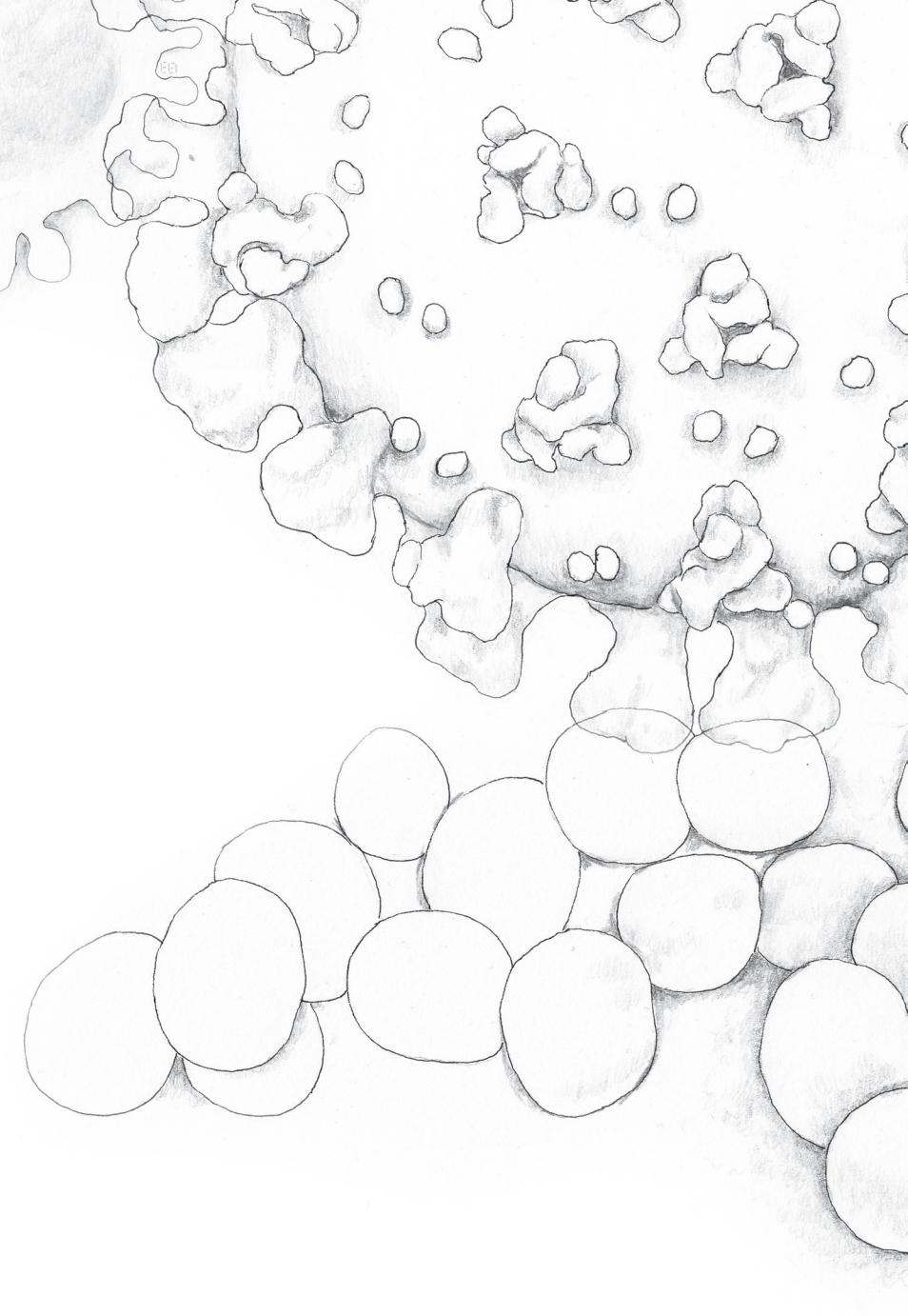
Colour in Coronavirus



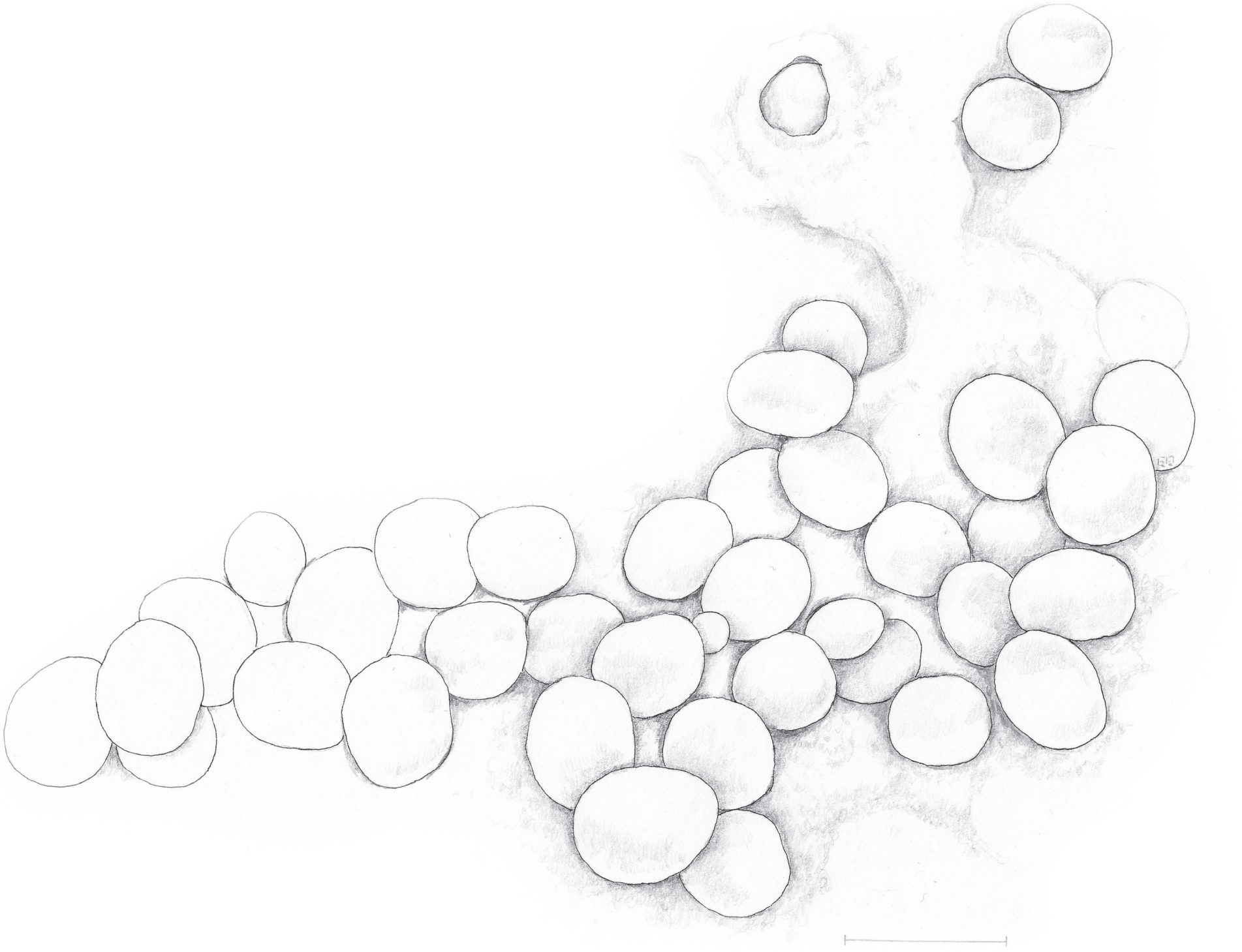
It's astonishing that something as tiny as a virus can change our world. These drawings have all been made in March 2020 when novel coronavirus, COVID-19, has become a pandemic across the world. We have all become aware of this tiny nanoworld and interest in the intricacies of this new virus has grown. Much is still to be answered and this newly emerged virus is now the focus of research for scientists and doctors across the world to team together to help slow the spread and find new treatments. Understanding this virus brings hope.

These drawings are based on microscope and computer models of the virus SARS-CoV-2 that is having such a huge influence on our lives. For most of us, our immune system (white blood cells and antibodies) will spot this virus. The distinct proteins on the outside of a virus are called antigens and are recognised as invaders by our immune system. Antibodies are made by our B-cells and help flag up an invading virus to encourage T-cells to kill infected cells.

