

# GIST

## GIRLS SCIENCE TECHNOLOGY

VOLUME 1: DJERAN AUTUMN 2016



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eins bin unll un  
üks un ichi jeden en  
Τηκεν uno jedan  
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# First up

## WELCOME TO GIST!

**Seeing as this is our first issue, we have chosen a theme of 'FIRST'. I asked lots of my friends, workmates and family what they thought of when I said 'first'.**

Not surprisingly, most of them said 'prize', usually in some sort of race or competition. They all thought being first was a good thing. But being first is not always easy, and definitely not always fun. In this issue, our stories explore lots of different aspects of 'first' and 'one', and some really cool ways that women have been first in science, maths and technology. It's also your first look at the topics, activities and games we have included – check out the Brainspace!

We're also excited to invite you all to contribute to GIST. We are looking for young writers with a passion for science and

technology to write for us. You could describe an experiment or project that your class has done for 'The Experimentalists' section, write a biography for 'Ladies in the Lab', or submit photos and sightings for 'Nuts over Nature'. And make sure you send us events to include in our Calendar, and topics you would love to see in future issues.

See you at the end (I'll be there first!)

**Ella Lemson**  
**Kristina Lemson**  
Editors



## Meet the editors

Our editors for this issue are Ella Lemson and her mum Kristina. Ella is in year seven and loves reading, writing and watching movies. One of her favourite activities is camping in the bush – especially if it is far away from home. Kristina teaches biology and environment students at the School of Science at Edith Cowan University. She is a botanist and loves the outdoors too.

# First time for everything

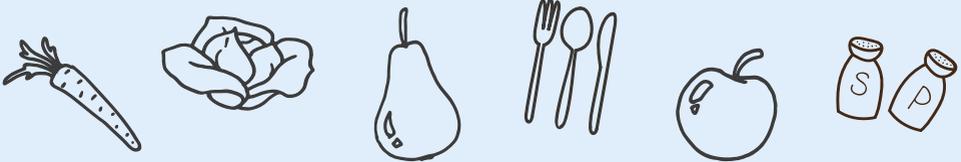
GIST asked two readers about times when they were the first to do or be something.

## Candace – Conservation scientist



My 'first' was quite a challenge – it is being the first in my group of friends to become a vegetarian. I didn't do it overnight, though. I changed the way I ate over a period of time because I read an article and decided that I wasn't happy with the way I was living. And then in the end I stopped eating meat altogether.

It was interesting though, because lots of my friends didn't really understand, and I had to keep explaining myself all the time. That became a bit frustrating, but I could live with it. I am just happy that I can live my own values and do what I believe is right.



## Amelia – Year 10, loves chemistry and drama



The first time I went on stage in a performance was really daunting. It was in a musical when I was in year 7. I didn't think I was that good at singing and dancing, and neither did some of the people around me. I was also the smallest performer by far, and the whole thing was really nerve-wracking. So I concentrated just on getting everything right on the night, and it ended up going really quickly. When it was finished I thought 'Phew!' and was glad it was over.

But when I look back, I think it was the first time I convinced myself that I was capable of doing something like that. I think I underestimated myself, and I got a surprise. Now, I think the best way to make sure I do achieve something is for someone to tell me I can't!!



# One on One

GIST talked with Ute Mueller, Associate Professor of Maths, about what is special about the number one.



The number one is quite interesting. It's much older than zero, which was only invented formally in India in about AD 500. Before that, people only used a placeholder – something to show that there

was nothing in a certain position – instead of a number like zero, which can be used in calculations.

There are actually two ways of writing one – the integer 1 and the recurring decimal 0.999999999. A recurring decimal is a number that has a digit or set of digits to the right of the decimal point that repeats forever, which is shown by putting a dot above the digit that repeats. Recurring decimals can seem a bit strange. For 0.999999999 the maths is that if you convert the recurring decimal to a fraction, it comes out at  $9/9$  – which equals 1!

