



21st Century STEAM Innovators Essay Competition 2021

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With thanks to:

Austin – Emmi Parmenter, Hayden Porter, Timothe Peyret, Alexa Holland

Benet – Kaena Wasley, Oscar Reynolds, Joe Jacob

Fisher – Ben Rose, Krystina Yuen

More – Anjola Okusanya, Jacob Iley, Lampros Papadogiannakis

Foreword

To celebrate British Science Week, which took place this year on 5-14th March, Princethorpe hosted a STEAM essay writing competition, challenging pupils to write a 300-500 word essay about a STEAM innovator who they find inspirational. These could include: scientists, engineers, artists, mathematicians, designers, computer scientists, and more! Essays needed to include the following in order to qualify:

- What the innovator's job is
- What they are currently researching or working on
- Why they admire them
- A bibliography of any resources they use

Princethorpe pupils certainly delivered. They produced excellent quality, well researched essays on a range of different innovators, truly showing just how diverse the world of STEAM really is.

I hope that you will enjoy reading a selection of the winning and highly commended entries. There were so many to choose from, and each was of such an exceptional standard, that this booklet could very easily have included them all!

Lauren Mason, STEAM Ambassador



1st
Prize

Peter Zumthor

Jack Dando (Benet, Year 9)

The innovator I have chosen is a Swiss architect by the name of Peter Zumthor, who attended the Pratt Institute School of Architecture as an exchange student in 1966 in New York, where he studied industrial design and architecture. In more recent times, his most powerful works including the 7132 Hotel and Feldkapelle are often described as 'uncompromising' and 'minimalist'. In 2009 Zumthor was the winner of the Pritzker Prize, which is a prize given to living architects whose work demonstrates qualities of talent, vision and commitment. In addition to this award, he also received the Royal Gold Medal in 2013, awarded by the Royal Institute of British Architects on behalf of the British monarch. Zumthor describes what makes up an architectural atmosphere as, "this singular density and mood, this feeling of presence, well-being and harmony". This quote suggests that he personally believes that all architecture must create a sense of elegance and beauty, but also it must work with the environment that surrounds it in order to create the feeling of well-being when you experience it.

As he began to develop his skills, he was able to incorporate his knowledge of different materials, whilst still keeping it simple, and minimalist. Moreover, despite his many works, the one which is considered by many to be his most important contribution to architecture, and the build that really conveys his style, is the Therme Vals Spa in Switzerland. Built in 1996, the space creates an experience of hot and cold, the heat coming from the warm spa, juxtaposed with the colder air outside in the snowy mountainous regions of Switzerland. The build was made with locally quarried stone and is partially submerged within a hillside. The grass roof of the build helps it to be at one with the surrounding landscape and is almost completely invisible to the human eye.

As I'm considering becoming an architect, Zumthor is an inspiration as his work often blends in with its surrounding area, sometimes making it invisible from a distance. Looking at many different buildings, I find pieces of architecture that create this sense of camouflage especially interesting. Furthermore, I believe it is good to see the works of others to use as possible inspiration for me in the future. Whilst watching shows such as 'Grand Designs' and 'George Clarke's Amazing Spaces' I have come to really appreciate pieces of architecture that incorporate old and new, and ones that really work with their environment. Zumthor's buildings create a feeling within you and induce you into following what he has done throughout most of his life and conveys how beautiful and elegant so many pieces of architecture can be all over the world.



Therme Vals Spa, Switzerland

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2nd
Prize

Erin Smith

Mia Petrucci (More, Year 7)

I feel inspired when I read about girls who are involved in STEM. I love DT woodwork and I am in the club after school and I love to see when other girls join with me and I can't wait to have other opportunities where I can do more things like this. For this project I researched young innovators and particularly wanted to find young females who are making a difference in the world of medicine. I found so many interesting people, for example a student who found a way to make light using body heat which was used to help students in countries where they didn't have access to electricity for homework. I also really enjoyed reading about a boy who designed and developed a specialist bra that detected changes in breast tissue to alert the wear to early cancer signs. He did this after very sadly seeing his mum die of the disease. However, Erin Smith's works really hooked me!

