UNBOXED
CREATIVITY IN THE UK

ABOUT US

WE ARE CELLULAR

This resource has been produced for About Us as part of UNBOXED: Creativity in the UK.

This interdisciplinary resource brings together creative writing, literature and science: teachers can use it in the classroom to explore literary techniques in scientific contexts, and to explore the creativity behind scientific themes. Older students can use the resource in their own time to further their reading and generate ideas for poems of their own.

CURRICULUM LINKS

England:
English: Writing & Reading Composition
Science: Working Scientifically, Structure & Function of Living Organisms (KS3), Cell Biology (KS4)
Key Stages: KS3, KS4, KS5

Northern Ireland:
Language & Literacy: Writing & Reading
Science & Technology: Organisms & Health
Key Stages: KS3, KS4, KS5

Scotland:
Languages: Literacy & English – Writing & Reading
Sciences: Biological Systems
Levels: Third/Fourth Level, Senior Phase

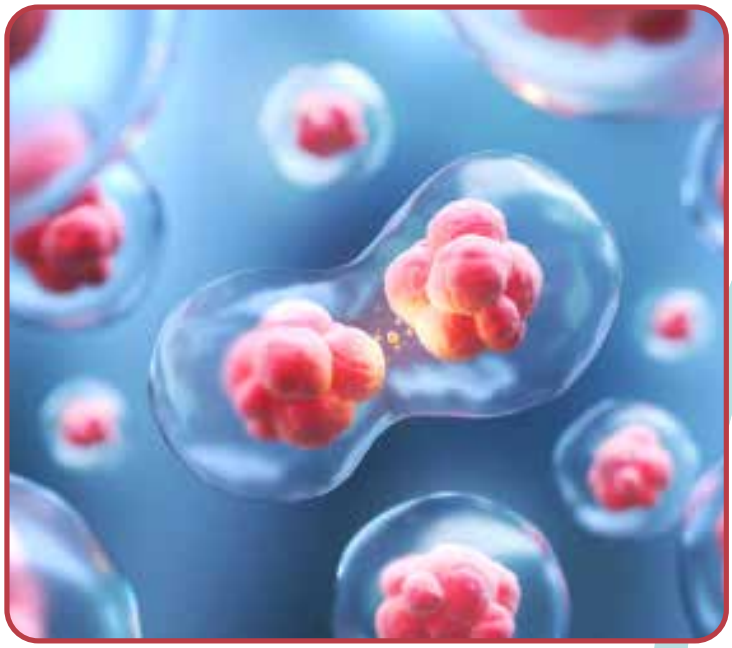
Wales:
Languages, Literacy & Communication: Literature
Science & Technology: Being Curious, The World Around Us
Progression Steps: PS4, PS5, A levels

AGES 11–18

Topics
- Cell biology
- History of science – Robert Hooke
- identity and diversity

Literary features
- Metaphor
- Simile
- Punctuation
- Creative writing

This lesson plan explores Jack Cooper's 'Micrographia, 1665', a new poem about the discovery of cells by Robert Hooke. The resource contains discussion and writing prompts to inspire students to explore the reasons why poets use simile and metaphor, think about the power of a name, and draw from cell biology to create their own writing.



GETTING STARTED

The poem you are about to read is all about the discovery of cells. When you think of cells, what do you think of? Brainstorm words that you would use to describe them. Before you read on, imagine you are the scientist who discovers cells for the first time. How would you feel?