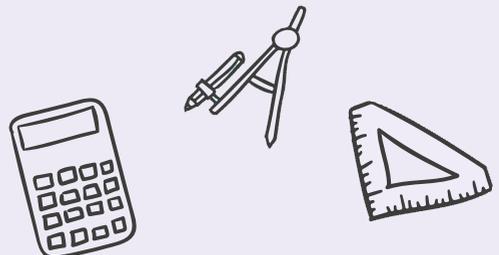
Two things about one that are really nice are that it's the only integer that has just one factor and that it is not a prime number. It's funny because people have argued over whether one is a prime number – there are some older textbooks that argue that it is. However, by definition a prime number has two factors – one and itself, so that obviously can't apply when the number of interest is actually one! So to keep the definition of a prime number consistent, one had to be left out.

One is also special because when you multiply one by one you get – one! There is a special name applied to this feature called 'idempotent'. Another complicated name is the 'multiplicative unit' – which really just means that when you multiply any number by one you just get that same number ; say when you multiply 2 by 1 you get 1.

If we think about numbers being raised to powers – like squaring a number – any number raised to the power of zero is one.

The way one has been written has changed over time. We write one as a downwards stroke, which probably started out in a tally system like the one used by the Romans. However the symbol for one is quite complicated in some writing systems – for example that symbols in Thai and Hebrew script don't look familiar at all. The Hebrew system is a bit more complicated too. The symbol aleph can be different depending on whether the number is rational and part of a counting scheme or if it is a real number.

My favourite number one is in the book 'The Number Devil' by Hans Magnus Enzenberger. He says 'You need one thing only – all you need to start with is ONE!'.



# First on the block

We looked back through history to see just how long women have been doing science, maths and technology. It turned out to be a very long time! Here are some of the amazing firsts that you have probably never heard of – all of them before the year 1600 AD.

## TIMELINE

**2700BC Merit-Ptah** – Physician, Egypt. The first woman scientist known by name, Merit Ptah was the chief physician in Egypt.



**2285–2250BC Enheduanna** – Sumerian/Akkadian Astronomer and poet. She was high priestess of the most important temple in Ur, Sumeria and is the first author in history known by name. Her work required her to make very accurate astronomical observations and calculations.



**2000BC Yi Shuo** – doctor, China. Yi Shuo was interested in herbs and medicines from a young age, and amassed a great knowledge and vast experience in healing. She became famous after curing a dying woman and was called to work at the palace of Emperor Wu, as imperial physician for his mother, the empress dowager.

## 3000BC

**2640BC Xi Ling Shi** – legendary first empress of China. Said to have discovered the secret of silk by studying the silkworm's lifecycle carefully, and then to have designed a process to remove the thread from the moth's cocoon. This traditional story was retold by Kung Fu Tze, and may be a myth rather than historical fact – there are fragments of silk fabric that date back to 3630 BC!



## 2000BC

**2000BC Tapputi-Belatekallim** – perfumer in Babylon. Tapputi made perfumes and is the person recorded as having used a chemical process. The record is on a clay tablet, which was used for writing at the time.



## 1000BC

**700–600BC Gargi Vachaknakvi** – natural philosopher, India. Gargi's disputations with leading scholars of her time are recorded in the Brihadaranyaka Upanishad, a Hindu text.



**1200BC Agamede, princess of Elis (Greece)** – physician and herbalist. According to ancient Greek historians, Agamede "knew of all the medicines that are grown on the broad earth".

### 500BC Theano –

mathematician, Greece.

Traditionally thought to be either the wife or daughter of Pythagoras of the triangle fame, Theano is also thought to have taught in his academy.



### 400BC Agnodike – greek

physician, was the first woman to practice legally as a physician in Athens – but she had to pretend to be a man to do it!



**300BC Pythias of Assos** – marine zoologist, Greece. Pythias collected and made detailed observations of many specimens. She was married to the famous philosopher Aristotle.

### 200BC Aglaonike – first

woman astronomer in Greece, Thessaloniy Greece. Aglaonike was famous for being able to predict solar eclipses and was considered to be a sorceress because she was 'able to control the moon'.



AD

### 100 Mary the Jewess –

alchemist, Alexandria (Egypt). Mary is said to have invented new equipment for chemistry, particularly double-boilers used to produce a gentle heat, and stills. Most of what we know about Mary comes from the writings of Zosimos, who lived 500 years later than Mary.