In 2016 when Erin Smith was still in high school, she spent one day binge watching YouTube videos of Michael J Fox. She observed a change in his smile as the years went on. Michael J Fox was diagnosed with Parkinson's and Erin watched more videos of him talking to other patients with the disease. She noticed that when they smiled or laughed with each other their emotions looked distant; she wondered if this was a common symptom, so she decided to pursue this idea further. Erin spoke to doctors at a local hospital who looked after people with Parkinson's and they told her that they had also noticed this among their patients. Going forward she questioned if facial expressions could be used to monitor changes in the brain. She soon learned that the part of the brain involved in facial expressions was one of the first parts to be affected with Parkinson's; she was right! This exciting discovery meant that if she monitored facial expression she could detect early signs of Parkinson's. Erin then developed an outstanding AI technology called FacePrint which did exactly this. Her work was picked up by the Michael J Fox Foundation who funded her work further.

One of the things I find most extraordinary is that Erin had no idea how to code, but she had an idea, and was going to make it happen. She brought a coding app for dummies and taught herself how to programme. She had never coded before but she wasn't going to let that stop her, she kept on trying and was surprised when it actually worked. Smith is currently studying neuroscience and computer science at Stanford University, working with its medical school to get FacePrint to the point where it can diagnose Parkinson's long before traditional tests are able to do so.

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[Meet the Teenage Founder of FacePrint \(and learn her tips on changing the world\) | BUILT BY GIRLS](#)

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3rd
Prize

Issey Miyake

Amaanya Bose (Austin, Year 9)

Issey Miyake is a Japanese fashion designer, who is renowned for his innovative construction of textiles and the materials used in his clothes. Born in Hiroshima, his talent has spread worldwide for audiences to appreciate. He is particularly recognised for his pleated attire and accessories that are practical, comfortable, and crease-free! Many of his projects have been exhibited in museums due to their originality and technical essence. At age 82, he aspires to create what hasn't been done in the past - establishing new realities. This attitude is reflected in all his work, and it remains to still influence it. In 2004, The Issey Miyake Foundation was established. This was where traditional technological methods were conserved and passed on to future generations to acquire. At the beginning of March, he released his latest collection, "As the Way It Comes to Be". This series focuses on colours and shapes that naturally occur in nature, as well as the interaction between the clothes and the environment. Intricate, new forms are made as the wind blows into each fold; shadows are cast in areas lacking light; the beauty of it being subtly different each time.

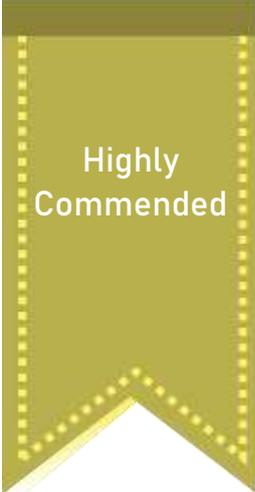
I admire Issey Miyake due to his constant pioneering in the design field. He has an exceptional ability to produce apparel that is so far ahead of its time. It has taken a great deal of time developing each individual concept – I am fascinated by this. Miyake demonstrated a great deal of dedication when it came to refining his signature pleated garments; a pleat that flawlessly blends into the smooth fabric, as well as not requiring re-pleating. Additionally, he has influenced the public on a global level, collaborating with other designers worldwide. I am especially impressed by his feature in the 1999 *Time* article "The Most influential Asians of the 20th Century", alongside Mahatma Gandhi and Mao Zedong. This makes me look up to him, being an Asian person myself. It encourages me to remain committed, to not fear experimenting, and to adopt a similar work ethic.

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Highly
Commended

Michio Kaku

Ed Twyman (More, Year 9)

Doctor Michio Kaku is an American theoretical Physicist, futurist (which means he takes interest in the technologies of the future and predicts what may happen) and he also helped popularise science in America due to the fact that he makes regular appearances on TV, radio and in film. He has also written many books about physics and similar other topics. He is also a professor at the City College of New York and CUNY Graduate Centre.