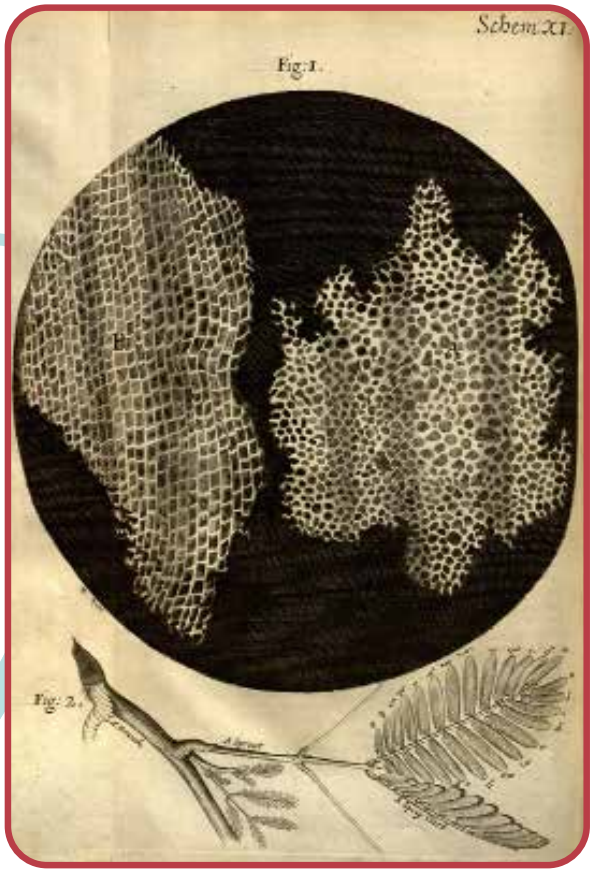
The activities in this resource will explore metaphors and similes. What do you know about them already? How are they similar and how are they different?

EXPLORING THE TOPIC

The information in this resource was provided by Jack Cooper, the poet and scientist whose writing you are about to read, and fact-checked by Dr Darius Koester.

ABOUT CELLS

Cells are the smallest unit of life, meaning that every living thing is made of cells. Unicellular organisms consist of a single cell that carries out all essential life processes, such as feeding, digestion, and reproduction. Bacteria are unicellular organisms. Multicellular organisms are formed from many cells that work together, often specialising to do jobs that other cells in the same organism don't. A multicellular organism can have fewer than one hundred cells, or it can have trillions: the average human body is estimated to have approximately 30 trillion cells – more cells than there are stars in the Milky Way!



THE DISCOVERY OF CELLS

Cells were discovered in 1665, over 350 years ago. This means we knew about cells more than a century before the United States of America was founded, decades before the piano was invented, and a whole year before the Great Fire of London!

When we think of cells, we tend to think of them as flat and unmoving. Perhaps this way of thinking goes all the way back to their discovery. Cells were discovered by Robert Hooke, an English scientist. He used a handmade microscope to study slices of dead cork, and became the first human in history to see cells. With more advanced microscopes, we now know that cells are actually quite lively!

The average human cell is around 10 micrometres in diameter, meaning they are 100,000 times smaller than you are! To put that into perspective, if you were 100,000 times bigger, your head would reach into space and each hand would be the size of Mount Everest. Their size is part of what makes cells difficult to study. We may have known about cells in 1665, but it was centuries before technology developed to a point where real progress could be made in understanding them.

CELL MIGRATION

Cell migration is the deliberate movement of cells in response to information from their surroundings. Unicellular organisms might migrate to find nutrients, or to move into an area with a temperature that better suits them, while there are many reasons that individual cells within a multicellular organism might migrate. Some reasons cells migrate include:

- Immune cells chase invading bacteria.
- Platelets travel to wounds to help them heal.
- Neural crest cells migrate through embryos to make sure the nervous system develops.

Cells can also migrate in groups, which we call **collective migration**. Interestingly, there are similarities between how groups of cells move and how groups of animals move. Think of flocks of birds, shoals of fish, and swarms of insects: the group wants to reach their destination as quickly as possible without getting lost, without the animals crashing into one another, or getting separated.

The way these groups work together to move can be mathematically modelled, and it seems that collectively migrating cells and groups of animals share some strategies in how individuals communicate and share information with one another, how they keep a consistent distance between one another, and how they respond to obstacles and threats.