### 300 Hypatia (370-415) –

maths and astronomy, Alexandria (Egypt). Hypatia was an extraordinary woman. The daughter of a mathematician called Theon, who worked at the university in Alexandria, Hypatia learned maths from her father. He employed her at the university to teach teacher in not just maths but also philosophy and science. She has also been credited with inventing scientific instruments. Hypatia was murdered by an angry mob in AD 415, at a time of great political turmoil in her home city.



1000AD

### 1000 Hildegard of Bingen (1098-1179) – natural

philosopher, Germany. Hildegard was an abbess of a convent, and wrote about many topics, including theology and music. Her two scientific works cover the medicinal properties of plants and animals and the causes and treatments of diseases and injuries, Hildegard also invented an alternative alphabet. Her scholarly contribution to the Roman Catholic Church was recognised in 2012 when she was only the fourth woman ever to be named 'Doctor of the Church'.



### 1100 Trota of Salerno

(c1100-c1150) – physician, Italy. Considered to be the first true gynaecologist and obstetrician, Trota lived and worked in Salerno, Italy, where the first medical school in Europe was located. She specialised in treating women (gynaecology), delivering babies (obstetrics) and healing children (paediatrics).



**1300 Dorotea Bucca (1360-1436)** – Professor of medicine, Italy. Dorotea followed her father in



becoming Professor of Medicine at the University of Bologna, a position she held for more than 40 years. That amazing, since at the time women never went to school, or learnt to read and write.

**1500 Sophia Brahe (1556-1643)** – astronomer &



chemist, Denmark. The sister of astronomer Tycho Brahe, Sophia worked as his assistant from the time she was 17. From Tycho she learned about horticulture and chemistry, but he told her not to study astronomy – so she went and learned that all by herself! Brother and sister made accurate measurements of the positions of planets over many years. In her later life, Sophia was a horticulturalist. Her final academic work was quite different – a family tree of Danish aristocratic families.



**1200 Magistra Hersend (ca 1249)**

– Surgeon, France. One of only two women recorded as Royal physician or surgeon, Magistra accompanied King Louis IX on the seventh Crusade. She also tended to the Queen and the camp followers.

**1500 Tarquinia Molza (1542 -1617)** – natural



philosopher, Italy. This woman had an astounding array of talents – not only did she study Greek, Latin, Hebrew and Philosophy alongside her brothers when young, she also studied science, poetry and music as an adult – and wrote music too! Tarquinia was the first woman to be granted 'Roman citizenship', otherwise strictly reserved for men, in 1600. She was designated 'l'unica' at the time, because of her singular virtues and merits.

**1554-1631 Catherine de Parthenay (1554-1631)**



– mathematician, France. Catherine was an heiress and encouraged to study by her mother, who employed Francois Viète as her tutor. Viète was considered to be the greatest mathematician at the time, but he also taught Catherine about geography, current affairs and the stars. Catherine married young and was already a widow by the time she was 18. Later, she married again and become Princess of Rohan.

### CAN YOU FILL IN THE GAPS?

Can you find other women who could be on this list? What about women who came after 1600? Write to us at [k.lemson@ecu.edu.au](mailto:k.lemson@ecu.edu.au) and tell us what you find. If you include an image make sure that it is listed as being in the Public Domain.

# The experimentalists



## ANIMALS OF THE SOIL AND LITTER

Year seven students from Joseph Banks Senior College recently did an experiment that investigated animals that live in the soil. This is a summary of their experiment compiled from the reports they wrote.

### Aim

To discover what animals would be attracted to bait bags buried in the soil.

### Method

We filled mesh bags with fresh fruit and veggies. We made three bags which all had the same foods in them – bread, pumpkin, apple, carrots, potatoes and tomato – and buried them in a hole in the ground. We came back to dig one bag up each week for three weeks. We took them back to the lab in trays and looked through the rotting foods for animals and fungi, and chose some animals to look at using a microscope.

### Results

We found the most animals after one or two weeks, but the time was different for different groups. There were lots of insect larvae (especially maggots), ants springtails and nematodes. The nematodes were really tiny. There were also a few beetles.

