Cancer cell, overlaid with p53 protein structure. Martyna C

2019 CALENDAR

Science and Society


JANUARY

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
	1	2	3	4	5	6
7	8	9	10	11	12	13
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Connection

The intention of 'Connection' is to compare the bonds between proteins and people. Relationships require strong bonds to function, otherwise they fall apart. These links allow us to function and be our happiest and healthiest selves. Similarly, many proteins must work in groups to carry out their function. Proteins must have physical contact between them for larger structures to form, however there doesn't have to be physical interaction for a relationship to exist in humans. The protein shown is an AMPA-type glutamate receptor, which mediates neurotransmission and synaptic plasticity in the nerve cells, allowing communication between them.

Acrylic on canvas
Natalia Heirman

PDBe.org/5ide


FEBRUARY

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Detecting pain

Depicted in this image is a trimeric ion channel protein (red) from chicken, shown in the membrane of a sensory neuron (grey). These acid-sensing ion channels are found throughout membranes in vertebrate nerve cells. They are sodium-selective pores that detect protons produced during inflammation or ischemic injuries, such as those that occur in the heart in low oxygen or in inflammatory disease, which can then be interpreted as pain. Toxins produced by snakes, spiders and sea anemones can hijack this family of pores, inducing extreme pain in the victim. To determine this structure, the protein was produced from a chicken gene expressed in a bacteria, so no chickens were harmed in the creation of this artwork.

Silk Batik
Tia D.

PDBe.org/4nty


MARCH

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Growth

This artwork investigates the concentric circles of tree rings, and looks at the link between plant growth and the plant growth hormone, auxin. The image shows an artwork inspired by the rings formed as trees grow (brown/black), overlaid with a depiction of a protein bound to auxin (cream). Mirrored in the protein structure are the growth rings. Auxin regulates plant cell elongation, division, differentiation and morphogenesis and derives its name from the Greek word αυξειν meaning to grow or increase.

Mixed media acrylic on canvas, mixed textile materials and heat press. Overlaid with pen and ink on paper.
Kitty Yarrow

PDBe.org/1lrh


APRIL

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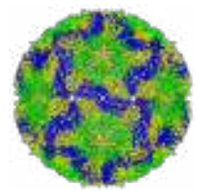
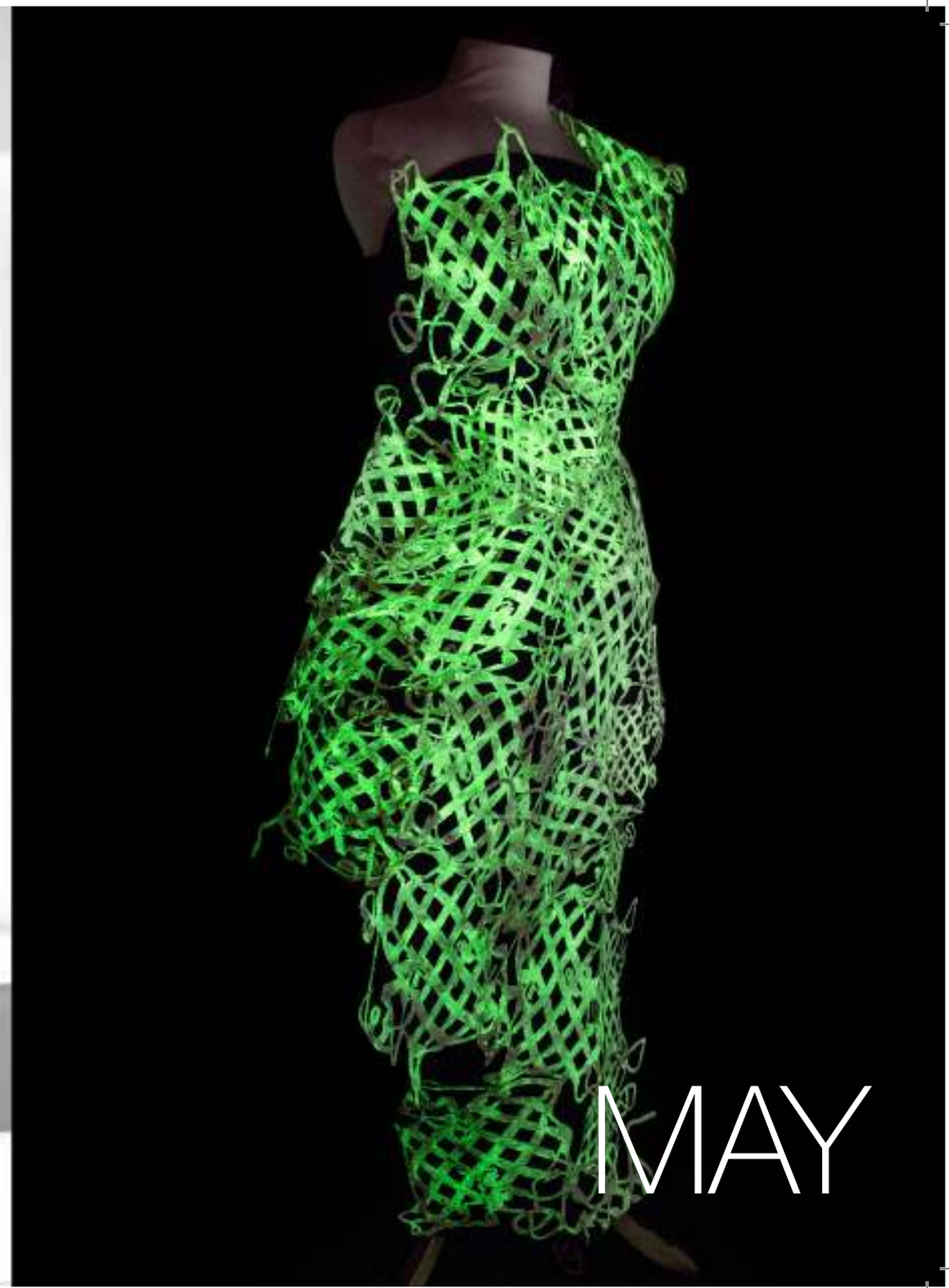
Getting on the front foot