By studying one group, scientists gain insights into the other. Since cell migration happens so often in multicellular organisms, diseases can be caused by cell migration going wrong. If scientists can better understand how cells migrate, they can understand how and when it might go wrong, and look into ways to stop that from happening.

CELL MIGRATION MECHANISMS

There are many ways that cells can migrate. For example, bacteria use tail-like flagella to push themselves forward, rotating like propellers.

Human cells use their **cytoskeleton** to move. Think about the role of your skeleton in your body: it helps your body keep its shape, protects and holds your organs in place, and helps you walk – by contracting or relaxing muscle that is attached to bone, you can move your legs. The cytoskeleton does a similar thing for your cells. Molecules called F-actin and myosin attach themselves to the plasma membrane of a cell. Their contraction and relaxation moves the plasma membrane, and by coordinating this process across large areas of the plasma membrane, the entire cell moves.

NOW LET'S THINK ABOUT THIS TOPIC IN THE FORM OF A POEM...

Here is 'Micrographia, 1665', by Jack Cooper

MICROGRAPHIA, 1665

Robert Hooke – on observing the rigid, repeating pores
in a piece of cork
laid out like a lattice of hollow bricks
under the lens of his hand-made microscope –
christened them cells,
thinking of the minute rooms monastics would seal themselves in,
or a microscopic prison
petrified beneath his gaze.

But if he had seen living tissue,
cells dancing along a Petri dish like water droplets
in a frying pan,
what would he have named them?

Comets.

Quicksilver.

Self-slung slingstones.

How would the first human in history to see the building blocks of a body think of his own?

Curiosity is a dividing cell;
something that can't help but make more of itself.

Read through 'Micrographia, 1665': you could do this together as a class or quietly to yourself if you're using this resource independently. Think about the following discussion points. You could talk to a partner about them or jot down some ideas.

THEMES AND FORM

- What do you think the themes of the poem are? Why do you think the poet, and poets in general, might choose to write about cells and other scientific topics? Did the poem help you see or understand cells in a way that the scientific background didn't?
- Why do you think the poet chose not to write from the perspective of Robert Hooke? How might the tone of the poem be different if it were written from Hooke's point of view?
- The poem uses dashes, indentations, and a semi-colon. Read the poem out loud, by yourself or as a group. How did these features of punctuation influence your reading of the poem? Why do you think the poet would want to guide the reader in this way?
- Think about the line breaks. How does their placement affect the emphasis and impact of a phrase?
- Look again at this sentence: 'How would the first human in history to see the building blocks of a body / think of his own?'. What do you think the poet meant by this? Can you think of how line breaks might have been use differently here? How would that have changed the poem?

METAPHOR AND SIMILE

In groups, identify the metaphors and similes used in the poem. Now choose one metaphor in the poem to focus on. Can you describe how it works and what makes it an effective metaphor? Rewrite that metaphor as a simile. Does this change how it impacts the reader? Why?

Metaphor and simile have important roles in both poetry and scientific communication. Scientists have to use very precise language so they can describe complicated concepts accurately, but they also need to make their communication accessible, particularly when their field of expertise has an impact on the general public. Simile and metaphor can be useful in explaining science. For example, during the Covid-19 pandemic, England's Deputy Chief Medical Officer, Jonathan van Tam, became known for his use of metaphor in explaining aspects of public health. Talking about the development of vaccines, he said: "It's clear in the first half, the away team gave us an absolute battering, and what we've done now is it's the 70th minute, they got a goal, and in the 70th minute we've now got an equaliser." Take a look at more of his metaphors in this BBC article. How do you think metaphor made his message clearer?

Look back at the 'Exploring the topic' section of this resource. How many examples of metaphor and simile can you find? How did it help you understand the way cells behave?

Poets are also very precise in their use of language, and they also draw frequently on simile and metaphor. Why do you think poets use metaphor and simile? Is it for the same reasons that metaphors and similes were used in the scientific background section?