After one week, we could still tell what the different foods were. One of the potatoes sprouted, but the they were still hard, like the carrots and apples. The bread, tomatoes and a kiwi were very squishy and had lots of fungi on them.

The amount of food left was much less after two weeks, and everything was going mushy and smelly. That was when we got the most maggots. In the last week there weren't very many animals. A couple of groups had food that was shrivelled up and really dry.



### Discussion

We predicted that the animals would like the food because it is summer and the sand was really dry. We though we would see more different kinds, but it was really hot and so they might not have liked walking around. It rained in the first week, so there might have been more animals around everywhere then. It was much drier and hotter in the other weeks, which is probably why some peoples' food scraps shrivelled up.

### Things we could improve

Each group put their three bags in one hole, so when we took out the first bag we also bumped and disturbed the other two. Next time we would bury each bag in its own hole so this didn't happen. One or two groups also didn't bury their bags very deep, which could be why they dried out. If we did the experiment when it was cooler and wetter we think we would see more animals.

### Special precautions

We had to wear gloves and keep our faces away from the tray while we handled the bait bags after we dug them up.

# Kitchen Chemistry



## BLUE SILLY PUTTY

**NOTE:** This recipe uses hot water and a small amount of Borax. Make sure you have an adult to assist you. *Always* read and follow the handling instructions on the containers of chemicals you use in the house. And don't forget to clean up and wash your hands afterwards!

### What you will need:

Clear school glue – 150ml

150ml water

$\frac{1}{2}$  teaspoon of Borax

$\frac{1}{2}$  cup hot water

A few sprinkles of silver and blue glitter

A few drops of blue food colouring

Mixing bowl

Ceramic cup

Pour the glue into the mixing bowl. Add the water to the glue – use the glue bottle to measure out the water. Mix the glue and water until combined. Add the food colouring and stir. Then add the glitter and stir again.

Pour the hot water into the cup. Add the  $\frac{1}{2}$  teaspoon borax and stir it until dissolved.

Pour the borax solution into the glue solution and mix. What happens?

Have fun playing with your silly putty!

# Nuts over Nature

## FANTABULOUS FUNGI

**The start of the wet season brings with it a whole host of changes in our environment. Keep your eyes one for one of the quickest – the start of the fungus season.**

You probably know about and even eat some fungi already – the mushrooms at the supermarket are one common kind, but did you know that yeast used to make bread is also a fungus? And maybe you have seen puffballs in your lawn.

The range of sizes and shapes in our local fungi is really amazing. Here are some examples of ones we have found already.



Bracket  
fungi



Earth ball



Mushroom

Taking pictures of fungi is one way to try and find out what they are – if you can, take a photo of the underside that shows any gills or pores, as their colours and shapes help in identification. So too does knowing the size and shape of the cap, and whether it has a slimy or sticky surface. And some fungi are recognisable because they smell really bad! There are a few resources to help you – try the free electronic book *Fungi of the Perth Region and Beyond* by Dr Neale Bougher (available from the West Australian Naturalists Club website) or look up the *FungiMap* project online.

Did you know? One of our most common local fungi is called the **Dog Poo Fungus**. Can you guess why?

# Ladies in the Lab



Marie Curie was a chemist and physicist. She is famous for her work on radioactivity and for being the first person ever to be awarded two Nobel Prizes.

She was born in 1867, in Poland. She had four brothers and sisters. Her father was a maths and physics teacher, and Marie loved those subjects. Tragically, her mother died when Marie was only 10.

Marie was one of the top students at secondary school, but could not study at the university in Warsaw, because she was a girl. So she kept on studying maths, chemistry and physics by going to secret classes, while she worked as a governess to support herself and her sister Bronya.

In 1891, Marie moved to Paris in France. Here she attended a very famous university called the Sorbonne. This was expensive and Marie was very poor – sometimes, all she had to eat was buttered bread and tea. But she finished a masters degree in physics 1893 – and then went straight on to get a second degree in maths in 1894! She got a job studying steel and magnetism, for which she needed a laboratory. The one she found belonged to Pierre Curie, who was also a physicist – Pierre and Marie later got married.