Join us in learning about this remarkable new virus. Add colour to make the virus striking so it will be spotted by the immune system. We hope you keep well and, in the meantime, make your own eye-catching art with these drawings.

Share on social media @britsocimm #ColourInCoronavirus

Drawings and writing: science-based artist Dr Lizzie Burns in collaboration the British Society for Immunology.



SARS-CoV-2: A new coronavirus emerges

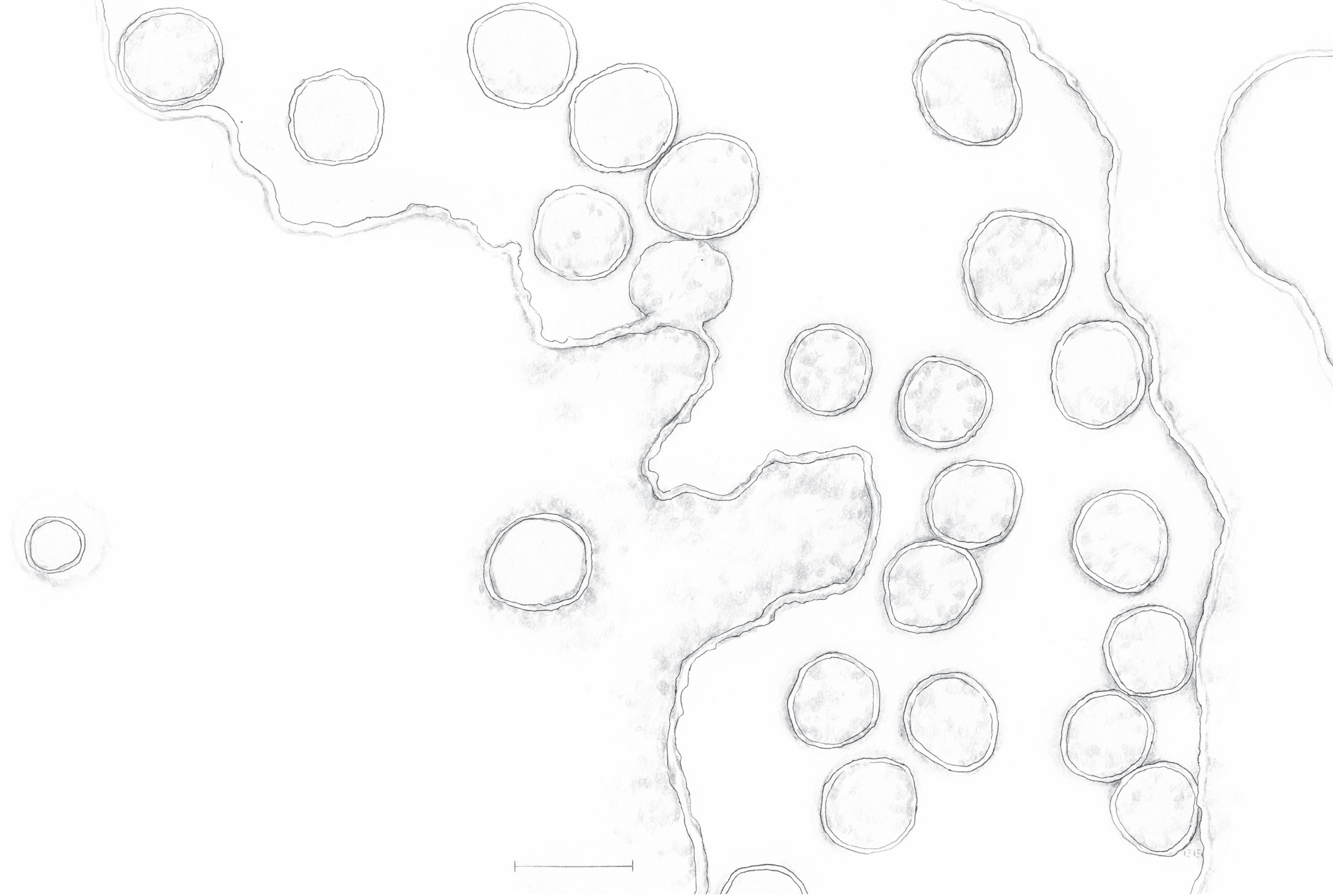
This drawing is based on images taken by scientists using scanning electron microscopy to reveal the tiny nanoworld of viruses. While so tiny, we know the disruption they can make to our lives.