This artwork features the spherical foot-and-mouth disease virus capsids, depicted in blue, purple and orange against a backdrop of yellow. The foot-and-mouth virus is highly infectious, and the resulting infection can be fatal. Foot-and-mouth disease affects cloven-hoofed animals (e.g. cows, sheep and pigs). The virus' ability to take hold within a population, spreading very rapidly between animals and farms, means there is an urgent requirement for research into the structure and mechanism of infection. Using these research results and molecular structural details, we can aim to develop drugs and vaccines to protect farm animals.

Silk Batik
Megan S.

PDBe.org/5aca





MAY

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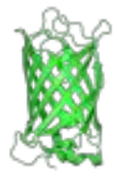
Dressed to Fluoresce

Bioluminescent proteins, coupled with fluorescent proteins, emit light in some living organisms such as deep sea fish and jellyfish. This effect is recreated by laser cutting the green fluorescent protein molecule, from the jellyfish *Aequorea victoria*, out of cartridge paper. Then the paper is coated with glow-in-the-dark paint, and assembled into a mesh layer of material around the black body of the dress. The molecules 'float' around certain parts of the dress, mirroring jellyfish movement underwater, and in the dark the dress glows green much like bioluminescent proteins in deep sea organisms.

Fabric and laser cut paper
Rachel Glinsman

PDBe.org/1ema




JUNE

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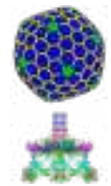
Agents of Disease

Bacteriophage are a type of virus, and some look like the creepers in the game Minecraft. They get inside bacteria, replicate and then can break open and kill the bacterium, leading to their name “bacteriophage” which translates to “bacteria eater” in Greek. In some cases, they don’t destroy the bacteria, but can turn them into agents of disease. Infected with ‘phage’, these bacteria are able to infect humans and cause food poisoning and other diseases. It is this darker side of bacteriophage that is captured here in this artwork.

Pen and pencil on paper
K. Prince

PDBe.org/5iv5
PDBe.org/5vf3




JULY

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Disruption of the Mind

This is a textile and cultural piece, showing large holes and cracks within the material with large wires and string tangling around in a consuming manner to portray the effects of Tau tangles in Alzheimer's disease. Ethernet cables represent the nerve cells transmitting thoughts in the brain. The holes are in the memory of people suffering the disease, whereas the wire, harsh lines and fabric are the neurofibrillary tangles and amyloid plaques that are present in the brain tissue of patients. The pattern within the glass depicts these microscopic Tau protein plaques and aggregates within the brain. This glass is hanging off the piece, while the holes and tangled lines consume the entire artwork.

Mixed media, ethernet cable, heat pressed plastic onto chicken wire with added tactile materials such as netting and wire.
Lucy Tunsley

PDBe.org/5o3o


AUGUST

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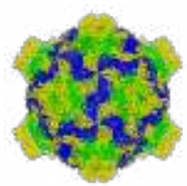
Icosahedron Assembly

The virus depicted here is deformed wing virus and it infects honey bees. Like many other viruses, it is made up of repeating symmetrical units that self-assemble into three dimensional objects that can be built with flat faces, edges and corners or vertices. The shapes the virus form are often similar to the Platonic solid series that the ancient Greeks studied extensively. Theaetetus gave each a mathematical description and they are prominent in the philosophy of Plato, hence the name Platonic solids. He wrote about them around 360 B.C in his work *Timaeus* where he linked the shapes with four classical elements; earth, air, water, and fire.