Marie developed a fascination for a discovery by French physicist Henri Becquerel – that a strange source of energy came from the element uranium. She showed that the radiation was produced by the atomic structure of the uranium, and invented the term 'radioactivity'. A few years later, Marie and Pierre working together discovered new radioactive elements Polonium and Radium.

Marie Curie became famous in 1903 when she became the first woman awarded the Nobel Prize in physics, which was awarded jointly to Marie and Pierre Curie and Henri Becquerel. The pair used their prize money to continue their research.

Sadly, Pierre was killed in a road accident in 1906, leaving Marie to continue their studies and to bring up their two daughters Irene and Eve. Marie was appointed the first woman professor at her old university, where she was able to keep researching.

In 1911, she was honoured again, with a second Nobel Prize in chemistry. She was the first scientist win twice. Following this, she supported the development of portable x-ray machines for use in the First World War, and kept on researching radium and other radioactive substances.

Marie Curie died in 1934, from a disease that can be caused by radiation exposure. The following year, her daughter, Irene Joliot-Curie was awarded the Nobel Prize for finding more radioactive elements – work that built on that of her mother. This made Marie Curie special one more time!



# Brainspace

Puzzles to get the grey matter going!



## WORD SEARCH

C D U O R A N N O D A M I R P  
L A S R E V I N U W I R E R E  
A E H W Z T W C R E A T E X I  
N L C H A M P I O N T C T M K  
I E N U L S G S K E O E U C O  
D R U E B E O N S C G N S O O  
R E A P L L G D I E A T L M R  
O I L Y I F N O N N A O S M E  
N M D T A E U E I R N R I E N  
L E A O R S S M T E P I N N N  
Y R N T T I O E I D P G G C I  
Y P O O S U L R A N R I L E W  
G T M R S S O P L U I N E W B  
Q G Q P D E B U T O M A Z U L  
U N I T Y Z E S V F E L I S T

Alpha  
Beginning  
Champion  
Commence  
Create  
Debut  
Founder  
Genesis  
Initial  
Launch  
Lead  
List  
Lone  
Monad  
New  
Only  
Ordinal  
Original  
Precocious  
Premiere  
Primadonna  
Prime  
Prototype  
Rank  
Rookie  
Self  
Single  
Solitary  
Solo  
Start  
Supreme  
Trailblazer  
Trendsetter  
Unanimous  
Unity  
Universal  
Winner

## One sided: Make a Mobius strip

Can you believe that a piece of paper has only one surface? Try this and see if you do. Cut a long strip of paper, then twist it once and join the ends together with sticky tape.

Starting at the join, draw a continuous line along the middle of the length of the paper. What happens? What if you try to colour one side pink and the other purple?



# Fab Facts about 1

- The only number that when multiplied by itself is the answer! It has a special name, called the 'multiplicative identity', which pretty much says the same thing.
- Your whole body starts out as just one cell, called a zygote.
- 1 is equal first with zero as 0 the most important number in the world. Why? Because they are used to represent all kinds of information in the binary code used in computers, phones and lots of our other devices.
- For a long time, was the smallest known number. Zero was invented by the Babylonians, and before that 1 was it.
- Is the average number of times a sloth poos in a week.
- Many writing systems use a single stroke to represent 1, but not all of them. For example, Persian, Hebrew, Thai and Khmer systems use much more complex symbols.



- People don't agree about whether 1 is a prime number!

## Calendar of Events

ECU Open Day – Joondalup 17 July 2016, 10am–3pm

ECU Open Day – Mount Lawley and WAAPA 14 August 2016, 10am–3pm

Perth Science Festival 13–14 August 2016

National Science Week 15–19 August 2016

ECU Open Day – South West 28 August 2016, 12pm–3pm

LabRats at Edith Cowan University 19–21 September 2016

Scitech Brainstorm Challenge Days 17–21 October 2016

Tim Harrison, Outreach and Science communicator from Bristol University, UK 21–25 November 2016



For more information on how to get involved in this magazine, please contact in the following ways:

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