The building blocks of our body are cells. Inside each cell there is DNA, which encodes the proteins that carry out the myriad functions of life. Viruses are tiny nano-scale particles that can latch onto the outside of a cell, enter and take over the machinery of the cell so it starts to make more viruses. New viruses emerge, bursting the cell open and start to infect surrounding cells. When such a takeover happens, our heroic immune system reacts to kill infected cells to get us feeling better. New viruses can emerge from crossing species barriers, which is an astonishingly rare event but has created new diseases throughout history. COVID-19 is a new disease in humans caused by the SAR-CoV-2 coronavirus. Even with a new disease our body usually gets us better, but not always.

This drawing represents looking at the outside of a cell where SARS-CoV-2 viruses are seen in detail emerging and escaping. New viruses are seen popping out from the infected cell.

Celebrate the study of science and bring this drawing to life. Add colour to make the viruses stand out so they will be eye-catching and noticed by our immune system. The line is a scale and represents 100 nanometres. More than 1,000 viruses if lined up would fit across the width of a human hair.

#ColourInCoronavirus



SARS-CoV-2: Release and dispersal

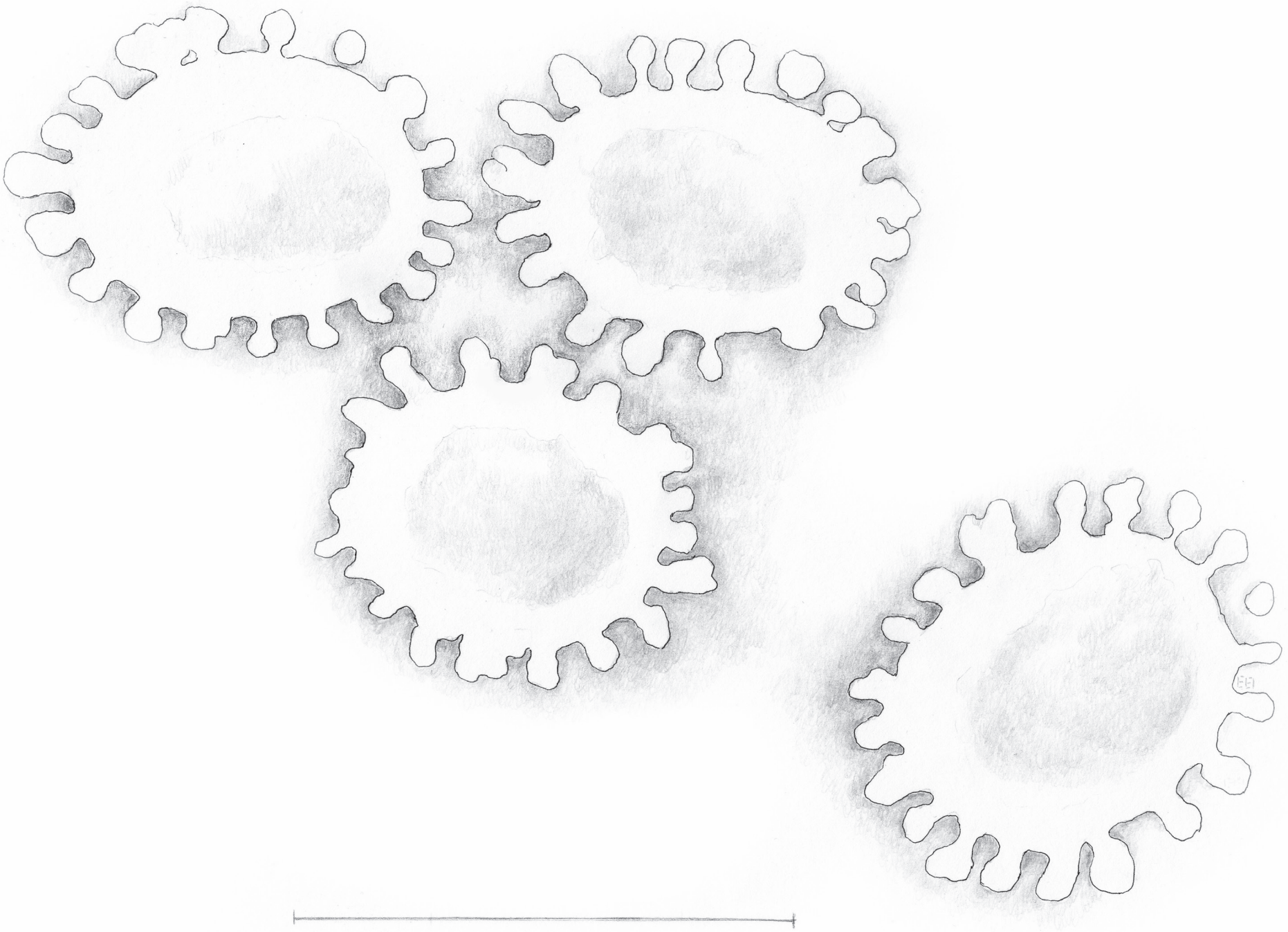
This drawing is based on images taken by scientists using transmission electron microscopy to reveal the tiny nanoworld of viruses. While tiny, we know the disruption they can make to our lives.