THE METAPHOR OF NAMES

Names are powerful: they can influence how we think about something. Can you think of some objects or brands whose names influence our perception of it? Discuss the relationship between name and identity in the following. Are any of these metaphorical?

- Facebook
- Manchester United
- Galaxy Chocolate
- Jaguar cars

When scientists discover something, they often have the honour of naming it. So when Robert Hooke looked at slices of dead cork through his microscope, he saw that the cork was made of highly organised structures that were similar in size and shape. They reminded him of small rooms in monasteries called 'cells', so he named his discovery after them, creating a metaphor.

'Micrographia, 1665' imagines what cells would have been named if Robert Hooke had seen living, migrating cells instead of dead cork. Discuss the three names in the poem. Is there a common theme? Why do you think the poet chose these metaphors? What do they tell the reader about 'living tissue'?

Earlier, we brainstormed words that we would use to describe cells. Read through that list again. Do you think that list would have been different if cells had been named after comets, quicksilver, or slingstones instead?

Imagine cells were only just discovered today. What would you name them? Perhaps you'd name cells after something that reminds you of how they look, like a football, or something that reminds you of how they move, like a slug? Be as imaginative as you want! There's no wrong answer as long as you can think of a reason for the name.

What else could you rename? As a group, choose one or two objects from the list below and think of metaphors that could describe them. For example, a racing car could be called a greyhound. Have fun!

- Lamp
- Pen
- Computer
- Eraser
- Pillow
- Shoe
- Cardboard box
- Book
- Mirror
- Mobile phone
- Wallet
- TV
- Car
- Chair
- Tree
- Football

WRITING YOUR OWN POEM

There are lots of different approaches to writing a poem. No approach is right or wrong: it's about finding what works for you. Here are four ideas to get you started.

SIMILES

In the 'Exploring the topic' section, the reader's body was compared to Mount Everest to help them understand how small cells are. Write a poem where you use similes to help the reader understand something. This might be an unusual object or situation. It might be a complicated emotion. Whatever it is, take advantage of how similes let you make unexpected and exciting comparisons.

CELLS ON THE MOVE

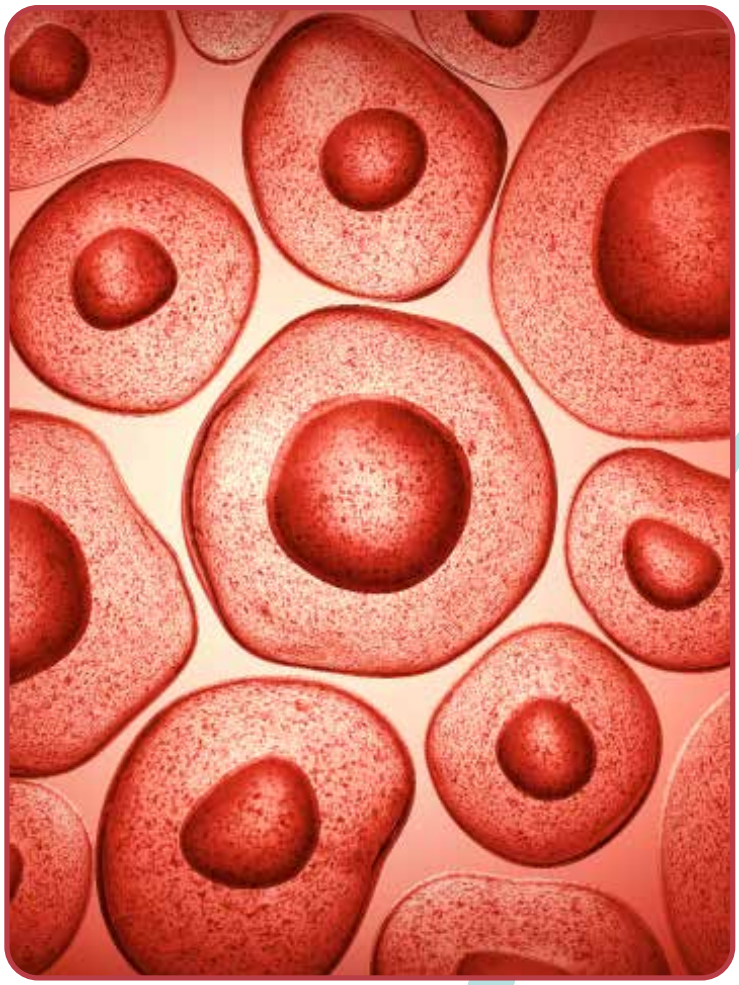
Watch one of the migrating cell videos that are provided below in the Further Resources section. Using metaphor and simile, write a poem that describes what you see. What stands out to you? You might focus on how the cells move, or on how the collectively migrating cells work together. The 'Exploring the topic' section also has some ideas you could explore: perhaps you want to write about how a group of cells is like a shoal of fish?

