workers.

Now, in the middle of a global pandemic, where there have been 96.2 million cases and 2 million deaths so far, the need for healthcare workers is crucial. The UK itself has one of the highest number of cases and deaths in the world, with the second wave currently being ten times worse than the first back in March 2020. Every day approximately 3,700 people are admitted to hospital in the UK due to COVID-19, which is on top of daily non-COVID patients. Consequently, healthcare workers have to tend to a significantly larger number of patients each day, leading to almost 10-12 hours of work, with minimal rest.

In an interview with a consultant paediatrician, Dr Anshoo Dhelaria, she explains how her rota for the week consists of not only seeing sick and unwell children, but also managing COVID patients that are kept in a separate area. Due to the sheer number of patients being admitted to hospital per day, she describes how the patients have to be triaged into red and yellow zones depending on the severity of their symptoms. Despite the whole pandemic, the NHS staff are still attending to non-urgent patients too, ensuring that other health issues are also given importance.

In the wake of these unprecedented times, the NHS staff are learning as they go along and Dr

Dhelaria mentioned that one of the greatest things they have adapted is 'stopping a lot more and asking colleagues how they are, how family has been, and to take care etc. So that empathetic and compassionate aspect of a doctor's life has become more pronounced'. The mental health of every individual in this pandemic has been affected, in particular the doctors and nurses that have been working tirelessly with profoundly busy schedules.

A particularly important message Dr Dhelaria conveyed was 'the saying that "all the carers are heroes" hasn't just come by the by. People in the first wave of the pandemic have been really resilient and brave and their whole intention to actually do well for the community has come across and continues



to throughout the second wave.' The first and foremost duty of doctors and nurses is to act in the best interest of their patients – known as beneficence, one of the four pillars of medical ethics. This has been clearly demonstrated by all the NHS staff, since they have been

sacrificing their own wellbeing and focusing solely on their patients throughout the pandemic.

Unequivocally, the NHS have overcome numerous difficulties over the past year, starting with arranging protective gear (PPE) for the workers, handling COVID testing for the public and now distributing the vaccine quickly, efficiently and safely during this third lockdown. All of these responsibilities are in addition seeing almost quadruple the number of patients that health care workers generally tend to. Dr Dhelaria concluded the interview by saying 'the NHS has done remarkably well, and I'm very proud to actually say I'm working in the NHS.' Indisputably, we are all very proud to have an extraordinary healthcare service and our selfless heroes whose role during this pandemic will never be forgotten.

Tisha S

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# Girls in further maths



## What is the main problem with girls in further maths?

Further Mathematics is a requirement from top universities to access many potentially lucrative mathematics-rich degree courses in STEM subjects. It gives students a head-start in others where specific mathematical skills are taught during the degree. Despite receiving 55% of A levels overall this year, girls received just 43% of A levels awarded in STEM subjects. This is not the case for all STEM subjects: girls are just as likely as boys to take chemistry, and more likely to take biology. The most striking gaps are in physics and maths: girls accounted for 39% of 2015's maths A levels, 28% of further maths A levels, and just 22% of all physics A levels. Confidence seems to be a big part of the issue. Being one of the only girls in a further maths class at school or in a STEM job seems to be a major deterrent. Teachers also cited a lack of confidence as the biggest factor affecting the gender gap in pursuing STEM subjects to A level.

## Has there been any progress with the problem?

Girls' entries to AS Further Mathematics rose from around 1000 in 2003 to almost 8000 in 2015; and at A-level Further Mathematics they increased from approximately 1500 to over 4000. Despite these large increases, girls have consistently formed only around 30% for both qualifications. Since the average entry size for Further Mathematics A-level in a mixed school is seven students, this means that a girl studying this subject is likely to have only one female peer in her class and many will have none.

## Why should girls take further maths?

Some research suggests that workplace diversity can aid innovation. Having a further maths A level has shown to bring financial rewards in specific industries, and can open doors to potentially lucrative university degrees. The increased time spent engaging with mathematics develops a greater fluency, preparing you for the hardships faced at university with a maths-enriched degree. The important topics in pure mathematics aren't covered at A-level, such as complex numbers and matrices, that are essential for anyone going on to study maths, physics or engineering. It gives girls an opportunity to study a broader range of applications of mathematics, whilst expanding confidence and resilience in tackling demanding mathematical problems.

Jyanie P



# Can solving for 'x' save the world?

Sunbeams scorch your skin as you tumble through the desert land. Your lips chapped and your mouth parched as you struggle to breathe through the damp fabric of your gas mask.

*The air is too toxic. This is the consequence. This is the result. This is the suffering we must endure because we couldn't control our greed.*

We couldn't overcome deforestation or stop global warming. The dystopian future of our world is slowly becoming a reality. With excessive pollution, enormous carbon footprints, and an ever-growing list of endangered species – our only hope to keep alive the human race is seemingly to get to Mars and restart the world. But what if one of the most hated subjects in the world could potentially save the future of humanity?

The root cause of global warming is the production of greenhouse gases from fossil fuels. It is a well-known fact that renewable energy is the only option to a cleaner planet. The efficacy of renewable energy relies on mathematical ideas to pick the optimal location with an efficient layout. For example, the angle of a solar panel or the arrangement of wind turbines.

*And if you still think maths is useless. I can guarantee you*

## **Maths has saved your life at least once.**

We've all been sick or relied on medication to ease the pain. The dosage of the drugs must be correctly calculated in order to provide the intended effect but simultaneously not cause any harmful side effects. Probability and statistics are used to estimate the survival of patients undergoing various treatments from chemotherapy to transplants. In addition, every time you cross a road, your mind does a quick mathematical calculation to make sure you will be safe.

So next time when you are sulking away in maths – remember the possible dystopia you can prevent, remember all the suffering you can end by simply thinking logically for 50 minutes every day.

**Caroline R**

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# CanSat 2021

**This year, for the first time ever, Townley is entering an international engineering competition called CanSat.**

CanSat is a programme for teams of 14–19 year olds to design and build, start to finish, their own satellite, which fits into a soft drinks can. The product is tested at a regional launch (where all satellites are launched by rocket, drone or balloon) and then the best are chosen for the national competition.

The structure of the programme is that every group has to complete the 'primary mission' which is to measure the air pressure and temperature as the CanSat falls, and then complete an additional 'mission' of their own. We have chosen to incorporate a camera into our design, which will transmit images of the view as the can falls.

The competition is not purely engineering based– groups are also marked on their planning and organisation, teamwork and outreach. As part of this, we [successfully!] applied to the PTA for funding for the whole project.

Our team consists of 20 year 12 students, split into four teams – Radio Communication, Software development, Electronic design and Mechanical design – each with their own team leader.

We began work on the project in October, just before half term. The first thing we had to do was attempt to break down the project into all of its components (i.e an antenna, a parachute, code for the arduino – the programming tool we are using– sensors for the circuit). We then had to research how to build or work on each element, in order to buy the right pieces. Just before Christmas we started ordering parts, with the aim of beginning the testing and building phase in January.

Some modifications have been made to the competition to make it easier to complete under current circumstances, and we're looking forward to being back at school and working on this together again.

**Kate D**

 **Website:** [www.townleygrammar.org.uk](http://www.townleygrammar.org.uk)

# TOWNLEY *Shake Up* STEM

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SCIENCE | TECHNOLOGY | ENGINEERING | MATHS



*With huge thanks  
Year 12 STEM Leaders*

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Caroline R

Sharon U  
Caitlin T  
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Tisha S  
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*From Ms Laura Acosta  
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STEM Lead for Townley*



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