

October 24th

Memory Verse:

For now we see through a glass, darkly;

but then face to face:

now I know in part;

but then shall I know even as also I am known. I Corinthians 13:14

For more about this verse see tomorrow's lesson.

A story from the space race to read

After the Second World War the United States of America and Communist Russia were rivals in a nuclear arms race. Who would be the first to have reliable Inter Continental Ballistic Missiles? These were very long range “rockets” capable of carrying nuclear weapons. In order to protect themselves, and indeed all democratic countries, from the threat of Russian aggression the Americans had to keep ahead of the race. Then in 1955 both countries announced their intentions to put artificial satellites into space and the Space Race began. Who would be the first to have the capability to launch nuclear weapons from space?

The Russians did well. They launched their artificial satellite Sputnik 1 in 1957 ahead of the Americans' Explorer 1 in 1958. Then the Russians put the first man into space in 1961 once again ahead of the Americans' Commander Alan Bartlett Shepard Jr. later the same year.¹ Were the Americans losing the Space Race?



The following year the American president John F Kennedy made a speech in which he committed the USA to putting a man on the moon *within ten years*. He called for peaceful international co-operation in the exploration of space but he said, “We intend to be first.” Then he asked, “Why climb the highest mountain, why, 35 years ago, fly the Atlantic?” then he said, “We choose to go to the Moon in this decade and do the other things, not because they are easy, but because they are hard; because that goal will serve to organize and measure the best of our energies and skills, because that challenge is one that we are willing to accept, one we are unwilling to postpone, and one we intend to win, and the others, too.”²

This was a daring, perhaps even rash commitment: after all the Russians were ahead. It would surely take a supreme effort to achieve this goal before they did. But something terrible had happened on **24th October** the previous year which, although neither the President nor anyone else in the West was aware of it, had given the Russians an awful set back. It was something which we can see showed the complete contrast between the two countries in the way they approached technological challenges of this type. The ideological systems by which the two nations were governed were different. The outcomes were different as a result.

Soviet war hero, Marshal Mitrofan Ivanovich Nedelin (1902-1960), was commander-in-chief of the USSR's Strategic Rocket Forces. It was he who had realised that rockets, not bombers, were the best method for the USSR to deliver a nuclear strike against the USA. His fostering of rocket science led to the early success of the Russians in the Space Race. The Russian test centre for Inter Continental Ballistic Missiles was at Tyuratam, now known as Baikonur, in modern day Kazakhstan.

¹ See the lesson for 12th April.

² You can hear the speech here: <https://www.gale.com/intl/archives-explored/the-space-race-to-put-a-man-on-the-moon/kennedy-rice-university-speech>. You could start listening at about 8 minutes.

In 1960, Russian scientists were testing the R-16 Inter Continental Ballistic Missile at Baikonur. Marshal Nedelin was anxious to have the rocket ready before the celebrations for the anniversary of the Bolshevik Revolution.³ The inventor of the R-16, Mikhail Yangel, had designed it to be simpler to fuel and so more quickly made ready to fire than the R-9 a type of Inter Continental Ballistic Missile which was being developed by a different Russian engineering team. Political pressure to have the R-16 ready quickly and fierce competition with the R-9 team led the harassed R-16 team to ignore vital safety procedures. An electrical fault caused damage to fuel line membranes. This meant the rocket could not stay on the launch pad with fuel on board for more than two days. Now the clock was ticking.

As more electrical problems surfaced, Marshal Nedelin ordered technicians to work longer and longer hours. By the time the crucial problem occurred on 24th October they had already been working for 72 hours non-stop. The rocket was already fuelled when another electrical fault occurred. To repair it safely the fuel would have to be removed. But if the corrosive fuel was removed from the rocket it would no longer be possible to launch it at all. It would have to go back to the factory. Marshal Nedelin ordered the fault to be repaired on the launch pad without removing the fuel. "We'll modify the missile on the launch pad," he is said to have decided. "The nation is waiting for us!"