He studied at Harvard University where in 1968 he graduated at the top of his class with a Bachelor of Science degree, from there he went on to achieve a Ph.D from Berkeley Radiation Laboratory in 1972. The area of science he has contributed to the most is quantum mechanics and specifically his contribution to String Field Theory (Quantum field theory) which is a version of string theory.

Kaku and many other scientists believe that similarly to Einstein's model of the universe, we are all sat on an ever-inflating bubble that we can't break free from, but string theory says that there are many other bubbles or a multitude of universes, similar to ours that can join or split. This theory suggests that the splitting of two universes is what caused the big bang and the start of ours. He also uses the metaphor of having two dots on a piece of paper and the most efficient way from one to the next being a line however theoretically we can bend the paper and connect the dots through the air between, this is meant to represent a wormhole. He theorises that by creating a wormhole between two universes, which is possible considering Einstein's calculations, then we would be able to travel through time as well as space. He used this ideology to infer that it is possible when in trillions of years all of the stars die and our universe freezes, we would be able to escape and live in another universe.

I admire Kaku as although his theories seem impossible and science fictional, they don't seem too far out of reach, and the fact that he has contributed to a possible theory of everything is simply mind boggling. He also has many other fields of interest, for example in the 1980s he wrote a couple of books outlining how Nuclear warfare may be won demonstrates that his mind is versatile and he is an expert on many things.

In conclusion, Michio Kaku is an interesting scientist that is helping to pioneer the ideas of what the universe actually is and teaching people his findings in interesting ways.

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Highly
Commended

Henry James

Soren Wasley (Benet, Year 7)

Henry James is currently a student at the university of the West of England, but he has just won the 'STEM awards 2020 innovation challenge'. He combines his studies with a job as a project manager at Wales and West Utilities.

Henry James has come up with a concept of making modular houses eco-friendly. His concept, 'GridGrow' looks to reduce the carbon footprint of modular houses, so they look more desirable, as they are easier and cheaper to construct than any other houses. He achieves this by designing plans for these houses with substitutes to things like gas boilers which are bad for the environment. His idea means that the modular houses don't necessarily have to be on the electricity and gas grid, eliminating all of those costs.

Henry's plan is to have off-grid modular houses where all the energy doesn't come from the electricity or gas grid, he wants all the power to come from alternate sources. One of those sources is ordinary salt water, they extract the hydrogen from the oxygen and it goes through a machine that converts it into electricity. This process is called electrolysis. The house will be run off wind and solar, and powered by electrolysis.

This innovative design is killing two birds with one stone, making the modular houses more desirable by reducing the carbon footprint of them is good, because they are cheaper to build, but also, GridGrow reduces the carbon footprint of the world.

I admire Henry James, because I worry about climate change, and he is addressing it and helping reduce all of our carbon footprint. Also, I love engineering, and he is an engineer who has already achieved so much, but he is only in university, so when I read an article in the Telegraph newspaper, I felt really inspired by this man, so henceforth, I have written this essay on Henry James.

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Highly
Commended

Andrew Pollard

Charlie Atkins (More, Year 7)

Andrew Pollard is the director of the team of scientists that came up with the idea of the Oxford AstraZeneca vaccine in the fight against Covid-19. He is a professor of paediatric infection and a vaccinologist as well as being a Vice Master of the St Cross College in Oxford. He was born on the 29th of August 1965 and he studied at Barts and the London School of Medicine and Dentistry.

Mr Pollard found out about the severity of the coronavirus when in a taxi with John Edwards while he was on his way to make a presentation on Typhoid. They discussed at depth the new virus emerging in China. John knew a lot about it already as he had recently been studying the virus and was very nervous of its potential impact across the country and the world. Andrew was scared about the possible impact and outcome of the virus as his knowledge of it grew.

The backbone of the vaccine is a common cold virus that causes infections to chimpanzees; as this cold virus is ineffective to humans, it is perfect for basing the vaccines upon. It is compiled of the genetic components of the coronavirus enabling your body to build up your immune system and give you immunity, meaning that the effects of the coronavirus will not be felt at such a massive level. Coincidentally, Andrew's team of Scientists had been working on a vaccine for the past covids meaning that they had information to base the Covid-19 vaccination on.