In this drawing, SARS-CoV-2 viruses are seen emerging from a cell on the left, which they have taken over. As each virus is released from one cell, it can go on to infect other cells. In this case, the virus has started infecting a neighbouring cell on the right. These cells are found inside the airways of the lungs and this is how the virus spreads in the lungs.

Inside each virus particle is genetic material encoding the virus – in this case RNA, which is similar to DNA. This genetic material is packaged up inside an envelope which can be broken apart by chemicals in soap. This is why it's important to wash hands with soap for at least 20 seconds to break down the outside of the virus. Once broken up the virus is harmless and can no longer be caught or transmitted.

Celebrate the study of science and bring this drawing to life. Add colour to make the viruses stand out so they will be eye-catching and noticed by our immune system. The line is a scale and represents 100 nanometres. More than 1,000 viruses if lined up would fit across the width of a human hair.

#ColourInCoronavirus



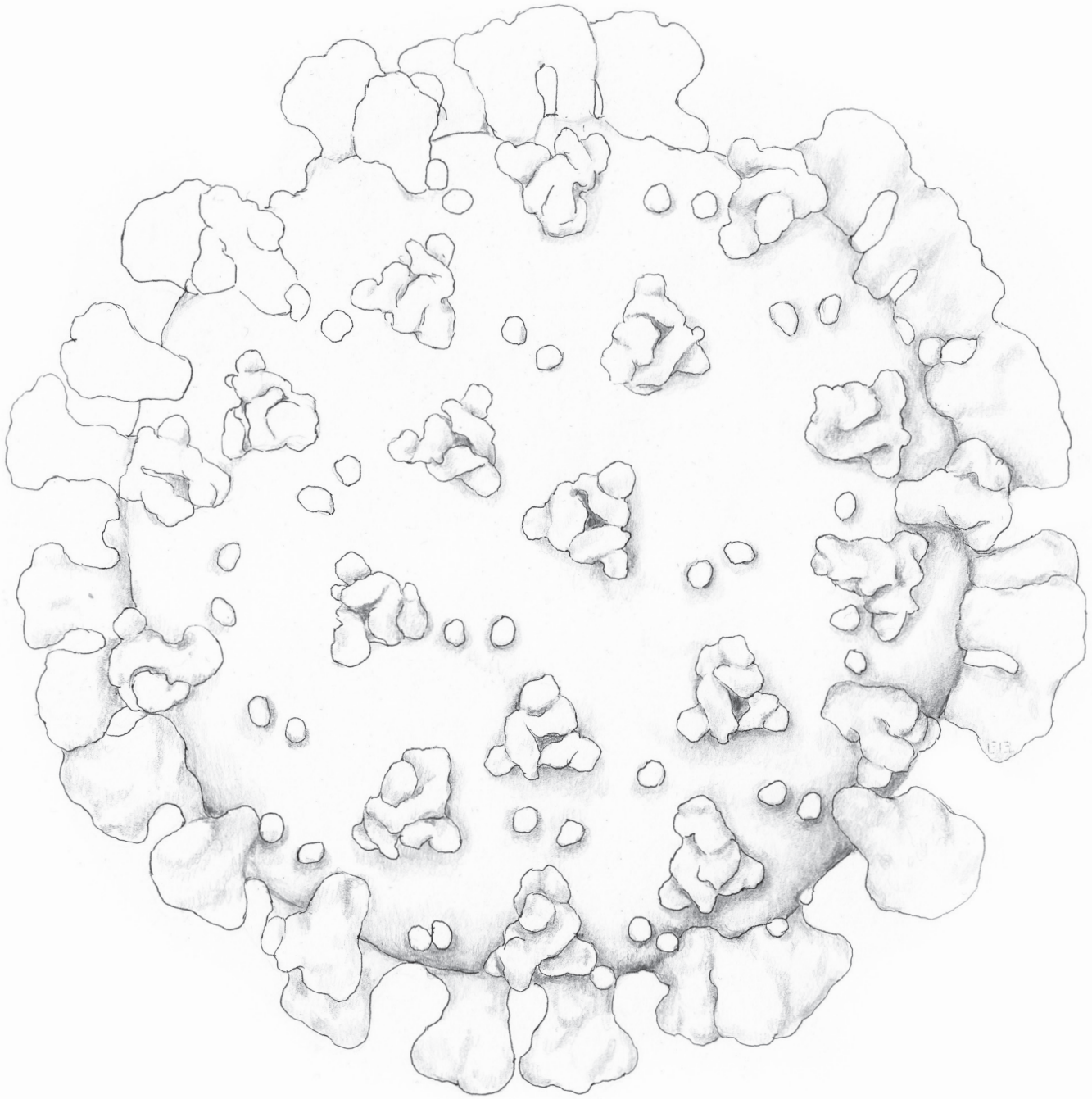
SARS-CoV-2: A virus that looks like the sun