By this stage all personnel apart from those actually working on the rocket were supposed to be off the launch pad. Marshal Nedelin did not go. He set out a deck chair close to the rocket to watch, direct operations on the spot and to signal to his subordinates that they were expected to be there too – whatever the rules said.

Throughout the day Marshal Nedelin had been receiving calls through a special communication channel from the Kremlin (the seat of Russian government at Moscow). Some say the Soviet leader Khrushchev himself rang to ask when the launch would take place. Delay followed delay. Then at a quarter to seven in the evening, half an hour before the rescheduled launch time, another fault occurred and the rocket's second stage engine suddenly came to life. The flames burst through the fuel tank below and the whole fully-fuelled rocket exploded in a giant fireball.

Because personnel had not left the launch pad, as many as 250 skilled engineers, top scientists, rocket technicians and specialists lost their lives. The launch facilities were completely destroyed.

The Russian authorities told no one. The whole business was covered up. No one in the west knew what happened that terrible day at Baikonur until the Soviet Union came to an end in the 1990s.

What was the difference between the two nations in their approach to rockets?

The American's were working in a democratic system which, though far from perfect, had its deep historic roots in a Bible-based Christian morality. They were reaping the benefits of hundreds of years of civilisation that had grown within a Christian consensus. Their systems of government and justice, however imperfect, had been originally set up by people who acknowledged the Bible as the source of our knowledge of right and wrong. The Russians were working in a system which had evolutionary atheism as the root of its morality. The "good of the people" was the standard of morality, not the unchanging absolutes of the Word of God. But who defines what is the "good of the people"? In practice whoever was in control in Communist Russia dictated what was the "good of the people". The massacres, show trials, forced labour, torture of "dissidents" and other horrors that resulted led to a climate of fear. Scientists, managers and technicians cannot do their best in these circumstances.

³This was when the Lenin and the Bolsheviks took control of Russia from the Russian Duma or Parliament in 1917.

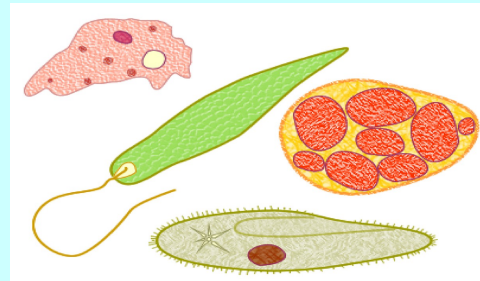
This difference of ideology did not just affect how people thought. Ideas always have consequences. They can be quite unexpected. This terrible accident was just a small one of them. Scientists working to satisfy leaders who exercised the power of life and death over them took unacceptable risks.

Something to do⁴

Do you have a microscope? If you do, get it out today. If you have not, don't worry, some of the things we are going to look for can be seen with a hand lens or even the naked eye.

Anthony van Leeuwenhoek (1632-1723) was born on 24th October 1632 in Delft, Holland where he spent most of his life. If you are wondering how to pronounce his Dutch surname you can say it "Lay-when-hook!" He was the first man to use a microscope to investigate the exciting world of animal organisms not visible to the naked eye. He never wrote a book and all his findings were recorded in letters to his friends. Here is an extract from a letter he wrote in October 1676.

In the year 1675, about half way through September, I discovered living creatures in rain, which had stood but a few days in a new tub that was painted blue within. This observation provoked me to investigate this water more narrowly; and especially because these little animals were, to my eye, more than ten thousand times smaller than the water flea, which you can see alive and moving in water with the bare eye.



Of the first sort that I discovered in the said water, I saw, after divers observations, that the bodies consisted of 5, 6, 7 or 8 very clear globules, but without being able to discern any membrane or skin that held these globules together, or in which they were enclosed. When these animalcules bestirred themselves, they sometimes stuck out two little horns, which were continually moved, after the fashion of a horse's ears. The part between these little horns was flat, their body else being roundish, save only that it ran to a point at the hind end; at which pointed end it had a tail, near four times as long as the whole body, and looking as thick, when viewed through my microscope, as a spider's web.