CELLS AS THE MUSE

Write a poem that uses cells to explore another topic. For example, platelet cells migrate to wounds to help them heal: could this be used as a metaphor for your friends and family getting you through a tough time? Cells are beautiful and complex, but they can't be seen with the naked eye: what else can't people see?

DISCOVERY

'Micrographia, 1665' is about the discovery of cells. Write a poem about a different moment of discovery, and how it changed the world. This could be personal. How did it feel when you discovered a sport you love? How did it feel when you realised you'd met a new friend? Or you could write a poem about another scientific discovery. What would it be like to be the first human in history to start a fire?



This resource and the poem contained within it, 'Micrographia, 1665!' were written by poet and scientist Jack Cooper. Jack Cooper is a poet and scientist, researching embryonic immune cell migration. He has performed on BBC CWR and BBC Hereford & Worcester, and was a mentee on the BBC Words First Developmental Scheme with Young Identity. You can read more of Jack's poems here.

FURTHER RESOURCES:

In this video, the poet featured in this resource describes his latest scientific research (0:00-0:51) and how he got started in poetry (2:04-onwards). Please note, this video contains mildly offensive language.

Explanation of the cytoskeletal model of movement by Khan Academy

An immune cell chasing a bacterium (*in vitro* - cells in culture/a petri dish)

Migrating stem cells tracked over 24 hours (*in vitro* - cells in culture/a petri dish)

Collective cell migration in a zebrafish embryo (*in vivo* - a recording of the embryo itself, able to be done due to the transparency of the embryo)

Collective cell migration of kidney cells in an artificial environment (*in vitro* - cells in culture/a petri dish)

Immune cells migrating within the inner ear of zebrafish embryos (*in vivo* - a recording of the embryo itself, able to be done due to the transparency of the embryo)

Border cells (green) migrating through a fruitfly egg chamber (red) (*in vivo* - a recording of the embryo itself, able to be done due to the transparency of the embryo)

FOR OLDER STUDENTS

Further written explanation of the concepts introduced in this resource can be found on the website of the MechanoBiology Institute. In particular, see this page on cytoskeletons.

NEXT STEPS

For more poetry opportunities, check out Young Poets Network, The Poetry Society's free online platform for poets worldwide up to the age of 25. You'll find features, challenges and competitions to inspire your own writing, as well as new writing from young poets, and advice from the rising and established stars of the poetry scene. youngpoetsnetwork.org.uk

About this project

About Us is one of ten commissions for UNBOXED: Creativity in the UK. The project explores the infinite ways we are connected to the universe, the natural world and one another. A major live show toured the UK in spring 2022.

59 Productions is an award-winning design studio and production company who created the breath-taking video design for the London 2012 Olympic Opening Ceremony. Stemettes is an award-winning social enterprise working to bring young women and non-binary young people into Science, Technology, Engineering and Maths (STEM) careers. The Poetry Society is an Arts Council England National Portfolio Organisation and is one of the UK's most dynamic arts organisations, championing poetry for all ages.