This drawing is based on images taken by scientists using transmission electron microscopy to reveal the tiny nanoworld of viruses. While tiny, we know the disruption they can make to our lives.

In this drawing, individual viruses are seen. Each contains genetic material (RNA) wrapped up in an envelope decorated with spikes. Coronaviruses were named after their particularly striking spikes which resemble sun rays or a crown. These spikes allow the virus to attach to the surface of a cell and gain entry.

Celebrate the study of science and bring this drawing to life. Add colour to make the viruses stand out so they will be eye-catching and noticed by our immune system. The line is a scale and represents 100 nanometres. More than 1,000 viruses if lined up would fit across the width of a human hair.

#ColourInCoronavirus



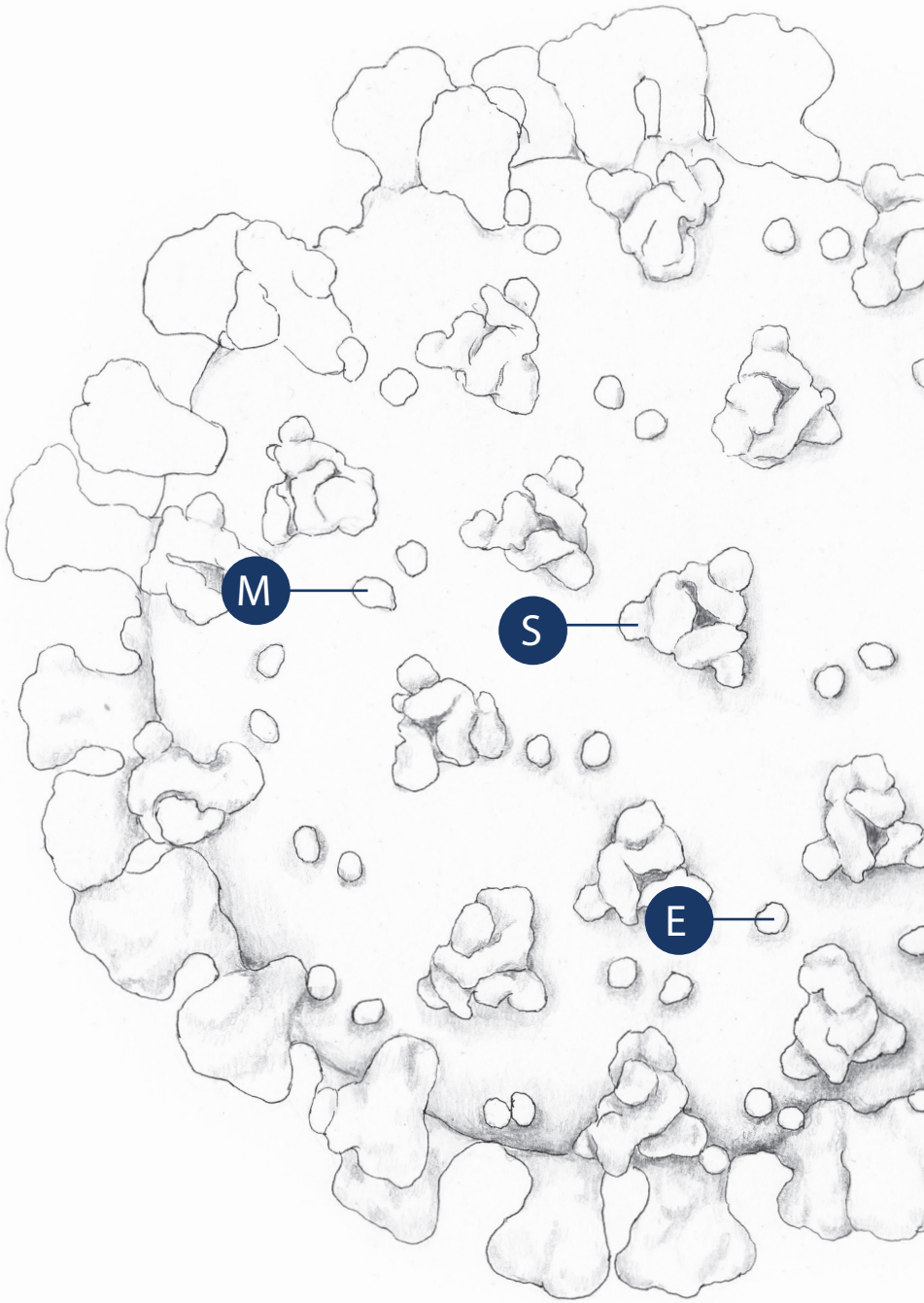
SARS-CoV-2: Anatomy of a virus

This drawing is based on a computer model based on the different parts that would be seen on the outside of the virus. While tiny we know the disruption they can make to our lives.