Pen and watercolour
Rebecca Sheng

PDBe.org/5mv5




SEPTEMBER

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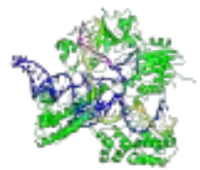
Pygmalion 5x2g

This photoshop piece, entitled “Pygmalion 5x2g”, shows the progression of a being, written in code and becoming something akin to human, with different colours and degrees of shading. Inspiration was drawn from the myth of Pygmalion, whose sculpture came to life. The image shows the enzyme Cas9, which can be used to edit DNA. This piece illustrates the idea of DNA being altered and changed until AI and humans become virtually indistinguishable.

Digital print
Annabel Rogers

PDBe.org/5x2g




OCTOBER

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Under the Ocean

This image shows a ribbon diagram of the protein myoglobin bound to oxygen. Myoglobin is the primary oxygen-carrying protein found in muscle tissues. Having a high concentration of myoglobin in muscle, to carry the oxygen, allows animals to hold their breath for longer - a very useful function for diving mammals, like whales and seals. The myoglobin structure shown here is from sperm whale, a mammal which can dive, and hold its breath for up to 90 minutes at a time. This painting was inspired by the work of the artist Gregory Edwards.

Acrylic painting and pencil
Henry N.

PDBe.org/1mbo


NOVEMBER

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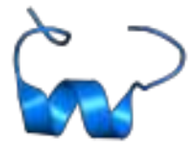
Clouds with a Silver Lining

This artwork depicts a toxic peptide from the Imperial cone, a species of predatory sea snail that can be extremely venomous. These snails use a needle-like modified tooth to inject toxin, both to attack prey, such as small fish, and in defence. These toxins from the cone snail family are being studied for their medical uses, as they each act on a very specific class of protein receptors in the victim. One such example of a medicine derived from these toxins is Ziconotide (or Prialt). It is administered as pain relief for those suffering severe and chronic pain, and is about 1,000 times as effective as morphine.

Intaglio print
William Rayner

PDBe.org/1akg




DECEMBER

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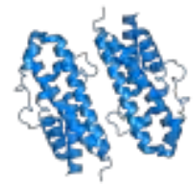
Protein Data Bank in Europe

Marvel's Captain America

This artwork explores the idea of greatness of an individual and greatness of a nation. Captain America is both the individual and the nation. The greatness of the individual can be shown through the character of Captain America, who is ideally a symbol of hope and strength. He is perceived as great through his strength and physicality. This piece questions whether his greatness comes from the man behind the superhero identity, or from the serum that gave him his powers. Thus the shield represents the person while the cartoon coils of Somatotropin, a growth hormone, represents the serum. The colours used, blue, pink and orange, represent the fractured state of masculinity and femininity, and asks whether masculinity equates to greatness.

Digital Print
Emi Rush

PDBe.org/1huw



About the project

This project is a collaboration between Protein Data Bank in Europe (PDBe), The Arts Society GRANTA, The Arts Society CANTAB, and Cambridge schools (The Leys, The Perse, Stephen Perse Foundation and Impington Village College). School students are using 3D structures of molecules in the PDB archive as inspiration for artworks within their school art curriculum. The resulting images from the students are featured in this calendar. PDBe is part of EMBL-EBI, based on the Wellcome Genome Campus. We thank the campus Public Engagement Team for their help.

Martyna C.

Martyna is a student at Impington Village College. She likes horses and painting. Her favourite subject is art.

Natalia Heirman

Natalia is a student at Stephen Perse Foundation Sixth Form College who is studying the International Baccalaureate with Visual Art, Biology and Psychology as her higher level subjects. She enjoys kickboxing.

Tia D.

Tia is a student at Impington Village College and enjoys painting and visiting art galleries. Her ambition is to follow in her father's footsteps and pursue a career in recruitment.

Kitty Yarrow

Kitty is a student at Stephen Perse Foundation Sixth Form College and is studying English, Latin and Art at A level. She describes art as her hobby.

Megan S.

Megan is a student at Impington Village College and likes gymnastics and music - especially pop music. Her favourite subjects are Art and German.

Rachel Glinsman

Rachel is a student in the upper sixth at the The Perse school, and she plans to study art at college next year.

K. Prince

K. Prince is a student at Impington Village College who loves being outside and is very interested in creatures, real or not real.