With the country getting struck by a large infection rate of the coronavirus, it made Andrew even more determined to develop a vaccination. He was confident that he would be successful with it so he pressed on, using lock down as an even bigger boost to get a vaccine developed. The pandemic generated a huge amount of motivation for him. His laboratory was affected because of social distancing but he worked around that like everyone else has had to do and he edged closer and closer to creating a vaccine... until it was done.

I chose Andrew Pollard to research and write about because he has shown great perseverance and dedication to making a globally available vaccine. He is so influential because no matter what he faced, he kept going showing grit and determination, until he got there and that is truly amazing. Covid-19 has puzzled many people and I am so pleased that Andrew and his team of Scientists have managed to work together to develop the AstraZeneca vaccination. The vaccination is now being rolled out as quickly as possible so hopefully all of our lives can return to normal.

Information from the BMJ interview with Andrew Pollard on the AstraZeneca vaccine:

<https://open.spotify.com/embed-podcast/episode/3SZ3hYuZ1ABXyM2yLScgaV>

Highly
Commended

Cynthia Kenyon

Sammie Borland (More, Year 9)

Have you ever wanted to live forever? Well molecular biologist, Cynthia Kenyon, has found a very promising way to at least double the lifespan of humans and slow aging. Her recent studies regarding *C. elegans* worms, show that a *daf2* hormone receptor mutation doubled the lifespan of a simple worm without any impact on its quality of life, for example, a mutant worm would live like a teenager during middle age.



Cynthia graduated valedictorian from the University of Georgia in chemistry and biochemistry in 1976. She received her Ph.D. studying genes on the basis of their activity profiles, in Graham Walker's lab. Postdoctoral studies she moved to England, to study the development of *C. elegans* at Cambridge University.

Since 1986 she has been at UCSF as a biochemistry and biophysics professor and is now an American Cancer Society professor. In 1999 she co-founded Elixir Pharmaceuticals, with Leonard Guarente, to attempt and develop the drugs that would slow down the aging process in humans. This led to her being elected as Vice President of aging research at Calico in April 2014.

Her early work enabled her to discover that the Hox gene, which were originally known to pattern the body segments in the fruit fly, also were found to pattern the body of *C. elegans*. These findings demonstrated that the hox gene weren't simply involved in segmentation, as previously thought, but instead played a role in a much larger process.

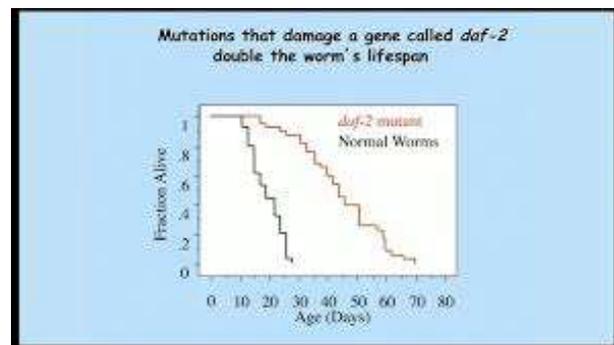
Scientists before Kenyon's research had discovered the extension of a *C. elegans* life through mutations. However, those experiments consisted of caloric restriction rather than the single gene mutation of *daf-2*.

The same experiments of the gene mutation were repeated on mice and the same effect took hold proving that this method could be used on mammals, indicating the same could be achieved in humans. Another finding was that animals with the mutated hormone receptors, were less likely to gain aging related diseases, such as Alzheimer's, cancer and heart disease. Cynthia Kenyon currently works with Google's Calico and aims to lengthen human lives by 100 years and help everyone live healthier lives too. Imagine being able to take a pill that could lengthen your life, slow your aging and increase your quality of life for that long!

She is defiantly a scientist to aspire to, as lengthening life is a topic thought about for decades and her research has developed the most promising solution. It's an astounding finding that will never fail to astonish and lead scientific research and solutions other problems.

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- Calico labs





Highly
Commended

Greta Thunberg

Megan Thandi (Fisher, Year 7)

Greta Thunberg is a young girl who is an environmental activist who is known across the whole world for challenging world leaders to go against climate change. She gained the most notice for her youth and her straightforward speaking manner, both in public and to political leaders where she criticises them for their failure and not being able to produce enough action to address the matters of climate change. Greta's activism started when she convinced her parents to adopt some lifestyle choices to reduce the carbon footprint.