I also discovered a second sort of animalcules, whose figure was an oval; and I imagined that their head was placed at the pointed end. Their belly is flat, provided with divers incredibly thin little feet, or little legs, which were moved very nimbly. These animals would change their body into a perfect round, but mostly when they came to lie high and dry.

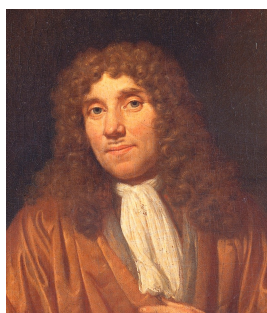
Furthermore, I discovered a third sort of little animals, that were about twice as long as broad, and to my eye quite eight times smaller than the animalcules first mentioned. Their motion was very quick, both roundabout and in a straight line.

The fourth sort of animalcules were so small, that for my part I can't assign any figure to them. These little animals were more than a thousand times less than the eye of a full-grown louse, and they surpass in quickness the animalcules already spoken of. I have divers times seen them standing still, as 'twere in one spot, and twirling themselves round with a swiftness such as you see in a whip-top a-spinning before your eye.

⁴ Adapted from Owen, Evan, *What Happened Today?* Book 3 available on the *Mothers' Companion* flashdrive <https://motherscompanion.weebly.com/> with additional information from <https://creation.com/leeuwenhoek> and other sources.

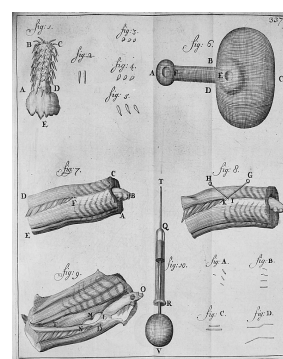


The “fourth sort of animalcules” are now believed to have been bacteria. Anthony van Leewenhoek was the first person ever to observe them.



In Anthony van Leewenhoek's day most scientific correspondence was carried out in Latin. Every well educated man understood Latin so it did not matter where a researcher came from or what his native language was, his ideas could be quickly passed on to others. But, although he was clever and painstaking, Anthony van Leewenhoek had not had a classical education. He spoke only the Dutch of his native area. When the Royal Society of London became aware of his remarkable findings the Dutchman's letters had to be translated. Henry Oldenburg, one of the society's members, learned the local Dutch of Anthony van Leewenhoek's area specially for the purpose.

Although he did not invent the microscope, Anthony van Leewenhoek made such good lenses, which he ground himself with great patience, that he was able to improve it greatly. What he saw astounded him and others. “For Leeuwenhoek, the amazing diversity of tiny life forms revealed under his home-made microscopes glorified God as much as looking at stars through a telescope.”⁵ He never ceased to marvel at the beauty of the design and the wonderful movement of the creatures he saw. He enclosed very accurate drawings of the creatures he discovered to accompany the letters he wrote to the Royal Society. He himself was not good at drawing so he employed a draughtsman to look at the discoveries through a microscope and draw what he saw.



If you have a microscope you can use it to observe a drop of rainwater that has been outside for a while – in a puddle for instance. If you have a water butt that collects rainwater from gutters that would be ideal. A roadside ditch would be another good source. Pond water is usually full of life so get some of that if you possibly can. Follow the instructions that come with your microscope to prepare the water for observation. If you do not have a microscope but can get hold of some pond water you may be able to see living creatures in it using a hand lens or even with the naked eye. Don't forget to give God the glory for what you see, just as Anthony van Leewenhoek did!⁶

5 https://digitalcommons.liberty.edu/cgi/viewcontent.cgi?article=1136&context=bio_chem_fac_pubs

6 This website has a gallery of video clips of microscopic creatures found in pond water:
<https://www.microscopyu.com/galleries/dic-phase-contrast/pond-life>