Lucy Tunsley

Lucy is a student at Stephen Perse Foundation Sixth Form College and is studying Geography, Maths and Art at A Level. She enjoys drama and acted recently in a 6th form production.

Rebecca Sheng

Rebecca is a student at Stephen Perse Foundation Sixth Form College and is studying Art, Chemistry, Mathematics and Classics at A level.

Annabel Rogers

Annabel is a student at Stephen Perse Foundation Sixth Form College and is studying English Literature, Art, Psychology and Latin at A level. She enjoys writing and is currently editor of the school newspaper.

Henry N.

Henry is a student at Impington Village College and enjoys art.

William Rayner

William is a 13 year old student at Impington Village College and likes art and fiction. He chose to study art next year in GCSE because he very much likes creating things.

Emi Rush

Emi is a student at Stephen Perse Foundation Sixth Form College and is studying Art, English and History at A Level. She enjoys writing and drama.

THE ARTS SOCIETY GRANTA

EMBL-EBI

WELLCOME GENOME CAMPUS | PUBLIC ENGAGEMENT

PDBe Protein Data Bank in Europe

About the proteins

January

PDBe.org/5ide

Structure and organization of heteromeric AMPA-type glutamate receptors. Herguedas *et al*. Science (2016)

February

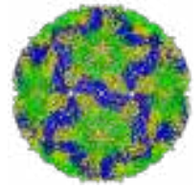
PDBe.org/4nty

X-Ray Structure of Acid-Sensing Ion Channel 1-Snake Toxin Complex Reveals Open State of a Na(+)-Selective Channel. Baconguis *et al.* Cell (2014)

March

PDBe.org/1lrh

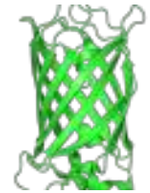
Crystal structure of auxin-binding protein 1 in complex with auxin. Woo *et al.* EMBO J. (2002)



April

PDBe.org/5aca

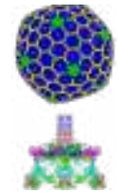
Structure-based energetics of protein interfaces guides foot-and-mouth disease virus vaccine design. Kotecha *et al.* Nat. Struct. Mol. Biol. (2015)



May

PDBe.org/1ema

Crystal structure of the Aequorea victoria green fluorescent protein. Ormö *et al*. Science (1996)



June

PDBe.org/5iv5

Structure of the T4 baseplate and its function in triggering sheath contraction. Taylor *et al*. Nature (2016)

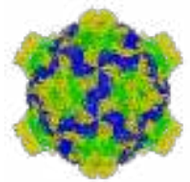
PDBe.org/5vf3

Cryo-EM structure of the bacteriophage T4 isometric head at 3.3-Å resolution and its relevance to the assembly of icosahedral viruses. Chen *et al*. Proc. Natl. Acad. Sci. U.S.A. (2017)

July

PDBe.org/5o3o

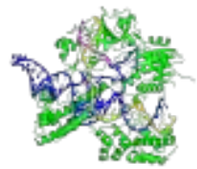
Cryo-EM structures of tau filaments from Alzheimer's disease. Fitzpatrick *et al*. Nature. (2017)



August

PDBe.org/5mv5

Structure of deformed wing virus, a major honey bee pathogen. Škubník *et al*. Proc. Natl. Acad. Sci. U.S.A. (2017)



September

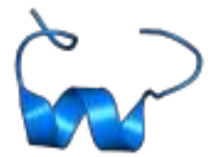
PDBe.org/5x2g

Crystal Structure of the Minimal Cas9 from *Campylobacter jejuni* Reveals the Molecular Diversity in the CRISPR-Cas9 Systems. Yamada *et al*. Mol. Cell. (2017)

October

PDBe.org/1mbo

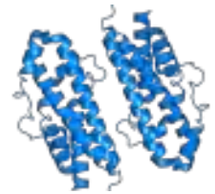
Structure and refinement of oxymyoglobin at 1.6 A resolution. Phillips. J. Mol. Biol. (1980)



November

PDBe.org/1akg

Crystal structure at 1.1 A resolution of alpha-conotoxin PnIB: comparison with alpha-conotoxins PnIA and GI. Hu *et al*. Biochemistry (1997)



December

PDBe.org/1huw

The crystal structure of affinity-matured human growth hormone at 2 A resolution. Ultsch *et al*. J. Mol. Biol. (1994)

PDBe

Protein Data Bank in Europe

Explore and view PDB entries in 3D at PDBe.org

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WORLDWIDE PDB PROTEIN DATA BANK

PDBe is a member of the Worldwide Protein Databank (wwPDB.org).

EMBL-EBI

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