In August 2018, she started spending her days outside of school and Parliament by trying to make more people aware of climate change. She held up signs which read, "Skolstrejk för klimatet" (which translates to killstreak for climate) under the name of, "Fridays for Future."

After she addressed the 2018 United Nations Climate Change Conference, student strikes took place every week somewhere in the world. In 2019, there were multiple coordinated multi-city protests involving over a million students each!

To reduce carbon footprint more, she sailed to North America, instead of flying, where she attended the 2019 UN Climate Action Summit. In her speech there, she exclaimed, "How dare you," which was hugely taken up by the press.

She is also supporting the Farmers Protest in India which is also important to my family as my whole family in India are farmers.

When she started protesting, she only did it to the Swedish Government until she asked people to protest for immediate climate change in their own country!

She reached her goal, on March 15th 2019, which was to over one million children in 2,200 strikes over 125 countries. By September 20th 2019, it had grown to over four million people world-wide! It was mostly children, but her word is spreading out which I find inspirational because she has done all this in one or two years and have been spreading her word faster and better and that she is younger than most.

When she was younger, she became very depressed from knowing people do not care that much about climate change and after that she stopped eating and lost 22 pounds! She was diagnosed with Asperger syndrome, OCD, and selective mutism. At one of her first speeches, because of her selective mutism, that she "only speaks when necessary." She does not see her Asperger's syndrome as an illness rather, she sees it as a superpower! This inspires me because she sees her "illness" as a superpower which is helping and better and it is also

inspirational because my brother is autistic and rather as a disadvantage, she sees it as an advantage, a superpower.

One of Greta Thunberg's book is, "No One Is Too Small to Make a Difference" which sounds very inspirational because it is talking about how anyone can make a difference in this world and that at her age, she has already written a book which is full of wisdom!

I used Wikipedia and The Telegraph as websites.



Highly
Commended

Maggie Aderin-Pocock

André Onyekwe (Benet, Year 8)

Maggie Aderin-Pocock is a space scientist and a science communicator. She is an honorary research associate of University College London's Department of Physics and Astronomy. As a space scientist she enjoys building satellites that go up in space, and as a science communicator she specializes in translating some of the difficulties of science into a simple format that younger people like us can understand.

She got a PhD in mechanical engineering. However, her first degree was in physics. Maggie has always liked solving problems and she enjoys applying the physics and mechanical engineering that she learnt when she was younger to a variety of different problems. When she left university, she wasn't sure what career path she wanted to take. However, she found a job with the Ministry of Defence and she had the pleasure of making instruments for them. The first sort of instrumentation she was working on was a device called a missile warning system. This was a quite a complex piece of equipment, but what it was designed to do was warn pilots when a missile was coming and then automatically let off signals to protect the pilot and the aircraft. This was something she was working on at the start of her career.

Maggie's main passion is space. She really enjoys studying it and discovering new information. Presently, her goals are to keep on sending satellites into space so we can obtain more information about our universe. I find it particularly impressive that she has stated that in 2024 she wants to be the first woman to land on the moon! This will be a massive step further in her career and her achieving all her goals.

Maggie really inspires me because she is a great innovator who reaches for the stars at any given opportunity she gets, even if the process is daunting. Maggie had her fair share of challenges – she was diagnosed with dyslexia at the age of 8 and found reading and writing challenging. She also attended 13 different schools before she was 18 and this must have been very unsettling for her. However, she did not let any of these stop her. Her advice that she gives every young person is “if you fall over then just pick yourself up and try again”. This quote really stands out for me because everyone has had or experienced a setback in their lives, but what matters is that we keep on pursuing our dreams and keep digging deeper and reaching further. It is a great attitude that we can all adopt, so that is why she is such a great role model, innovator and inspiring leader.

Highly
Commended

Elon Musk

Alex Lloyd (Benet, Year 7)



Elon Musk is an innovative, self-made billionaire. He is an entrepreneurial designer and engineer who has created and owns a portfolio of technology companies.