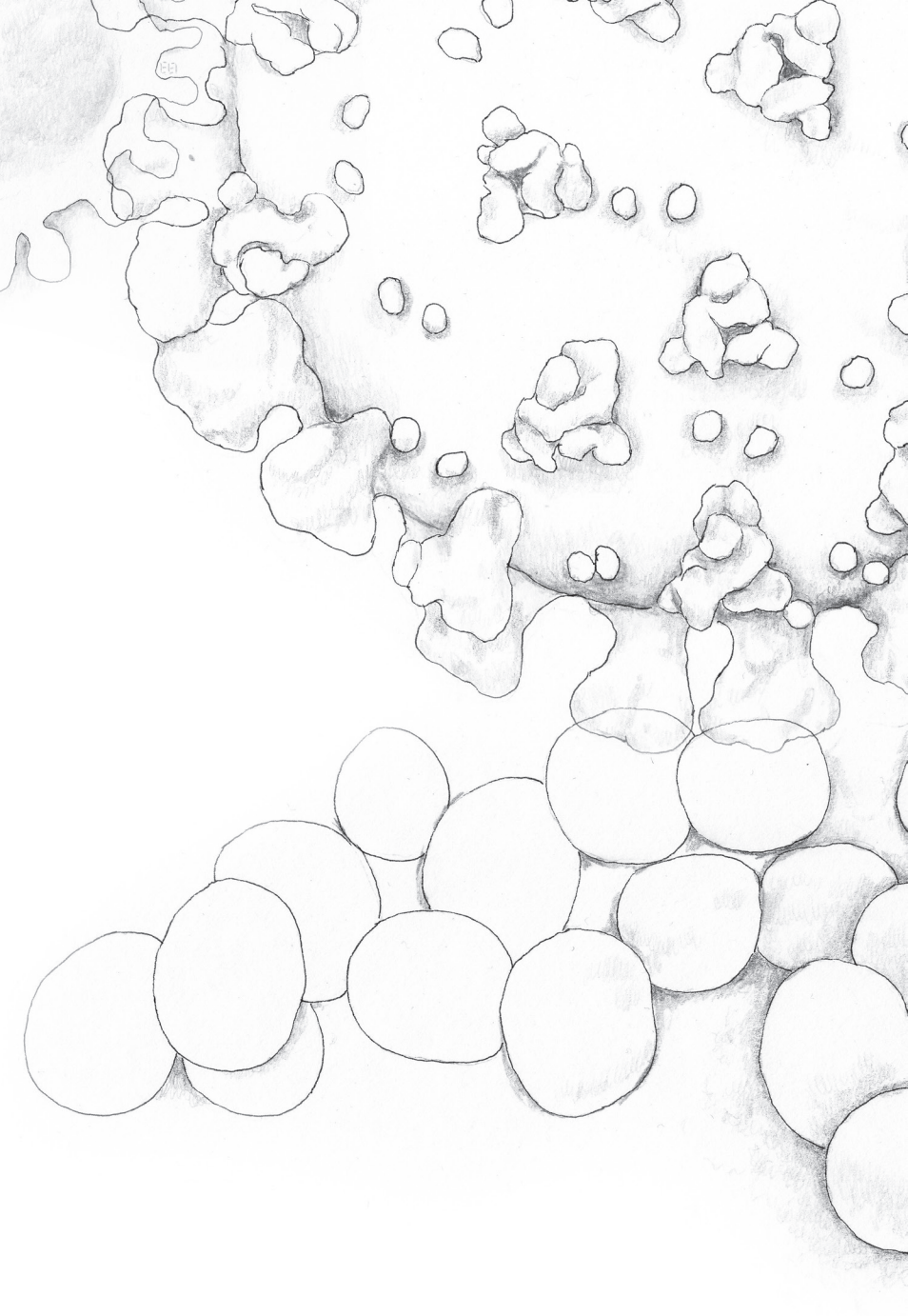
This model of a single virus shows the three types of proteins which can be seen on the outside of coronaviruses. The striking triangular formation of the spikes **(S)** are attracted to receptors on human cells found in airways, which allows the virus to enter cells. The smaller membrane **(M)** proteins in pairs and occasional single envelope **(E)** proteins are involved in the assembly and release of mature viruses. Underneath the decorative outside of the virus, and out of view in this drawing, are nucleocapsid **(N)** proteins that package the genetic material to encode instructions of how to make further viruses.

Celebrate the study of science and bring this drawing to life. Add colour to make this virus stand out so it will be eye-catching and noticed by our immune system. The line is a scale and represents 100 nanometres. More than 1,000 viruses if lined up would fit across the width of a human hair.

#ColourInCoronavirus



Appendix



Antigen – is part of an invading germ, such as the spike protein on the outside of a virus, which provokes an immune response in the body with the production of antibodies.

Antibody – is a Y-shaped protein made by our B-cells when an antigen is detected. Specific antibodies are made to tag the antigen and mark the virus for destruction. Antibody production is a natural defence strategy of our immune system.

COVID-19 – was given as a name to this new disease by the World Health Organization based on 'Coronavirus Disease 2019' which refers to when the new coronavirus emerged.

Coronaviruses – are a group of related viruses that cause diseases in mammals and birds. In humans, coronaviruses cause respiratory disease that can be mild and a common cause of colds, while others can be lethal such as SARS, MERS and COVID-19. Their genetic material is RNA, and they are named 'corona' from Latin meaning 'crown' or 'halo' due to the distinctive protein spikes.

Viruses – are tiny sub-microscopic infectious particles which replicate using the inside of a living cell. Viruses are the most common type of biological entity on our planet. They consist of genetic material (DNA or RNA) packed in a protected protein case (capsid), which can be further packaged in an outside envelope of lipids.

These drawings have been inspired by the amazing work of scientists across the world collaborating together to understand this virus.

References include: Model of COVID-19 and electron microscope images, Centers for Disease Control and Prevention (CDC) - C.S. Goldsmith & A. Tamin, and National Institute of Allergy and Infectious Diseases and Rocky Mountains Laboratories (RML) – E de Wit & E Fischer