Born in Pretoria, South Africa in 1971 on 28th June to a Canadian Mother and South African Father. His younger brother, Kimbal, was born just over a year later. When he was 12 years old Elon taught himself computer programming and created a video game called Blaster, which he sold for \$500.

When Musk was 17, he moved to Canada and later studied at Queen's University in Ontario for two years. He then moved to the USA to attend the University of Pennsylvania where he received two Bachelor's Degrees in economics and physics. After graduating, Musk moved to California to study physics at Stanford University. After just two days he left and decided to get involved with the Internet boom that was happening at the time. Musk established his first company, called Zip2 with Kimbal. It provided online newspapers with maps and business directories. Aged 28 he sold Zip2 to Compaq in 1999 for \$307 million.

In 1999 Elon Musk co-founded an online payment company that eventually became known as PayPal. It was acquired by eBay in 2002 for \$1.5 billion and earned \$165 million himself.

In the same year he then founded SpaceX, an aerospace manufacturer and space transport services company, that is now used by NASA for space flights to the International Space Station. His aspiration is to reduce the cost of space travel and therefore make it affordable enough to create a Space Tourism Industry.



In 2004 he joined the Tesla motor company as Chairman and chief product architect and became the Chief Executive in 2008. Under his leadership Tesla has succeeded in the manufacture of electric cars where other manufacturers have failed. He has founded or been instrumental in the creation of other businesses such as SolarCity, (founded by his cousins) which is a solar energy services company; OpenAI, a non-profit research company that promotes friendly artificial intelligence; Neuralink, a neurotechnology company focused on developing brain-computer interfaces; and a tunnel construction company called The Boring Company,.

A few fun facts are; he has an IQ of 155, his net worth is £131bn and he owns 20% of Tesla.

Elon Musk still has plans to create a high-speed train called the Hyperloop – a concept in which a long tube (like London Underground) contains a vacuum. Inside the tube is a streamlined train and because the vacuum significantly reduces air resistance, the train can travel at higher speeds using less energy. The Hyperloop is planned to be completed sometime in 2021 and travel at an estimated 1223km/h (760mph).

I chose Elon Musk because he has created and plans to create incredible engineering feats and even when he does run into problems, he shrugs them off and finds a way to go round it. He has a great never-give-up attitude and amazing determination and that is something that I really like about him.

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Highly
Commended

Richard Yim

Jack Fleming (More, Year 9)

There are currently over 100 million landmines known to be underground at this very moment (not counting however many unknown ones there are), remnants of past wars, waiting to explode to the unsuspecting child, hiker or cyclist. This number may not seem like a lot in comparison to the surface area of the Earth, however this still doesn't stop around 5,000 people dying or being maimed each year from bombs they couldn't see. Usually when a landmine is thought to be detected, "deminers" will put on some body armour and prepare to dig out the bomb using hand tools. And as extremely effective and not at all dangerous this is, a certain person has found a much more efficient, and life-saving way of doing it, his name being Richard Yim. Richard Yim is the CEO of the company "Demine Robotics", a company that has developed a remote-controlled robot called "Jevit" to dig up landmines that could be a liability to people walking around or on them. The landmines are then detonated by humans from a safe distance.

Yim was born in Cambodia, which is one of the countries with the most landmines on Earth. Yim's aunt was killed after stepping on a landmine, bringing a personal matter to the problem for Yim. Although he was brought up in Canada, Yim went over to his native country in order to test Jevit, inspired by the word "life" in Khmer. His aim is "to build solutions to clear indiscriminate weapons such as landmines, cluster munitions and improvised explosion devices" as well as "to save lives around the world".

I admire Richard Yim for his determination to make the Earth safer for everyone walking around, even if it's just a little, it can at least be comforting for people to know how they can go outside without the fear of stepping on a random landmine from 60 or so years ago and ruining their life and others forever. The website for Demine Robotics truly shows his dedication for wanting to protect as many lives as possible, with the remote controlled operation of removing the bombs to the simpleness of the robot, Jevit. They are using the most recent tools in the field of robotics to make them accessible to other demining operators.



Sources: <https://deminerobotics.com> ,
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